EMERGENCY EVALUATION STUDY REPORT ON THE JULY 29, 2003, FLOODING IN AJO, ARIZONA

(AJO FLOOD ENGINEERING ASSISTANCE PROJECT)

Prepared for:

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(REVISED AUGUST 2004)

Tetra Tech, Inc.

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I. INTRODUCTION

Ajo, Arizona, is an unincorporated community located within Pima County, Arizona, and lies approximately 160 miles west of Tucson (see Figure 1: Location Map). On July 29, 2003, the community of Ajo experienced a severe flood. From approximately 7:45 p.m. to 9:00 p.m., a very strong thunderstorm produced significant rainfall in the Ajo area. Flooding occurred primarily along the Gibson Arroyo and tributaries located south of the arroyo (see Figure 2: Vicinity Map).

The Pima County Department of Transportation and Flood Control District was quick to respond to the flood, providing immediate (same-day and next-day) assistance with clean up and maintenance of streets, bridges, and portions of the Gibson Arroyo. Pima County Flood Control District (District) staff members were also on the scene very soon after the flood in order to document the extent of the flooding, assess damages to homes and infrastructure, and to interview residents. In addition, the District immediately asked for and received approval to enter onto the portion of the Gibson Arroyo owned by Phelps Dodge in order to dredge along an extensive stretch of the channel to provide increased hydraulic capacity, which would help avoid, or at least reduce, similar flooding in the event that another significant storm event occurred.

As part of the District's response, a consulting contract was awarded to Tetra Tech, Inc., for the purpose of providing an emergency evaluation and report on the flooding. The consultant's work included new aerial-topographic mapping for the affected Ajo area, a field review of the flooding, data collection, and preparation of preliminary hydrologic and hydraulic analyses.

An initial assessment of flooding conditions and data collection was performed, including surveys for the new mapping. Using the new aerial-topographic mapping, detailed hydraulic analyses were performed using HEC-RAS computer modeling of the Gibson Arroyo. With the aid of the new mapping, flow paths and watershed boundaries within the urban area of Ajo were also identified. In February 2004, a detailed field assessment was performed to:

- Field-verify the results of the hydraulic modeling;
- Field-verify flow paths through the urban area; and
- Identify and measure hydraulic structures within the southern watersheds.

Finally, Tetra Tech has prepared this summary report of the investigation of the July 29, 2003 flood event, with supporting engineering analyses. This report also identifies elements that should be included in a Master Drainage Plan for Ajo, Arizona, that would provide future flood-control solutions beyond the recommendations emanating from the initial emergency response and investigative work.

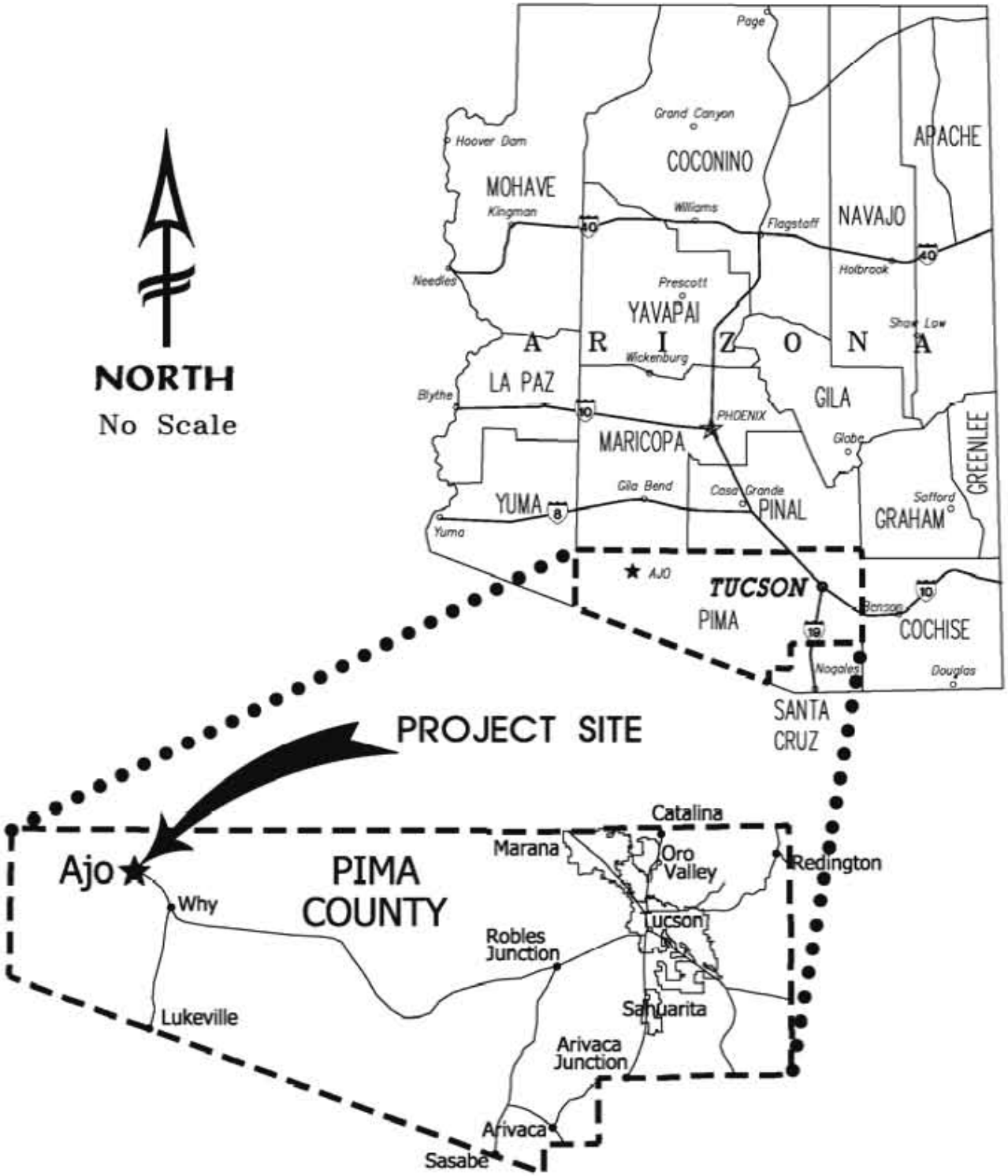

FIGURE 1

VICINITY MAP

AJO FLOOD ENGINEERING ASSISTANCE PROJECT

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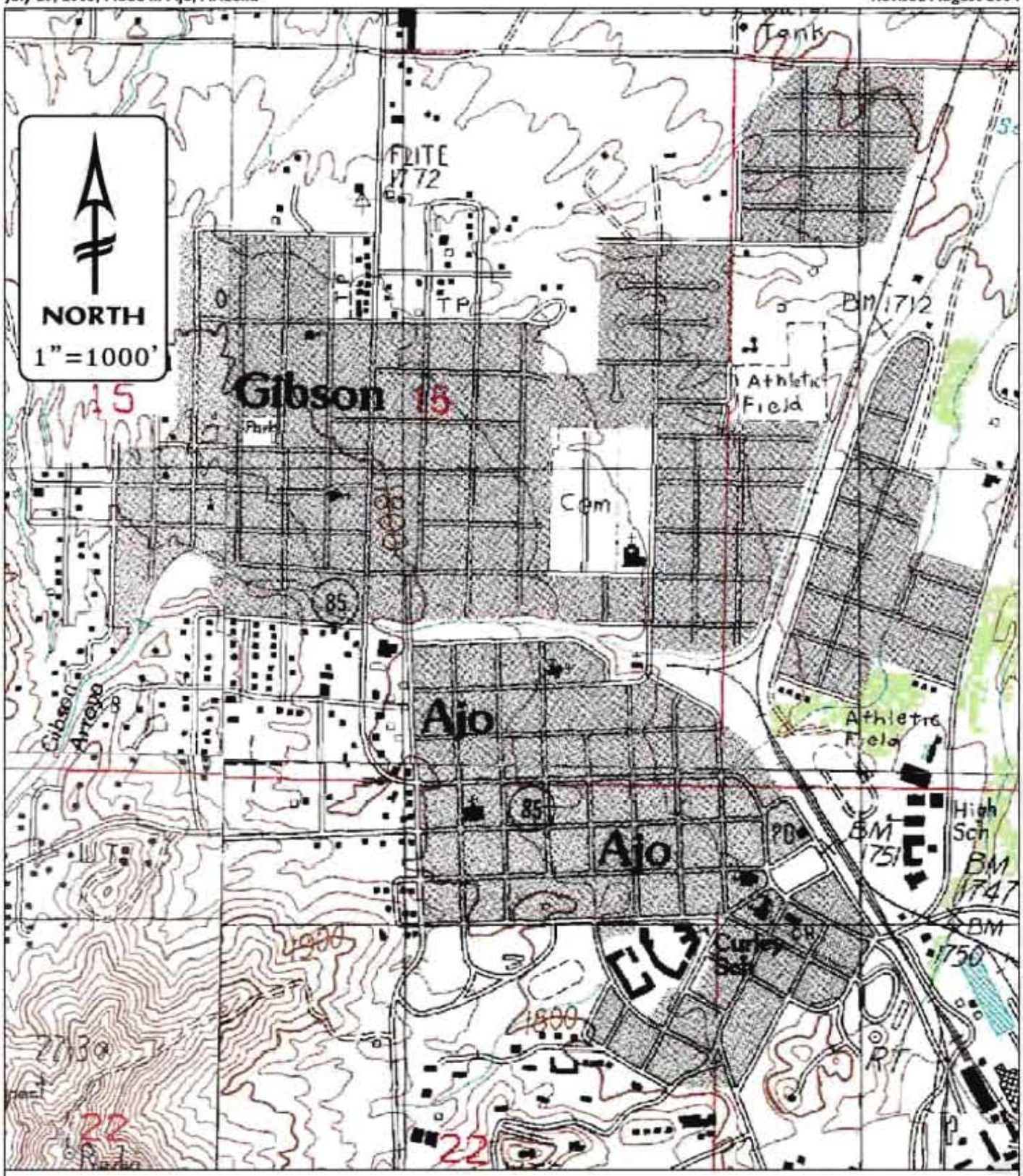

FIGURE 2

LOCATION MAP
AJO FLOOD ENGINEERING ASSISTANCE PROJECT

TETRA TECH, INC.

II. DESCRIPTION OF JULY 29, 2003 FLOOD

A. Rainfall

On July 29, 2003, from approximately 7:45 p.m. to 9:00 p.m., a very strong thunderstorm occurred over the Gibson Arroyo watershed. According to eyewitnesses and National Weather Service (NWS) radar information, the storm started near Why, Arizona, and then tracked northerly to Ajo. In Ajo, the storm shifted to the west, and stalled near the Little Ajo Mountains in the upper portions of the Gibson Arroyo watershed. The cell then crossed the mountains in a westerly direction. The storm created very high runoff in the Gibson Arroyo and 4 smaller watersheds, located immediately to the south and lying between Ajo and the nearby Phelps-Dodge copper pit. Unfortunately, the NWS was not able to produce a radar image for the storm, because Ajo is located near the working limits for both the Tucson and Yuma radar stations, and such an image was therefore unavailable.

Runoff patterns indicate that the intense portion of the storm was relatively short in duration, and centered over the western portion of Ajo. The rain gauge at the Pima County Automotive Services Shop recorded 1.75 inches of rainfall in about 30 minutes. Unofficial rainfall amounts increased to the west. These unofficial reported amounts ranged from 2.7 to 4.0 inches of rain in approximately one hour. Information indicates that the NWS called the Ajo Sheriff's Department three times in order to warn them about high winds and the possibility of brief, heavy rainfall. Based upon the radar data the NWS was receiving, its estimate of rainfall amounts was less than observed values. The NWS estimated that the town received a "wet microburst." It is also possible that the direction the storm took over the mountains created orographic lifting, which would have further increased total precipitation.

B. Flooding

The majority of the flooding that occurred in Ajo on July 29, 2003, was associated with the Gibson Arroyo. However, flooding also occurred along 4 southern tributaries. The most severe flooding occurred at points located immediately upstream and downstream of the Phelps-Dodge railroad tracks, which were overtopped during the flood. Damages to public infrastructure were minimal, given the widespread extent of the flooding. Pima County was quick to remove debris from the roads, and also removed sediment and debris from underneath the East Second Avenue Bridge. It was not uncommon to see anywhere from one-foot-high to two-foot-high debris lines on residential chain-link fences, and in some instances even higher debris lines. It appeared that the chain-link fences might have slowed down the runoff on private properties, thus reducing the potential for erosion damages to existing residences.

Many residences in Ajo were flooded. During Pima County's investigation on July 31, 2003, it was observed that a number of residences had wet carpets; and individual property owners stated that some of their neighbors had water several inches deep in their homes. Pima County estimates that the flooding affected approximately 100 properties. Photographs taken by Richard Walker, of Pima County Automotive Services in Ajo, showed very large debris lying in the roadways immediately after the flood. Some trees were uprooted, broken, and even partially stripped of their bark—demonstrating the force and energy of the floodwaters.

The eastern end of Arroyo Avenue, located west of the railroad, appeared to have been subjected to the greatest depth of overbank flow. Near this location, the railroad abruptly forces runoff from the Gibson Arroyo to turn from an easterly to northerly direction at an extremely sharp angle. The fall/slope of the segment of the channel located downstream of the abrupt turn is significantly flatter than the fall/slope of the upstream segment of the channel. Along this flatter downstream reach of the Gibson Arroyo, from East Second Avenue south to Arroyo Avenue, the railroad was overtopped at many locations. Upstream, flows broke out across the right overbank, and flowed to the south. Neighborhoods east of the railroad were also flooded, but were subjected to significantly less debris.

In some locations the flooded areas were wider than what is shown on the existing Flood Insurance Rate Maps. Based upon specific information collected by the District for areas of inundation along both the Gibson Arroyo and the southern tributaries, a map has been prepared that depicts flooded areas in Ajo on July 29, 2003 (see Figure 3). The map also depicts some of the flooding sources during the July 29, 2003 flood event.

The District provided Tetra Tech with ground photographs taken immediately following the flood. These ground photographs depict the magnitude of the flooding and erosion that occurred in Ajo. The photographs are included in Figure 4. Additional photographs are included in Appendix 2.

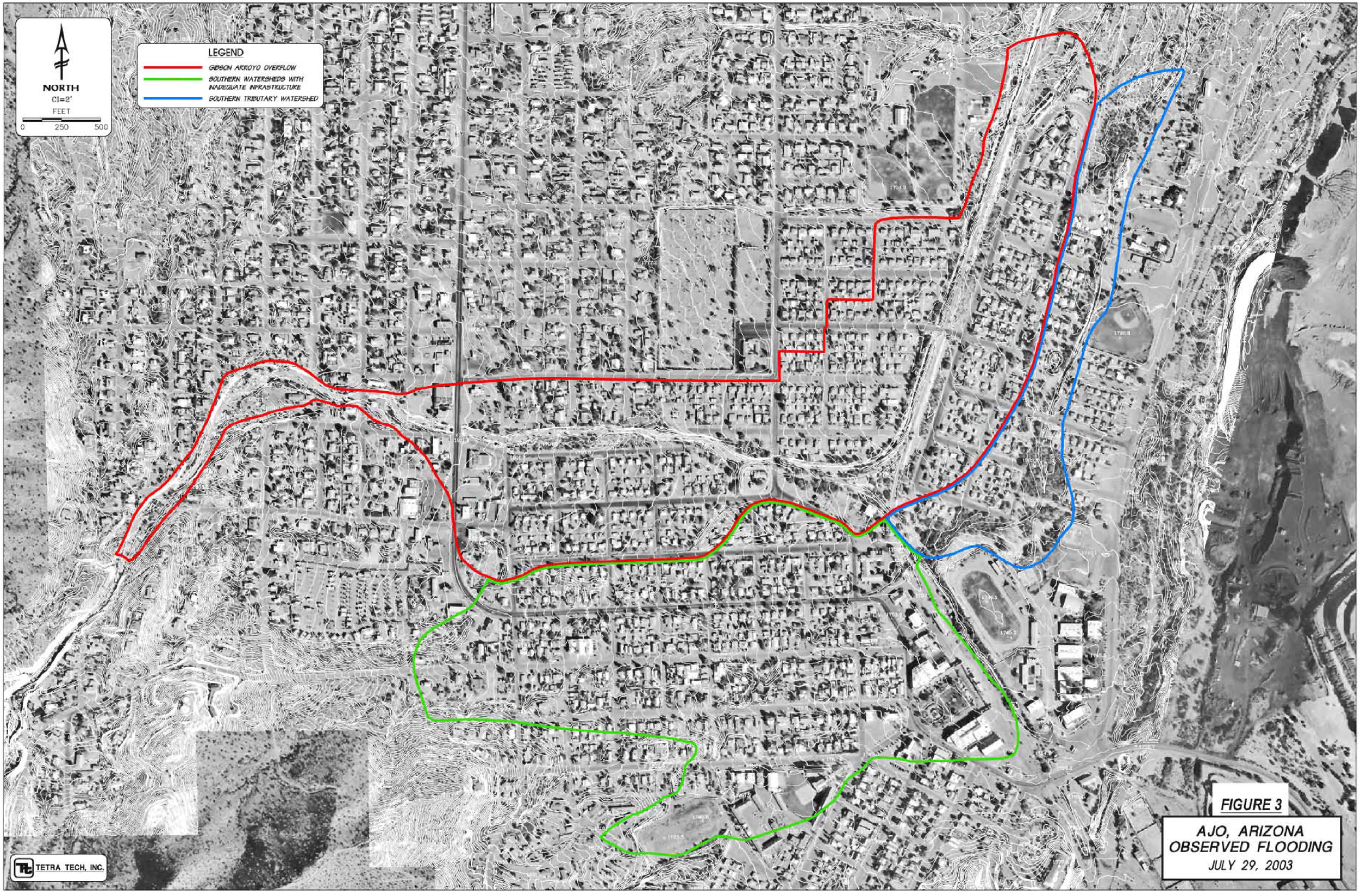

FIGURE 3

AJO, ARIZONA
OBSERVED FLOODING
JULY 29, 2003

Figure 4 - Ground Photographs, Aftermath of July 29, 2003, Flood

Looking North at Railroad North of East Second Avenue Bridge in Ajo
(09-18-03)

Looking East at East Second Avenue in Ajo, East of Railroad
(09-18-03)

Figure 4 (Continued)

Looking North at Gibson Arroyo in Ajo
(09-18-03)

Looking South at Railroad South of East Second Avenue Bridge in Ajo
(09-18-03)

Figure 4 (Continued)

Looking South at Gibson Arroyo in Ajo, South of East Second Avenue
(Photo Taken During Channel Dredging on 09-02/03-03)

Looking South at Gibson Arroyo in Ajo, South of East Second Avenue Bridge
(09-18-03)

Figure 4 (Continued)

Example of Channel Dredging by Pima County along Gibson Arroyo in Ajo (09-02/03, 2003)

Another Example of Channel Dredging by Pima County along Gibson Arroyo in Ajo (09-02/03, 2003)

Figure 4 (Continued)

Example of Debris Blockage at East Second Avenue Bridge
Over Gibson Arroyo in Ajo During Flood of 07-29-03

Looking North (Downstream) at East Second Avenue Bridge Over the
Gibson Arroyo in Ajo after Pima County Dredging on 09-02/03-03

Figure 4 (Continued)

Example of Flow Depth in Overbank Areas Adjacent to Gibson Arroyo in the Vicinity of East Second Avenue in Ajo During Flood of 07-29-03

Example of Local Scour Caused by Overbank Flows in Ajo During Flood of 07-29-03

Figure 4 (Continued)

Example of Magnitude of Debris and Sediment Transport in Ajo
During Flood of 07-29-03

Another Example of Flood and Erosion Damage in Ajo
During flood of 07-29-03

Figure 4 (Continued)

Another Example of Debris Blockage at East Second Avenue Bridge on Gibson Arroyo in Ajo During Flood of 07-29-03

Example of Damage to Railroad due to Flow Escaping the Gibson Arroyo in Ajo During Flood of 07-29-03

Figure 4 (Continued)

Another View of Damage to Railroad from Flow Escaping the Gibson Arroyo in Ajo During Flood of 07-29-03

Example of Flood Damage along Drainage Tributaries to the Gibson Arroyo in Ajo During Flood of -07-29-03

Figure 4 (Continued)

Flows piped under wall located to the northeast of the Gibson dip section at Cedar

Another Example of Flood Damage in the Vicinity of the Gibson Arroyo in Ajo
During Flood of -07-29-03

Looking at Debris on fence at Arroyo and Cedar. Looking north.

Example of Flow Depth in Overbank Areas of Gibson Arroyo in Ajo
During Flood of 07-29-03

Figure 4 (Continued)

Property located at the intersection of the Gibson Arroyo and Arroyo Street. Looking northerly.
Another Example of Flood Damage Caused by Overbank Flows
from the Gibson Arroyo in Ajo During Flood of 07-29-03

Property at east end of Arroyo Street next to Gibson Arroyo by Railroad.
Another Example of Overbank Flow Depths in the Vicinity of
the Gibson Arroyo in Ajo During Flood of 07-29-03

Figure 4 (Continued)

Looking upstream from Second Avenue at railroad embankment (right embankment of Gibson Arroyo)

Photo Showing Repairs to 07-29-03 Flood Damage Underway to Railroad Adjacent to Gibson Arroyo in Ajo (Photo Date: 07-31-03)

Mud on back porch. Location unknown but east of Railroad Avenue

Example of Flood Damage to a Residence in Ajo During Flood of 07-29-03 (Note Silt Line on Cabinets)

IV. Existing Drainage Patterns And Infrastructure

Flow paths and watershed boundaries within the urban area of Ajo were identified using field surveys and the new aerial-topographic mapping prepared as an element of this emergency evaluation effort. Even with the detailed topographic mapping, drainage patterns in parts of the southern watersheds were not discernable. Accordingly, in February of 2004 a more detailed field assessment was conducted in order to verify flow paths and identify hydraulic structures located within the southern watersheds.

Historically, construction of homes and streets altered the natural flow paths in the urban area of Ajo. Natural washes have been replaced with undersized channels and underground storm drains, including conduits under buildings. In other areas, flow paths exist in streets and through low areas in residential back yards. The new topographic maps and a field assessment provide much better detail with which to document drainage patterns for the majority of the southern urban areas. However, some underground flow paths still could not be confirmed, since no construction plans are available and only an inlet or outlet feature was found.

An exhibit has been prepared which shows drainage patterns and hydraulic infrastructure for the urban area of the southern tributaries (see Figure 5). Detailed information on a larger map is found in Appendix 4. Key hydrologic concentration points have also been identified, and can be referenced to the hydrologic analysis, results of which are provided in Appendix 4.

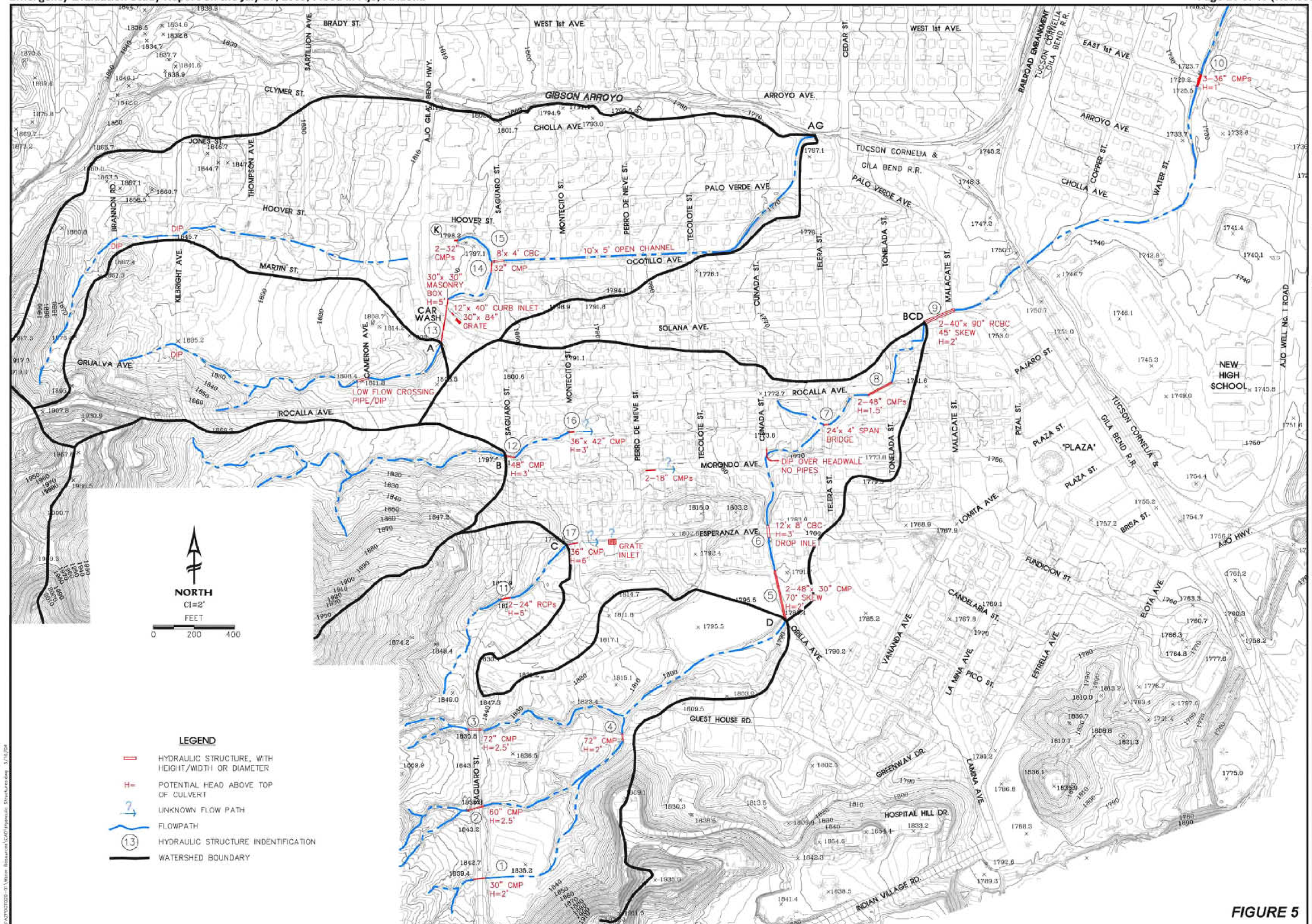

FIGURE 5

NO.	REVISION	APPV'D.	DATE

DESIGNED BY: LKR
DRAWN BY: CRT
CHK'D BY (PRELIM.): LKR
PROJ. ENGR. (FINAL):
FIELD BOOK NO.:

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PROJ. No.: PDOT020-01
DATE: Jan., 2004
SCALE HORIZ.: 1"=200'
SCALE VERT.: N/A
SHEET NO.: 1 OF 1

AJO, ARIZONA
SOUTH TRIBUTARIES HYDRAULIC STRUCTURES AND FLOW PATHS

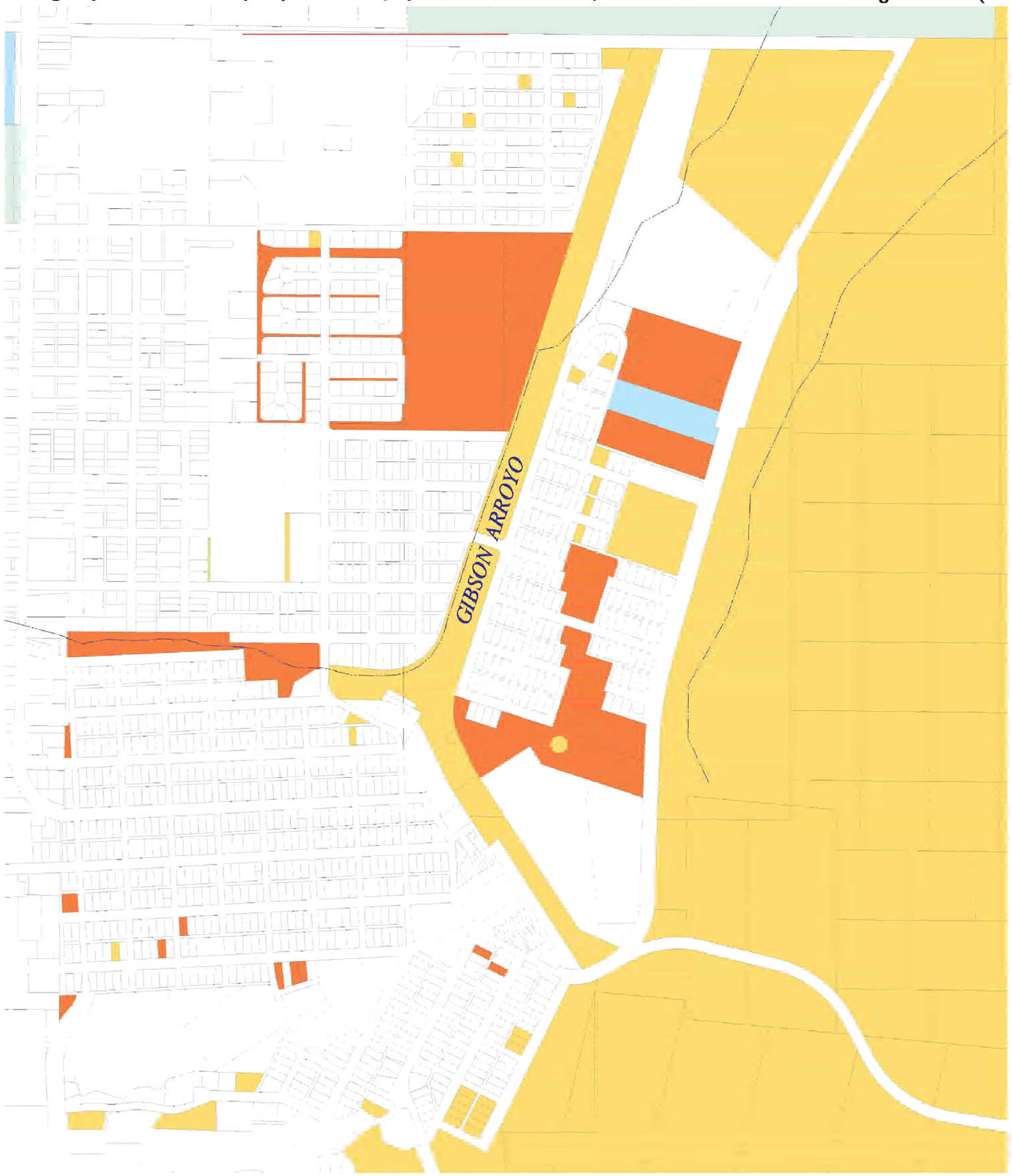
V. EXISTING OWNERSHIP AND MAINTENANCE RESPONSIBILITIES

A. Ownership

Ownership of drainage infrastructure within the urban core of Ajo appears to be highly varied, and follows no organized pattern. It is believed this is due primarily to the fact that Ajo was founded as a mining town; and the founder of the town (Phelps Dodge) was, at one point in time, the primary owner of the majority of the property located within the urban core of the community. Over time the ownership transfer process has apparently resulted in some elements of the drainage infrastructure in Ajo being deeded to private property owners. This is especially true of drains located under buildings. Other drainage structures remain in the ownership of Phelps Dodge. Consequently, with the limited information available and according to the District and data from the Pima County Assessor's records, what has been determined is that Pima County and the District appear to be owners of portions of the bed and banks of the Gibson Arroyo (see Figure 6). Other major owners of (business) property located contiguous to the Gibson Arroyo include the International Sonoran Desert Alliance and Phelps Dodge. Also, from researching Pima County Assessor's records it appears that watercourses tributary to the Gibson Arroyo cross no less than 65 privately owned parcels. For the tributaries, School District No. 15 property lies contiguous to the tributary passing through the culvert under W. Esperanza, and Pima County is listed as the owner of properties located at 900 W. Morondo Avenue and 910 W. Morondo Avenue, both of which are properties containing a tributary to the Gibson Arroyo. Finally, Disie S Desert Realty owns properties along East Second Avenue and N. Saguaro Road that contain tributaries, and Holt Ajo Sales also appears to have several parcels containing tributaries, but the only a single address is listed for these multiple properties: 303 N. Cameron Avenue. See Appendix 3 for a listing of identified property ownerships.

B. Maintenance

While identifying property ownership related to drainage infrastructure in Ajo is difficult to determine, identifying maintenance responsibilities for this same drainage infrastructure is even more difficult to accomplish. There are inadequate records of transference of Phelps Dodge's drainage infrastructure maintenance responsibilities to "others." Contact with affected entities produced no clear results. In fact, almost all that is currently known has been acquired from anecdotal evidence which suggests that Pima County is responsible for the maintenance of portions of the Gibson Arroyo, as well as those culverts and bridges which pass underneath the county-maintained streets in Ajo (see the "Street Maintenance Map" in Appendix 1). The District has performed spot title searches and has found no public ownership for drainage infrastructure outside of the public road right-of-way, which includes channels, culverts, and storm drains that exist within the urban core of Ajo—many of which lie immediately adjacent to, and in some cases actually pass underneath, private residences. Private drainage improvements appear to lack capacity, and are in various stages of deterioration. Therefore, unless documentation is found to the contrary, maintenance of the drainage infrastructure outside of the public road right-of-way is the responsibility of owners of the private property owners through which the drainage infrastructure traverses. Accordingly, Tetra Tech recommends that, in the future, a detailed assessment of maintenance responsibilities be part of the development of a detailed Master Drainage Plan for Ajo.



Map Courtesy of the Pima County Department of Transportation and Flood Control District

Tetra Tech, Inc.

Pima County and Phelps Dodge Owned Parcels for the Town of Ajo

- Phelps Dodge Properties
- Pima County Properties
- United States Properties
- State of Arizona Properties
- Washes

FIGURE 6 -- (INCLUDING PORTIONS OF GIBSON ARROYO)

Pima County Index Map

Index Map Scale 1:1,500,000

N

PIMA COUNTY DEPARTMENT OF TRANSPORTATION

TECHNICAL SERVICES

THE SEAL OF PIMA COUNTY ARIZONA

VI. HYDROLOGIC ANALYSIS

A. Gibson Arroyo

1. Peak-Discharge Estimate

Two methods were used to computationally estimate the July 29, 2003, peak discharge on Gibson Arroyo at Sartillion Avenue:

- The Slope-Area Method
- Weir-Flow Criteria

The Slope-Area Method was applied to two naturally occurring channel cross-sections located approximately 73 feet and 173 feet upstream of Sartillion Avenue, respectively; while the Weir-Flow Criteria was applied at the Sartillion Avenue dip crossing, using cross-sections located at the west upstream edge of pavement and at the east downstream edge of pavement, respectively. These latter two cross-sections are located about 22 feet apart.

Using the Slope-Area Method produces a flood-peak estimate of 3150 cubic feet per second (cfs); while using Weir-Flow Criteria produces a flood peak estimate of 3050 cfs (see Technical Memorandums in Appendix 5). Averaging these two values yields a flood peak estimate of 3100 cfs for the July 29, 2003 peak discharge on Gibson Arroyo at Sartillion Avenue.

2. Flood-Frequency Estimate – Alternate No. 1

Sartillion Avenue is located a little more than 500 feet upstream of State Highway 85, the location where Pima County and FEMA estimates for the regulatory (100-year) flood peak are both equal to 3990 cfs (see Technical Memorandum, Appendix 5). Pima County and FEMA flood-peak estimates at State Highway 85 may overstate the regulatory peak discharge, especially when compared to the USGS Regional Regression Equation (RRE) estimate of 1775 cfs for the 1.7-square-mile contributing watershed area. However, using rainfall data from the NOAA Atlas 2, Volume VIII (hereinafter shortened and referred to as "NOAA Atlas VIII") and an adjusted basin factor to account for the steep slopes in the watershed, the Pima County Flood Peak Procedure (Sept. 1979) produces a regulatory flood peak estimate of 3085 cfs (see Technical Memorandum, Appendix 5).

3. Flood-Frequency Estimate – Alternate No. 2

When applying new NOAA Atlas XIV rainfall estimates (NOAA, 2003) in conjunction with the Pima County procedure and a "default" basin factor, the predicted 100-year flow rate at Sartillion Avenue is 2370 cfs. When applying new NOAA Atlas XIV rainfall estimates with the Pima County procedure and an adjusted basin factor, the predicted 100-year flow rate at Sartillion Avenue is 1816 cfs. It is interesting to note that when using the applicable USGS RRE, the latter value is very close to the computed RRE estimate of 1775 cfs. If one were to

assume that 1816 cfs represents the best 100-year flow rate at Sartillion Avenue, this would mean that Tetra Tech's estimate of 3,100 cfs for the July 29, 2003, flood would be equivalent to an event with a flood-recurrence of slightly greater than once every 500 years, on the average. In addition, a pseudo 500-year USGS RRE estimate for Q500 (extrapolated) is approximately 3080 cfs, which is very close to the July 29 value of 3100 cfs.

4. Rainfall Estimate

The NOAA Atlas VIII estimate for the 100-year, 1-hour point rainfall at Ajo is 2.86 inches; and the 100-year, 2-hour point rainfall is 3.26 inches. The revised 2003 NOAA Atlas XIV estimates for the 100-year, 1-hour point rainfall value at Ajo, 2.21 inches; and the 100-year, 2-hour point rainfall 2.57 inches, are significantly less than the older NOAA Atlas VIII values. The 2003 NOAA Atlas XIV rainfall data also provide estimates for the 500-year event, information that NOAA Atlas VIII does not provide. For the 500-year rainfall, the 1-hour point rainfall value is 2.61 inches; and the 500-year, 2-hour point rainfall is 3.23 inches.

According to observers who collected rainfall data at Ajo on July 29, 2003, rainfall depths generally ranged from 1.75 inches to as much as 4.0 inches over durations varying from 30 minutes to a few hours. (The average-annual rainfall for Ajo is only 8.95 inches.) Information received in an e-mail dated September 29, 2003, from Marilyn Chambers of the Desert Research Institute, located at the Western Regional Climate Center in Reno, Nevada, indicates that the official NWS cooperative gauge (a sophisticated recording gauge) in Ajo recorded 1.79 inches of rainfall for the entire day (in Tetra Tech's professional opinion, this amount of rainfall probably occurred in less than 1 hour). Unfortunately, due to the nature of thunderstorm rainfall and lack of recording rain gages, it is not possible to reliably ascertain the true areal, spatial, and temporal distributions of the rainfall event that led to the July 29, 2003, Ajo flood on the Gibson Arroyo and tributaries. This becomes especially evident when considering the topography of the contributing watershed area, which likely contributed to significant orographic uplift that produced pockets of short-duration rainfall with greater intensities along the east-facing slopes of the western portion of the Little Ajo Mountains—the mountain range that comprises the vast majority of the Gibson Arroyo contributing watershed area that is located upstream of Sartillion Avenue.

5. Summary and Conclusions for Gibson Arroyo

- Using the Slope-Area Method and applicable Weir-Flow Criteria, a flow peak of 3100 cfs was calculated for the July 29, 2003 flood on the Gibson Arroyo. The peak was calculated at Sartillion Avenue.

- Using Pima County procedures with an adjusted basin factor and old NOAA Atlas VIII rainfall data, Tetra Tech's computation of the flow peak for Gibson Arroyo at Sartillion Avenue indicates that the flood frequency of the July 29, 2003, flood on the Gibson Arroyo is approximately equivalent to a 100-year event.

- Using Pima County procedures with an adjusted basin factor and new NOAA Atlas XIV rainfall data, Tetra Tech's computation of the flow peak for Gibson Arroyo at Sartillion

Avenue, indicates that the flood frequency of the July 29, 2003, flood on the Gibson Arroyo is slightly greater than a 500-year event.

Based upon the preceding comparisons in combination with:

- Measured watershed characteristics (i.e., catchment slopes, watercourse length, catchment shape, soil types, vegetative cover, etc.);
- Local rainfall estimates; and
- The fact that anecdotal evidence (i.e., statements from long-time Ajo residents) suggests that the July 29, 2003, flood on the Gibson Arroyo was the largest to have occurred for at least the past 60 years, it is Tetra Tech's professional opinion that:
  - The existing Pima County/FEMA regulatory 100-year peak estimates for Gibson Arroyo at State Highway 85 appear to be too high,
  - Computation of the flow peak using Pima County procedures with old NOAA Atlas VIII rainfall data and an adjusted basin factor indicates that the computed flow peak for the July 29 event on the Gibson Arroyo was approximately equivalent to a 100-year flood, and
  - Computation of the flow peak using Pima County procedures with new NOAA rainfall data and an adjusted basin factor indicates that the computed flow peak for the July 29 event on the Gibson Arroyo was slightly greater than a 500-year flood.

In summery, regardless of the predictive method used to estimate peak-discharge rates, or the regulatory value that is selected, one thing is for certain—the July 29, 2003, flood on the Gibson Arroyo in Ajo was of extraordinary magnitude. The best data and methodologies available suggest that this event falls within the range of a 100-year to 500-year flood.

Table 1 summarizes the results of Tetra Tech's hydrologic assessment of Gibson Arroyo.

B. Four Southern Tributaries

The watershed boundaries for 4 southern tributaries to the Gibson Arroyo were delineated, and hydrologic parameters collected, for the purpose of determining 100-year flow rates at key concentration points along the edge of the urban area, as well as along points farther downstream. "Rural" watershed boundaries are shown on both Figure 7 and Figure 8. Watersheds boundaries on Figure 7 (aerial photo) were determined using USGS topographic maps as a base. For ease of reference, watershed boundaries located farther downstream, within the urban areas, were delineated using a more detailed 200-scale topographic map. These areas are depicted on an exhibit in Appendix 1 titled "South Tributaries Hydraulic Structures and Flow Paths." Note that the flow paths through the urban areas were field verified, as mentioned earlier in this report.

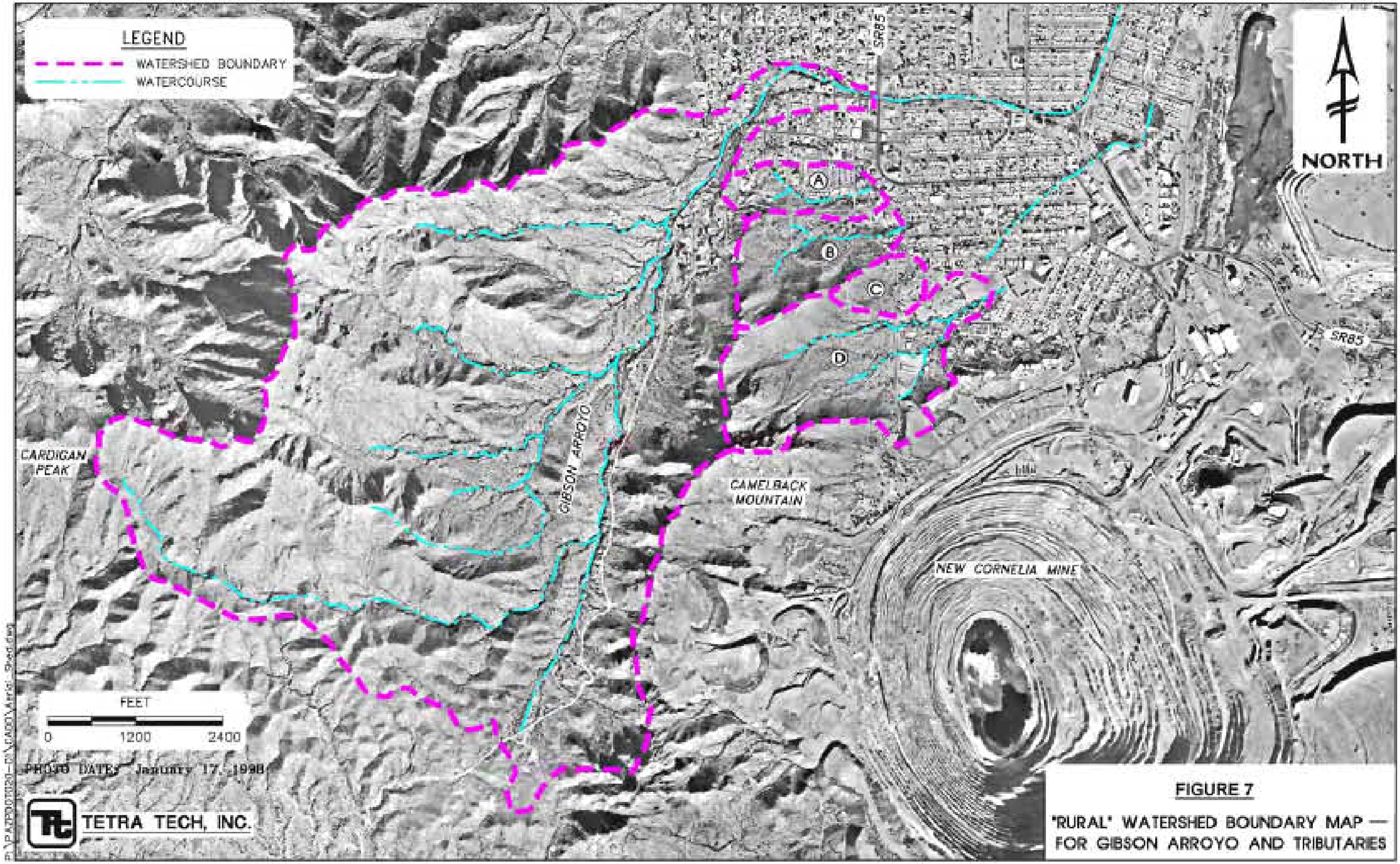


FIGURE 7

"RURAL" WATERSHED BOUNDARY MAP — FOR GIBSON ARROYO AND TRIBUTARIES

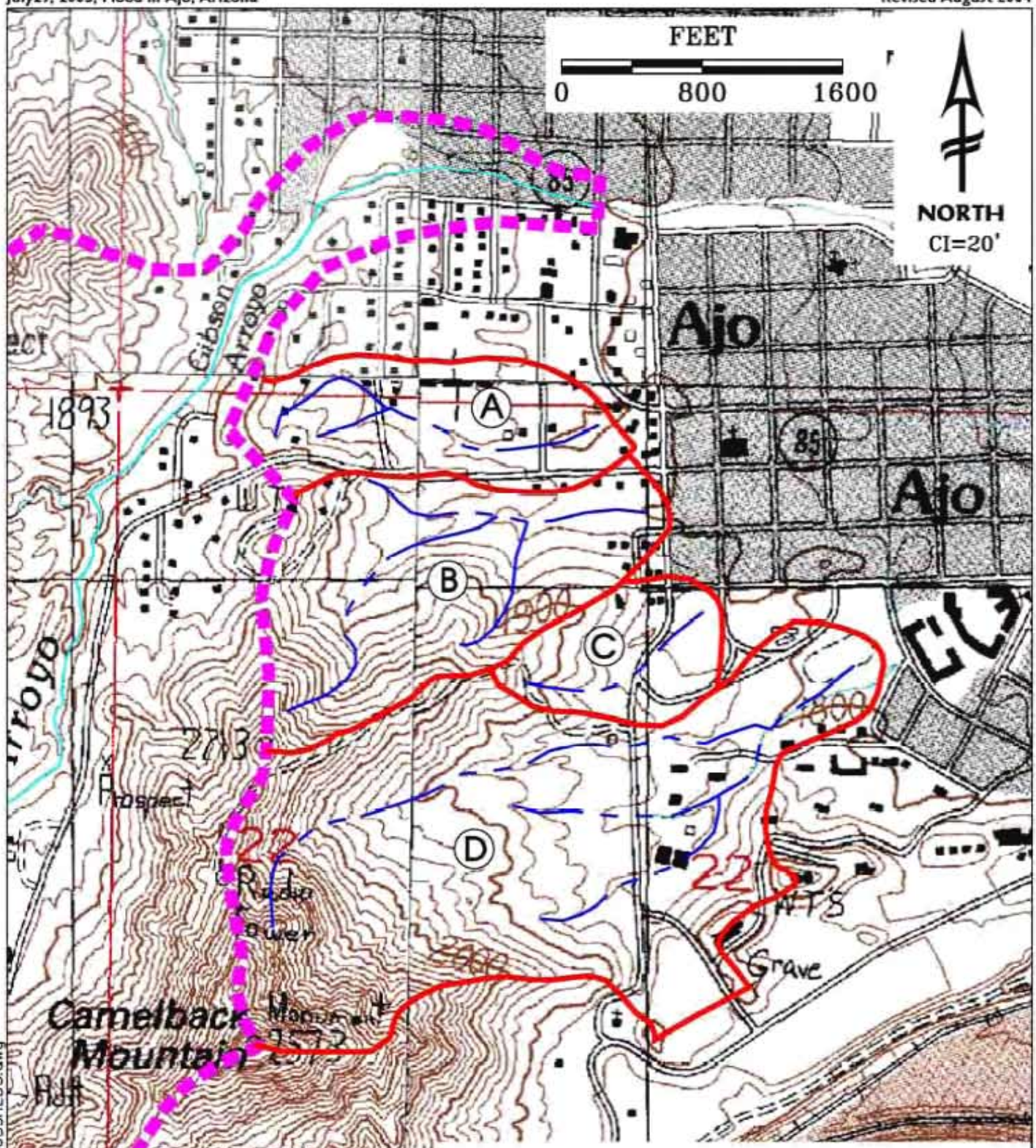


FIGURE 8

"RURAL" WATERSHED BOUNDARY MAP — FOUR (4) SOUTHERN TRIBUTARIES TO GIBSON ARROYO

TETRA TECH, INC.

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TABLE 1: HYDROLOGIC COMPARISONS—GIBSON ARROYO

Storm Event	METHODS OF HYDROLOGIC PREDICTION			
	Slope Area/Weir	Pima County 1*	Pima County 2*	USGS RRE
July 29, 2003	3100 cfs	-	-	-
100-yr. (default n_b)	-	3990 cfs	2370 cfs	1775 cfs
100-yr. (adjusted n_b)	-	3085 cfs	1816 cfs	-
500-yr. (default n_b)	-	6890 cfs (ext.)†	3367 cfs	3080 cfs (ext.)†
500-yr. (adjusted n_b)	-	5330 cfs (ext.)†	2586 cfs	-

*Pima County 1 = peak computed using NOAA Atlas VIII rainfall. Pima County 2 = peak computed using NOAA Atlas XIV rainfall.
†ext = peak is an extrapolated estimate, due to a lack of necessary data to compute value.

FLOOD-FREQUENCY ESTIMATES FOR JULY 29, 2003, STORM ON GIBSON ARROYO

METHODS OF HYDROLOGIC PREDICTION				
Pima County 1 (Default n_b)	Pima County 1 (Adjusted n_b)	Pima County 2 (Default n_b)	Pima County 2 (Adjusted n_b)	USGS RRE
210 YEARS**	100 YEARS**	51 YEARS**	27 YEARS**	26 YEARS**
1170 YEARS‡	510 YEARS‡	225 YEARS‡	107 YEARS‡	100 YEARS‡

**Flood-frequency estimates are based upon the assumption that Pima County 1 (adjusted n_b) = Q_{100}.
‡Flood-frequency estimates are based upon the assumption that USGS RRE = Q_{100}.

RAINFALL ESTIMATES

Storm	Observed	NOAA Atlas VIII	NOAA Atlas XIV	Average-Annual
07/29/03	1.75 - 4.0 INCHES	-	-	-
1-HOUR, 100-	-	2.86 INCHES	2.21 INCHES	-
2-HOUR, 100-	-	3.26 INCHES	2.57 INCHES	-
1-HOUR, 500-	-	-	2.61 INCHES	-
2-HOUR, 500-	-	-	3.23 INCHES	-
Average-Annual	-	-	-	8.95 INCHES

Table 2 provides the concentration points, contributing watershed areas, and the 100-year peak flow rates for these 4 southern tributaries. The Pima County Peak Flow Method was used to calculate the flow rates presented in Table 2. The hydrologic calculation sheets for these values can be found within Appendix 4.

TABLE 2: REGULATORY HYDROLOGY FOR 4 TRIBUTARY WATERSHEDS

Concentration Point	Contributing Area (acres)	100-Year Discharge (cfs)
A*	31.6	215
B*	54.7	316
C*	17.6	115
D*	125.4	626
AG†	101.9	558
BCD†	251.0	973

*For "rural" watershed boundaries, see Figure 7 and Figure 8.
†For "urban" watershed boundaries, see exhibit in Appendix 1 titled "South Tributaries Hydraulic Structures And Flow Paths."

VII. HYDRAULIC ANALYSIS

A. HEC-RAS Modeling for Gibson Arroyo

Hydraulic modeling of the Gibson Arroyo was performed using the U.S. Army Corps of Engineers computer program HEC-RAS. New (November 2003) aerial-topographic mapping was used as the topographic base for the model. In order to supplement the new mapping and provide more detailed topographic data within the channel of the Gibson Arroyo, Tetra Tech survey crews also collected station/elevation data for multiple cross-sections along the Gibson Arroyo. The field cross-sections were located at 100-foot intervals along the channel. (Note: Topographic data in the overbank areas that were located more than a short distance from the edge of each channel bank were obtained from the new aerial/topographic mapping.)

Using a flood peak estimate of 3100 cfs, the initial hydraulic model was compiled with the intent to re-create the flood elevations observed during the July 29, 2003, flood event in Ajo. In order to do this, overbank flooding and flow breakouts were correlated to conditions observed immediately following the July 29 event. Correlation was reasonable, with the exception of breakout flow along the railroad embankment located between the East Second Avenue Bridge and the Arroyo Avenue alignment. Tetra Tech believes that the poor correlation is this area resulted from the fact that the new topography does not reflect the channel geometry at the time of the flood because, in early September of 2003, Pima County crews performed some channel dredging to remove some excess sediment that had deposited along the channel bottom during the July 29 flood (and perhaps during previous flow events). Consequently, Tetra Tech recognized that the new topography reflects a greater channel cross-section than existed during the flood. In addition, the East Second Avenue Bridge was essentially blocked by sediment and debris during the July 29 event. Accordingly, in an attempt to re-create physical conditions know to exist at the time of the flood, the model was revised by artificially raising the channel bottom and by blocking the East Second Avenue Bridge with debris. The resulting floodplain, shown in Appendix 4, correlates well with the observed flood. The model input and output is also included in Appendix 4.

Another hydraulic model was created using the July 29, 2003, discharge estimate of 3100 cfs, but with existing topographic conditions. This model reflects a larger channel cross-section, as mentioned above, and also uses a 50-percent blockage factor for debris at the East Second Avenue Bridge. This "existing-conditions" floodplain model, with all input and output data, is also included in Appendix 4.

B. Hydraulic Structures for Four Southern Tributaries

On February 5 and 6, 2004, a field investigation was performed to identify hydraulic structures located within the watersheds of the 4 southern tributaries (see Table 3). The structure locations provided supplemental information to the aerial-topographic maps, and permitted flow paths and watershed divides to be more accurately defined. Also, structure capacity is information that is needed for the evaluation of upstream flood-control solutions. Accordingly, a map was prepared (see Figure 5 and Appendix 1 [for a larger scale map]) that depicts the location of the structures, the sizes of the structures, and the tributary flow paths.

Each structure was measured and photographed. Maximum ponding depths were estimated according to topography located immediately adjacent to the structure inlet. Photographs of each structure are included in Appendix 2. The hydraulic capacity of each structure was determined assuming inlet control. Results are provided in Table 3. Calculations are included in Appendix 4.

TABLE 3: CAPACITY OF HYDRAULIC STRUCTURES

I.D. Number	Location	Description	Capacity (cfs)
1	Saguaro Road, ±730 Feet South of Guest House Rd.	30"-Diameter CMP*	42
2	Saguaro Road, ±370 Feet South of Guest House Rd.	60"-Diameter CMP	205
3	Saguaro Road at Guest House Rd.	72"-Diameter CMP	308
4	Guest House Road, ±730 Feet East of Saguaro Rd.	72"-Diameter CMP	289
5	Orilla Avenue, ±440 Feet South of Esperanza Ave.	2, 48"-Diameter CMPs	80/Pipe = 160
6	Orilla Avenue at Esperanza Ave.	12'-Wide x 8'-High RCBC*	1165
7	Telera Street, ±180 Feet North of Morondo Ave.	24'-Wide x 4'-High Span Bridge	855
8	Rocalla Avenue at Tonelada St.	2, 48"-Diameter CMPs	108/Pipe = 216
9	Solana Avenue at Malacate St.	2, 90"-Wide x 40"-High RCBCs	212/Box = 414
10	East First Avenue, ±340 Feet East of Copper St.	3, 36"-Diameter CMPs	51/Pipe = 153
11	Saguaro Road, ±270 Feet South of Esperanza Ave.	2, 24"-Diameter RCPs	38/Pipe = 76
12	Saguaro Road, 100 Feet North of Morondo Ave.	48"-Diameter CMP	134
13	Solana Avenue, ±300 Feet West of Saguaro Rd.	30"-Wide x 30"-High Masonry Box	76
14	±35 Feet West of Intersection of Saguaro Rd. and Ocotillo Ave.	32"-Diameter CMP	25
15	Saguaro Road, ±25 Feet North of Ocotillo Ave.	8'-Wide x 4'-High RCBC	178
16	Montecito Street, ±200 Feet North of Morondo Ave.	42" x 36" Elliptical CMP	104
17	Montecito Street, ±10 South of Esperanza Ave.	36"-Diameter CMP	96
18	East Second Avenue, at Gibson Arroyo	3, 7.33'-Wide x 3.4' High Bridge	200/Bay = 600
19	State Highway 85, at Gibson Arroyo	3, 10'-Wide x 8'-High RCBC	867/Box = 2600

*CMP = Corrugated Metal Pipe.
*RCBC = Reinforced Concrete Box Culvert.

C. Sediment Transport Estimate

Eyewitness accounts, ground photographs, and survey data indicate that large amounts of sediment and debris were present and were transported along the Gibson Arroyo during the July 29, 2003, flood. Soon after the flood, Pima County crews removed much of the sediment and debris from the channel. The following is a summary of the analysis that was performed by Tetra Tech to estimate the bed-material sediment transport that occurred during the July 29 flood. A Technical Memorandum, included in Appendix 5, provides the backup calculations. In order to make such an estimate of the bed-material sediment transport, the peak discharge and flood hydrograph must first be determined. For this particular exercise, a flood peak of 3150 cfs was used, which is based upon the Slope-Area Method (see Section IV.A.1).

Incorporating this peak-discharge estimate, a flood hydrograph was then developed using the Pima County Synthetic Flood Hydrograph Procedure.

Bed-material sediment transport was then calculated for each time step of the flood hydrograph using the Zeller-Fullerton Sediment Transport Equation. The hydraulics for each time step were taken as the average of the hydraulic parameters for two channel cross-sections located approximately 73 feet and 173 feet upstream of Sartillion Avenue, respectively. The hydraulic parameters used for each time step were based upon regression-equation estimates of the average depths, velocities, and widths versus discharge for the two referenced cross-sections (see Technical Memorandum in Appendix 5). The resulting computed bed-material sediment-transport estimate of 82,569 cubic feet represents "bulked" sediment conditions (i.e., assuming an active bed-layer sediment density of 100 pounds/cubic foot).

Bed-material sediment transport that occurred in upstream channel reaches can also be computed using an approximating equation specific to the hydrologic and hydraulic conditions that existed during the referenced flood (see Technical Memorandum in Appendix 5). Given a rise time of 36 minutes for the computed flood peak and an upstream watercourse slope of 0.0212 ft/ft, application of the equation to the 1.7-square-mile contributing watershed area of the Gibson Arroyo upstream of Sartillion Avenue yields sediment volume of:

$$Vs \approx 4.61 \text{ acre-feet, or}$$
$$Vs \approx 200{,}812 \text{ cubic feet}$$

According to USGS quadrangle maps, which are based upon mapping conducted in 1961, the bed slope of the Gibson Arroyo around Sartillion Avenue should be 0.0212 ft/ft. However, the current bed slope for the same reach (measured by Pima County survey crews) has an approximate value of 0.0133 ft/ft. In Tetra Tech's professional opinion, this nearly 40% reduction in bed slope reflects an ongoing process of sedimentation that has occurred along the study reach of the Gibson Arroyo during the past 40+ years (i.e., since 1961).

The USGS quadrangle maps also indicate that at a point located approximately 1/2 mile downstream of Sartillion Avenue, at the North Cedar Street crossing, the slope of the Gibson Arroyo streambed flattens to approximately 50% of the slope at and near Sartillion Avenue. Slope reductions of this magnitude create corresponding reductions in the sediment-transport rates that are approximately equivalent to 1/3 to 1/2 of the upstream sediment-transport rate. This means that, during the July 29, 2003, flood in Ajo, it is estimated as much as 67% of the bed-material sediment transported from upstream watershed reaches "dropped out" within the Gibson Arroyo channel reach beginning immediately upstream of Sartillion Avenue and extending downstream to the East Second Avenue Bridge (a total reach length of approximately 4500 feet). This is consistent with evidence of debris in the streets and blockage of the downstream culverts.

Along the study reach, near Sartillion Avenue the primary flow conveyance portion of the Gibson Arroyo channel varies from 20 to 40 feet in width (average ≈ 30 feet); averages about 40 feet in width at the North Cedar Street crossing; and narrows down to only 10 feet, or so, in width about 1100 feet downstream, along the railroad tracks. Overall, a width of about 30

feet would seem to represent a reasonable "average" width for the primary flow conveyance portion of the Gibson Arroyo channel along the overall segment of the study reach.

Given this average width, and assuming that all of the predicted sediment excess "dropped out" uniformly along the study reach during the July 29 event, the net effect would have been to raise the primary flow conveyance portion of the channel streambed by an average of approximately 1 foot. On the other hand, if the excess sediment were proportioned along the reach, then it is predicted that an average of approximately 1.0 foot of sediment would have dropped out in the first 2,900 feet, an average of approximately 0.75 feet of sediment would have dropped out in the next 1100 feet of the reach, and an average of approximately 3.0 feet of sediment would have dropped out in the last (i.e., most downstream) 500 feet of the reach.

Actual aggradational depths will vary along a reach, with sedimentation occurring at channel expansions, backwater areas, breakout flows, and where conditions of flow retardance are at a maximum. For example, the abrupt northward bend of the channel at the point located just west of the existing railroad tracks would significantly exacerbate sedimentation immediately upstream of this point. It is very likely that this feature, in combination with the flow breakout that occurred along this reach of the Gibson Arroyo, caused sediment deposition to range anywhere from 2 feet to 4 feet in depth during the July 29, 2003, flood.

Along the segment of the study reach beginning at the abrupt northward bend to upstream of Sartillion Avenue, measured data suggest that segments of the Gibson Arroyo streambed have flattened by almost 40 percent since existing USGS quadrangles maps were first prepared using 1961 data. The July 29, 2003, flood contributed to this trend of streambed flattening by depositing significant amounts of sediment along this particular segment of the Gibson Arroyo.

The trend of streambed flattening along the Gibson Arroyo due to sediment deposition will continue without:

- A significant reduction in upstream sediment supply; or
- Modification to the current north-south channel alignment located along the railroad tracks.

In the absence of either of these mitigation measures, routine channel maintenance will help control the ordinary depositional problems that are being experienced, *but will not eliminate the threat of significant deposition during the occurrence of a major flow event*. Such a depositional episode would lead to a reduction in channel conveyance. This, in turn, would likely lead to flooding similar in magnitude to the July 29, 2003, event.

Also a factor in the preceding is the consideration for debris transport during a flood event. It is a well-known fact that the East Second Avenue Bridge "plugged" with sediment and debris during the July 29, 2003, flood. This "plugging" was due primarily to debris accumulation on the upstream side of the bridge structure. Section VIII of this report addresses this issue.

VIII. PRELIMINARY FLOOD-CONTROL OPTIONS

A. East Second Avenue Bridge

1. Replace Existing Bridge with New Bridge

Coupled with post-flood ground photographs, eyewitness accounts of the July 29, 2003, flood in Ajo provide ample evidence of the conditions that existed at the East Second Avenue Bridge during the flood event (see Appendix 2). That is, debris and sediment effectively blocked the conveyance area of the bridge and increased flooding conditions within the immediate vicinity of the bridge. The bridge is a 3-cell structure, with each opening about 7.33 feet wide and 3.4 feet high. The relatively low profile of the bridge, coupled with the two pier walls between the cells, restricts the amount of debris and sediment that can freely pass downstream. Hydraulic modeling of the existing bridge reveals that, if the opening were not clogged by debris/sediment, flow capacity would be about 600 cfs and 100-year flow depth at the bridge would be reduced by about 1.3 feet. This suggests that, while increased channel/bridge maintenance can improve flow capacity during low to moderate flow events, the recurrence of a large flow event like the July 29 flood will likely produce similar conditions at the bridge because of limited flow capacity, and because the Gibson Arroyo watershed generates extreme loads of debris/sediment during severe flooding.

Accordingly, replacement of the existing bridge is considered a viable option as a means to reduce the potential for flooding in the immediate vicinity. A new bridge can be designed to accommodate debris and sediment, and thus reduce flooding due to the presence of the bridge. However, the majority of such benefits would be realized in the immediate vicinity of the bridge, and would not address flooding at other locations along the Gibson Arroyo.

2. Remove Old Bridge and Replace with an "At-Grade" Crossing

Removal of the existing East Second Avenue Bridge can also be considered as an option to prevent increased flooding as the result of debris and sediment. Removal of the bridge, and replacement with an "at-grade" road crossing at East Second Avenue, will effectively allow debris, sediment, and floodwaters to be conveyed farther downstream. An "at-grade" crossing, however, creates safety issues. The adjacent location of a railroad track would result in a very radical road profile, if the bridge were replaced with a "dip" section. Also, during times of flow in the channel, emergency vehicles typically will have to find alternate routes, which may result in significant increases in response times to emergency situations. In addition, the "at-grade" crossing would also increases risks to both vehicles and pedestrians. Due to these serious health and safety issues, an "at-grade" crossing is not a high-ranking alternative for this location.

Table 4 presents comparisons of hydraulic parameters for the Gibson Arroyo at/near the East Second Avenue Bridge under conditions of (1) extreme flow blockage, and (2) standard flow blockage for a peak discharge of 3100 cfs.

TABLE 4: COMPARISON OF HYDRAULIC PARAMETERS AT/NEAR THE EAST SECOND AVENUE BRIDGE

HEC-RAS Reach	River Station	Reach: Primary Profile	Profile: PF 1 Plan*	Q Total (cfs)	W. S. Elevation (ft.)	Max Channel Depth (ft.)	Channel Top Width (ft.)	Channel Velocity (ft./sec.)		
Primary	42	PF 1	added sed, debris	1018.77	1736	5	40	9.3		
Primary	42	PF 1	existing split flow	2232.05	1737.9	6.9	124	9.5		
Primary	43	PF 1	added sed, debris	1018.77	1736.5	5.1	49	9.9		
Primary	43	PF 1	existing split flow	2232.05	1739	7.5	210	10.5		
Primary	44	PF 1	added sed, debris	1018.77	1738.5	5.3	135	4.4	Downstream Face of Bridge	
Primary	44	PF 1	existing split flow	2245.07	1740.8	7.6	287	5.3		
Primary	45	PF 1	added sed, debris	1018.77	1742.1	2.2	263	7.7	Upstream Face of Bridge	
Primary	45	PF 1	existing split flow	2245.07	1740.8	6.5	127	11.2		
Primary	46	PF 1	added sed, debris	1170.97	1743.1	3.3	267	5.3		
Primary	46	PF 1	existing split flow	2253.05	1742.4	7.7	212	8.7		
Primary	47	PF 1	added sed, debris	1269.88	1743.9	2.1	247	7.9		
Primary	47	PF 1	existing split flow	2258.53	1742.6	5.8	146	9.7		
Primary	48	PF 1	added sed, debris	1288.28	1746	2.1	258	8		
Primary	48	PF 1	existing split flow	2258.53	1743.7	6.9	51	11.3		
Primary	49	PF 1	added sed, debris	1503.03	1747.4	2.4	299	8		
Primary	49	PF 1	existing split flow	2258.8	1746.5	6.4	231	9.8		
Primary	50	PF 1	added sed, debris	1700.99	1748.3	2.4	279	8.7		
Primary	50	PF 1	existing split flow	2259.53	1747.3	6.5	211	9		
Primary	51	PF 1	added sed, debris	1779.78	1749.6	3.3	280	7.6		
Primary	51	PF 1	existing split flow	2259.53	1749.1	5.4	236	9.5		
Primary	52	PF 1	added sed, debris	1779.78	1750.5	2.5	297	8.8		
Primary	52	PF 1	existing split flow	2259.53	1750.4	5.5	292	9.5		
Primary	53	PF 1	added sed, debris	1206.29	1751.7	2.8	50	9.2		
Primary	53	PF 1	existing split flow	1729.53	1751.8	4.3	51	10.4		

*First line represents conditions with extreme flow blockage, and second line represents conditions with standard flow blockage.

B. Channel Improvement

Potential channel improvements of the Gibson Arroyo should be evaluated in more detail during the Master Drainage study. The evaluation should include consideration for increasing channel capacity and reducing or eliminating erosion and sedimentation potential along the study reach. A preliminary investigation by Tetra Tech indicates that the existing channel could be lowered and/or widened in several places to increase the flow conveyance. However, a more detailed evaluation must be conducted which will:

- Determine the effectiveness of any channel modifications,
- Quantify sedimentation and erosion potential, as well as the need, if any, for stabilization measures; and
- Determine right-of-way needs.

This type of channel evaluation is beyond the scope of services for this emergency evaluation.

C. Stormwater Detention

1. Gibson Arroyo

a. Computed 100-Year Flood Volumes

In order to provide a conservative estimate of the flood-runoff volume produced, which is needed when assessing stormwater detention potential along the Gibson Arroyo, hydrologic parameters were taken from the Pima County Flood Peak Procedure, with applicable rainfall estimates derived using NOAA Atlas VIII data and procedures.

Using the preceding methodology, the estimated 100-year flood volume for the Gibson Arroyo at Sartillion Avenue was computed to be approximately 200 acre-feet. For a 10-year event, the flood volume was extrapolated to be about 90 acre-feet. Accordingly, in order to account for the potential for a piggyback storm event, the design flood volume would have to be 290 acre-feet.

b. Stormwater Detention Facility Sizing

When considering the target outflow from a potential stormwater detention basin along the Gibson Arroyo, a reasonable goal would be to reduce the 100-year peak discharge so that the outflow from the detention facility would be equivalent to a 5-year peak discharge (extrapolated estimate = 700 cfs). Assuming that 3100 cfs is a reasonable estimate for the 100-year peak discharge, this would mean that, for online detention, a storage volume of approximately 154 acre-feet would be required for an online stormwater detention facility, before consideration of a piggyback storm event and sediment accumulation in the stormwater detention facility. When these factors are included, the required design storage volume for an online detention facility is estimated to be about 230 acre-feet.

For offline detention, and given the same hydrologic conditions as assumed in the preceding paragraph, a storage volume of approximately 120 acre-feet would be required for an offline stormwater detention facility along the Gibson Arroyo. This estimate is before considering a piggyback storm event and sediment accumulation in the stormwater detention facility. When these factors are included, the required design storage volume for an offline detention facility is estimated to be about 195 acre-feet.

Such storage volumes exceed the Arizona Dam Safety threshold criteria for above-ground surface-water impoundment facilities (i.e., they become jurisdictional dams), which means that if a stormwater detention facility were to be constructed along the Gibson Arroyo, either it would have to be designed to exist below natural grade, or it would have to be designed as a small dam. The proposed dam would be subject to criteria that would likely include consideration of one-half the Probable Maximum Flood (PMF) event, at a minimum, and the entire PMF, at worst. In any case, the technical, environmental, regulatory, and social obstacles associated within a jurisdictional dam would be significant; and thus would be extremely difficult to overcome without substantial effort and monetary cost.

c. Preliminary Construction Costs—Online Stormwater Detention

Including land costs, basin excavation, inlet/outlet appurtenances, landscaping, and associated contingency factors of 1.3 and 1.2 for ancillary construction costs and engineering/project management, respectively, Tetra Tech has arrived at a very preliminary cost of $5,327,923.00 to construct an approximately 54-acre, 25-foot-deep geometrically square online stormwater detention facility with side-slopes of 4H:1V, with a bottom slope of 0.5 percent, that would contain 230 acre-feet of stormwater runoff (see Technical Memorandum in Appendix 5 for supporting calculations).

2. Four Southern Tributaries

During the July 29, 2003, storm in Ajo, the primary source of flooding was the Gibson Arroyo. A secondary source was as the result of stormwater runoff emanating from 4 southern tributaries located south of the Gibson Arroyo. Field reconnaissance and aerial photography/topography reveal that there are 4 locations where stormwater runoff from these 4 southern tributaries could be detained for flood-control purposes. The locations of the potential stormwater detention facilities are as follows:

- Site "A." This potential facility would be located immediately south of State Highway 85, approximately 275 feet west of Saguaro Road (see Technical Memorandum in Appendix 5). Site "A" is a vacant parcel of land. It has a surface area of approximately 1.0 acre in size. The contributing watershed area at this location is 31.6 acres.

- Site "B." This potential facility lies near the northwest corner of the intersection of Saguaro Road and West Morondo Avenue (see Technical Memorandum in Appendix 5). Site "B" also is a vacant parcel of land. It has a surface area of approximately 1.8 acres in size. The contributing watershed area at this location is 54.7 acres.

- Site "C." This potential facility lies at the southeast corner of the intersection of Saguaro Road and West Esperanza Avenue (see Technical Memorandum in Appendix 5). Site "C" is a vacant parcel of land. It has a surface area approximately 0.75 acres in size. The contributing watershed area at this location is 17.6 acres.

- Site "D." This potential facility lies immediately west of Orilla Avenue, approximately 200 feet south of West Esperanza Avenue (see Technical Memorandum in Appendix 5). Site "D" is an old, abandoned, athletic field. It has a surface area approximately 2.65 acres in size. The contributing watershed area at this location is 125.4 acres.

a. Computed 100-Year Peaks and Flood Volumes

In order to provide a conservative estimate of the flood-runoff volume for the 4 potential stormwater detention facilities located along the 4 tributary watersheds, contributing watershed areas were first computed and then hydrologic parameters were estimated using the Pima County Flood Peak Procedure, which applicable rainfall estimates derived using NOAA Atlas VIII data and procedures. Using the preceding methodology, the estimated 100-year flood peaks and volumes were computed for potential detention facility sites located along the 4 southern tributaries. The results of these computations are summarized in Table 5. Supporting calculations are contained within a Technical Memorandum in Appendix 5.

TABLE 5: TRIBUTARY DISCHARGES AND FLOOD VOLUMES

Proposed Stormwater Facility ID	100-Year Peak Discharge* (cfs)	100-Year Flood Volume* (acre-ft)	10-Year Flood Volume* (acre-ft)
"A"	215	6.29	2.83
"B"	319	9.97	4.49
"C"	115	3.24	1.46
"D"	631	22.98	10.34

*Note: Where applicable, the preceding flood peaks and flood volumes are based upon future watershed conditions.

b. Stormwater Detention Facility Sizing

When considering the target outflow from these potential stormwater detention basins, a reasonable goal would be to reduce the 100-year peak discharges so that the outflow from the detention facilities would be equivalent to a 5-year peak discharge. Assuming that the values presented in Table 4 are reasonable estimates for the 100-year peak discharge, online detention storage volumes of approximately 4.86 acre-feet, 7.72 acre-feet, 2.51 acre-feet, and 17.81 acre-feet would be required for stormwater detention facilities at the 4 sites. When consideration of a piggyback storm event and sediment accumulation is included, the required storage volumes at the detention basins need to be increased by a factor of 1.5.

Due to the highly urban nature of the land uses located near the 4 potential detention facility sites, the potential for offline detention is less feasible than it is along the much larger Gibson Arroyo watershed. Nevertheless, assuming that offline detention was employed, storage volumes were calculated, which also included consideration for a piggyback storm event and sediment accumulation.

FIGURE 9:

POTENTIAL STORMWATER DETENTION FACILITY "A"

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FIGURE 9 (continued):
POTENTIAL STORMWATER DETENTION FACILITY "B"

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FIGURE 9 (continued):
POTENTIAL STORMWATER DETENTION FACILITY "C"

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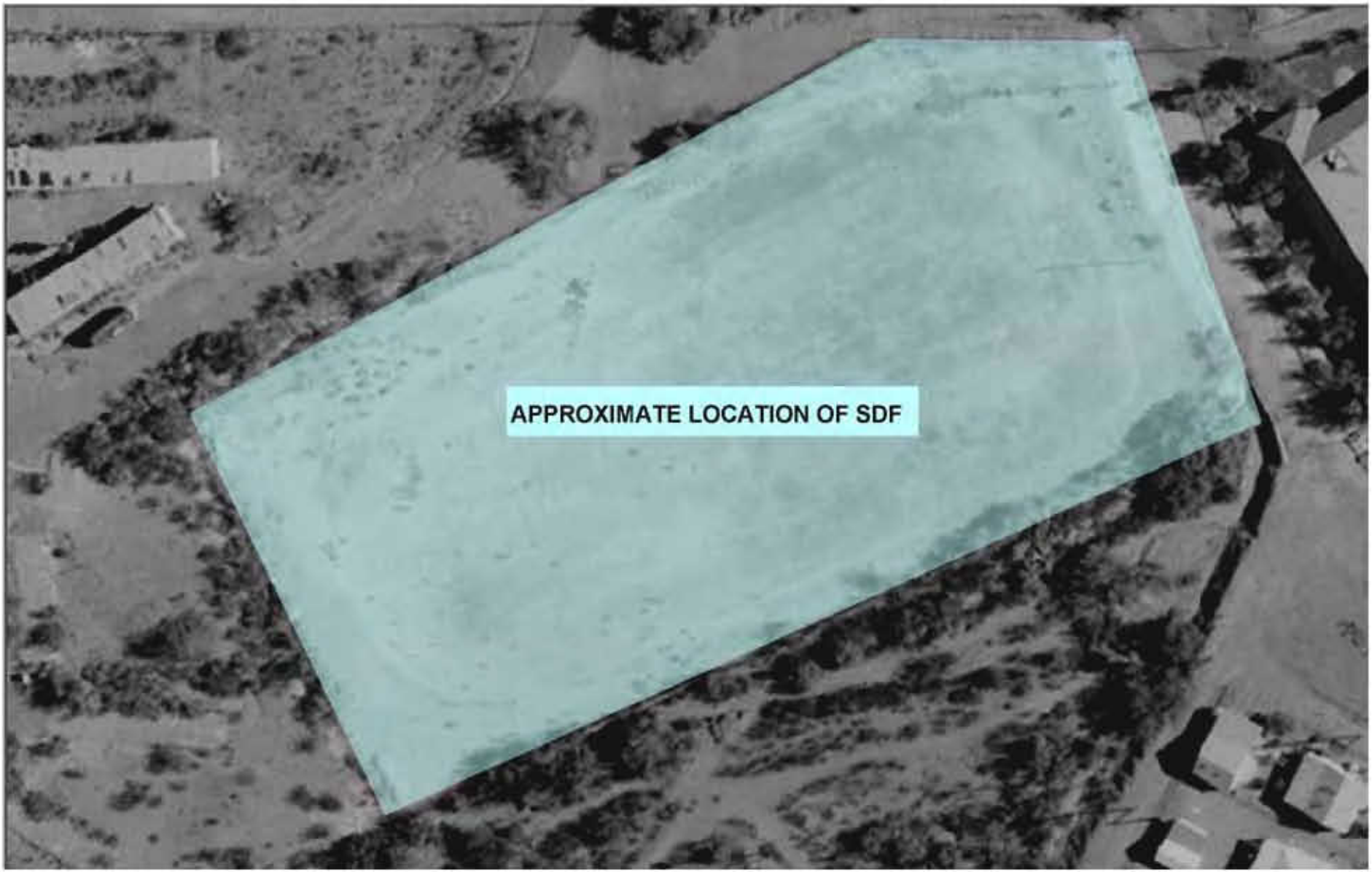
FIGURE 9 (continued):
POTENTIAL STORMWATER DETENTION FACILITY "D"



TETRA TECH, INC.

Table 6 provides a summary of the stormwater-detention-facility requirements at the 4 sites.

TABLE 6: DESIGN FLOOD VOLUMES FOR POTENTIAL STORMWATER DETENTION FACILITIES

Proposed Stormwater Facility ID	Design Outflow (5-Year Discharge)* (cfs)	Design Flood Volume for Online Basin* (acre-ft)	Design Flood Volume for Offline Basin* (acre-ft)
"A"	215	7.29	6.20
"B"	319	11.58	9.84
"C"	115	3.77	3.20
"D"	631	26.72	22.71

*Note: Where applicable, the preceding design-outflows and design-volumes are based upon future watershed conditions.

Potential basin depths were estimated for online basins assuming:

- The entire vacant surface areas would be available for use in conjunction with potential detention facilities;
- All the facilities would have 4:1V side-slopes; and
- All the facilities would have bottom slopes of 0.5 percent.

For these conditions, the depth at Site "A" would have to be about 14 feet, the depth at Site "B" would have to be about 10 feet, the depth at Site "C" would have to be about 8 feet, and the depth at Site "D" would have to be about 13 feet. These depths, while significant, could be achieved at each of the 4 identified locations, especially if some of the required depth were obtained using above-ground levees. A critical issue yet to be resolved, however, is the identification of a suitable outfall location for each site and a downstream discharge location.

Potential basin depths were estimated for offline basins using the same assumptions. For offline basins, the depth at Site "A" would have to be about 12 feet, the depth at Site "B" would have to be about 9 feet, the depth at Site "C" would have to be about 7 feet, and the depth at Site "D" would have to be about 11 feet. These depths could be achieved at each of the 4 identified locations, especially if some of the required depth were obtained using above-ground levees. Again a critical issue, yet to be resolved, would be the identification of a suitable outfall location for each site and a downstream discharge location.

c. Preliminary Construction Costs for Stormwater Detention

Preliminary cost estimates to construct the 4 previously referenced online stormwater detention facilities are provided in Table 7. The estimates include land costs, excavation, inlet/outlet appurtenances, landscaping, and contingency factors of 1.3 and 1.2 for ancillary construction costs and engineering/project management, respectively (supporting calculations can be found in a Technical Memorandum in Appendix 5).

TABLE 7: PRELIMINARY CONSTRUCTION COSTS FOR 4 ONLINE STORMWATER DETENTION FACILITIES—SOUTHERN TRIBUTARIES	
Proposed Online Stormwater Facility ID	**Preliminary Construction Cost Estimate**
Site "A"	$155,688.00
Site "B"	$241,591.00
Site "C"	$ 94,703.00
Site "D"	$474,691.00
Cost to Construct all 4 Facilities:	**$966,673.00**

D. Channel Diversion

1. Channel Diversion Potential

A third potential option for the Gibson Arroyo may be a diversion channel to divert flow north and around the community of Ajo. Accordingly, channel diversion potential along the Gibson Arroyo was also evaluated. Diversion of the Gibson Arroyo northward and around the urban area of Ajo would entail a constructed, earthen channel, with flow ultimately returning to within its original watershed boundaries. A preliminary alignment for the diversion channel and the recommended point of diversion are depicted on Figure 9. The technical details of the diversion concept are presented in a Technical Memorandum that can be found in Appendix 5.

The preliminary alignment for the proposed diversion channel would have an approximate length of 7200 feet. The proposed channel would be earthen, would be 8 feet deep, would have a bottom-width of 40 feet and a top-width of 88 feet, and would have side-slopes of 3H:1V. The longitudinal slope along the bed of the diversion alignment would average approximately 2 percent. If 20-foot-wide access and maintenance roads were provided along each channel bank, the total width of right-of-way required along such a diversion channel would be 128 feet. In order to account for the potential of some lateral movement of the channel banks, though, a right-of-way width of 150 feet was selected by Tetra Tech for preliminary cost-estimating purposes.

2. Preliminary Construction Costs

Using the preliminary configuration described in the preceding paragraph, and as graphically depicted in a Technical Memorandum found in Appendix 5, it is roughly estimated that (1) about $827,521.00 worth of property would have to be acquired along the length of the diversion channel; (2) about $129,600.00 would be required for a structure to provide 100-year, all-weather access across the diversion channel (tentatively at Childs Street); and (3) approximately $762,665.00 would be required in order to construct the diversion channel—with the latter cost estimate including a contingency for attendant stabilization measures, if and where warranted. Therefore, when using contingency factors of 1.30 and 1.20 to account for ancillary construction costs (such as a possible culvert at North Second Avenue [U.S. Highway 85]), and engineering/project management, respectively, the total cost for the diversion-channel option is roughly estimated to amount to $2,682,866.00. Supporting calculations for this preliminary construction cost estimate can be found in a Technical Memorandum contained within Appendix 5.

1998 ANNOTATED AERIAL PHOTOGRAPH—AJO, ARIZONA

Note: The Arrows Indicate Potential Diversion of Gibson Arroyo Around Urban Area of Ajo

FIGURE 10: Potential Alignment for Diversion Channel—Gibson Arroyo

3. Environmental Considerations

A critical issue related to diversion of the Gibson Arroyo is the associated environmental implications. In particular, diversion of existing flow along another channel alignment may cause some concern related to the 404 permitting process, and any impacts created to riparian habitat along the existing Gibson Arroyo. Another issue is the potential consequences of flow diversion across a watershed divide, and discharging flows into a separate watershed (although, as stated previously herein, it is tetra tech's intent that the diversion channel would ultimately direct flows back to the same watershed from whence they originated).

IX. RECOMMENDATIONS

A. Rights-of-Way Acquisition and Maintenance Activities

1. Rights-of-Way

Existing drainage infrastructure is under various ownerships, without any clear definition as to responsibilities for maintenance. A unified approach for the Gibson Arroyo is recommended for the purpose of flood control, floodplain management, and maintenance. Maintenance of the Gibson Arroyo is especially critical in the reach between State Route 85 (Ajo-Gila Bend Highway) and Fourth Avenue. Pima County Acquisition of right-of-way and/or maintenance easements for this reach of the Gibson Arroyo is recommended.

While it is far too early to determine precise rights-of-way acquisition needs for flood-control improvements in Ajo, it can be said that rights-of-way acquisitions will certainly be necessary if channel diversion, stormwater detention facilities, or channel improvements are to be implemented for either the Gibson Arroyo or any of the 4 southern tributaries to Gibson Arroyo that were evaluated as elements of this study effort. Preliminary estimates of the quantitative amounts of rights-of-way for channel diversion and stormwater detention facilities have been provided within this report. The amount of rights-of-way necessary for channel improvements, however, will be dependent upon whether the magnitude of *future* flows will remain the same in and along the Gibson Arroyo and the 4 southern tributaries, given the opportunities for upstream channel diversion and stormwater detention.

2. Maintenance

Once maintenance easements or rights-of-way are secured, regularly scheduled, periodic maintenance of the existing Gibson Arroyo channel and bridges is recommended in order to maximize conveyance capacity and reduce flooding potential associated with excessive debris and sedimentation that accumulates during flow events. Maintenance activities should consist of removal of debris and sediment within the channel and at bridges. In addition, removal of excessive debris located upstream, along the channel banks, is also recommended.

Routine maintenance should be scheduled in concert with the normal rainfall seasons. Maintenance should be performed:

- Prior to the summer thunderstorm season, in early July; and
- Following the summer thunderstorm and the fall rainy seasons.

Inspections should be performed before maintenance activities, in order to determine the extent of necessary maintenance. In addition, maintenance inspections should be performed after every significant flow event, and maintenance performed, if required.

B. Master Drainage Plan

The contents of this report represent an emergency evaluation of, and report on, the cause and effects of the July 29, 2003, flood in Ajo, Arizona. As part of this evaluation, some specific hydrologic and hydraulic analyses were completed with respect to the observed flooding. In addition, preliminary conceptual flood-control alternatives were identified as potential solutions to the flooding. However, a long-term solution to the flooding that was observed on July 29, 2003, is best determined as part of a comprehensive Master Drainage Plan for the entire urban area of Ajo.

Accordingly, it is recommended that a Master Drainage Plan be prepared for the urban area of Ajo. The Master Drainage Plan would build upon the work completed as part of this study for the Gibson Arroyo and the southern watersheds, and would recommend specific approaches for addressing these flood-prone areas. In addition, other areas of Ajo would also be evaluated, and recommendations would be prepared. Given a comprehensive Master Drainage Plan to guide future activities, implementation and funding for flood-control and stormwater management options would more likely be achievable.

1. Recommended Technical Tasks/Reports—Master Drainage Plan Scope of Services

The following items represent technical tasks and reports recommended for inclusion in a Scope of Services to prepare a Master Drainage Plan for Ajo, Arizona:

- Site Visits
- Data Collection and Analysis
- Field Surveying and Mapping
- Rights-of-Way and Easements
- Ownership and Maintenance Responsibilities
- Hydrologic Analysis
- Hydraulics Analysis
- Erosion and Sedimentation Analysis
- Potential Lateral-Migration Analysis
- Alternatives Analysis
  —Includes Possible Land Acquisition via County's Floodprone Land Acquisition Program
- Biological Survey Documentation and Report
- Jurisdictional Delineation (if applicable)
- Recommended Alternatives Analysis
- Master Drainage Plan Report

- Maintenance Plan
- Implementation Plan
- Public Involvement and Intergovernmental Agreements
- Permits and Approvals

Reports

- Data Collection Report
- Project Survey Report
- Rights-of-Way, Easements, Ownership, and Maintenance Responsibilities Report
- Project Technical Report
- Alternatives Analysis Report
- Recommended Design Report
- Master Drainage Plan Report

Priorities for evaluation in the Master Drainage Report include capital improvements for Gibson Arroyo at East Second Avenue and flood control for the Ajo Business District.

2. East Second Avenue Bridge

In the absence of channel diversion in the upstream reaches of the Gibson Arroyo, it is recommended that the East Second Avenue Bridge be replaced with a higher profile, single (i.e., long-span) bridge in order to minimize debris and sedimentation buildup at the bridge. A bridge, rather than an at-grade crossing, is recommended in order to maintain all-weather access for the area and reduce the risk to public health, safety, and welfare.

3. Ajo Business District

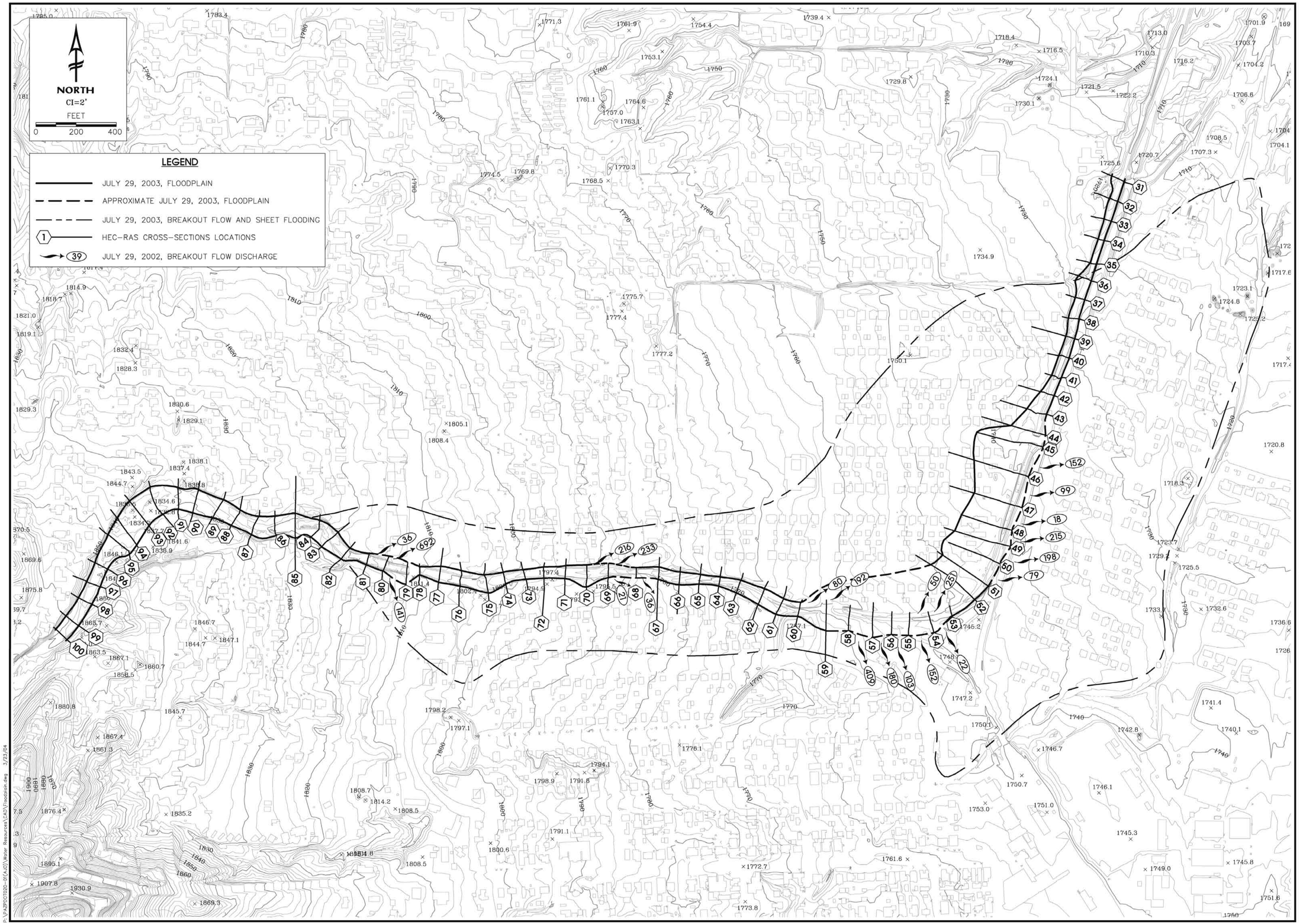
Flooding and Drainage problems of the Ajo Business District and Plaza have occurred after any significant storm event. Upstream Stormwater detention in tributary Watershed D should be evaluated as a means to reduce downstream flooding.

APPENDICES

Appendix 1: Additional Maps and Exhibits
Appendix 2: Summary of Collected Information and Complaints Forms
Appendix 3: Hydrologic and Hydraulic Data
Appendix 4: Miscellaneous Technical Memorandums

APPENDIX 1

Additional Maps and Exhibits



NO.	REVISION	APPV'D.	DATE

DESIGNED BY: LKR
DRAWN BY:
CHKD BY (DESIGN): CRT
CHKD BY (FIELD SURVEY):
FIELD BOOK NO.:

TETRA TECH, INC.
33 N. Stone Ave., Suite 1500, Tucson, AZ, 85701
(520) 623-7980 • FAX (520) 884-5278

PROJ. No.: PAZPDOT020-01
DATE: Mar., 2004
SHEET NO.: 1 OF 1

AJO FLOOD ENGINEERING ASSISTANCE PROJECT

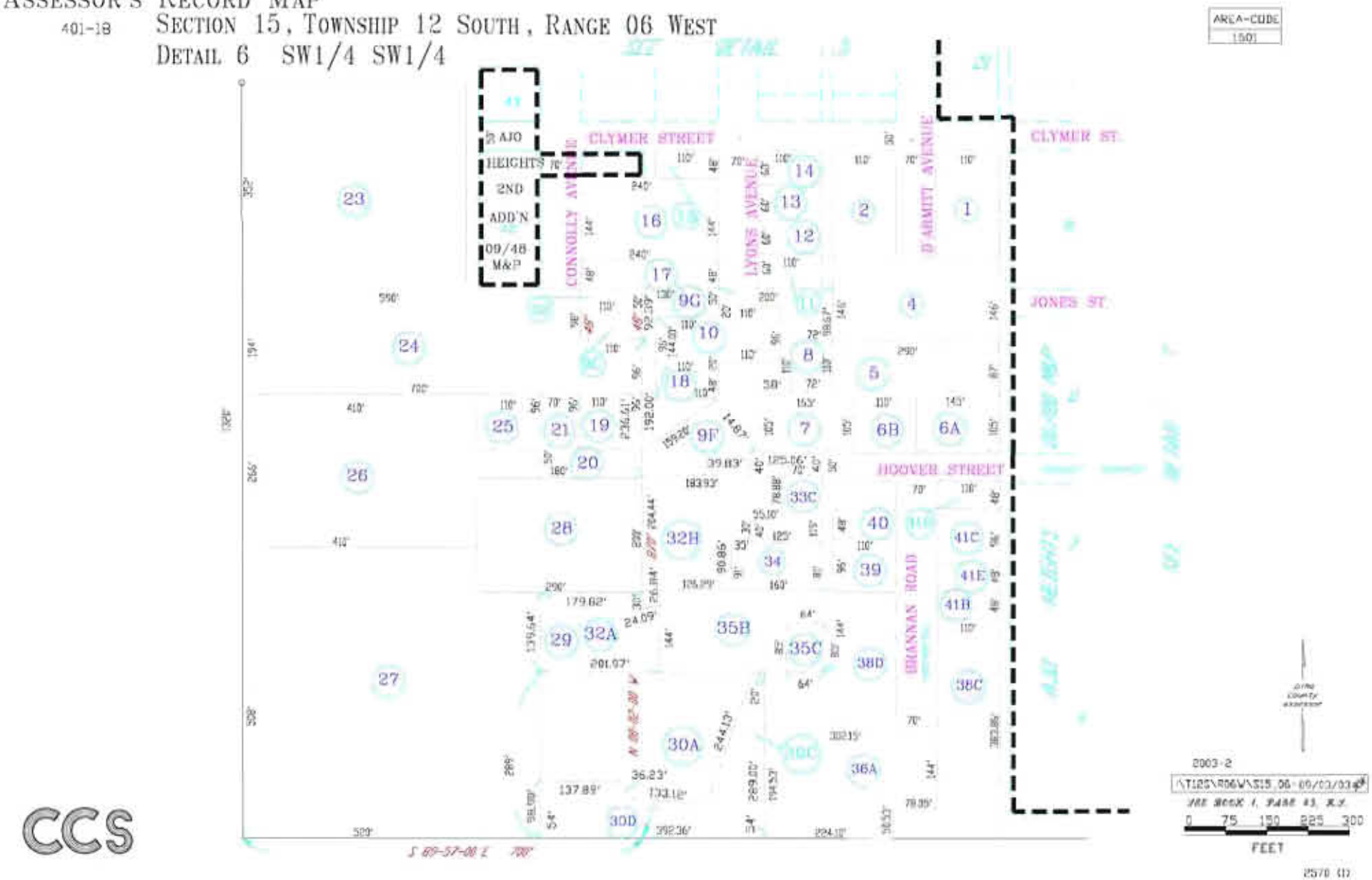
GIBSON ARROYO FLOOD HAZARDS

July 29, 2003

P:\PAZPDOT020-01(A-AO)\Water Resources\CAD\floodplain.dwg 3/23/04

Detail No. 1--Property Ownership along Potential Diversion Channel for Gibson Arroyo.

Tetra Tech, Inc.



Detail No. 2--Property Ownership along Potential Diversion Channel for Gibson Arroyo.

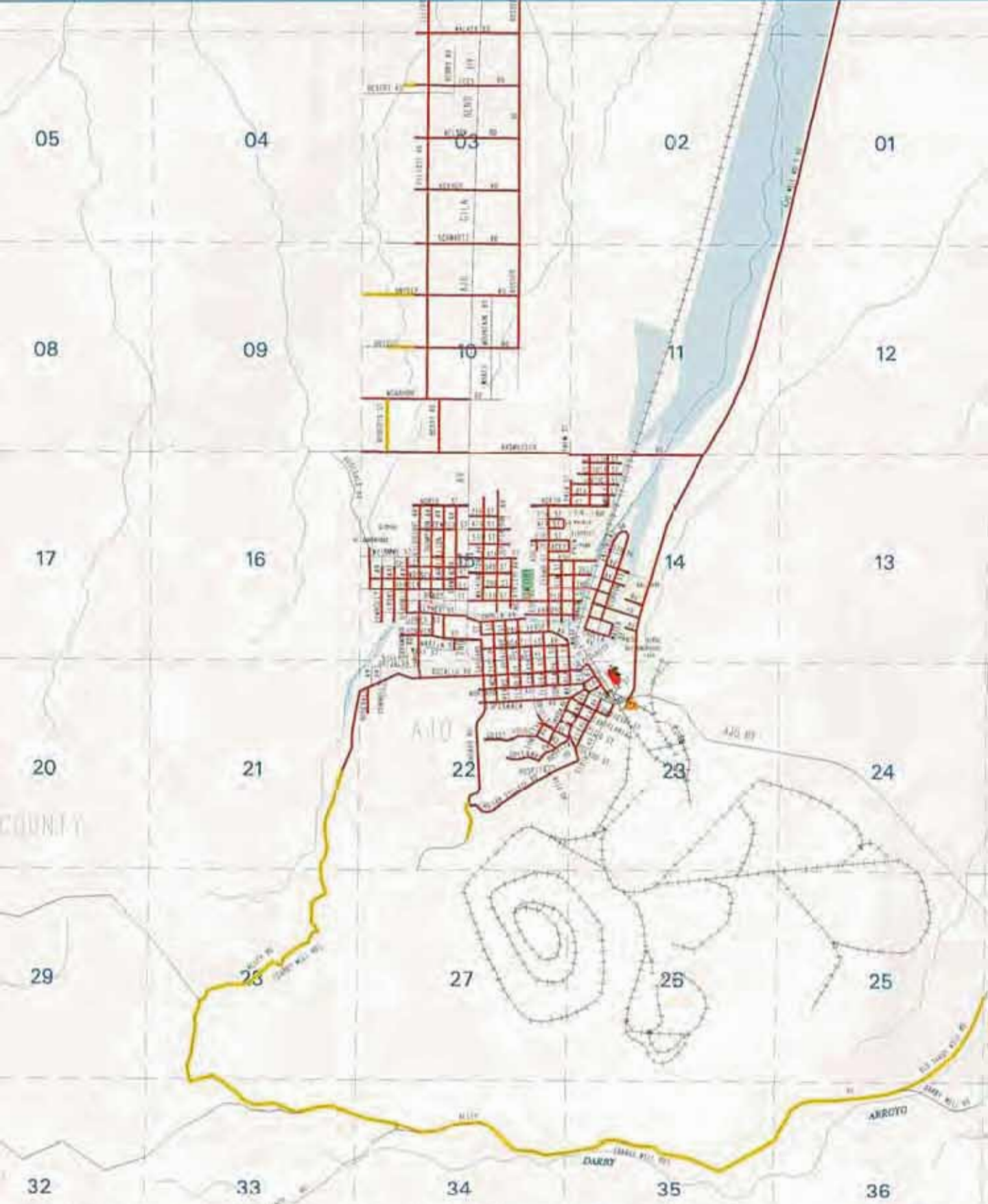
Tetra Tech, Inc.

PRELIMINARY LIST OF LAND OWNERSHIP AND ESTIMATED PROPERTY VALUES FOR POSSIBLE GIBSON ARROYO DIVERSION CHANNEL, URBAN SEGMENT OF AJO, AZ. (i.e., along Lyons Ave., N. to S., from approximately Welcome St. Alignment to Hoover St. Alignment)

Property Owner (Only First Name Listed)	Assessor's Parcel Number	Property Value[†]
Wayne	401-16-0770	$5,400
Cole	401-16-0790	$5,400
Parker	401-16-0720	$5,400
Parker	401-16-0740	$5,400
Parker	401-16-0760	$3,000
Wayne	401-16-0640	$5,400
Wayne	401-16-0660	$5,400
Cole	401-16-0680	$3,000
Vasquez	401-16-0290	$4,752
Grane	401-16-0300	$2,376
Grane	401-16-0560	$3,000
Grane	401-16-0570	**$60,618**
Grane	401-16-0310	$2,376
Davis	401-16-032A	**$74,022**
Jerez	401-16-0270	$11,160
Jerez	401-16-0340	**$75,539**
Rose	401-18-0150	$773
Barger	401-18-0160	**$115,881**
Barger	401-18-0170	$1,755
Canez	401-18-009G	$2,363
Andrews	401-18-0100	**$69,351**
Canez	401-18-0180	$810
Cox	401-18-009F	$6,345
	Total:	$469,521

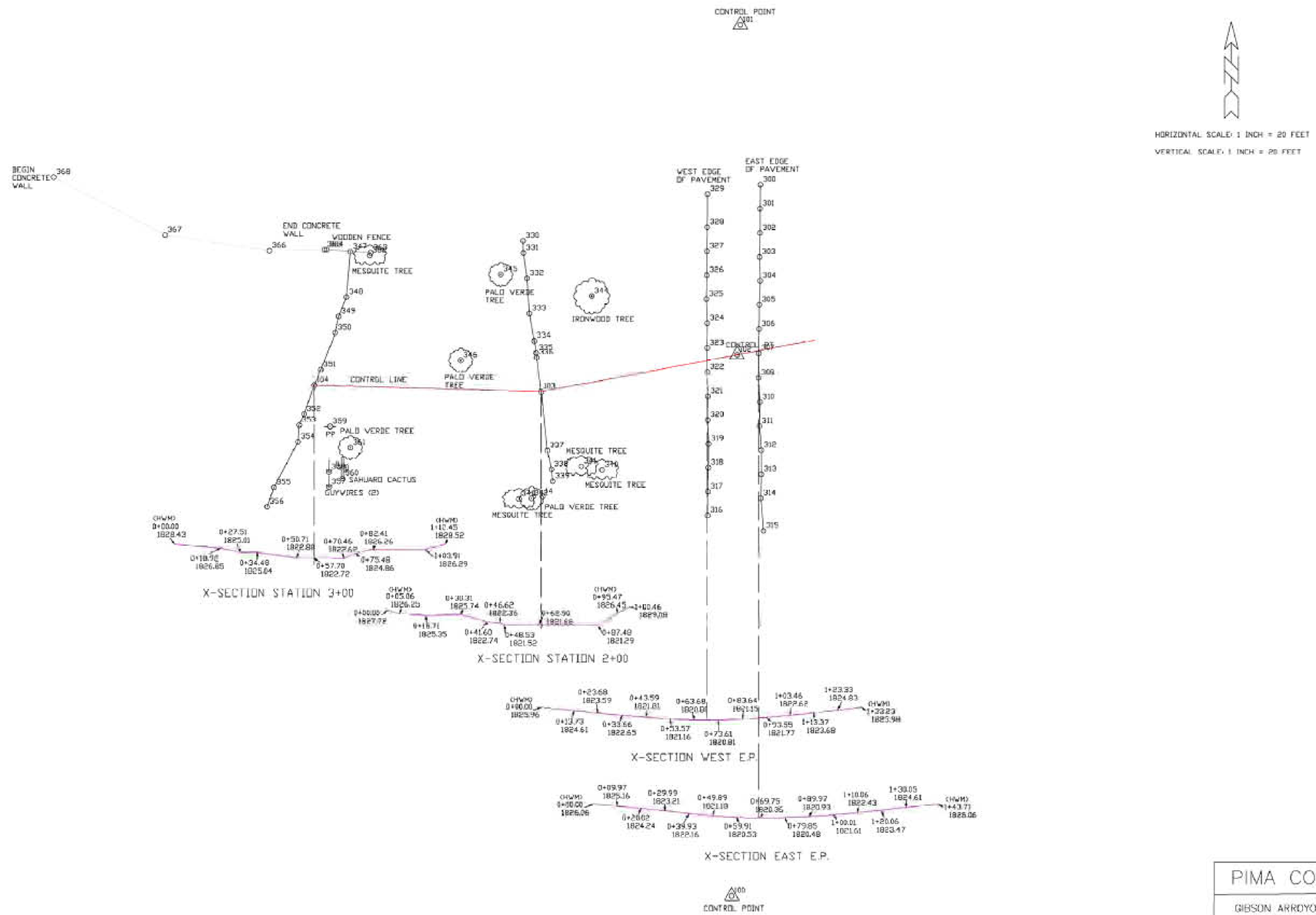
[†]Property values are based upon Pima County Assessor's Full Cash Value, times an adjustment factor of 1.50. The Property Values listed in **bold** are for improved properties with structures.

In addition, for analysis purposes vacant land that is not subject to easements, restrictions, or natural hazards is estimated to have a value of $25,000 per acre. Floodprone land is estimated to have a value of $10,000 per acre.



Street Maintanance Map of the Community of Ajo, Arizona. The "red-lined" infrastructure indicates facilities maintained by Pima County.

Tetra Tech, Inc.



PIMA COUNTY SURVEY

GIBSON ARROYO AND SARTILLION AVENUE
LOCATED IN SECTION 15,
TOWNSHIP 12 SOUTH, RANGE 6 WEST,
GILA AND SALT RIVER MERIDIAN,
PIMA COUNTY, ARIZONA.

DATE: SEPT. 10 2003 DRAWN BY: DWS SHEET 1 OF 1

APPENDIX 2

Summary of Collected Information and Complaints Forms

-----Original Message-----
From: Kate Garmise [mailto:kate@cunews.info]
Sent: Friday, September 19, 2003 4:45 PM
To: Zeller, Mike -- ISG-AZ
Subject: Re: Ajo Flooding

Here's the article you requested.

Kate

STORM & FLOOD

Ajo Copper News issue of August 6, 2003

IT WAS THE STORM OF THE CENTURY — SO FAR

Eight o'clock Tuesday, July 29: The summer storm began with gusting winds. And then it rained.

And it rained.

And it rained for just over an hour. Various amounts were reported throughout the area. In the Five Acres 1.25 inches fell; in town, Phelps Dodge reported 1.79 inches; at the top of the hill on Rocalla, 2.75 inches; and farther out on the Scenic Loop Road, more than 3 inches were reported.

Those caught walking were drenched and a few reported they were nearly swept away by the force of water surging down streets.

By nine o'clock folks were out checking out the damage. The Ajo skyline was filled with people wasting no time in getting started on roof repairs while shovels, rakes, and hoses appeared in yards. One resident of the Plaza area measured an 18" high water line near her home.

Some people lost outdoor furniture. Others lost parts of their roofs, walls, or yards. Almost everyone lost something.

Or gained something. Some were inundated with gallons of water. Others had rocks, bricks, trash, and sludge dumped near homes, cars, against fences, and wherever the water slowed enough to set its collection down.

The Pima County road crew and everyone with heavy equipment began working immediately and some are still working. Tons of dirt were removed from streets, roads, and alleys.

Immediately after the storm, Pima County Sheriff's Department deputies, Ajo/Gibson Volunteer Fire Department personnel, and Ajo Ambulance crews were busy responding to calls asking for aid, requesting advice on how to deal with problems, and asking for help in removing family members from buildings, as well as directing traffic around obstacles and preventing people from entering flooded washes, according Lt. David Allen of the Pima County Sheriff's Department's Ajo District.

Allen said the Gibson Arroyo was already full when a 3 to 5 foot wall of water hit the Second Avenue bridge washing debris and water across the highway. He said he was pleased with the way all emergency units worked together and how citizens cooperated and helped. He did note that if people do not have to be out during or immediately following a severe event like that, they should stay home rather than take a chance of getting in the way of emergency workers and possibly causing an accident or even becoming involved in an accident themselves.

Allen also said that residents who remember back 60 years said they have never seen that much water come down in that short a period of time. They've seen higher winds, but never that much water, he said.

The Great American Sweeping street cleaning crew pictured in last week's issue of the *Ajo Copper News* had begun cleaning streets on Monday. They had even more work than when they started as they returned to clear streets they'd left neat and tidy.

One home inspector looked at about 100 homes in Ajo. She estimated interior damage to only about 20 but that almost all had some type of exterior damage that made landscaping and clean-up necessary.

Several businesses had parking lots covered with branches, trash, and mud, and a few were flooded.

The public library had to close and, on Monday, librarian Virginia Beauchel said she didn't know when they would be able to resume their regular hours.

Boulders stood sentry in debris-strewn streets. Rocks from the landscaping at Good Shepherd Presbyterian Church were found at the Desert Senita Community Health Center, blocks away.

On Thursday, Pima County Supervisor Sharon Bronson, Kurt Weinrich of Pima Transportation and Flood Control, and Terry Hendricks of the Floodplain Management Division visited Ajo to see what could be done to help those who suffered severe damage. A community meeting will be held at 6:30 p.m. on Thursday, August 7, to provide information to those who sustained damage.

One area of major damage was the Second West Avenue bridge and the homes nearby. Residents of the area have been asking for help since a storm in 2001 flooded many

homes in that area when the arroyo filled with debris and the West Second Avenue bridge was washed out.

Pima County representatives and Phelps Dodge officials have been debating whose responsibility it is to clean the wash. Bronson said they had been willing to correct the problem, but that it was Phelps Dodge property and PD hadn't yet grant their permission. Environmental and railroad right-of-way concerns were said to also stand in the way of any action.

Hendricks said he believed the amount of rain in the short space of an hour during this particular storm was more than the wash could have handled even if it had been clean. He is gathering information with the aid of aerial mapping to submit to Federal Emergency Management Agency (FEMA) to define the event as a flood. This should help those with flood insurance get some reimbursement for the damage incurred, he said.

Weinrich inspected the Second Street bridge and said he believes it is structurally sound. Following pavement repair, it should be usable.

Bronson said she was working with the county's Community Services Department and had contacted Congressman Raul Grijalva to see what assistance could be made available to the estimated 50 residents with severe damage. They will continue to work with Phelps Dodge to resolve responsibility issues, she said.

Residents continue to clean up and repair damage while they wait for the next big storm. To help them, booklets prepared by the American Red Cross and FEMA, *Repairing Your Flooded Home* will be available in the public library when it reopens.

Ajo Copper News

Headline news from the issue of August 6, 2003

For the full versions of these stories & more news SUBSCRIBE to the Ajo Copper News!

STORM!

Ajo was inundated by about two inches of rain in just over an hour on Tuesday evening, July 29. When the downpour abated, the skyline was full of people working on damaged roofs while below others cleared water and mud out of homes. Crews were busy clearing streets and several roads were closed, including the one near Second Avenue and Railroad Drive that links the east and west sides of the community. The library had to close due to damage from flooding. Supervisor Sharon Bronson visited with officials from the Department of Transportation and Flood and announced a meeting to be held August 7 to disperse information to flood victims.

Care facility

If all goes smoothly, the adult care facility will be ready for occupancy in early 2004, said Ed Sicurello of Desert Senita Community Health Center. The start of construction has been approved. The five-bedroom facility will house ten residents who need assistance in living but not nursing care.

Homicide

Anyone with information about an apparent homicide near Why is asked to contact the Pima County sheriff's office at 888-CRIME or the homicide unit at 520-741-4806. The body of a man was found in a shallow grave about a mile north of the community. The 5' 11" man had short dark brown hair and appeared to be in his twenties. The name Antonio or Antonia was tattooed on his upper left arm and the letter E was tattooed in Old English script on the outside of his left calf.

Birth

Hannah Marie Garcia was born in Sirra Vista on July 16, 2003, to Samantha and Tony Garcia of Sierra Vista.

Weekday Weather

High temperature was 104F and low temperature was 68F. There was 0.08 inch of rain on July 27, 0.05 inch on July 28, 1.79 inch on July 29, and 0.05 inch on July 31 according to information courtesy of Phelps Dodge Mining Company. On July 29, 1.29 inch of rain was recorded in the Five Acres area and 2.75 inch on top of the hill at Rocalla by individuals with rain gauges.

Death

John Boesenberg, 77, died at his home in Olympia, Washington, on July 30, 2003. He was born March 24, 1926, in Chicago, Illinois. He served in the US Navy from 1944 to 1974 and then worked for the Clallam County sheriff's Dept. in Washington. He came to Ajo from Washington in 1990 and lived here for thirteen years. He is survived by his sons and daughter and other family members. At his request, no service will be held for Mr. Boesenberg.

From: **Michelle Chambers [Michelle.Chambers@dri.edu]**
Sent: Monday, September 29, 2003 4:17 PM
To: Zeller, Mike -- ISG-AZ
Cc: 'wrcc@dri.edu'
Subject: Re: July 29, 2003, Storm and Flood in Ajo, Arizona

We do not have the data from the weighing gauge. I did look at the daily data for July 29, 2003 and the total for the day was 1.79 inches.

FYI - this was close to a 24 hr, 5 yr storm event.

Any other questions, please let us know.

Michelle Chambers
Assistant Climatologist
Western Regional Climate Center
Desert Research Institute
2215 Raggio Parkway
Reno, NV 89502
Phone: 775-674-7010
Fax: 775-674-7016

On Mon, 29 Sep 2003, Zeller, Mike -- ISG-AZ wrote:

To Whom It May Concern:

My firm has been contracted by the Pima County Flood Control District PCFCD) to investigate the storm and flood of July 29, 2003, that occurred in Ajo, Arizona. We are focusing primarily upon flooding along the Gibson Arroyo and two of its tributaries. Unfortunately, due to the long time that it has taken for Tetra Tech to "get on board," we are at somewhat of a disadvantage in obtaining accurate, on-the-ground information. However, as far as the precipitation that occurred during the event is concerned, I am aware that on August 5, 2003, Mr. Mike Schaffer of NOAA sent e-mail to Terry Hendricks of the PCFCD which stated the following:

Terry,

We have a COOP site near the mine. They reported about 2 inches. The gage is a weighing gage and thus very accurate. In convective weather, as little as just over one mile in distance can make a significant difference in rainfall.

We are looking into the time step on the Ajo precip estimates and will get back to you shortly in that regard.

Mike

When I contacted Mr. Schaffer, he instructed me to contact you for the "official data." Accordingly, I was hoping that, at this point in time, there might be additional information, or refinement to previous information, that you could make available to Tetra Tech regarding the amount, time of occurrence, and temporal distribution of the precipitation which fell during the storm of July 29, 2003, in Ajo, Arizona (including any estimates gleaned from radar images).

Thank you, in advance, for your cooperation regarding this matter.

Michael E. Zeller, P.E., P.H.
Manager of Water Resources
Tetra Tech, Inc.
33 North Stone Avenue, Suite 1500
Tucson, Arizona 85701-1413
Telephone: (520) 623-7980
Facsimile: (520) 884-5278
E-Mail: mike.zeller@tetratech.com

From: **Mike Schaffner [Mike.Schaffner@noaa.gov]**
Sent: Tuesday, August 05, 2003 7:55 AM
To: Terry Hendricks
Cc: Andy Wigg; Erik Pytlak
Subject: Re: Ajo Rainfall

Terry,

We have a COOP site near the mine. They reported about 2 inches. The gage is a weighing gage and thus very accurate. In convective weather, as little as just over one mile in distance can make a significant difference in rainfall.

We are looking into the time step on the Ajo precip estimates and will get back to you shortly in that regard.

Mikc

Terry Hendricks wrote:

I am hearing from the locals the rainfall for the storm that occurred on July 29 in Ajo ranged from 2.7 to 4 inches in an hour. Does the NWS have a weather volunteer in the area?

R. "Terry" Hendricks, CFM, Chief Hydrologist
Pima County Flood Control District
201 N. Stone Avenue
Tucson Arizona 87501-1207

Phone (520) 740-6350
FAX (520) 740-6749

Email: Terry.Hendricks@dot.pima.gov <mailto:Terry.Hendricks@dot.pima.gov>

From: Marum, Patrick -- ISG-AZ
Sent: Friday, September 26, 2003 9:35 AM
To: Zeller, Mike -- ISG-AZ
Subject: FW: Another Ajo rainfall value

FYI

-----Original Message-----
From: Terry Hendricks [mailto:Terry.Hendricks@dot.pima.gov]
Sent: Friday, September 26, 2003 8:33 AM
To: 'Patrick.Marum@tetratech.com'
Subject: Another Ajo rainfall value

Ron Metsch at 200 E. Second Ave. had a rain gauge estimate of 2.5" in 1.5 hours. Mr. Metsch can be reached (520) 387-6158.

R. "Terry" Hendricks, CFM, Chief Hydrologist
Pima County Flood Control District
201 N. Stone Avenue
Tucson Arizona 87501-1207

Phone (520) 740-6350
FAX (520) 740-6749

Email: Terry.Hendricks@dot.pima.gov <mailto:Terry.Hendricks@dot.pima.gov>

From: **Zeller, Mike -- ISG-AZ**
Sent: Tuesday, February 03, 2004 12:36 PM
To: Terry Hendricks (E-mail)
Subject: Rainfall - Ajo

Terry:

Larry said that you inquired about whether Tetra Tech had generated a rainfall map for the July storm in Ajo. The answer is No. The reason is that we were unable to get any official readings of total rainfall from the National Weather Service, either via gauge measurements or radar images; and the other "data" that was provided addressed only two or three unofficial measurements which did not correlate well to one another. Given such limited information, Tetra Tech felt that any attempt to reconstruct a rainfall map would have been impracticable and unreliable, and thus of little technical value.

If you have some new rainfall information that you can provide to me since the last time we discussed this matter, near the end of September, 2003, I would be happy to review it.

By the way, if you have new information regarding flooding complaints and/or completed questionnaires from any Ajo residents impacted during the storm event, I would very much appreciate your transmitting an electronic copy of the information to me; or, send it by fax, if you do not have electronic versions of such documents.

Thank you.

Michael E. Zeller, P.E., P.H.
Manager of Water Resources
Tetra Tech, Inc.
33 North Stone Avenue, Suite 1500
Tucson, Arizona 85701-1413
Telephone: (520) 623-7980
Facsimile: (520) 884-5278
E-Mail: mike.zeller@tetratech.com

From: John M Kobar [John.M.Kobar@noaa.gov]
Sent: Friday, October 03, 2003 9:48 AM
To: NCDC.Orders
Cc: Mike.Zeller@tetratech.com
Subject: Re: jk*July 29, 2003, Storm and Flood in Ajo, Arizona

Hi Mr. Zeller,

I took a look at the radar data from the Tucson AZ (KEMX) and Yuma AZ (KYUX) radar sites for 07/29/03. The city of Ajo Arizona is more than 100 nautical miles from both radar sites. At this distance, the radar estimated precipitation products such as One-Hour Precipitation and Storm Total Precipitation are not very accurate and would not be of much use to you. Unfortunately, the area of interest is in a poor location if you want to obtain any radar data coverage. Sorry about the bad news. Have a good weekend.

John

NCDC.Orders wrote:

To Whom It May Concern:

My firm, Tetra Tech, Inc., has been contracted by the Pima County Flood Control District PCFCD) to investigate the storm and flood of July 29, 2003, that occurred in Ajo, Arizona. Tetra Tech is focusing primarily upon flooding along the Gibson Arroyo and two of its tributaries. Unfortunately, due to the long time that it has taken for us to "get on board," we are at somewhat of a disadvantage in obtaining accurate, on-the-ground information. In this regard, the PCFCD recommended that Tetra Tech contact NOAA as the reliable source for radar information concerning the July 29, 2003, storm in Ajo, Arizona.

Accordingly, Tetra Tech contacted Mr. Mike Schaffner of your local NOAA office. However, he instructed us to contact you for the "official" radar data. Consequently, Tetra Tech is hoping that, at this point in time, there might be additional radar information, or refinement to previous radar information, that you could make available to us regarding the amount, time of occurrence, and temporal/spatial distribution of the precipitation which fell during the storm of July 29, 2003, in Ajo, Arizona. Tetra Tech's understanding is that both the Tucson and Yuma radar were able to (partially) track the July 29, 2003, storm event. Mr. Schaffner tells us that the Tucson radar ID is KEMX, and is located in the Empire Mountains to the SE of Tucson; while the Yuma radar is located about the same distance from Ajo. Any storm data that you could provide Tetra Tech would be greatly appreciated.

Thank you, in advance, for your cooperation regarding this matter.

MEMORANDUM TO FILE

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Patrick W. Marum, P.E., and Michael E. Zeller, P.E., P.H.

DATE: September 12, 2003 (Revised September 15, 2003)

RE: Meeting Notes Concerning September 9, 2003 Kickoff Meeting for Ajo Flood Engineering Assistance Project

---

Ajo Flood Study—Kickoff Meeting Notes

11:00 a.m., September 9, 2003—Tetra-Tech/Pima County Flood Control District

Those present were: (from Pima County Flood Control District) Jerry Curless, P.E., R. Terry Hendricks, Suzanne Shields, P.E., (from Tetra Tech) Mike Zeller, P.E., and Pat Marum, P.E.

Jerry presented the Notice to Proceed Letter (9/9/2003) to Tetra Tech at this meeting. In order to aid in the discussion at this meeting, Terry presented some exhibits that included: an aerial photograph (labeled SCALE 1"=200' Ajo with FIRM overlay Photo Date 8-30-03) of the subject area, and an aerial photo [scale 1"=800'] of the watershed-as delineated by Terry-mounted on foam board. Terry mentioned that he has taken some field photos (before the cleanup), which will be made available to Tetra Tech.

A copy of the contract scope of work was given to Jerry.

We were told that the flood event occurred on 7/29/2003, with the peak of the storm (and presumably the peak of the runoff) passing through the populated areas sometime around dusk (7:00-8:00 p.m). Terry Hendricks stated that there was an estimate that approximately 100 houses that were flooded (or at least there was some sort of seepage inside the house), and that perhaps as many as 400 properties had floodwaters on them. It was noted that there is spotty rainfall and flood information surrounding the storm event, leaving much of the account based upon anecdotal evidence—although there is a rain gauge at the Pima County maintenance yard, located in town. The contact person for the County is a Mr. Ray Graves (a County Operations person). Terry relayed an account that had the storm originating near Why, Arizona; then traveling northwest towards Ajo, Arizona, where it turned west and seemed to stall over the hills west of the town. It was suggested that a follow-up contact with the Weather Service be made in a effort to gather any (additional) pertinent info they may have. Tetra Tech agreed to follow up on this item. It was suggested that a field visit be conducted, soon, to evaluate what remnants of the erosion and debris evidence remain.

Tetra Tech learned that Pima County has sent out a survey questionnaire to the affected public, and so far has received only a few responses with some information regarding high-water marks. Terry agreed to forward to Tetra Tech a copy of the survey questionnaire, a list of recipients, and any responses received.

Terry also brought to the attention of Tetra Tech the existence of a Gibson Arroyo "at-grade" crossing (at Sartillion Drive), where it is thought that a control section exists such that some reasonable measure of peak flow rate can be accomplished. The County has obtained field survey information at this location, which will be provided to Tetra Tech. Terry also thought that there was a breakout at the State Highway Bridge, for which the channel underneath has since been cleaned out. Terry directed Tetra Tech's attention to the street grid lying west of the state highway, where there was overbank flow on both sides of the channel that was estimated to be anywhere from 6 inches to 2 feet deep during the flood (dependent upon location). It was reported that a rock/masonry wall was undermined on Cedar Street. Erosion is not just a recent phenomenon, as illustrated by the mine rubble that was dumped in the bend area in order to

arrest bank erosion. Terry stated his belief that some of the chain-link fences lying in the flow path actually dissipated some flow energy and reduced velocity as water passed through the affected area. Terry reported that, in the downstream channel, he observed a tree whose bark was stripped off. Terry also reported that weir flow occurred over the railroad tracks in the area located between 2nd Avenue and the bend in the channel, as was evidenced by the loss of railroad ballast due to scour as a consequence of the weir flow. Terry also observed that there is a marked radical slope change (increase) upstream of the bend near 2nd Avenue. Although Pima County maintains the public roads, there is some question as to whether to improve the 2nd Street crossing structure, since traffic circulation patterns may have changed from the time at which the crossing was originally constructed. It was pointed out that there is no County maintenance of Gibson arroyo, since most of it is located on private property.

Pima County would like to negotiate with Phelps Dodge for an easement for channel maintenance along Gibson Arroyo. Bryce Romeg is the Phelps Dodge Manager who would be contacted regarding this issue. Tetra Tech is encouraged to work with PD on this.

The regulatory floodplain, as depicted on FEMA FIRM Zone AO-1, was exceeded in several places during the July 29th flood.

There is a shallow waterline located at or near the surface in a Phelps Dodge easement that carries floodwaters. This waterline may need to be protected, since it appears that it is in an area where there is a jeep trail; and it may be subject to being driven over (which, in turn) could damage the waterline.

There are several places in Ajo where a complex array of culverts and storm-drain connections are observed but flow direction or outlets are not readily apparent. Some of these openings are plugged with debris, and may have been abandoned. In addition, some grates appeared to have experienced reverse flow during the July 29th flood event.

Terry mentioned interviewing a helpful individual (Mr. Leap) who resides on Monroe Street.

Terry told of a sewer main strapped onto the timbers of a bridge crossing. Suzanne stated that the District cannot fix it all. Mr. Kurt Weinrich, P.E. (Director of the District), wants information on culverts and/or utilities

Terry has conducted a title search, which came up with some useful info. Apparently, in this mining community the homeowner only owns the upper five feet of the property upon which the house is located. Below this level the utilities have certain rights; and, at a depth below the twenty-five feet, the land belongs to the mines. It was noted that the general public might be unaware of this. It was suggested that it would be helpful to obtain the legal interpretations and an historical assessment of this unusual situation. This may be useful in understanding the Franchise Agreement for utilities, and whether drainage maintenance and/or modifications are permitted. The question of historic channel conditions (i.e., prior to the advent of the Clean Water Act) was discussed.

It was mentioned that Kurt had a discussion with Supervisor Sharon Bronson regarding the need for a Basin Management Study in order to gain a better understanding with regard to drainage improvements and maintenance in this area.

Based upon review of the FIRM Overlay on the air photo, together with actual flood evidence, Mike Zeller suggested that there may the need, in the future, to re-map the floodplains—at least the regulatory floodplain of the Gibson Arroyo.

Suzanne stated that the County would be getting new topography of the area in the near future.

Suzanne noted that major debris flow, especially along Gibson Arroyo, may have occurred during the July 29th flood event.

In order to reduce the damage of another flood of similar magnitude, several topics were mentioned, including whether a level-of-service analysis may be warranted.

Mike Zeller suggested that during the data-collection effort an evening meeting with the affected residents might be helpful to gain anecdotal evidence regarding the July 29th flood event. It was suggested that the community center might provide a suitable meeting place. It was also recommended that such a meeting be advertised in the Copper News newspaper (i.e., the Ajo newspaper).

Terry Hendricks stated that the population of the community consists of approximately 50% retirees (many of whom probably were absent during the flood on July 29); and that the rest work in town, and thus they likely were present during the flood.

Suzanne stated that a mass mailing could be conducted, and that Tetra Tech may want to contact the sheriff's office for additional flood information. Pima County was provided with excellent feedback from some County employees who live and work in the Ajo area.

Mike Zeller suggested that there might be the need for channel conveyance improvements, but was cautioned that such improvements may run into cleanup/pollution issues with respect to former mining activities. Suzanne stated that certain vulnerable houses might need to be acquired.

The meeting adjourned at 12:20 p.m.

MEMORANDUM

TO: File (PAZ-PDOT-020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 19, 2003

RE: September 18, 2003, Field Trip to Ajo, Arizona

On September 18, 2003, Patrick Marum, P.E., and Michael E. Zeller, P.E., P.H., visited the Town of Ajo, Arizona, in western Pima County, to observe the areas of the community that were severely flooded the evening of July 29, 2003. In attendance was Terry Hendricks of the Pima County Flood Control District, who had traveled to Ajo the preceding day, September 17th, to gather additional information regarding the July 29th flood event, and take some more photographs for documentation (many flood-damage photographs were taken immediately after the July 29th event, on July 30th and July 31st, by Pima County staff) prior to meeting with Mr. Marum and Mr. Zeller on the September 18th.

Mr. Marum and Mr.; Zeller arrived in Ajo around 9:30 a.m., and met Mr. Hendricks shortly thereafter. Mr. Hendricks guided Mr. Marum and Mr. Zeller around the various locations in Ajo where flood damage had been observed. The number of flood-damage locations observed was numerous. Two distinct sources of flooding were identified: (1) the Gibson Arroyo and (2) localized upland watershed areas emanating from the south/southeast portions of town. The Gibson arroyo, by far, created the greatest amount of flood damage; but, on an individual basis, damage was just a severe from flooding emanating from upland areas watershed areas in the south/southeast portions of town. Mr. Marum and Mr. Zeller completed the field visit and departed from Ajo at approximately 3:00 p.m.

Although anecdotal evidence indicates that the magnitude and extent of the flooding was significant, at many locations in town Mr. Marum and Mr. Zeller were able to observe primarily remnants of the flood, because six weeks has passed since the event occurred and clean-up efforts have been ongoing during the elapsed time period. Nevertheless, along the Gibson Arroyo, Mr. Marum and Mr. Zeller were able to observe evidence of the flood magnitude by observing debris lines and erosion areas within undisturbed reaches of the arroyo. In addition Mr. Marum and Mr. Zeller observed debris lines and high water marks in locations of town were clean-up activities had yet to occur.

During the field visit, observation of the flood paths and areas impacted was complicated by the historical development of the community; where residences, businesses and infrastructure improvements (e.g., roadways and railroads) were constructed essentially within and over historic flow paths. Some homes were actually built over drainageways, and accessory structures were constructed into, and cantilevered over, washes.

COMPLAINTS FORMS

PIMA COUNTY
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
201 NORTH STONE AVENUE, FOURTH FLOOR
TUCSON, ARIZONA 85701-1207

KURT WEINRICH, P. E.
DIRECTOR

(520) 740-6410
FAX (520) 620-1933

February 24, 2004

Ralph Delisle
111 E. 2nd Avenue
Ajo, Arizona 85321

Re: Flood Damages at 111 East 2nd Avenue

Dear Mr. Delisle:

The purpose of this letter is two-fold. First, thank you for sending us a description of the flood damage that you incurred on July 29, 2004. I have enclosed is a repair manual from the Red Cross. The manual provides information regarding repairing the damage inside your residence. Second, the following is a list of actions the District has taken since the July 2003 flood:

1. The District obtained approval from Phelps Dodge to enter their property and remove sedimentation from the Gibson Arroyo. We are seeking further approvals from Phelps Dodge to remove additional sediment upstream and downstream of 2nd Avenue.

2. The District is working with Phelps Dodge to obtain permanent right-of-way along the Gibson Arroyo to facilitate public maintenance. Please be advised utility and environmental conflicts may limit our ability to make channel improvements.

3. Suzanne Shields, Deputy Director, Flood Control District, has proposed an addition to our Capital Improvement Budget to replace the 2nd Avenue Bridge over the Gibson Arroyo. If Ms. Shields' proposal were approved, the bridge replacement would occur in Fiscal Year 2005/06.

4. We have initiated a basin-wide study to address the flooding and drainage issues in Ajo. Phototopography has been generated and we have started the modeling of the basins.

Further updates of our progress will be provided in the future. However, please call me at (520) 740-6350, if you have any questions.

Sincerely,

R. "Terry" Hendricks, CFM, Chief Hydrologist
Floodplain Management

RTH/tj

Thank you for attending tonight's meeting. Pima County is looking for input from Ajo residents regarding the July 2003 flooding event. Please complete the form below and be sure to ask staff questions. Your input is valuable.

Sincerely,
Sharon Bronson, Chair
District 3

Name: RALPH J DELISLE

Address: 111 E 2nd AVE

City: Ajo **State:** AZ **Zip Code:** 85321

Home Phone: 520 387 3608 **Work Phone:** —

Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☒ Mud ☐ Access

Impact of Problem (Check the appropriate box.)

☐ Mobile Home Flooded	☐ Ponding in Roadway	☐ Driveway Damaged
☒ Home Flooded	☐ Road/Shoulder Washed Out	☒ Yard/Landscaping Flooded
☒ Garage Flooded	☐ Culvert Problem	☐ Wall/Fence Damaged
☐ Commercial Building Flooded	☐ Drainageway Needs Repair	☐ Other _____
☐ Accessory Building Flooded	☐ Drainageway Needs Cleaning	

Please describe the flooding and flood damage that occurred on your property:

- TWO to THREE INCHES OF MUD OVER ENTIRE PROPERTY
- CARPETING IN HOME SATURATED - REMOVED
- NEW CARPETING ORDERED
- NEW CRUSHED ROCK PURCHASED AND SPREAD AFTER MUD REMOVAL
- TOTAL COST TO RECOVER FROM FLOOD EXCEEDS $3,000

IF A MOTHER AND CHILD WERE IN FRONT OF MY HOUSE THEY WOULD HAVE DIED.

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or videotape of the flood and/or flood damage, if available.

Please return to:

The Pima County Flood Control District
Floodplain Management Division
201 North Stone, 4th Floor
Tucson, Arizona 85701

Telephone 520-740-6350 Fax 520-740-6749

Tetra Tech, Inc.

PIMA COUNTY
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
201 NORTH STONE AVENUE, FOURTH FLOOR
TUCSON, ARIZONA 85701-1207

KURT WEINRICH, P. E.
DIRECTOR

(520) 740-6410
FAX (520) 620-1933

February 24, 2004

Charles Godfrey
200 E. 2nd Avenue
Ajo, Arizona 85321

Re: Drainage at 200 East 2nd Avenue

Dear Mr. Godfrey:

Thank you for mailing us information regarding the ponding problem on 2nd Avenue near the dead end. Two factors complicate draining 2nd Avenue:

1. There is a waterline to the east at a very shallow depth. Cutting an outlet to allow the flow to drain eastward would damage the utility.

2. Pima County does not own the right-of-way to the north or to the east.

I will forward your information to our consultant so he can assess the situation for other alternatives. Additionally, we have initiated a basin-wide study in Ajo to address the flooding and drainage issues.

Please call me at (520) 740-6350, if you have any questions.

Sincerely,

R. "Terry" Hendricks, CFM, Chief Hydrologist
Floodplain Management Division

RTH/tj

Thank you for attending tonight's meeting. Pima County is looking for input from Ajo residents regarding the July 2003 flooding event. Please complete the form below and be sure to ask staff questions. Your input is valuable.

Sincerely,
Sharon Bronson, Chair
District 3

Name: CHARLES DAVID GODFREY

Address: 200 E. 2nd AVE.

City: AJO **State:** AZ **Zip Code:** 85321

Home Phone: 520-387-5079 **Work Phone:** 520-387-8535

Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☐ Access

Impact of Problem (Check the appropriate box.)

☐ Mobile Home Flooded	☒ Ponding in Roadway	☐ Driveway Damaged
☐ Home Flooded	☐ Road/Shoulder Washed Out	☒ Yard/Landscaping Flooded
☐ Garage Flooded	☐ Culvert Problem	☐ Wall/Fence Damaged
☐ Commercial Building Flooded	☒ Drainageway Needs Repair	☐ Other _____
☐ Accessory Building Flooded	☐ Drainageway Needs Cleaning	

Please describe the flooding and flood damage that occurred on your property:
NO MAJOR PROBLEM WITH PERSONAL PROPERTY. NEED END OF 200 BLK OF E. 2nd CLEANED SO DRAINAGE CAN OCCUR.

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or videotape of the flood and/or flood damage, if available.

Please return to:

The Pima County Flood Control District
Floodplain Management Division
201 North Stone, 4th Floor
Tucson, Arizona 85701

Telephone 520-740-6350 Fax 520-740-6749

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number:
Area: AJO

Name: Jack M. Higgins Sr.
Address: 100 E Arroyo
City, State, Zip Code: Ajo AZ Home Phone: 387-5463 Work Phone: —

Address or location of property with drainage problem?: 100 & 110 E Arroyo Ajo AZ 85321

Best time of day to reach you by phone? ✓ a.m. ✓ p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☐ Erosion ☑ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☑ Home Flooded
- ☑ Garage Flooded
- ☐ Commercial Building Flooded
- ☑ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☑ Culvert Problem
- ☑ Drainageway Needs Repair
- ☑ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☑ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☑ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☑ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? Debris hitting bridge at 2nd St.

Date flooding/damage occurred? Aug. Time of day that the flooding occurred? a.m. 10 p.m.

How many times has flooding occurred at that location? 2 or 3 times in 10 yrs
What year was the damaged structure/object constructed? 60's

F. Is there someone that caused the flooding? ☑ Yes ☐ No If yes, please fill out the following, if known:

Name: Pima County
Address: Tucson
City, State, Zip Code: Home Phone: Work Phone:

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#:

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Failure to clear wash of debris

Tetra Tech, Inc.

To:Pima County
From: Jack Higgins
Subject:
flooding at 100 and 110 E. Arroyo
Ajo Az August 2003

Dear Sirs

Upon returning to my winter residence in Ajo AZ I found that my property had been damaged by a flood that had occurred previously. I understand that the flood resulted from a choked dry wash just west of my property. The choking occurred because the dry wash had not been properly maintained by the county.

The flooding resulted in the following losses:

1. Cleaning of tile at 100 E. Arroyo		$80.00
2. Repair of damage to yard		335.00
3. Broken pottery		120.00
4. Repair of dryer located in garage		50.00
5. Cleaning of garage (water depth one foot)		75.00
	Total	$600.00

I realize that there is probably no possibility of recovering this money from the county. However, since the flood was a direct result of the counties neglect to properly maintain the wash or build a new bridge to see that this does not happen again, I should be compensated.

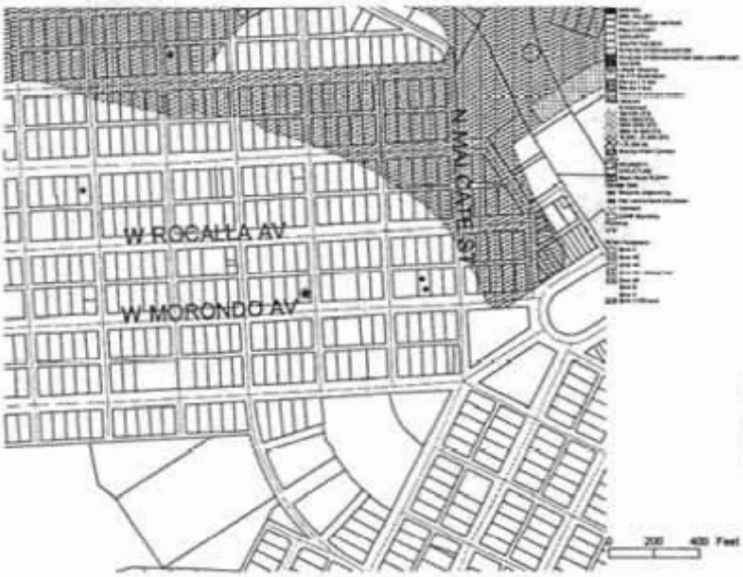
Hoping to hear from you soon.

Jack Higgins
520-387-5463

Drainage Complaint: 03184

TRS	W120622	TAX_CODE	401232520
DATE_IN	7/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			

LEGAL_DESC AJO TOWNSITE LOT 1 BLK 30



Complaint Source

Field Date:		Complaintant:	LEAP CHARLES A & ANDREA R CP/RS		
Date Out		Address	400 W MORANDO AVE	Phone	1-520-367-6591
Status	RECD	City:	AJO AZ	Zip	853210000
Code:	MIS			Inv:	HAG

Nature of Problem

Due to micro burst, flood damage occurred. Needs advice. See email attached.

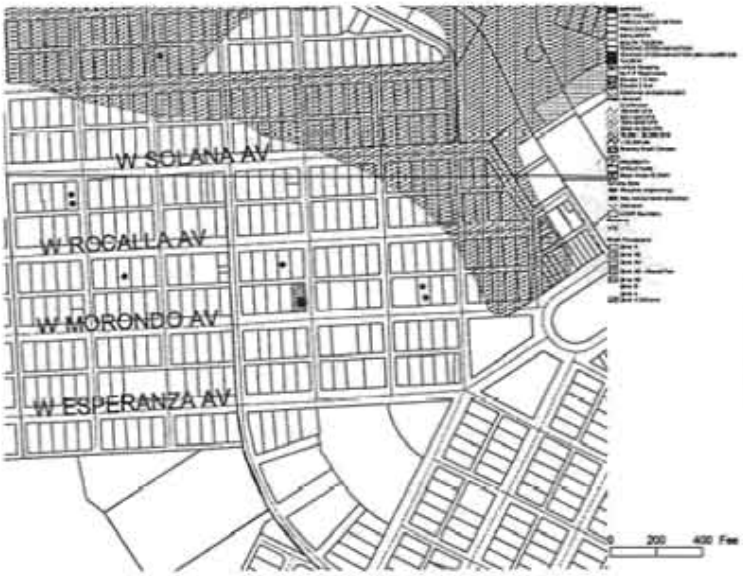
Notified Dave Z about the Bridge.
told Gary to email them Red Cross #.

Thursday, July 31, 2003

Tetra Tech, Inc.

Drainage Complaint: 03184

TRS	W120622	TAX_CODE	401232520
DATE_IN	7/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE LOT 1 BLK 30		



✱ Complaint Source

Field Date:		Complaintant:	LEAP CHARLES A & ANDREA R CP/RS		
Date Out		Address	400 W MORANDO AVE	Phone	1-520-367-6591
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	MIS			Inv:	RTH

Nature of Problem

Due to micro burst, flood damage occurred. Needs advice. See email attached. Terry H. is taking care of.

03-184

Debbie Grijalva

From: Gary Peterson
Sent: Thursday, July 31, 2003 8:57 AM
To: Debbie Grijalva
Cc: Henry Goglin
Subject: FW: Flood damage relief due to micro bursts of weather.

Hi Debbie

Here's an e-mail I received that looks like it out to be logged as a drainage complaint.I note that they have copied quite a few people on this... maybe a trip to Ajo for one of our hydros?

Thanks,

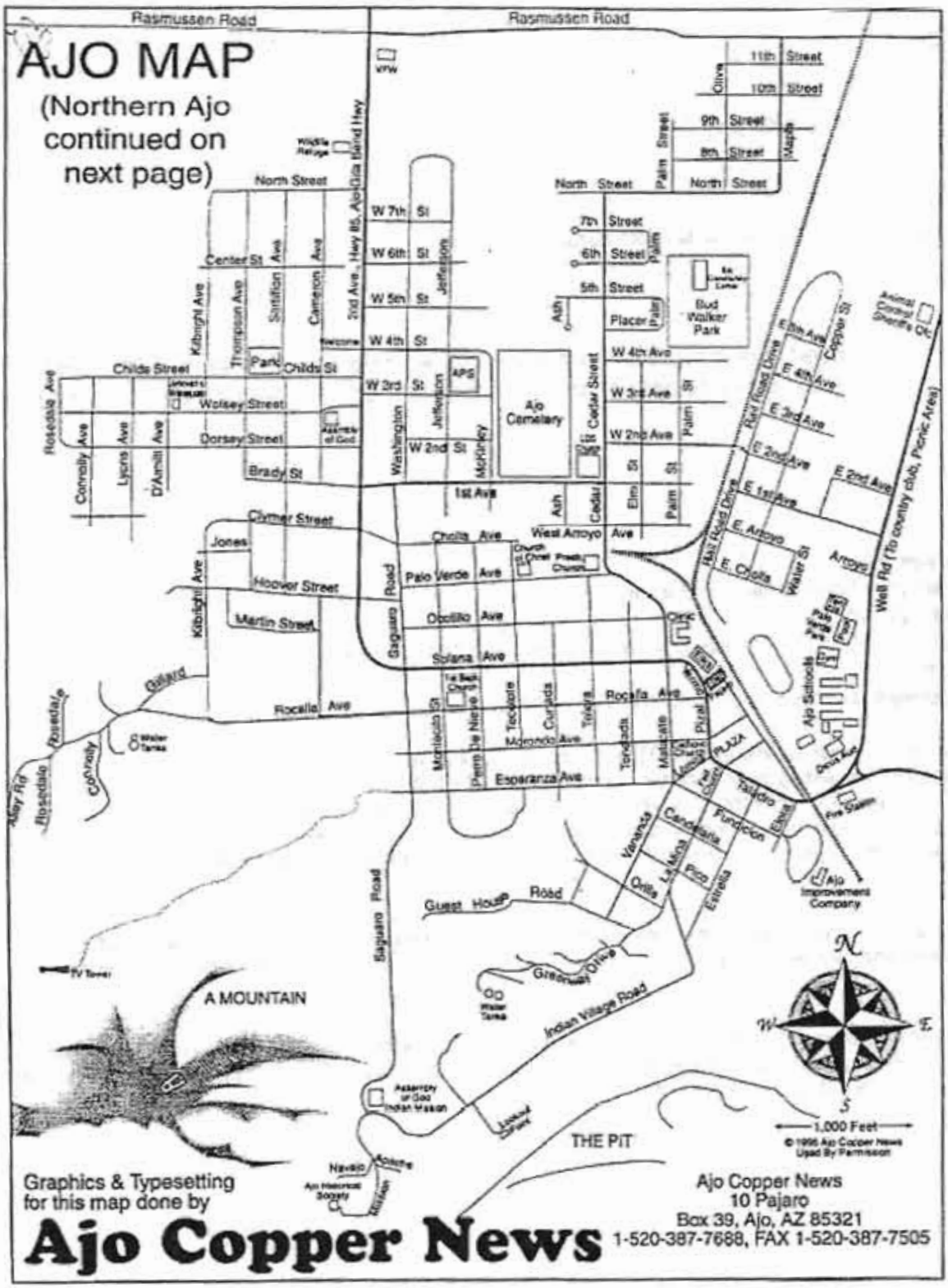
GP

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Wednesday, July 30, 2003 8:43 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: Flood damage relief due to micro bursts of weather.

Our house is located in Ajo which is extreme West Pima County and we suffered damage to the brick retaining wall that prevents the flash floods from destroying our house and carport. Such a flash flood occurred in Ajo yesterday evening and about thirty feet of retaining wall was undercut and destroyed. We are concerned that a future flood would seriously undercut and destroy our carport and house. The County maintained bridge which adjoins our property caused and was damaged in the same flood. Because the flow capacity under the bridge was inadequate, a vortex current developed upstream from the bridge and accelerated our erosion.

Folks who live upstream from us have built a very deep and narrow reinforced concrete flood channel which accelerates the water and causes a flood surge which would inundate our property if not for the now damaged retainer wall.

Folks who have property on Telera St. between Morondo Ave and Rocalla Ave suffer damage from the runoff from every storm as there are no curbs or gutters. This planned drainage is undercutting the brick wall on the eastside (Telera St.) of our property and defies logic as flood plain management.



My wife is unemployed and has Fibromyalga and I am a 100% disabled American Veteran. We have no flood insurance and the flood surpassed any engineering expectations. We do not have the resources to repair the damage. Are there any programs that we might use to make emergency repairs as the Monsoon season has not passed.

Charlie & Andrea Leap
400 West Morondo Ave
Ajo, Az
1-520-367-6591
7/31/2003

Tetra Tech, Inc.

Henry Goglin

From: Gary Peterson
Sent: Thursday, July 31, 2003 3:58 PM
To: 'Andrea Leap'
Cc: Henry Goglin
Subject: RE: Flood damage relief due to micro bursts of weather.

Dear Mr. and Mrs. Leap,

Thank you for your message. Since receiving your e-mail yesterday, I have logged your issue as a drainage complaint to start the investigation process. As I mentioned, this is an extremely busy time for our staff, however, I spoke with our hydrologist today and he indicated that he will try to contact you either tomorrow or early next week.

In addition, we have contacted our DOT Maintenance Operations Division on this matter, and have asked them to look into the bridge issue you mentioned. Likewise, we are also investigating possible American Red Cross and Community Services assistance in this regard.

I can't comment on citizen service or gerrymandering in Ajo, however, I should note that Pima County Supervisor Sharon Bronson and DOT Department Director Kurt Weinrich were in your community today looking at flooding issues. I think it might be a good idea to express your concerns directly to them, as they may have other ideas or resources to bear on your flooding concerns. Contact information for them can be obtained at: www.pima.gov.

Regards,

Gary Peterson
PCFCD

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Thursday, July 31, 2003 3:27 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: RE: Flood damage relief due to micro bursts of weather.

> I am not sure what a reasonable time is, because the neglect of these issues has gone on for years. I believe that the last big episode of flooding and property destruction occurred three years ago. My situation is not unique and there are renovations going on in many places in this community. What happened to Joe Citizen in Ajo? We didn't make the evening news and are apparently gerrymandered beyond consideration. There is another flood watch in effect for Pima County this afternoon.
>
> -----Original Message-----
> **From:** Gary Peterson [mailto:Gary.Peterson@dot.pima.gov]
> **Sent:** Thursday, July 31, 2003 9:05 AM
> **To:** 'Andrea Leap'
> **Subject:** RE: Flood damage relief due to micro bursts of weather.

Dear Mr. and Mrs. Leap:

Thank you for your message regarding flooding issues on your property in Ajo. This sounds like it may be a drainage complaint issue that the Flood Control District should investigate. Thus, I am forwarding your message to one of our hydrologists for action. Typically, our hydrologists will investigate the situation and make recommendations to those who may be diverting water onto your property, concerning how they should resolve the matter. You should hear from one of our staff shortly, but please bear in mind that this is a busy time of year for us.

In the event you are not contacted in a reasonable amount of time, please feel free to contact me at (520) 740-6350 and I will ensure that we get someone to look into this matter.

Thanks again for your message.

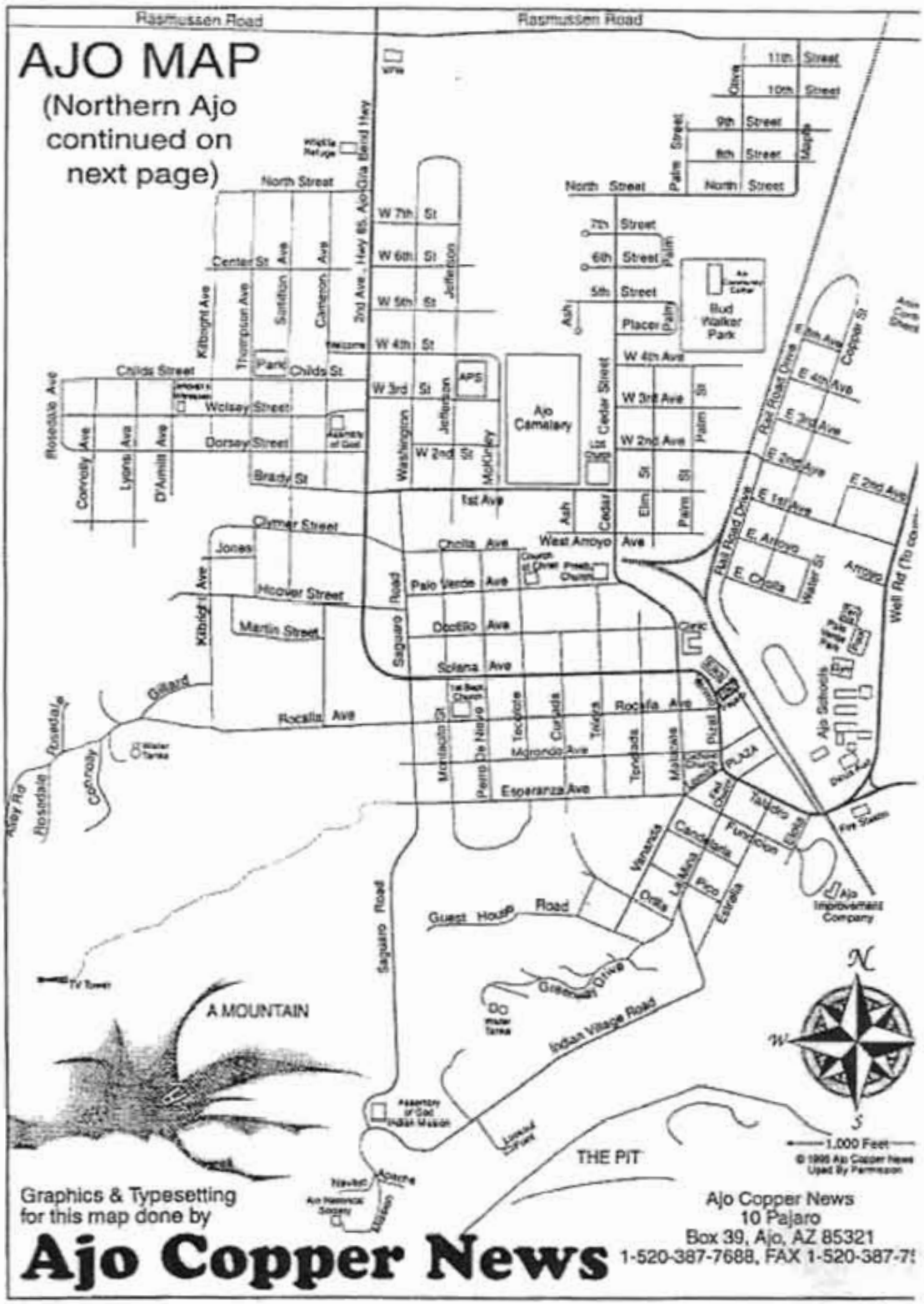
Gary Peterson
PCFCD

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Wednesday, July 30, 2003 8:43 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: Flood damage relief due to micro bursts of weather.

Our house is located in Ajo which is extreme West Pima County and we suffered damage to the brick retaining wall that prevents the flash floods from destroying our house and carport. Such a flash flood occurred in Ajo yesterday evening and about thirty feet of retaining wall was undercut and destroyed. We are concerned that a future flood would seriously undercut and destroy our carport and house. The County maintained bridge which adjoins our property caused and was damaged in the same flood. Because the flow capacity under the bridge was inadequate, a vortex current developed upstream from the bridge and accelerated our erosion.

Folks who live upstream from us have built a very deep and narrow reinforced concrete flood channel which accelerates the water and causes a flood surge which would inundate our property if not for the now damaged retainer wall.

Folks who have property on Telera St. between Morondo Ave and Rocalla Ave suffer damage from the runoff from every storm as there are no curbs or gutters. This planned drainage is undercutting the brick wall on the eastside (Telera St.) of our property and defies logic as flood plain management.



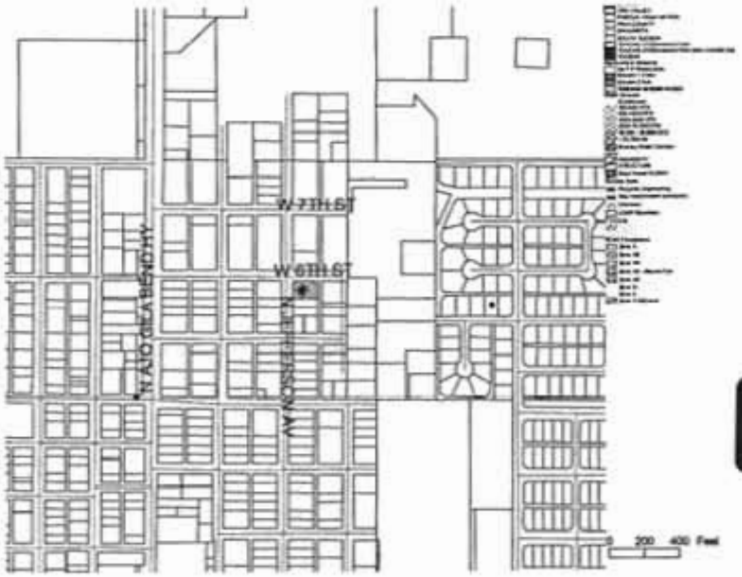
My wife is unemployed and has Fibromyalga and I am a 100% disabled American Veteran. We have no flood insurance and the flood surpassed any engineering expectations. We do not have the resources to repair the damage. Are there any programs that we might use to make emergency repairs as the Monsoon season has not passed.

Charlie & Andrea Leap

400 West Morondo Ave
Ajo, AZ 85321
520-367-6591

Drainage Complaint: 03291

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	HOMER BROWNS LOTS 1 & 2 BLK 11		



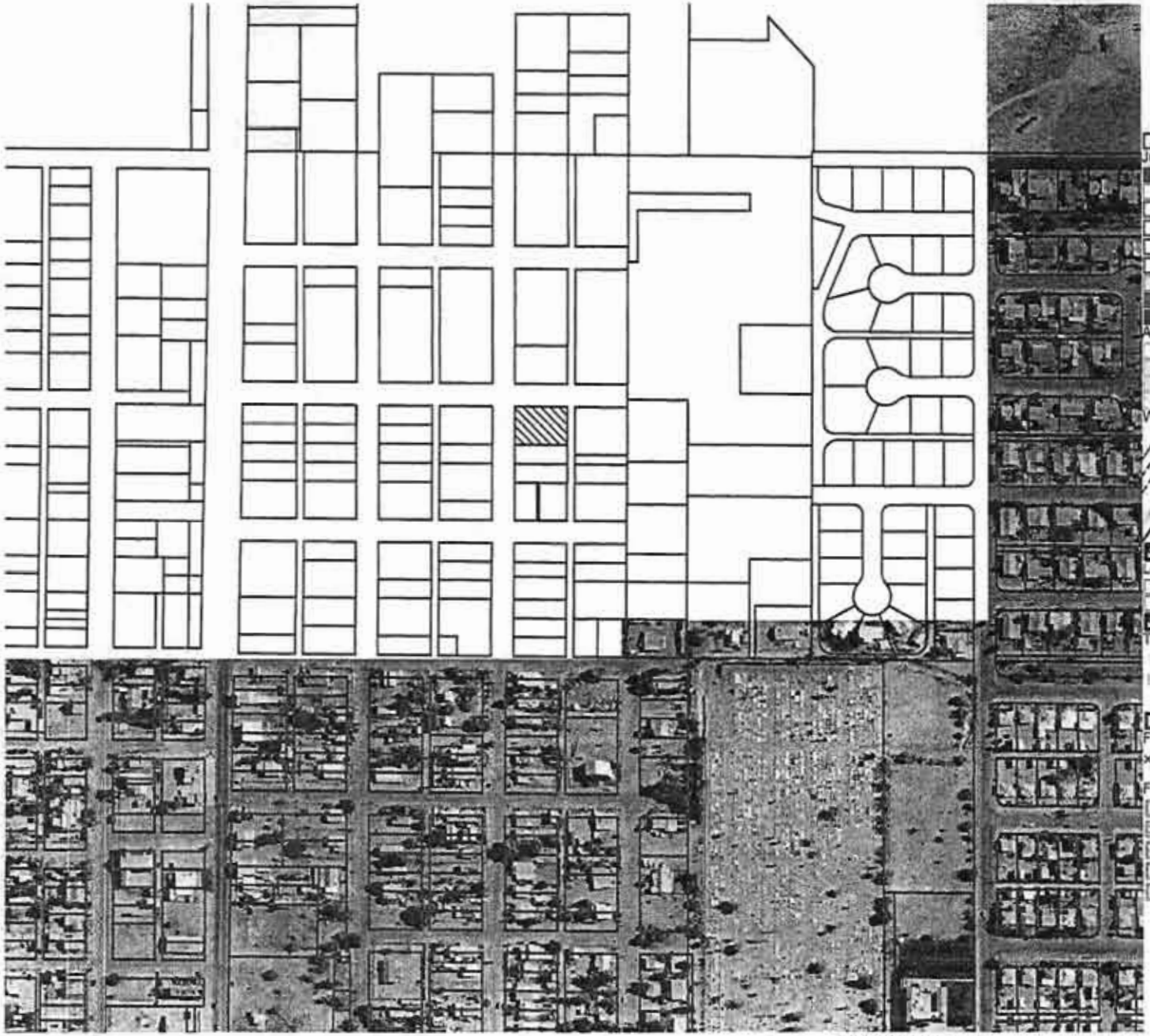
✱ Complaint Source

03

Field Date:		Complaintant:	DEL VALLE MANUEL (40112136A)				
Date Out		Address	1350 N JEFFERSON AVE			Phone	387-7178
Status	WAIT	City:	AJO AZ	Zip	853210000		
Code:	FGE			Inv:	TH		

Nature of Problem

Due to flooding on 7/29/03, his yard and landscaping has flooded out. Terry Hendricks working on it.



Street Network
TS.Regional Parcels
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRIC
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

FCD ANALYSIS RESULTS
Parcel: 40112136A
Owner: DEL VALLE MANUEL & ENRIQUETTA JT/RS
Address: 0
Legal1: HOMER BROWNS LOTS 1 & 2 BLK 11
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S06W15
FEMA Zone: ZONE X
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

Tetra Tech, Inc.

03291

MEMORANDUM

Department of Transportation and Flood Control District
Floodplain Management Division

DATE: September 5, 2003

TO: Ajo Drainage Complaint file

FROM: Terry Hendricks

RE: Survey Returned from Manuel P. Del Valle (1350 N. Jefferson Ave. Ajo, AZ)

After conferring with Maria Soto, of Community Services, I found that there is the possibility that Pima County may assist Mr. Del Valle in the repairs to his yard above the leech field. I told Mr. Del Valle to call Ms. Soto and make arrangements with them to see if this is a service that the County could provide. I also informed Mr. Del Valle that if this work is outside the guidelines for community services that they may be on their own as far as repairing the yard above their leech field.

I will need some one to
level my back yard as th
flooding almost uncover
my leaching field
probably need about 3 load
of sand I can do it
myself as I am to old
my age is 84 yrs and my
wife is 74 ye old

Thank You
Manuel & Enriqueta
Del Valle

Maria Soto

08-22-03P02:48 RCVD

08-22-03P02:

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number: 401-12-136A
Area: ____ AJO ____

Name: Manuel P. Del Valle
Address: 1350 N. Jefferson Ave.
City, State, Zip Code: 85321 Home Phone: 387-7178 Work Phone: None

Address or location of property with drainage problem?: ____

Best time of day to reach you by phone? 6:00 a.m. 9:00 p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other ____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☑ Street ☐ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? ____

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? ____ a.m. 8- p.m.

How many times has flooding occurred at that location? two times 7-29-03 & 8-19-03
What year was the damaged structure/object constructed? ____

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name: ____
Address: ____
City, State, Zip Code: ____ Home Phone: ____ Work Phone: ____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☑ No If yes, please fill out the following:
Subdivision Name: ____ Lot Number: ____
If no, please provide Assessor's Parcel#: HOMER BROWNS LOTS 1 & 2 BLK 11

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Tetra Tech, Inc.

I may pretend this is a good form

Please call this guy. Maybe ask me about this

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

401-17-068A 03298

Number: _____
Area: _____

Name: Manuel Santiago
Address: _____
City, State, Zip Code: _____ **Home Phone:** _____ **Work Phone:** _____

Address or location of property with drainage problem?: 1420 N. Kilbright Cip

Best time of day to reach you by phone? _____ a.m. _____ p.m. Answering Machine? ☐ Yes ☐ No
(520) 387-6040

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other _____

neight broke a hole in cement drainage wall.

D. Flood Water Information (Check the appropriate box.)

In what direction did the water come from? ☐ N ☐ S ☐ E ☐ W ☐ Other _____
What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other
In what direction did the water leave the property? ☐ N ☐ S ☐ E ☐ W ☐ Other _____

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway (?) ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

☐ If source is a new Development in close proximity, please print its name and location: _____

If flow was blocked, altered, or diverted, what was the cause? neighbor broke a hole in cement wall (6"-7")

Date flooding/damage occurred? NO 8/27/003 Time of day that the flooding occurred? _____ a.m. _____ p.m.

How many times has flooding occurred at that location? ?
What year was the damaged structure/object constructed? _____

F. Is there someone that caused the flooding? ☒ Yes ☐ No If yes, please fill out the following, if known:

Name: neighbor at 1400 Kilbright (?)
Address: _____
City, State, Zip Code: _____ **Home Phone:** 401-17-068A **Work Phone:** _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or other problem if available.**

Tetra Tech, Inc.

Drainage Complaint: 03298

TRS	W120615	TAX_CODE	40117066A
DATE_IN	12/31/2003		
AREA	5		
PANEL	645	ZONE	ZONE X
SUSPECT	AVALOS MELITON N & CRUZITA JT/		
SUSPECT_AD	1400 N KILBRIGHT AVE		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO HEIGHTS THIRD ADDITION LOT 13 BLK 4		

✱ Complaint Source

Field Date:		Complaintant:	SANTIAGO MANUEL (40117068A)		
Date Out		Address	1351 N KILBRIGHT AVE	Phone	520-387-6040
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Neighbor broke a hole in their cement wall causing all the water to divert onto Mr. Santiago's property.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

B300

A. General Information

Number:
Area: **AJO**

Name: Diane + George Moser
Address: 1838 SAKAI VILLAGE LOOP
City, State, Zip Code: BAINBRIDGE IS WA 98110 **Home Phone:** 206/842-1058 **Work Phone:** 206/842-1286

Address or location of property with drainage problem?: 101 E. 2ND AVE, AJO, AZ. 85321

Best time of day to reach you by phone? 9 a.m. 5 p.m. Answering Machine? ☒ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☒ Over 3" ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? DEBRIS @ E. 2ND AVE AND RAILROAD DRIVE BRIDGE — BLOCKED ARROYO (WEST 2ND AVE. BRIDGE)

Date flooding/damage occurred? 7/29/03 Time of day that the flooding occurred? a.m. p.m.

How many times has flooding occurred at that location? 2
What year was the damaged structure/object constructed? ?

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

However, lack of cleaning the arroyo by Phelps-Dodge and or the County caused the bridge to block with debris

Name:
Address:
City, State, Zip Code: **Home Phone:** **Work Phone:**

G. Is the property with the problem in a recorded subdivision? ☒ Yes ☐ No If yes, please fill out the following:
Subdivision Name: NEW CORNELIA ADDITION Lot Number: 367
If no, please provide Assessor's Parcel#:

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

VIDEO TAPE DONE WHEN SHARON BRUNSON INSPECTED THE DAMAGE A FEW DAYS AFTER IT OCCURRED.

Tetra Tech, Inc.

Drainage Complaint: 03302

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 367		

✱ Complaint Source

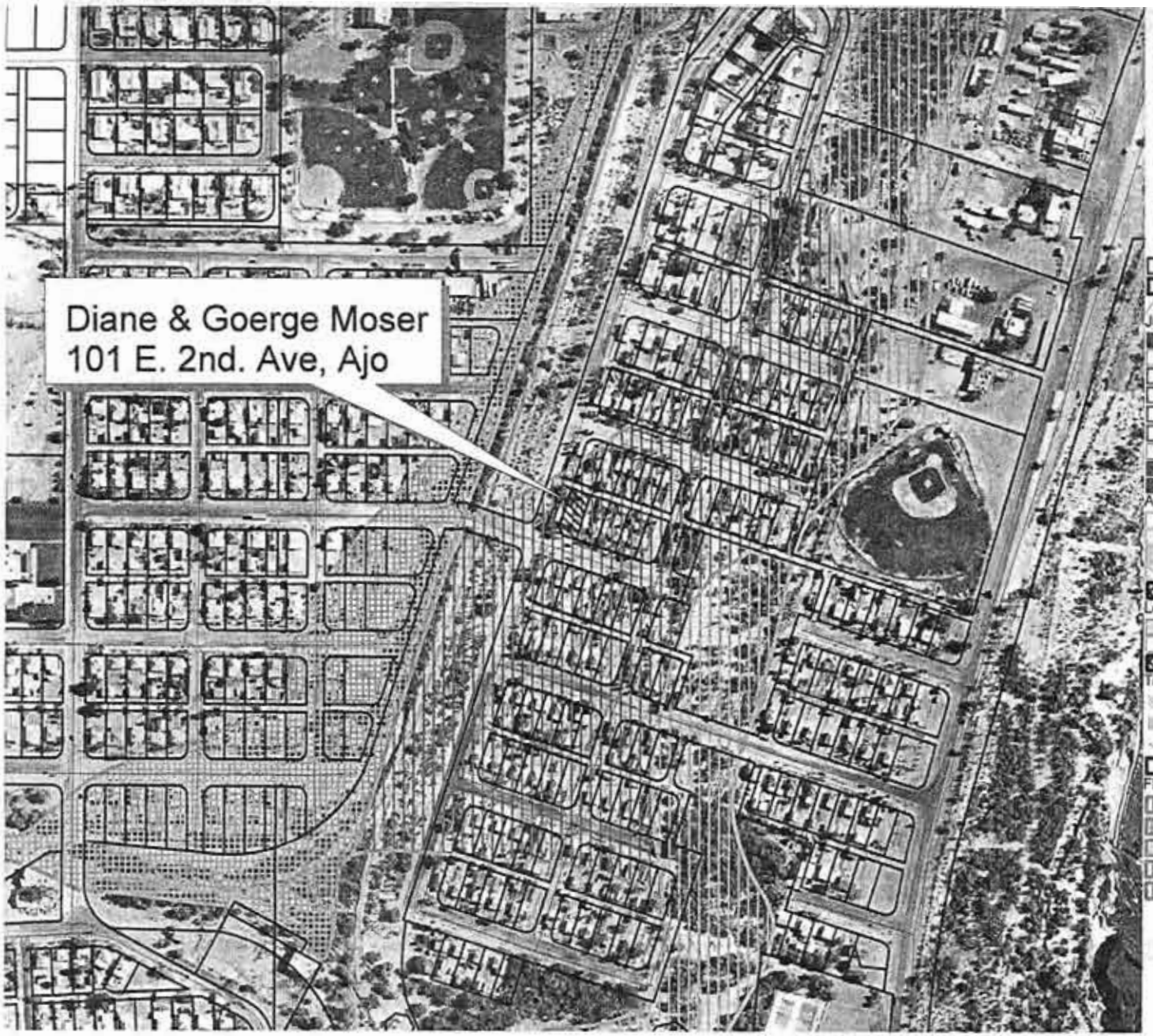
Field Date:		Complaintant:	MOSER GEORGE (401553670)				
Date Out		Address	101 E 2ND AVE			Phone	206-842-1286
Status	WAIT	City:	AJO AZ	Zip	85321		
Code:	FGE			Inv:	RTH		

Nature of Problem

Home flooded, garage flooded, road/shoulder washed out. Driveway damaged.

Wednesday, December 31, 2003

Tetra Tech, Inc.



TS.Regional Parcels
FIRM Panel Boundaries
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTR
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

FCD ANALYSIS RESULTS
Parcel: 401553670
Owner: MOSER GEORGE N & DIANE L CP/RS
Address: 101 E 2ND AV
Legal1: NEW CORNELIA LOT 367
FIRM Boundaries: 04019C0883 K
Section Boundaries: 12S06W14
FEMA Zone: ZONE AO 1
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

Scale 1"= 400.00 feet

Tetra Tech, Inc.

08-26-03P03:57 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

401-24-0780
03300

Number: _____
Area: _____ AJO _____

Name: FRANCISCA A. SANDOVAL
Address: 701 W SOLONA AVE
City, State, Zip Code: AJO, AZ 85321 Home Phone: 387-5409 Work Phone: 387-8539

Address or location of property with drainage problem?: _____

Best time of day to reach you by phone? ? a.m. ? p.m. (work shift work) Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☒ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☒ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☒ Street ☐ Wash ☒ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? Not sure what the cause is but poss alleyway has been built up cause water to run through yards 2 have complain to county before.

Date flooding/damage occurred? 8/ _____ Time of day that the flooding occurred? _____ a.m. X p.m.

How many times has flooding occurred at that location? 3 Times caused
What year was the damaged structure/object constructed? ?

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name: UNK
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No (UNK) If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available. Can some one come + check on problem last year I spoke to Ray Dhaves after 2 made a complaint to county. obviously nothing was done. I took pictures but they are not developed yet.

Tetra Tech, Inc.

Drainage Complaint: 03300

TRS	W120622	TAX_CODE	401240780
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE FIRST ADDITION LOT 10 BLK 40		

✱ Complaint Source

Field Date:		Complaintant:	SANDOVAL FRANCISCA A				
Date Out		Address	701 W SOLANA AVE			Phone	387-5409
Status	WAIT	City:	AJO AZ	Zip	853210000		
Code:	FGE			Inv:	RTH		

Nature of Problem

Alleyway is built up diverting the flow of water onto her property. Needs help. Terry H. working on it.

08-27-03P02:53 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

B301

Number:
Area: AJO

Name: MARIA Y. BUSTAMANTE
Address: 411 ROCALLA
City, State, Zip Code: AJO, AZ 85321 **Home Phone:** NONE **Work Phone:** NONE
MSG. PHONE: (602) 999-9243

Address or location of property with drainage problem?:

Best time of day to reach you by phone? ____ a.m. ____ p.m. Answering Machine? ☐ Yes ☐ No
ANYTIME ON MSG. PHONE

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

☐ Mobile Home Flooded	☐ Ponding in Roadway	☐ Driveway Damaged
☒ Home Flooded	☐ Road/Shoulder Washed Out	☐ Yard/Landscaping Flooded
☐ Garage Flooded	☐ Culvert Problem	☒ Wall/Fence Damaged
☐ Commercial Building Flooded	☒ Drainageway Needs Repair	☒ Other RETAINING WALL DAMAGED
☐ Accessory Building Flooded	☐ Drainageway Needs Cleaning	

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☒ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? RETAINING WALL ON NEXT DOOR NEIGHBOR'S PROPERTY WASHED AWAY

Date flooding/damage occurred? JULY 29 Time of day that the flooding occurred? ____ a.m. LATE p.m.

How many times has flooding occurred at that location?
What year was the damaged structure/object constructed?

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name:
Address:
City, State, Zip Code: **Home Phone:** **Work Phone:**

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: AJO TOWNSITE Lot Number: 9 BLK 30
If no, please provide Assessor's Parcel#: 2600

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

COUNTY 10 BOOK 401 MAP 23 PARCEL 2600

Tetra Tech, Inc.

Drainage Complaint: 03301

TRS	W120622	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD	411 ROCALLA		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE LOT 9 BLK 30		

✱ Complaint Source

Field Date:		Complaintant:	BUSTAMANTE MARIA (401232600)		
Date Out		Address	411 W ROCALLA	Phone	602-999-9243
Status	WAIT	City:	AJO, AZ	Zip	85321
Code:	FGE			Inv:	RTH

Nature of Problem

House flooded, drainageway needs repair, retaining wall damaged. RTH working on this.

FAX

03-299

Please Deliver Immediately

To Dept of Transportation & flood control

From Carol Kline Pelter

Message Two of my properties were flooded in the July 29 flood in AJO. Attached are Damage reports. We handled the clean up. Approx $$ Amount was $4000.00.

Date 8-13-03 Time

Number of pages sent 3

For any problems receiving this fax

Call 520 387 5115

Return FAX 520 387 7212

K 5 ENTERPRISES
625 N SECOND
AJO, AZ 85321

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number:
Area: AJO

Name: CD + Carol Kline fr / Lee call bill
Address: 625 N Second
City, State, Zip Code: AJO Az 85321 / Home Phone: 520 387 [illegible] Work Phone: 520 387 5115

Address or location of property with drainage problem?: 650 N Second (Hwy 85)

Best time of day to reach you by phone? _____ a.m. 3 or 4 p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☐ Erosion ☑ Mud ☐ Access

Wash flowed through the building and covered entire property

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☑ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☑ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? debris?

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? _____ a.m. 8 p.m.

How many times has flooding occurred at that location? Never before
What year was the damaged structure/object constructed? 1976

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name: _____
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☑ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information Number:_____ Area: AJO

Name: CD + Carol Kline fellers Cell none
Address: 635 N Cocoa rd FAX
City, State, Zip Code: AJO Az 85321 Home Phone: 387 7211 Work Phone: 387 5115

Address or location of property with drainage problem?: 750 N Sacramento (Hwy 85 at First)

Best time of day to reach you by phone?_____ a.m. 3-4 p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☑ Erosion ☑ Mud ☐ Access

Some water inside building (minor) Property covered with mud right to front door total south half of property covered with debris

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other_____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☑ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?_____

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred?_____ a.m. 9 p.m.

How many times has flooding occurred at that location? as far as I know never.
What year was the damaged structure/object constructed? entire lot below water + debris

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name:_____
Address:_____
City, State, Zip Code:_____ Home Phone:_____ Work Phone:_____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name:_____ Lot Number:_____
If no, please provide Assessor's Parcel#:_____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Tetra Tech, Inc.

09-09-03P04:27 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

03297

A. General Information

Number:
Area: AJO

Name: Lucila G. Montoya
Address: 631 W. Rocalla Ave.
City, State, Zip Code: Ajo, AZ 85321 **Home Phone:** 520-387-5647 **Work Phone:**

Address or location of property with drainage problem?: 631 W. Rocalla Ave

Best time of day to reach you by phone? 9:00 a.m. 6:00 p.m. Answering Machine? ☒ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☒ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other 1982 car flooded

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☒ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☒ Street ☒ Wash ☒ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? 1st neighbor to east of said property - in attempt to control drainage way, water back-ups 2nd neighbor to the east of said property - filled the wash with dirt - thus water back-up

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? ____ a.m. ____ p.m.

How many times has flooding occurred at that location? Twice
What year was the damaged structure/object constructed? 1981

F. Is there someone that caused the flooding? ☒ Yes ☐ No If yes, please fill out the following, if known:

Name: Terry Tregdwall
Address: 621 W. Rocalla Ave
City, State, Zip Code: Ajo, Az. 85321 **Home Phone:** 520-387-7870 **Work Phone:**

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#: 401-24-057-0

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Mike Morales
615 W. Rocalla
Ajo, Az. 85321
Phone 520-387-5566

Tetra Tech, Inc.

Drainage Complaint: 03297

TRS	W120622	TAX_CODE	401240580
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT	TREADWAY TERRY L & NORA E JT/		
SUSPECT_AD	621 W ROCALLA AVE		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE FIRST ADDITION LOT 8 BLK 38		

✱ Complaint Source

Field Date:		Complaintant:	MONTIJO LUCILA G		
Date Out		Address	631 W ROCALLA AVE	Phone	520-387-5647
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Neighbor to the east causing flooding, water back-ups. Terry H. working on it.

03293 08-20-03P03:17 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

401-55-1830.

A. General Information

Number:
Area: ____ **AJO** ✓

Name: Clairmond Benjamin
Address: 111 W 2nd Ave
City, State, Zip Code: Ajo Az 85321 **Home Phone:** 623 695 1819 **Work Phone:** —

Address or location of property with drainage problem?: 111 W Second Ave Ajo Az 85321

Best time of day to reach you by phone? Anytime a.m. ____ p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other ____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☒ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? Water backed up @ 2nd Ave Bridge

Date flooding/damage occurred? 7/29/03 Time of day that the flooding occurred? ____ a.m. 7:30-8:00 p.m.

How many times has flooding occurred at that location? 2 times
What year was the damaged structure/object constructed? Approx 1950

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: N/A
Address: ____
City, State, Zip Code: ____ **Home Phone:** ____ **Work Phone:** ____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: N/A Lot Number: ____
If no, please provide Assessor's Parcel#: ____

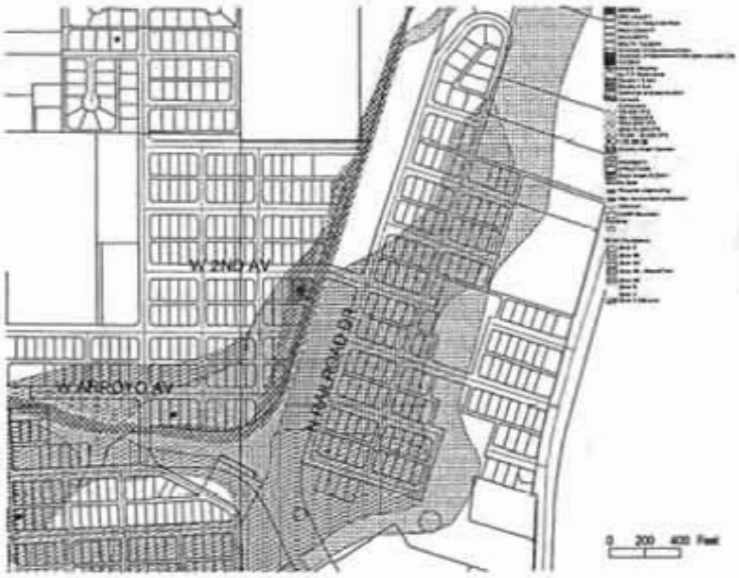
Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Bridge is not adequate to carry water.

Tetra Tech, Inc.

Drainage Complaint: 03293

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AE
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 183		



✱ Complaint Source

Field Date:		Complaintant:	BENJAMIN CLARIMOND (401551830)		
Date Out		Address	111 W 2ND AVE	Phone	623-695-1819
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Home flooded, garage flooded, driveway damaged, yard and landscaping flooded, wall/fence damaged. Terry working on this.

08-20-03P03:14 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number:_____
Area:_____**AJO**_____

Name: Danielle A Lewis
Address: 81 West 3rd ave
City, State, Zip Code: Ajo Az 85321 **Home Phone:** 520-387-6031 **Work Phone:** 520-387-7832

Address or location of property with drainage problem?: 81 West 3rd Ave

Best time of day to reach you by phone? Any a.m. Any p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other_____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☒ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?_____

Date flooding/damage occurred? 8/7/03 Time of day that the flooding occurred?_____a.m. 8:15 p.m.

How many times has flooding occurred at that location? twice
What year was the damaged structure/object constructed? unknown

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name:_____
Address:_____
City, State, Zip Code:_____ **Home Phone:**_____ **Work Phone:**_____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name:_____ Lot Number:_____
If no, please provide Assessor's Parcel#:_____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

401-55-1540

A. **General Information**

B294

Number:
Area: AJO

Name: Danielle A Lewis
Address: 81 west 3rd ave
City, State, Zip Code: Ajo Az 85321 Home Phone: 520 387 6431 Work Phone: 387-7832 520-

Address or location of property with drainage problem?:
81 west 3rd ave Ajo Az

Best time of day to reach you by phone? Any a.m. Any p.m. Answering Machine? ☐ Yes ☒ No

B. **Type of Problem** (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. **Impact of Problem** (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other

D. **Flood Water Information** (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☒ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. **Source of Water Runoff** (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?
Bridge and debree from was

Date flooding/damage occurred? Aug 2003 Time of day that the flooding occurred? a.m. 7pm p.m.

How many times has flooding occurred at that location? one
What year was the damaged structure/object constructed? unknown

F. **Is there someone that caused the flooding?** ☐ Yes ☒ No If yes, please fill out the following, if known:

Name:
Address:
City, State, Zip Code: Home Phone: Work Phone:

G. **Is the property with the problem in a recorded subdivision?** ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#:

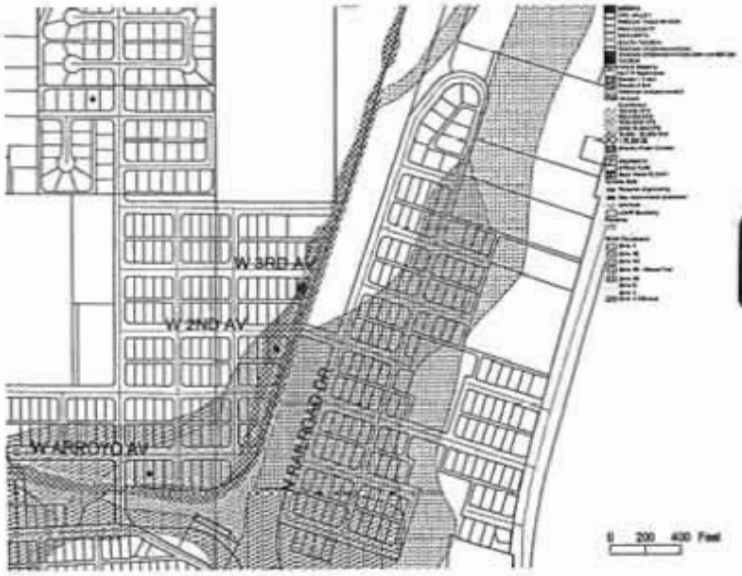
Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

12-05-03 P02:45 OUT

Tetra Tech, Inc.

Drainage Complaint: 03294

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 154		



* Complaint Source

03

Field Date:		Complaintant: LEWIS DANIELLE (401551540)			
Date Out		Address	81 W 3RD AVE	Phone	520-387-6031
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Due to rains in August 03, yard and landscaping has flooded. Terry working on this.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

Aug 21, 2003

A. General Information

03-296

Number: _____
Area: ____ AJO X

Name: John and Gloria Hayes
Address: 221 W. First Ave
City, State, Zip Code: AJO, AZ 85321 Home Phone: 520-387-5413 Work Phone: 520-387-560

Address or location of property with drainage problem?: 221 W. First Ave, AJO, AZ

Best time of day to reach you by phone? X a.m. _____ p.m. Answering Machine? ☒ Yes ☐ No
(office first, please)

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☒ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other Mud - debris

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☒ 3" - 6" (2nd time, Aug 20, 2003) ☒ 6" - 1' (1st time, July 29, 2003) ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☒ Other

If flow was blocked, altered, or diverted, what was the cause? Wash of overflow, Debris, High Water, Mud, Rockwork is gone, Driveway washed out.

Date flooding/damage occurred? _____ Time of day that the flooding occurred? ____ a.m. X p.m.

How many times has flooding occurred at that location? July 29, 2003 & Aug 20, 2003
What year was the damaged structure/object constructed? 1950's

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

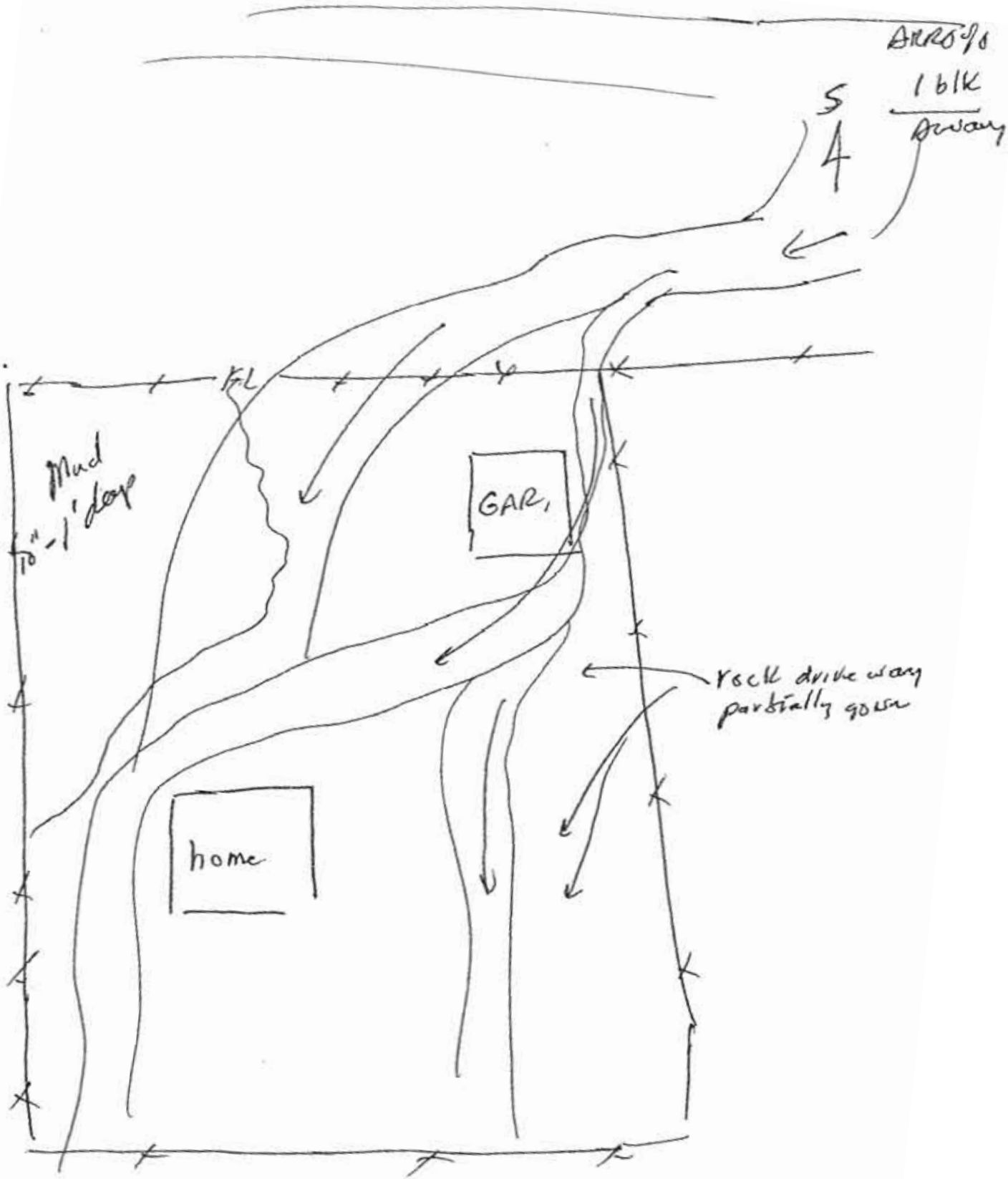
Name: _____
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

* Structures are OK. Mud, dirt! Decorative rock washed away. Alley is allowing extra water into yard, 1' deep of mud.

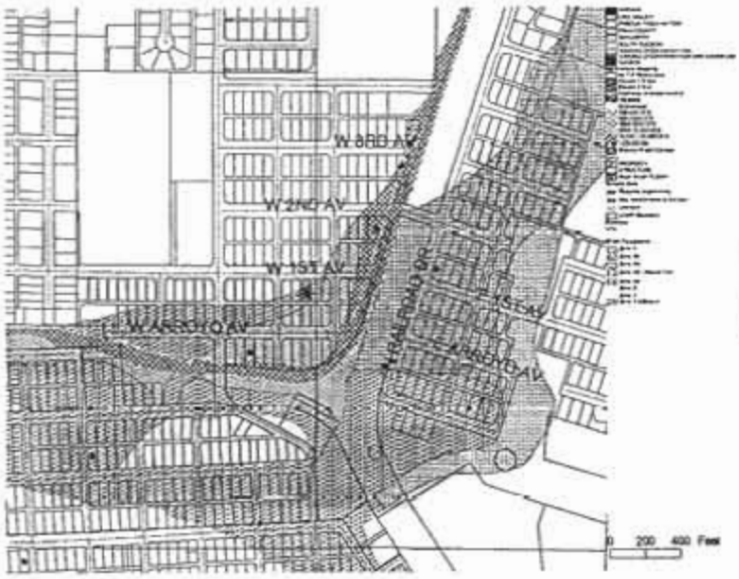
Tetra Tech, Inc.



221 West First Ave

Drainage Complaint: 03296

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X - 500-YEAR
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 217		

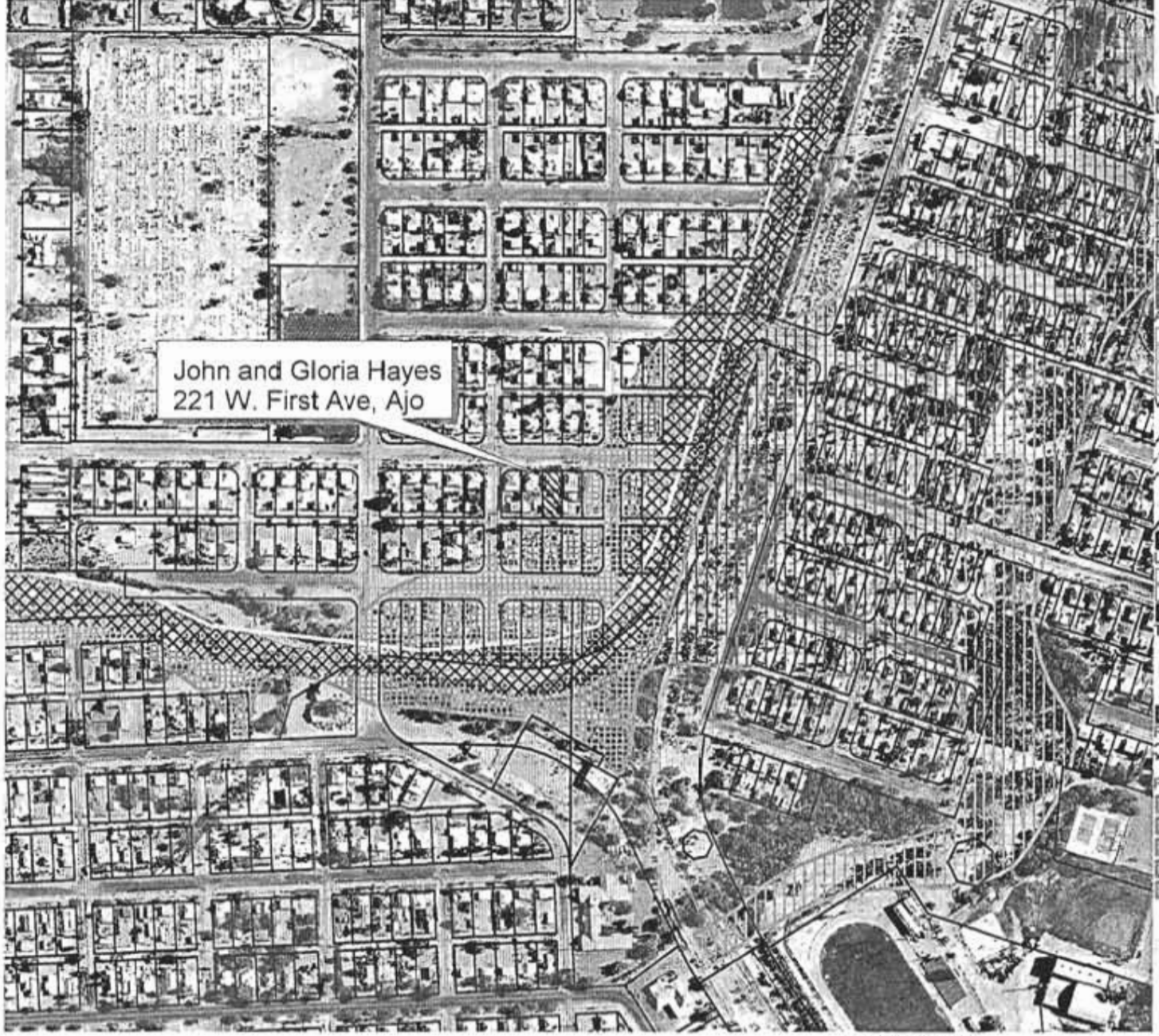


✱ Complaint Source

Field Date:		Complaintant:	HAYES WILLIAM (401552170)				
Date Out		Address	221 W 1ST AVE			Phone	520-387-5413
Status	WAIT	City:	AJO AZ	Zip	853210000		
Code:	FGE			Inv:	RTH		

Nature of Problem

Road/shoulder washed out, drainageway needs repair, yard/landscaping flooded, wall/fence damaged. Wash of overflow, debris, high water, mud, rocking is gone. Driveway washed out. Terry H. working on it.



TS.Regional Parcels
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRI
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

Tetra Tech, Inc.

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

N

FCD ANALYSIS RESULTS
Parcel: 401552170
Owner: HAYES WILLIAM J & GLORIA P JT/RS
Address: 221 W 1ST AV
Legal1: NEW CORNELIA LOT 217
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S06W15
FEMA Zone: ZONE X ZONE X - 500-YEAR
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

Scale 1"= 400.00 feet

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

Aug 21, 2003

A. General Information

03-296

Number: _____
Area: ____ AJO X

Name: John and Gloria Hayes
Address: 221 W. First Ave
City, State, Zip Code: AJO, AZ 85321 Home Phone: 520-387-5413 Work Phone: 520-387-5600

Address or location of property with drainage problem?: 221 W. First Ave, AJO, AZ

Best time of day to reach you by phone? X a.m. _____ p.m. Answering Machine? ☒ Yes ☐ No
(office first, please)

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☒ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other Mud & debris

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☒ 3" - 6" (2nd time, Aug 20, 2003) ☒ 6" - 1' (1st time, July 29, 2003) ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☒ Other

If flow was blocked, altered, or diverted, what was the cause? Wash of overflow, Debris, High Water, Mud, Rockwork is gone, Driveway washed out.

Date flooding/damage occurred? _____ Time of day that the flooding occurred? _____ a.m. X p.m.

How many times has flooding occurred at that location? July 29, 2003 & Aug 20, 2003
What year was the damaged structure/object constructed? 1950's

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

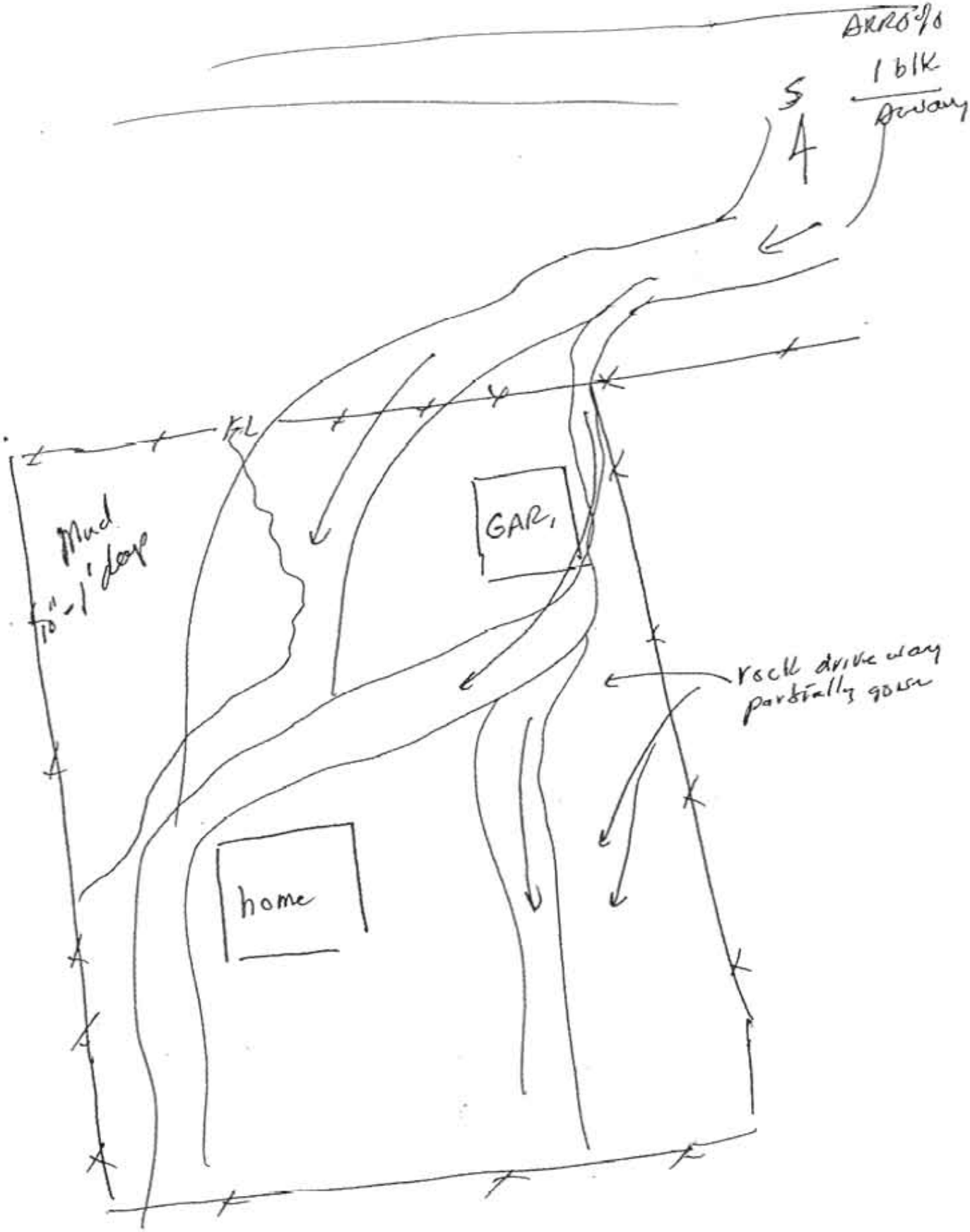
Name: _____
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

* Structures are OK. Mud, dirt! Decorative rock washed away. Alley is allowing extra water and

Tetra Tech, Inc.

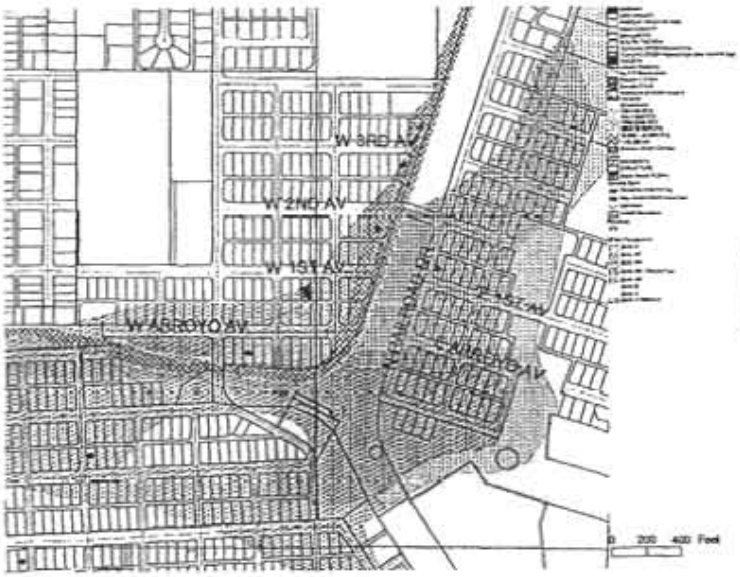


221 West First Ave

Tetra Tech, Inc.

Drainage Complaint: 03296

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X - 500-YEAR
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 217		



✱ Complaint Source

Field Date:		Complaintant:	HAYES WILLIAM (401552170)				
Date Out		Address	221 W 1ST AVE			Phone	520-387-5413
Status	WAIT	City:	AJO AZ	Zip	853210000		
Code:	FGE			Inv:	RTH		

Nature of Problem

Road/shoulder washed out, drainageway needs repair, yard/landscaping flooded, wall/fence damaged. Wash of overflow, debris, high water, mud, rocking is gone. Driveway washed out. Terry H. working on it.

Wednesday, December 31, 2003

Tetra Tech, Inc.

TS.Regional Parcels
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRI
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone AO - Alluvial Fan
Zone AO
Zone D
Zone X
Zone X 500-year

Tetra Tech, Inc.

FCD ANALYSIS RESULTS
Parcel: 401552170
Owner: HAYES WILLIAM J & GLORIA P JTRS
Address: 221 W 1ST AV
Legal1: NEW CORNELIA LOT 217
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S08W15
FEMA Zone: ZONE X ZONE X - 500-YEAR
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

N

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the

1-05-03 PM 2:45

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL 401-55-3920
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

03395

Number:
Area: AJO

Name: WALTER LIENHART
Address: 101 EAST 1ST
City, State, Zip Code: AJO AZ 85321 Home Phone: 520-387-7188 Work Phone:

Address or location of property with drainage problem?: 101 EAST 1ST 140 EAST 1ST

Best time of day to reach you by phone? _____ a.m. _____ p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☑ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☑ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☑ Street ☐ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?

Date flooding/damage occurred? 7/ /03 Time of day that the flooding occurred? _____ a.m. ✓ p.m.

How many times has flooding occurred at that location? 2
What year was the damaged structure/object constructed?

F. Is there ~~someone~~ THING that caused the flooding? ☑ Yes ☐ No If yes, please fill out the following, if known:

Name: BRIDGE ON SECOND STREET - IT IS A DAM
Address:
City, State, Zip Code: Home Phone: Work Phone:

G. Is the property with the problem in a recorded subdivision? ☑ Yes ☐ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#:

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

Drainage Complaint: 03295

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 392		

* Complaint Source

Field Date: Complaintant: LIENHART WALTER (401553920)

Date Out Address 101 E 1ST Phone 520-387-7184

Status WAIT City: AJO AZ Zip 85321

Code: FGE Inv: RTH

Nature of Problem

Yard and driveway damaged form floods in July 03. RTH working on this.

Drainage Complaint: 03295

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 392		

★ Complaint Source

Field Date: WALTER (401553920)

Date Out Phone 520-387-7184

Status WAIT Zip 85321

Code: FGE Inv: RTH

Nature of Problem

Yard and driveway damaged form floods in July 03. RTH working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

09-17-03P12:47 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

--17-03P12:46 RCVD

A. General Information

Number:
Area: AJO

Name: THELMA S. LEATHERWOOD
Address: 1221 N. KILBRIGHT AVE.
City, State, Zip Code: AJO, AZ 85321 Home Phone: 387-6774 Work Phone: -0-

Address or location of property with drainage problem?: 1221 N. KILBRIGHT AV.

Best time of day to reach you by phone? Most of the time a.m. Either or p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☐ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other Screens blown out on large screen porch + 2 screen doors damaged on porch. I have no screen back house door.

D. Flood Water Information (Check the appropriate box.) my gravel, 3 truck (dump loads) has washed out of drive way + ran down the street of our street, lowering mail box one a foot

What was the depth of the flood water? ☒ 1" - 3" ☒ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? The alley is higher than the road, we have raised our front yard probably a foot. It flooded a little. The rest all ran out into the street and took all the gravel + dirt with it leaving rocks sticking up

Date flooding/damage occurred? Aug 18, '03 Time of day that the flooding occurred? ✓ a.m. ____ p.m.

How many times has flooding occurred at that location? Most every rainey season - Summer rain
What year was the damaged structure/object constructed? 1951

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name:
Address:
City, State, Zip Code: Home Phone: Work Phone:

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#:

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

03-292

PIMA COUNTY
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
201 NORTH STONE AVENUE, FOURTH FLOOR
TUCSON, ARIZONA 85701-1207

KURT WEINRICH, P. E.
DIRECTOR

(520) 740-6410
FAX (520) 620-1933

December 17, 2003

Thelma Leatherwood
1221 N. Kilbright Avenue
Ajo, AZ 85321

Re: Drainage issues at 1221 N. Kilbright Avenue

Dear Ms. Leatherwood:

Thank you for filling out the drainage complaint checklist regarding the drainage problems on your property.

I have researched the topography in your area using stereo photographs, which revealed that your residence lies across an historic flow path. Although the size of the upstream watershed is relatively small, high intensity rains, such as those that you experienced in late July, will produce heavy runoff.

The natural drainage for the runoff on your lot is to the northeast. Therefore, it will not be possible for Pima County to use the alleyway behind your property to capture and redirect flow to the north, without adversely impacting other properties and possibly some utilities. I would caution against adding fill in the front of the property because additional fill may result in the further plugging-up of the natural flow path; thus, increasing the depths. Instead, I would recommend that you work with a landscaper to allow flow through your parcel, but away from your residence.

Although your property is not in a mapped floodplain and the drainage area impacting your property is too small to be regulated, I would caution against totally blocking the flow at the property boundaries. Such actions could induce damage to your neighbors. I would also advise you not to convey runoff through your property using pipes or culverts, unless a civil engineer designs it. The engineer would be able to address debris, headwater, and maintenance.

If you have any questions or if you would like some landscaping suggestions, please call me at (520) 740-6350.

Sincerely,

Terry Hendricks, CFM, Chief Hydrologist
Floodplain Management Division

RTH/tj

Drainage Complaint: 03292

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	645	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO HEIGHTS THIRD ADDITION LOTS 9 & 10 BLK 6		

✱ Complaint Source

Field Date:

Complaintant: LEATHERWOOD THELMA (401170920)

Date Out

Address 1221 N KILBRIGHT AVE

Phone 387-6774

Status WAIT

City: AJO AZ

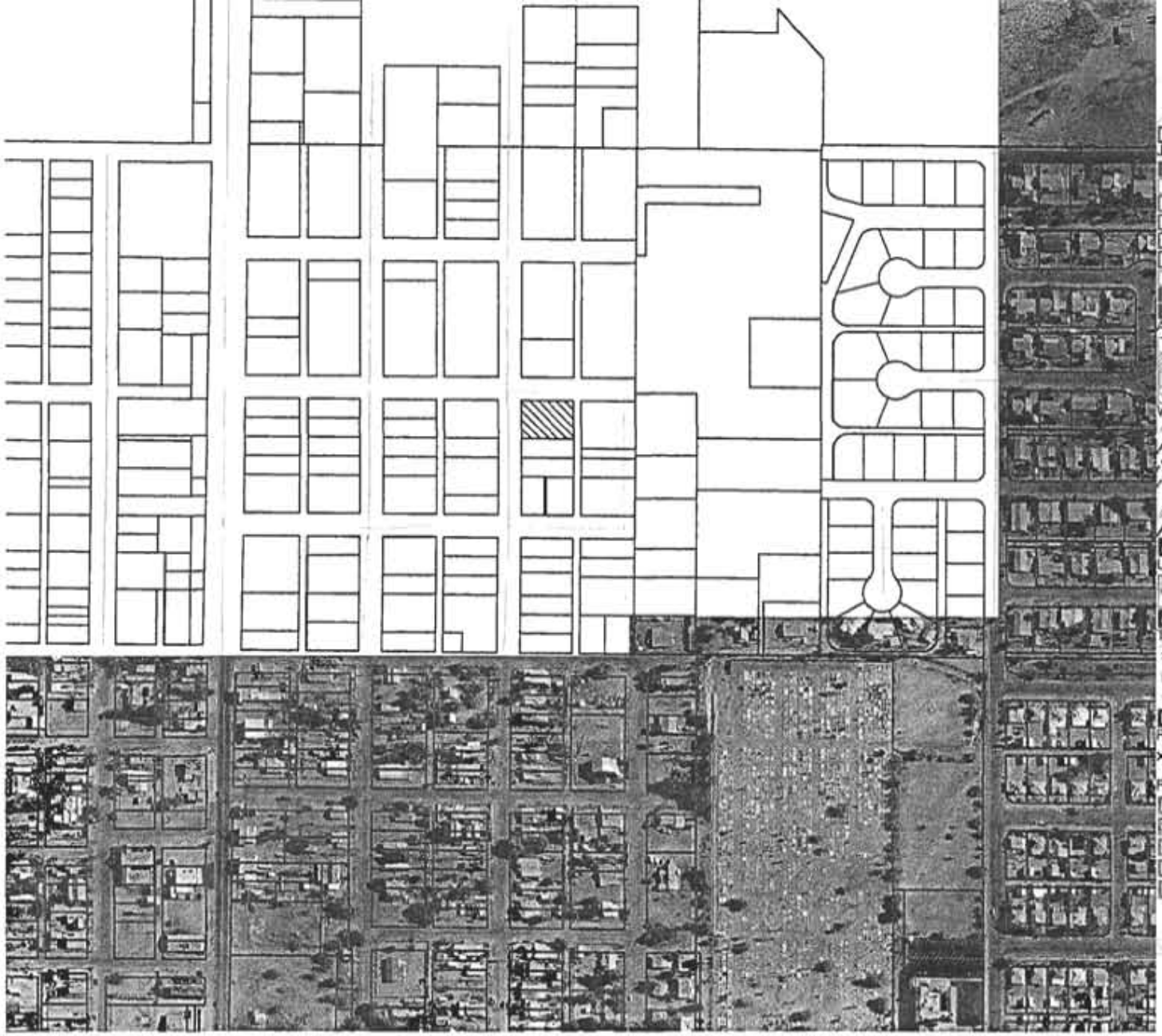
Zip 853210000

Code: FGE

Inv: RTH

Nature of Problem

Due to the rains in July 03, property has flooded. RTH wrote a letter explaining that their residence lies across an historic flow path.



Street Network
TS.Regional Parcels
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRIC
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

Tetra Tech, Inc.

FCD ANALYSIS RESULTS
Parcel: 40112136A
Owner: DEL VALLE MANUEL & ENRIQUETTA JT/RS
Address: 0
Legal1: HOMER BROWNS LOTS 1 & 2 BLK 11
FIRM Boundaries: 040190C0663 K
Section Boundaries: 12S06W15
FEMA Zone: ZONE X
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

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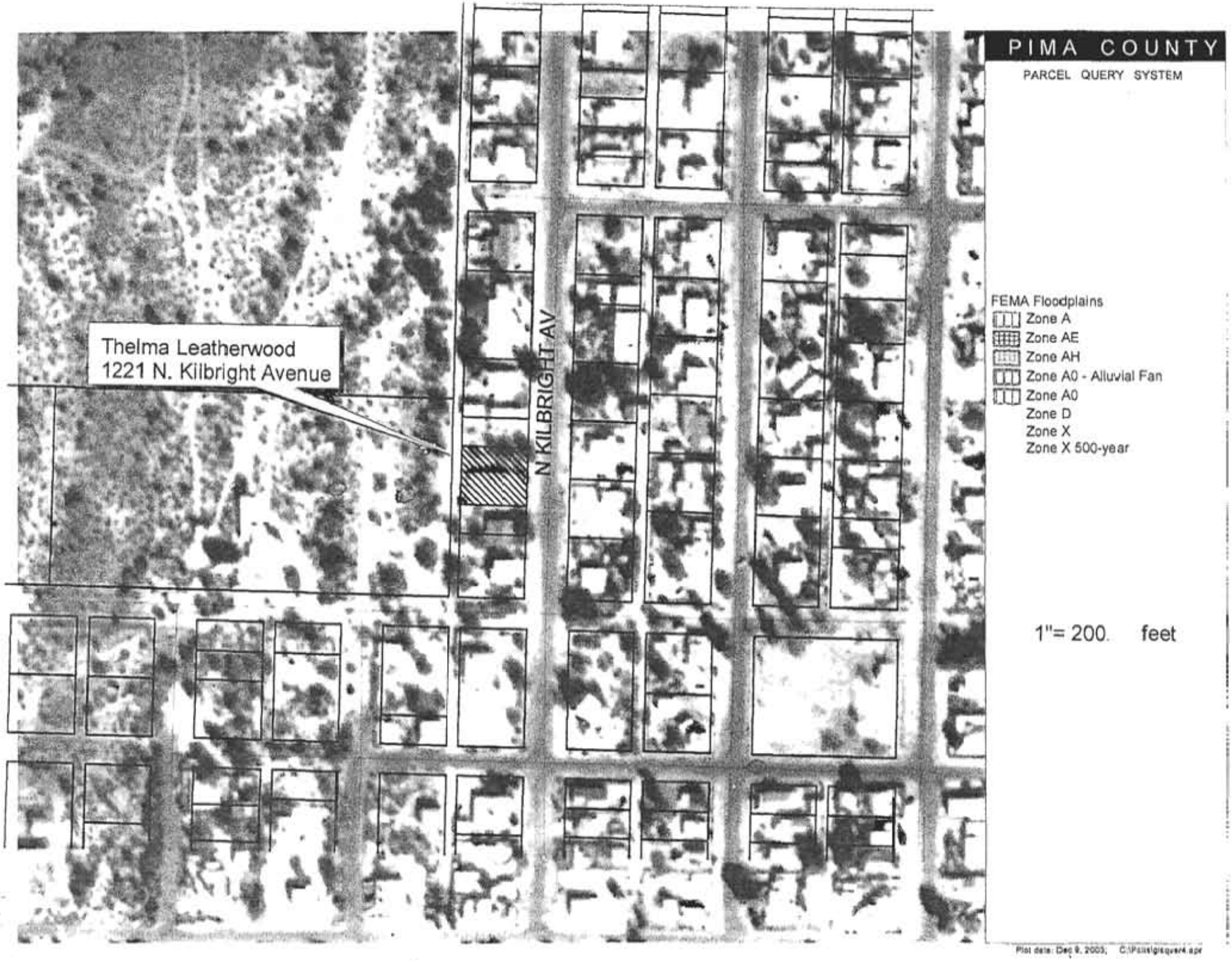
Scale 1"= 400.00 feet



Tetra Tech, Inc.

Drainage Complaint: 03299

TRS	W120615	TAX_CODE	40113146Z
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X - 500-YEAR
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			

LEGAL_DESC E190' OF W290' M/L OF S110' OF N530' M/L

* Complaint Source

Field Date:		Complaintant: KLINEFELTER CLARENCE D & CAROL M JT/RS			
Date Out		Address	625 N 2ND AVE	Phone	520-387-5115
Status	WAIT	City:	AJO AZ	Zip	853212003
Code:	FGE			Inv:	RTH

Nature of Problem

Two of his properties were flooded in the July 29th floods in Ajo. RTH is working on this.

TS.Regional Parcels
Street Center Lines - Major
FIRM Panel Boundaries
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRI
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

FCD ANALYSIS RESULTS
Parcel: 40113482
Owner: KLINEFELTER CLARENCE D & CAROL M JT/RS
Address: 650 N 2ND AV
Legal1: E190' OF W290' M/L OF S110' OF N530' M/L
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S08W15
FEMA Zone: Zone X (Shaded)-500-year or
less than 1 foot on 100-year or
in area protected by levee
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

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Scale 1"= 400.00 feet

Tetra Tech, Inc.

Drainage Complaint: 03184

TRS	W120622	TAX_CODE	401232520
DATE_IN	7/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			

LEGAL_DESC AJO TOWNSITE LOT 1 BLK 30

Complaint Source

Field Date:		Complaintant:	LEAP CHARLES A & ANDREA R CP/RS		
Date Out		Address	400 W MORANDO AVE	Phone	1-520-367-6591
Status	RECD	City:	AJO AZ	Zip	853210000
Code:	MIS			Inv:	HAG

Nature of Problem

Due to micro burst, flood damage occurred. Needs advice. See email attached.

Notified Dave Z about the Bridge.
told Gary to email them Red Cross #.

Thursday, July 31, 2003

Tetra Tech, Inc.

Drainage Complaint: 03184

TRS	W120622	TAX_CODE	401232520
DATE_IN	7/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE LOT 1 BLK 30		

Complaint Source

Field Date:		Complaintant:	LEAP CHARLES A & ANDREA R CP/RS		
Date Out		Address	400 W MORANDO AVE	Phone	1-520-367-6591
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	MIS			Inv:	RTH

Nature of Problem

Due to micro burst, flood damage occurred. Needs advice. See email attached. Terry H. is taking care of.

Debbie Grijalva

03484

From: Gary Peterson
Sent: Thursday, July 31, 2003 8:57 AM
To: Debbie Grijalva
Cc: Henry Goglin
Subject: FW: Flood damage relief due to micro bursts of weather.

Hi Debbie

Here's an e-mail I received that looks like it out to be logged as a drainage complaint.I note that they have copied quite a few people on this... maybe a trip to Ajo for one of our hydros?

Thanks,

GP

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Wednesday, July 30, 2003 8:43 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: Flood damage relief due to micro bursts of weather.

Our house is located in Ajo which is extreme West Pima County and we suffered damage to the brick retaining wall that prevents the flash floods from destroying our house and carport. Such a flash flood occurred in Ajo yesterday evening and about thirty feet of retaining wall was undercut and destroyed. We are concerned that a future flood would seriously undercut and destroy our carport and house. The County maintained bridge which adjoins our property caused and was damaged in the same flood. Because the flow capacity under the bridge was inadequate, a vortex current developed upstream from the bridge and accelerated our erosion.

Folks who live upstream from us have built a very deep and narrow reinforced concrete flood channel which accelerates the water and causes a flood surge which would inundate our property if not for the now damaged retainer wall.

Folks who have property on Telera St. between Morondo Ave and Rocalla Ave suffer damage from the runoff from every storm as there are no curbs or gutters. This planned drainage is undercutting the brick wall on the eastside (Telera St.) of our property and defies logic as flood plain management.

Dear Mr. and Mrs. Leap:

Thank you for your message regarding flooding issues on your property in Ajo. This sounds like it may be a drainage complaint issue that the Flood Control District should investigate. Thus, I am forwarding your message to one of our hydrologists for action. Typically, our hydrologists will investigate the situation and make recommendations to those who may be diverting water onto your property, concerning how they should resolve the matter. You should hear from one of our staff shortly, but please bear in mind that this is a busy time of year for us.

In the event you are not contacted in a reasonable amount of time, please feel free to contact me at (520) 740-6350 and I will ensure that we get someone to look into this matter.

Thanks again for your message.

Gary Peterson
PCFCD

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Wednesday, July 30, 2003 8:43 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: Flood damage relief due to micro bursts of weather.

Our house is located in Ajo which is extreme West Pima County and we suffered damage to the brick retaining wall that prevents the flash floods from destroying our house and carport. Such a flash flood occurred in Ajo yesterday evening and about thirty feet of retaining wall was undercut and destroyed. We are concerned that a future flood would seriously undercut and destroy our carport and house. The County maintained bridge which adjoins our property caused and was damaged in the same flood. Because the flow capacity under the bridge was inadequate, a vortex current developed upstream from the bridge and accelerated our erosion.

Folks who live upstream from us have built a very deep and narrow reinforced concrete flood channel which accelerates the water and causes a flood surge which would inundate our property if not for the now damaged retainer wall.

Folks who have property on Telera St. between Morondo Ave and Rocalla Ave suffer damage from the runoff from every storm as there are no curbs or gutters. This planned drainage is undercutting the brick wall on the eastside (Telera St.) of our property and defies logic as flood plain management.

Henry Goglin

From: Gary Peterson
Sent: Thursday, July 31, 2003 3:58 PM
To: 'Andrea Leap'
Cc: Henry Goglin
Subject: RE: Flood damage relief due to micro bursts of weather.

Dear Mr. and Mrs. Leap,

Thank you for your message. Since receiving your e-mail yesterday, I have logged your issue as a drainage complaint to start the investigation process. As I mentioned, this is an extremely busy time for our staff, however, I spoke with our hydrologist today and he indicated that he will try to contact you either tomorrow or early next week.

In addition, we have contacted our DOT Maintenance Operations Division on this matter, and have asked them to look into the bridge issue you mentioned. Likewise, we are also investigating possible American Red Cross and Community Services assistance in this regard.

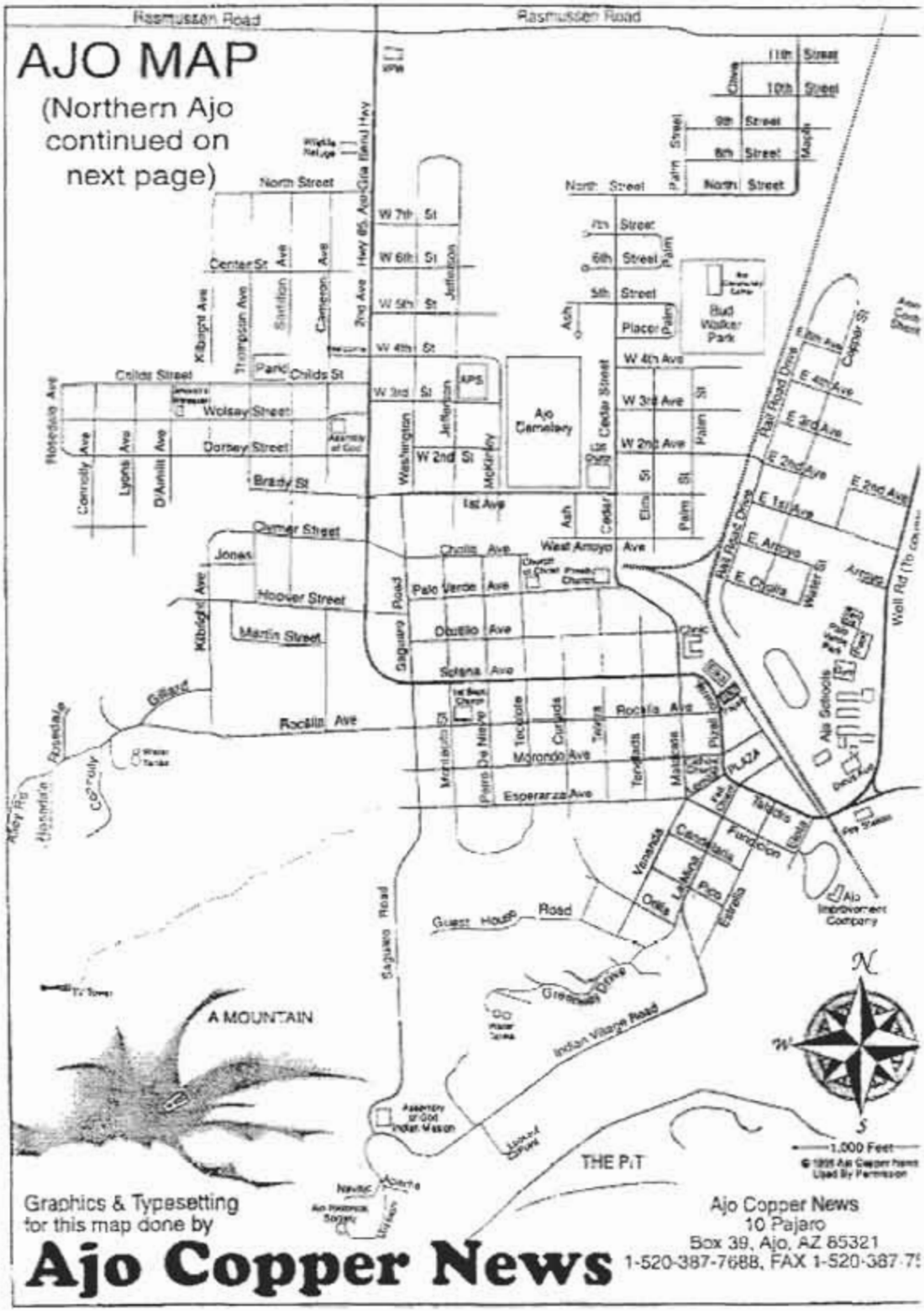
I can't comment on citizen service or gerrymandering in Ajo, however, I should note that Pima County Supervisor Sharon Bronson and DOT Department Director Kurt Weinrich were in your community today looking at flooding issues. I think it might be a good idea to express your concerns directly to them, as they may have other ideas or resources to bear on your flooding concerns. Contact information for them can be obtained at: www.pima.gov.

Regards,

Gary Peterson
PCFCD

-----Original Message-----
From: Andrea Leap [mailto:andrealeap@direcway.com]
Sent: Thursday, July 31, 2003 3:27 PM
To: Gary.Peterson@dot.pima.gov; marzberg@azleg.state.az.us; malvarez@azleg.state.az.us; ecker2@mindspring.com
Subject: RE: Flood damage relief due to micro bursts of weather.

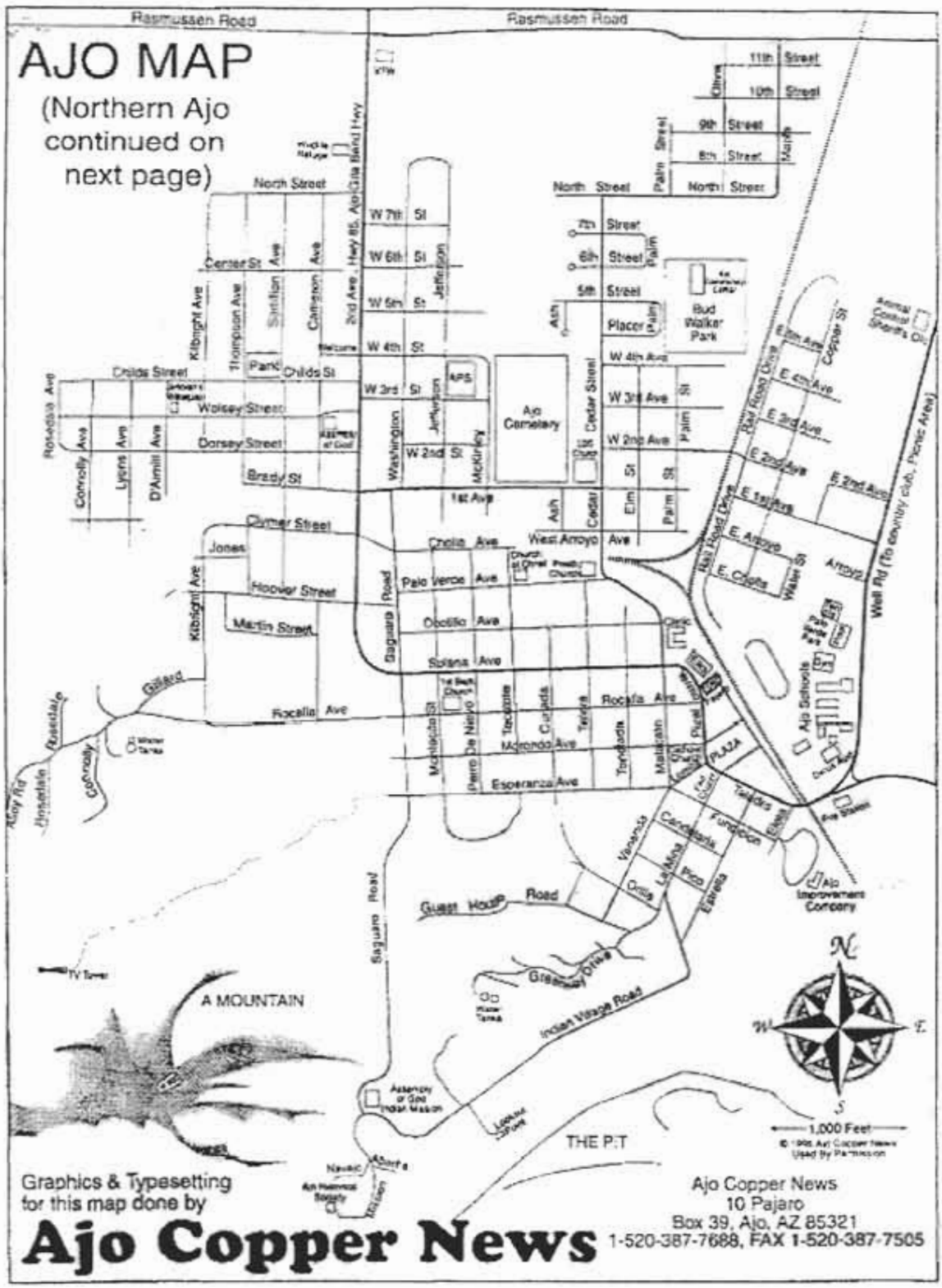
> I am not sure what a reasonable time is, because the neglect of these issues has gone on for years. I believe that the last big episode of flooding and property destruction occurred three years ago. My situation is not unique and there are renovations going on in many places in this community. What happened to Joe Citizen in Ajo? We didn't make the evening news and are apparently gerrymandered beyond consideration. There is another flood watch in effect for Pima County this afternoon.
>
> -----Original Message-----
> **From:** Gary Peterson [mailto:Gary.Peterson@dot.pima.gov]
> **Sent:** Thursday, July 31, 2003 9:05 AM
> **To:** 'Andrea Leap'
> **Subject:** RE: Flood damage relief due to micro bursts of weather.



My wife is unemployed and has Fibromyalga and I am a 100% disabled American Veteran. We have no flood insurance and the flood surpassed any engineering expectations. We do not have the resources to repair the damage. Are there any programs that we might use to make emergency repairs as the Monsoon season has not passed.

Charlie & Andrea Leap

400 West Morondo Ave
Ajo, AZ 85321
520-367-6591



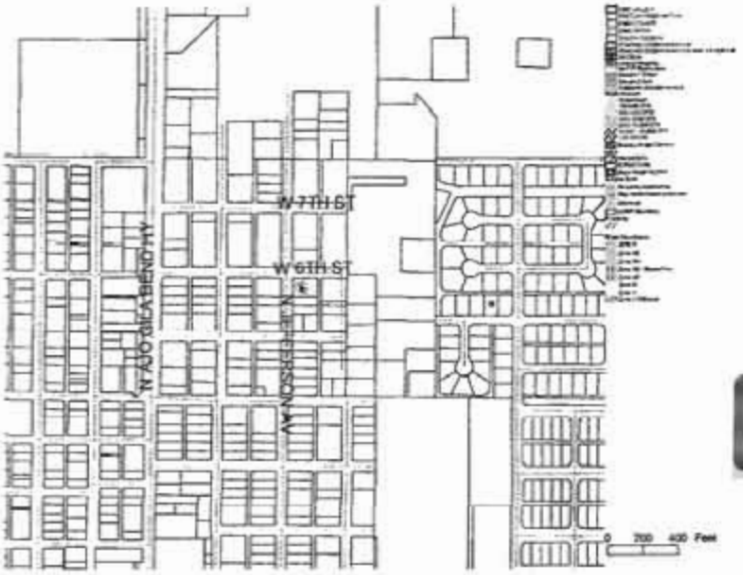
My wife is unemployed and has Fibromyalga and I am a 100% disabled American Veteran. We have no flood insurance and the flood surpassed any engineering expectations. We do not have the resources to repair the damage. Are there any programs that we might use to make emergency repairs as the Monsoon season has not passed.

Charlie & Andrea Leap
400 West Morondo Ave
Ajo, AZ
1-520-387-6591
7/31/2003

Tetra Tech, Inc.

Drainage Complaint: 03291

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	HOMER BROWNS LOTS 1 & 2 BLK 11		



Complaint Source

Field Date:

Complaintant: DEL VALLE MANUEL (40112136A)

Date Out

Address 1350 N JEFFERSON AVE

Phone 387-7178

Status WAIT

City: AJO AZ

Zip 853210000

Code: FGE

Inv: TH

Nature of Problem

Due to flooding on 7/29/03, his yard and landscaping has flooded out. Terry Hendricks working on it.

Wednesday, December 31, 2003

Tetra Tech, Inc.

Street Network
TS.Regional Parcels
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRIC
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

Tetra Tech, Inc.

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N

FCD ANALYSIS RESULTS
Parcel: 40112136A
Owner: DEL VALLE MANUEL & ENRIQUETTA JTIRS
Address: 0
Legal1: HOMER BROWNS LOTS 1 & 2 BLK 11
FIRM Boundaries: 04019C0563 K
Section Boundaries: 12S08W15
FEMA Zone: ZONE X
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

03291

MEMORANDUM

Department of Transportation and Flood Control District
Floodplain Management Division

DATE: September 5, 2003

TO: Ajo Drainage Complaint file

FROM: Terry Hendricks

RE: Survey Returned from Manuel P. Del Valle (1350 N. Jefferson Ave. Ajo, AZ)

After conferring with Maria Soto, of Community Services, I found that there is the possibility that Pima County may assist Mr. Del Valle in the repairs to his yard above the leech field. I told Mr. Del Valle to call Ms. Soto and make arrangements with them to see if this is a service that the County could provide. I also informed Mr. Del Valle that if this work is outside the guidelines for community services that they may be on their own as far as repairing the yard above their leech field.

DRAINAGE COMPLAINT CHECKLIST

LOOD CONTROL
749
NE 622-5800

Number:
Area: AJO

I will need some one to level my back yard as the flooding almost uncover my leaching field probably need about 3 loads of sand I can't do it myself as I am to old my age is 84 yrs and my wife is 74 yr old

Thank You
Manuel & Enriqueta
Del Valle

Mo-Ia Sod

01-12-136A

187-7178 Work Phone: None

p.m. Answering Machine? ☑ Yes ☐ No

Ponding ☐ Erosion ☐ Mud ☐ Access

d Out

epair
leaning

☐ Driveway Damaged
☑ Yard/Landscaping Flooded
☐ Wall/Fence Damaged
☐ Other

6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

low ☐ New Development ☐ Other

Date flooding/damage occurred: 7-8-03 Time of day le flooding occurred? a.m. 8 p.m.

How many times has flooding occurred at that location? two times 7-29-03 + 8-19-03

What year was the damaged structure/object constructed?

F. **Is there someone that caused the flooding?** ☐ Yes ☐ No If yes, please fill out the following, if known:

Name:
Address:
City, State, Zip Code: **Home Phone:** **Work Phone:**

G. **Is the property with the problem in a recorded subdivision?** ☐ Yes ☑ No If yes, please fill out the following:

Subdivision Name: Lot Number:

If no, please provide Assessor's Parcel#: HOMER BROWNS LOTS 1 + 2 BLK 11

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

08-22-03P02:48 RCVD

08-22-03P02:...

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number: 401-12-136A
Area: AJO

Name: Manuel P. Del Valle
Address: 1350 N. JEFFERSON AVE.
City, State, Zip Code: 85321 **Home Phone:** 387-7178 **Work Phone:** None

Address or location of property with drainage problem?:

Best time of day to reach you by phone? 6:00 a.m. 9:00 p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☑ Street ☐ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? a.m. 8 p.m.

How many times has flooding occurred at that location? two times 7-29-03 & 8-19-03
What year was the damaged structure/object constructed?

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name:
Address:
City, State, Zip Code: **Home Phone:** **Work Phone:**

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☑ No If yes, please fill out the following:
Subdivision Name: Lot Number:
If no, please provide Assessor's Parcel#: HOMER BROWNS LOTS 1 & 2 BLK 11

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

I may pretend this is a gift from

Please call this guy. Marilyn (ask me about this)

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

401-17-0681A 03298

Number: _____
Area: _____

Name: Manuel Santiago
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

Address or location of property with drainage problem?: 1420 N. Kelbright Ajo

Best time of day to reach you by phone? _____ a.m. _____ p.m. Answering Machine? ☐ Yes ☐ No
(520) 387-6040

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

☐ Mobile Home Flooded	☐ Ponding in Roadway	☐ Driveway Damaged
☐ Home Flooded	☐ Road/Shoulder Washed Out	☒ Yard/Landscaping Flooded
☐ Garage Flooded	☐ Culvert Problem	☒ Wall/Fence Damaged
☐ Commercial Building Flooded	☒ Drainageway Needs Repair	☐ Other _____
☐ Accessory Building Flooded	☐ Drainageway Needs Cleaning	

neight broke a hole in cement drainage wall.

D. Flood Water Information (Check the appropriate box.)

In what direction did the water come from? ☐ N ☐ S ☐ E ☐ W ☐ Other _____
What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other
In what direction did the water leave the property? ☐ N ☐ S ☐ E ☐ W ☐ Other _____

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway (?) ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

☐ If source is a new Development in close proximity, please print its name and location: _____

If flow was blocked, altered, or diverted, what was the cause? neighbor broke a hole in cement wall (6"-7")

Date flooding/damage occurred? NO 8/27/003 Time of day that the flooding occurred? _____ a.m. _____ p.m.
How many times has flooding occurred at that location? ?
What year was the damaged structure/object constructed? _____

F. Is there someone that caused the flooding? ☒ Yes ☐ No If yes, please fill out the following, if known:

Name: neighbor at 1400 Kelbright (?)
Address: _____
City, State, Zip Code: _____ Home Phone: 401-17-0681A Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: If you have additional comments, please attach an additional sheet of paper. Please include photo(s), or video tape of the problem, if available.

Drainage Complaint: 03298

TRS	W120615	TAX_CODE	40117066A
DATE_IN	12/31/2003		
AREA	5		
PANEL	645	ZONE	ZONE X
SUSPECT	AVALOS MELITON N & CRUZITA JT/		
SUSPECT_AD	1400 N KILBRIGHT AVE		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO HEIGHTS THIRD ADDITION LOT 13 BLK 4		

Complaint Source

Field Date:		Complaintant:	SANTIAGO MANUEL (40117068A)		
Date Out		Address	1351 N KILBRIGHT AVE	Phone	520-387-6040
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Neighbor broke a hole in their cement wall causing all the water to divert onto Mr. Santiago's property.

Wednesday, December 31, 2003

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

B300

A. General Information

Number:
Area: AJO

Name: Diane + George Moser
Address: 1838 SAKAI VILLAGE LOOP
City, State, Zip Code: BAINBRIDGE IS, WA 98110 Home Phone: 206/842-1058 Work Phone: 206/842-1286

Address or location of property with drainage problem?: 101 E. 2ND AVE, AJO, AZ. 85321

Best time of day to reach you by phone? 9 a.m. 5 p.m. Answering Machine? ☒ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☒ Over 3" ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? DEBRIS @ E. 2ND AVE AND RAILROAD DRIVE BRIDGE — BLOCKED ARROYO (WEST 2ND AVE. BRIDGE)

Date flooding/damage occurred? 7/29/03 Time of day that the flooding occurred? ____ a.m. ____ p.m.

How many times has flooding occurred at that location? 2
What year was the damaged structure/object constructed? ?

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

However, lack of cleaning the arroyo by Phelps-Dodge and or the County caused the bridge to block with debris

Name:
Address:
City, State, Zip Code: Home Phone: Work Phone:

G. Is the property with the problem in a recorded subdivision? ☒ Yes ☐ No If yes, please fill out the following:
Subdivision Name: NEW CORNELIA ADDITION Lot Number: 367
If no, please provide Assessor's Parcel#:

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

VIDEO TAPE DONE WHEN SHARON BROWSON INSPECTED THE DAMAGE A FEW DAYS AFTER IT OCCURRED.

Tetra Tech, Inc.

Drainage Complaint: 03302

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 367		

Complaint Source

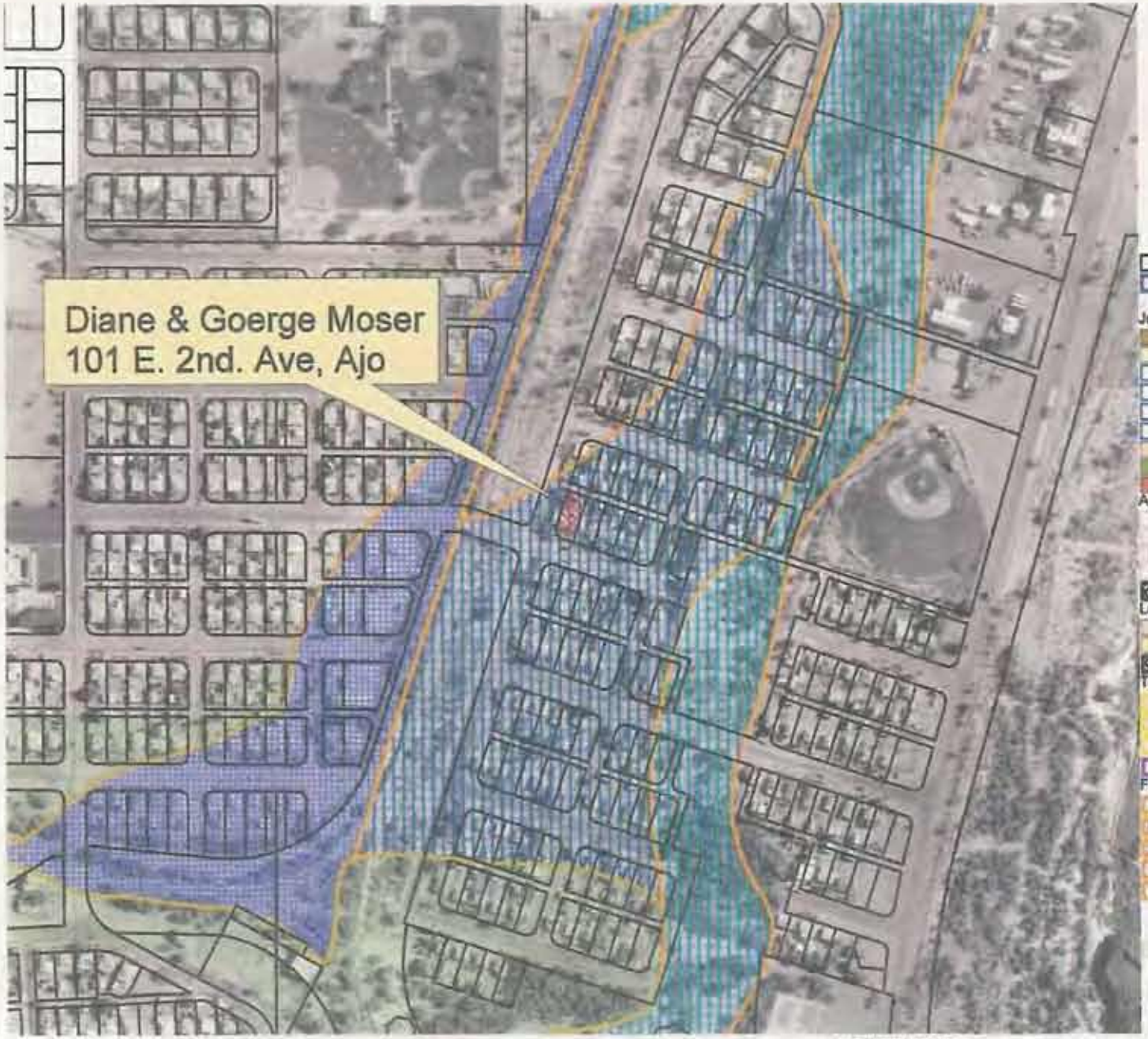
Field Date:		Complaintant: MOSER GEORGE (401553670)			
Date Out		Address	101 E 2ND AVE	Phone	206-842-1286
Status	WAIT	City:	AJO AZ	Zip	85321
Code:	FGE			Inv:	RTH

Nature of Problem

Home flooded, garage flooded, road/shoulder washed out. Driveway damaged.

Wednesday, December 31, 2003

Tetra Tech, Inc.



TS.Regional Parcels
FIRM Panel Boundaries
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTR
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone AO - Alluvial Fan
Zone AO
Zone D
Zone X
Zone X 500-year

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

N

FCD ANALYSIS RESULTS
Parcel: 401553670
Owner: MOSER GEORGE N & DIANE L CPWS
Address: 101 E 2ND AV
Legal1: NEW CORNELIA LOT 367
FIRM Boundaries: 04019C0661 K
Section Boundaries: 12S08W14
FEMA Zone: ZONE AO 1
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

Tetra Tech, Inc.

08-26-03P03:57 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

401-24-0780
03300

Number: _____
Area: AJO

Name: FRANCISCA A. SANDOVAL
Address: 701 W SOLONA AVE
City, State, Zip Code: AJO, AZ 85321 Home Phone: 387-5409 Work Phone: 387-8639

Address or location of property with drainage problem?: _____

Best time of day to reach you by phone? ? a.m. ? p.m. (work shift work) Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☒ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☒ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☒ Street ☐ Wash ☒ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? Not sure what the cause is but poss alleyway has been built up causing water to run through yards 2 Have complain to County before.

Date flooding/damage occurred? 8/ _____ Time of day that the flooding occurred? _____ a.m. X p.m.

How many times has flooding occurred at that location? 3 Times caused
What year was the damaged structure/object constructed? ?

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name: UNK
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

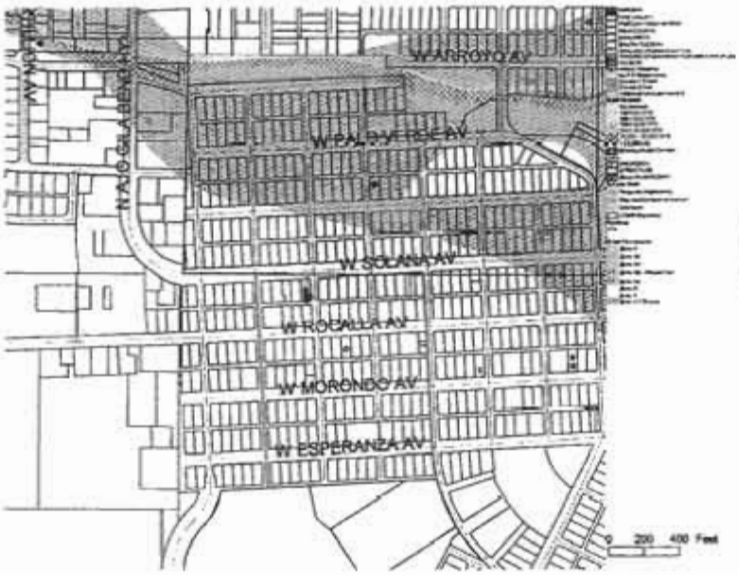
G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No (UNK) If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available. Can some one come + check on problem last year I spoke to Ray Draves after 2 made a complaint to county. obviously nothing was done. I took pictures but they are not developed yet.

Tetra Tech, Inc.

Drainage Complaint: 03300

TRS	W120622	TAX_CODE	401240780
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE FIRST ADDITION LOT 10 BLK 40		



Complaint Source

Field Date:		Complaintant:	SANDOVAL FRANCISCA A		
Date Out		Address	701 W SOLANA AVE	Phone	387-5409
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Alleyway is built up diverting the flow of water onto her property. Needs help. Terry H. working on it.

Wednesday, December 31, 2003

Tetra Tech, Inc.

08-27-03P02:53 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

B301

Number: _____
Area: AJO

Name: MARIA Y. BUSTAMANTE
Address: 411 ROCALLA
City, State, Zip Code: AJO, AZ 85321 **Home Phone:** NONE **Work Phone:** NONE
MSG. PHONE: (602) 999-9243
Address or location of property with drainage problem?: _____

Best time of day to reach you by phone? _____ a.m. _____ p.m. Answering Machine? ☐ Yes ☐ No
ANYTIME ON MSG. PHONE

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☐ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☒ Other RETAINING WALL DAMAGED

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☒ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? RETAINING WALL ON NEXT DOOR NEIGHBOR'S PROPERTY WASHED AWAY

Date flooding/damage occurred? JULY 29 Time of day that the flooding occurred? _____ a.m. LATE p.m.

How many times has flooding occurred at that location? _____
What year was the damaged structure/object constructed? _____

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: _____
Address: _____
City, State, Zip Code: _____ **Home Phone:** _____ **Work Phone:** _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: AJO TOWNSITE Lot Number: 9 BLK 30
If no, please provide Assessor's Parcel#: 2600

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

COUNTY 10 BOOK 401 MAP 23 PARCEL 2600

Tetra Tech, Inc.

Drainage Complaint: 03301

TRS	W120622	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT			
SUSPECT_AD	411 ROCALLA		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE LOT 9 BLK 30		

Complaint Source

Field Date:		Complaintant:	BUSTAMANTE MARIA (401232600)		
Date Out		Address	411 W ROCALLA	Phone	602-999-9243
Status	WAIT	City:	AJO, AZ	Zip	85321
Code:	FGE			Inv:	RTH

Nature of Problem

House flooded, drainageway needs repair, retaining wall damaged. RTH working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

FAX

03-299

Please Deliver Immediately

To Dept of Transportation & flood control

From Carol Kline Pelter

Message Two of my properties were flooded in the July 29 flood in AJO. Attached are Damage reports. We hired the clean up. Ap $ Amount was $4000.00.

Date 8-13-03 Time

Number of pages sent 3

For any problems receiving this fax

Call 520 387 5115

Return FAX 520 387 7212

K 5 ENTERPRISES
625 N SECOND
AJO, AZ 85321

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number:
Area: AJO

Name: CD + Carol Kline Fellers
Address: 630 N Second Ave
City, State, Zip Code: AJO Az 85321 **Home Phone:** 387 7211 **Work Phone:** 387 5115

Address or location of property with drainage problem?: 750 N Second (Hugh at First)

Best time of day to reach you by phone? _____ a.m. 3-4 p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☑ Erosion ☑ Mud ☐ Access

Some water inside building (minor) Property covered with mud right to front door total south half of property covered with debris

C. Impact of Problem (Check the appropriate box.)

☐ Mobile Home Flooded	☐ Ponding in Roadway	☐ Driveway Damaged
☐ Home Flooded	☐ Road/Shoulder Washed Out	☑ Yard/Landscaping Flooded
☐ Garage Flooded	☐ Culvert Problem	☐ Wall/Fence Damaged
☐ Commercial Building Flooded	☐ Drainageway Needs Repair	☐ Other _____
☐ Accessory Building Flooded	☐ Drainageway Needs Cleaning	

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☑ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? _____

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? _____ a.m. 9 p.m.

How many times has flooding occurred at that location? as far as I know never.
What year was the damaged structure/object constructed? on time lot was clear until [illegible]

F. Is there someone that caused the flooding? ☐ Yes ☐ No If yes, please fill out the following, if known:

Name: _____
Address: _____
City, State, Zip Code: _____ **Home Phone:** _____ **Work Phone:** _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number: _____
Area: AJO

Name: CD + Carol Kline fr / Lex call back
Address: 625 N Second
City, State, Zip Code: AJO Az 85321 / Home Phone: 520 387 4114 Work Phone: 520 387 5115

Address or location of property with drainage problem?: 650 N Second (Hwy 85)

Best time of day to reach you by phone? _____ a.m. 3 + 4 p.m Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☑ Flooding ☐ Ponding ☑ Erosion ☑ Mud ☐ Access

Wash flowed through the building and covered entire property

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☑ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☑ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? debris?

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? _____ a.m. 8 p.m.

How many times has flooding occurred at that location? Never before
What year was the damaged structure/object constructed? 1976

F. Is there someone that caused the flooding? ☐ Yes ☐ No *If yes, please fill out the following, if known:*

Name: _____
Address: _____
City, State, Zip Code: _____ **Home Phone:** _____ **Work Phone:** _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☑ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

Drainage Complaint: 03299

TRS	W120615	TAX_CODE	40113146Z
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X - 500-YEAR
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	E190' OF W290' M/L OF S110' OF N530' M/L		

Complaint Source

Field Date:		Complaintant:	KLINEFELTER CLARENCE D & CAROL M JT/RS		
Date Out		Address	625 N 2ND AVE	Phone	520-387-5115
Status	WAIT	City:	AJO AZ	Zip	853212003
Code:	FGE			Inv:	RTH

Nature of Problem

Two of his properties were flooded in the July 29th floods in Ajo. RTH is working on this.

TS.Regional Parcels
Street Center Lines - Major
FIRM Panel Boundaries
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRI
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

FCD ANALYSIS RESULTS
Parcel: 6011314BZ
Owner: KLINEFELTER CLARENCE D & CAROL M JT/RS
Address: 650 N 2ND AV
Legal1: E130' OF W290' M/L OF S110' OF N530' M/L
FIRM Boundaries: 04019C0563 K
Section Boundaries: 12S06W15
FEMA Zone: Zone X (Shaded)-500-year or
less than 1 foot on 100-year or
in area protected by levee
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

Tetra Tech, Inc.

09-09-03P04:27 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

03297

A. General Information

Number: _____
Area: ____ **AJO** _____

Name: Lucila G. Montoya
Address: 631 W. Rocalla Ave.
City, State, Zip Code: Ajo, Az. 85321 **Home Phone** 520-387-5647 **Work Phone:** _____

Address or location of property with drainage problem?: 631 W. Rocalla Ave

Best time of day to reach you by phone? 9:00 a.m. 6:00 p.m. Answering Machine? ☒ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☒ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☒ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other 1982 car flooded

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☒ 1" - 3" ☐ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☒ Street ☒ Wash ☒ Drainageway ☒ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? 1st neighbor to east of said property - in adjust. control drainageway, water back-ups 2nd neighbor to the east of said property - filled the wash with dirt - thus water back-up.

Date flooding/damage occurred? 7-29-03 Time of day that the flooding occurred? _____ a.m. _____ p.m.

How many times has flooding occurred at that location? twice
What year was the damaged structure/object constructed? 1981

(F.) **Is there someone that caused the flooding?** ☒ Yes ☐ No If yes, please fill out the following, if known:

Name: Terry Treadwell
Address: 621 W. Rocalla Ave
City, State, Zip Code: Ajo, Az. 85321 **Home Phone** 520-387-7870 **Work Phone:** _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: 401-24-057-0

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Mike Morales
615 W. Rocalla
Ajo Az 85321
Phone 520-387-6566

Tetra Tech, Inc.

Drainage Complaint: 03297

TRS	W120622	TAX_CODE	401240580
DATE_IN	12/31/2003		
AREA	5		
PANEL	1255	ZONE	ZONE X
SUSPECT	TREADWAY TERRY L & NORA E JT/		
SUSPECT_AD	621 W ROCALLA AVE		
SUSPECT_CI	AJO AZ		
SUSPECT_ZI	853210000		
SUSPECT_PH			
LEGAL_DESC	AJO TOWNSITE FIRST ADDITION LOT 8 BLK 38		

Complaint Source

Field Date:		Complaintant:	MONTIJO LUCILA G		
Date Out		Address	631 W ROCALLA AVE	Phone	520-387-5647
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Neighbor to the east causing flooding, water back-ups. Terry H. working on it.

03293 08-20-03P03:17 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

401-55-1830.

A. General Information

Number:
Area: AJO ✓

Name: Clairmond Benjamin
Address: 111 W 2nd Ave
City, State, Zip Code: Ajo Az 85321 Home Phone: 623 695 1819 Work Phone: —

Address or location of property with drainage problem?: 111 W Second Ave Ajo Az 85321

Best time of day to reach you by phone? Anytime a.m. p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☒ Home Flooded
- ☒ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☒ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? Water backed up @ 2nd Ave Bridge

Date flooding/damage occurred? 7/29/03 Time of day that the flooding occurred? a.m. 7:30-8:00 p.m.

How many times has flooding occurred at that location? 2 times
What year was the damaged structure/object constructed? Approx 1950

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: N/A
Address:
City, State, Zip Code: Home Phone: Work Phone:

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: N/A Lot Number:
If no, please provide Assessor's Parcel#:

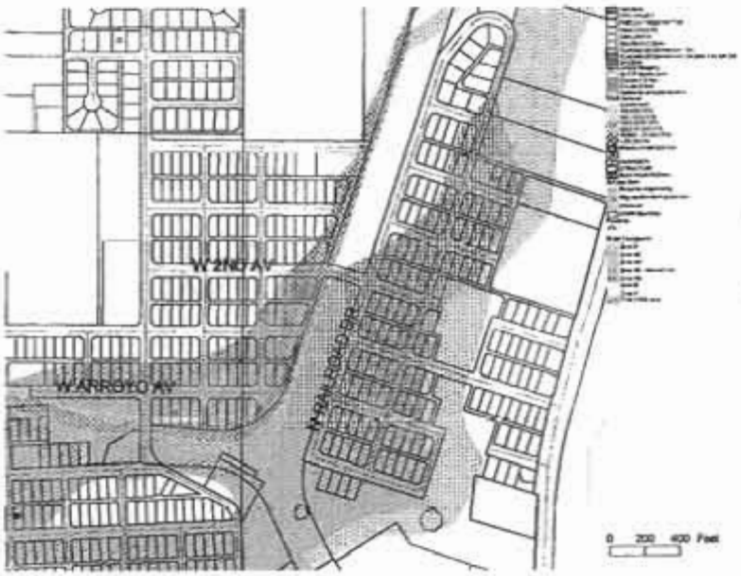
Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Bridge is not adequate to carry water.

Tetra Tech, Inc.

Drainage Complaint: 03293

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AE
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 183		



Complaint Source

Field Date:		Complaintant:	BENJAMIN CLARIMOND (401551830)		
Date Out		Address	111 W 2ND AVE	Phone	623-695-1819
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

Home flooded, garage flooded, driveway damaged, yard and landscaping flooded, wall/fence damaged. Terry working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

1-05-03 P02:45

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL 401-55-3920
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

03295

Number: _____
Area: _____ AJO _____

Name: WALTER LIENHART
Address: 101 EAST 1ST
City, State, Zip Code: AJO AZ 85321 Home Phone: 520-387 7184 Work Phone: _____

Address or location of property with drainage problem?: 101 EAST 1ST 140 EAST 1ST

Best time of day to reach you by phone? _____ a.m. _____ p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☑ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☑ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☑ Street ☐ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? _____

Date flooding/damage occurred? 7/ /03 Time of day that the flooding occurred? _____ a.m. ✓ p.m.

How many times has flooding occurred at that location? 2
What year was the damaged structure/object constructed? _____

F. Is there someone that caused the flooding? ☑ Yes ☐ No If yes, please fill out the following, if known:

THING

Name: BRIDGE ON SECOND STREET - IT'S A DAM
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☑ Yes ☐ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

Tetra Tech, Inc.

Drainage Complaint: 03295

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 392		

Complaint Source

Field Date: WALTER (401553920)

Date Out Phone 520-387-7184

Status WAIT Zip 85321

Code: FGE Inv: RTH

Nature of Problem

Yard and driveway damaged form floods in July 03. RTH working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

401-55-1540

A. General Information

B299

Number:
Area: ____ **AJO** ____

Name: Danielle A Lewis
Address: 81 west 3rd ave
City, State, Zip Code: Ajo Az 85321 Home Phone: 520-387-6031 Work Phone: 387-7832 520-

Address or location of property with drainage problem?:
81 west 3rd ave Ajo Az

Best time of day to reach you by phone? Any a.m. Any p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☐ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other ____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☒ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?
Bridge and debree from was

Date flooding/damage occurred? Aug 2003 Time of day that the flooding occurred? ____ a.m. 7pm p.m.

How many times has flooding occurred at that location? one
What year was the damaged structure/object constructed? unknown

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: ____
Address: ____
City, State, Zip Code: ____ Home Phone: ____ Work Phone: ____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: ____ Lot Number: ____
If no, please provide Assessor's Parcel#: ____

Note: If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.

12-05-03 P02:45 OUT

Tetra Tech, Inc.

08-20-03P03:14 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information

Number: _____
Area: _____ AJO _____

Name: Danielle A Lewis
Address: 81 West 3rd ave
City, State, Zip Code: Ajo Az 85321 Home Phone: 520-387-6031 Work Phone: 520-387-7832

Address or location of property with drainage problem?: 81 West 3rd Ave

Best time of day to reach you by phone? Any a.m. Any p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☒ Flooding ☐ Ponding ☒ Erosion ☐ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☐ Driveway Damaged
- ☒ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other _____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☐ 3" - 6" ☒ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☒ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? _____

Date flooding/damage occurred? 8/7/03 Time of day that the flooding occurred? _____ a.m. 8:15 p.m.

How many times has flooding occurred at that location? twice
What year was the damaged structure/object constructed? unknown

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: _____
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

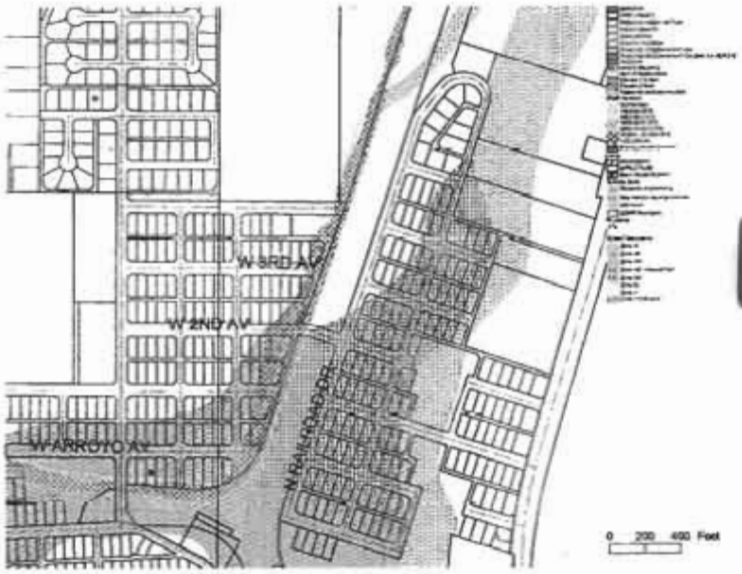
G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

Drainage Complaint: 03294

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 154		



Complaint Source

Field Date:		Complaintant:	LEWIS DANIELLE (401551540)				
Date Out		Address	81 W 3RD AVE			Phone	520-387-6031
Status	WAIT	City:	AJO AZ	Zip	853210000		
Code:	FGE			Inv:	RTH		

Nature of Problem

Due to rains in August 03, yard and landscaping has flooded. Terry working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL 401-55-3920
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

A. General Information 03295

Number:_____
Area:_____ AJO_____

Name: WALTER LIENHART
Address: 101 EAST 1ST
City, State, Zip Code: AJO AZ 85321 Home Phone: 520-387-7188 Work Phone:_____

Address or location of property with drainage problem?: 101 EAST 1ST 140 EAST 1ST

Best time of day to reach you by phone?_____ a.m. _____ p.m. Answering Machine? ☑ Yes ☐ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☐ Erosion ☑ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☑ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☐ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☑ Driveway Damaged
- ☑ Yard/Landscaping Flooded
- ☐ Wall/Fence Damaged
- ☐ Other_____

D. Flood Water Information (Check the appropriate box.)

What was the depth of the flood water? ☐ 1" - 3" ☑ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☑ Street ☐ Wash ☐ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause?_____

Date flooding/damage occurred? 7/ /03 Time of day that the flooding occurred?_____ a.m. ✓ p.m.

How many times has flooding occurred at that location? 2
What year was the damaged structure/object constructed?_____

F. Is there someone that caused the flooding? ☑ Yes ☐ No If yes, please fill out the following, if known:

Name: THING BRIDGE ON SECOND STREET - IT IS A DAM
Address:_____
City, State, Zip Code:_____ Home Phone:_____ Work Phone:_____

G. Is the property with the problem in a recorded subdivision? ☑ Yes ☐ No If yes, please fill out the following:
Subdivision Name:_____ Lot Number:_____
If no, please provide Assessor's Parcel#:_____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

Drainage Complaint: 03295

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 392		

Complaint Source

Field Date:

Complaintant: LIENHART WALTER (401553920)

Date Out

Address 101 E 1ST

Phone 520-387-7184

Status WAIT

City: AJO AZ

Zip 85321

Code: FGE

Inv: RTH

Nature of Problem

Yard and driveway damaged form floods in July 03. RTH working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

Drainage Complaint: 03295

TRS	W120614	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE AO 1
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	NEW CORNELIA LOT 392		

Complaint Source

Field Date:		WALTER (401553920)	
Date Out			Phone 520-387-7184
Status	WAIT	Zip	85321
Code:	FGE	Inv:	RTH

Nature of Problem

Yard and driveway damaged form floods in July 03. RTH working on this.

09-17-03P12:47 RCVD

DRAINAGE COMPLAINT CHECKLIST
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL
PHONE: 740-6350 OR FAX: 740-6749
WILDCAT ILLEGAL DUMPING HOTLINE 622-5800

-17-03P12:46 RCVD

A. General Information

Number: _____
Area: AJO

Name: THELMA S. LEATHERWOOD
Address: 1221 N. KILBRIGHT AVE.
City, State, Zip Code: Ajo, AZ 85321 Home Phone: 387-6774 Work Phone: ~~0~~

Address or location of property with drainage problem?: 1221 N. KILBRIGHT AV.

Best time of day to reach you by phone? Most of the time a.m. Either or p.m. Answering Machine? ☐ Yes ☒ No

B. Type of Problem (Check the appropriate box.) ☐ Flooding ☐ Ponding ☒ Erosion ☒ Mud ☐ Access

C. Impact of Problem (Check the appropriate box.)

- ☐ Mobile Home Flooded
- ☐ Home Flooded
- ☐ Garage Flooded
- ☐ Commercial Building Flooded
- ☐ Accessory Building Flooded
- ☐ Ponding in Roadway
- ☐ Road/Shoulder Washed Out
- ☐ Culvert Problem
- ☒ Drainageway Needs Repair
- ☐ Drainageway Needs Cleaning
- ☒ Driveway Damaged
- ☐ Yard/Landscaping Flooded
- ☒ Wall/Fence Damaged
- ☐ Other Screens blown out on large screen porch + 2 screen doors damaged on porch, I have no screen on back house door.

D. Flood Water Information (Check the appropriate box.) My gravel, 3 truck, 1 dump loads has washed out of drive way + ran down the shoulder of our street, lowering mail box one a foot

What was the depth of the flood water? ☒ 1" - 3" ☒ 3" - 6" ☐ 6" - 1' ☐ 1' - 2' ☐ 2' - 3' ☐ Over 3' ☐ Other

E. Source of Water Runoff (Check the appropriate box.)

☐ Street ☐ Wash ☒ Drainageway ☐ Neighbor Diverted Flow ☐ New Development ☐ Other

If flow was blocked, altered, or diverted, what was the cause? The alley is higher than the roads we have raised our front yard probably a foot. It flooded a little. The rest all ran out into the street and took all the gravel + dirt with it leaving rocks sticking up.

Date flooding/damage occurred? Aug 18, '03 Time of day that the flooding occurred? ✓ a.m. _____ p.m.

How many times has flooding occurred at that location? Most every rainy season - Summer rains
What year was the damaged structure/object constructed? 1951

F. Is there someone that caused the flooding? ☐ Yes ☒ No If yes, please fill out the following, if known:

Name: _____
Address: _____
City, State, Zip Code: _____ Home Phone: _____ Work Phone: _____

G. Is the property with the problem in a recorded subdivision? ☐ Yes ☒ No If yes, please fill out the following:
Subdivision Name: _____ Lot Number: _____
If no, please provide Assessor's Parcel#: _____

Note: **If you have additional comments, please attach an additional sheet of paper. Please include a drawing, picture(s), or video tape of the problem, if available.**

Tetra Tech, Inc.

03-292

PIMA COUNTY
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
201 NORTH STONE AVENUE, FOURTH FLOOR
TUCSON, ARIZONA 85701-1207

KURT WEINRICH, P. E.
DIRECTOR

(520) 740-6410
FAX (520) 620-1933

December 17, 2003

Thelma Leatherwood
1221 N. Kilbright Avenue
Ajo, AZ 85321

Re: Drainage issues at 1221 N. Kilbright Avenue

Dear Ms. Leatherwood:

Thank you for filling out the drainage complaint checklist regarding the drainage problems on your property.

I have researched the topography in your area using stereo photographs, which revealed that your residence lies across an historic flow path. Although the size of the upstream watershed is relatively small, high intensity rains, such as those that you experienced in late July, will produce heavy runoff.

The natural drainage for the runoff on your lot is to the northeast. Therefore, it will not be possible for Pima County to use the alleyway behind your property to capture and redirect flow to the north, without adversely impacting other properties and possibly some utilities. I would caution against adding fill in the front of the property because additional fill may result in the further plugging-up of the natural flow path; thus, increasing the depths. Instead, I would recommend that you work with a landscaper to allow flow through your parcel, but away from your residence.

Although your property is not in a mapped floodplain and the drainage area impacting your property is too small to be regulated, I would caution against totally blocking the flow at the property boundaries. Such actions could induce damage to your neighbors. I would also advise you not to convey runoff through your property using pipes or culverts, unless a civil engineer designs it. The engineer would be able to address debris, headwater, and maintenance.

If you have any questions or if you would like some landscaping suggestions, please call me at (520) 740-6350.

Sincerely,

Terry Hendricks, CFM, Chief Hydrologist
Floodplain Management Division

RTH/tj

Drainage Complaint: 03292

TRS	W120615	TAX_CODE	
DATE_IN	12/31/2003		
AREA	5		
PANEL	645	ZONE	ZONE X
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			
LEGAL_DESC	AJO HEIGHTS THIRD ADDITION LOTS 9 & 10 BLK 6		

Complaint Source

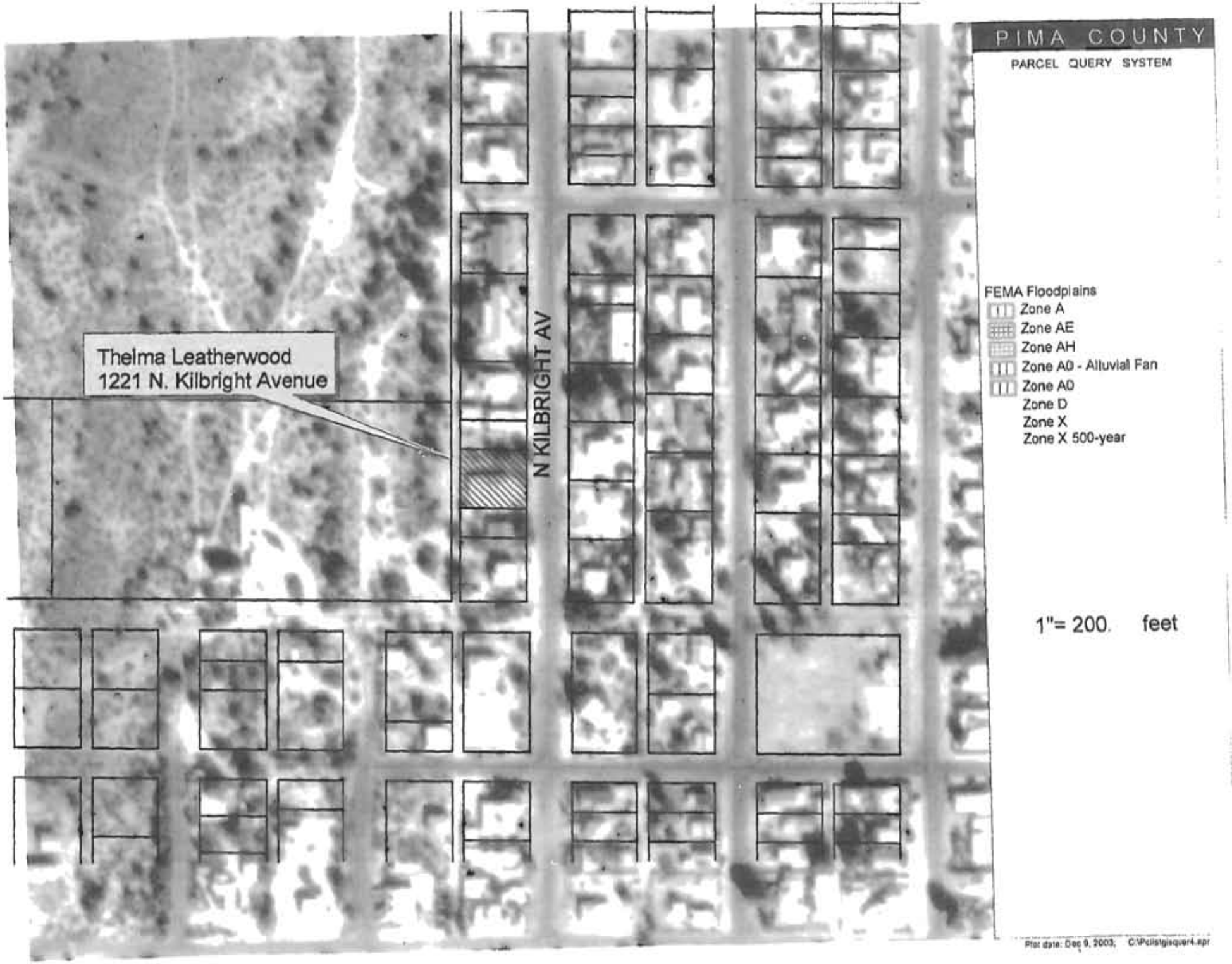
Field Date:		Complaintant:	LEATHERWOOD THELMA (401170920)		
Date Out		Address	1221 N KILBRIGHT AVE	Phone	387-6774
Status	WAIT	City:	AJO AZ	Zip	853210000
Code:	FGE			Inv:	RTH

Nature of Problem

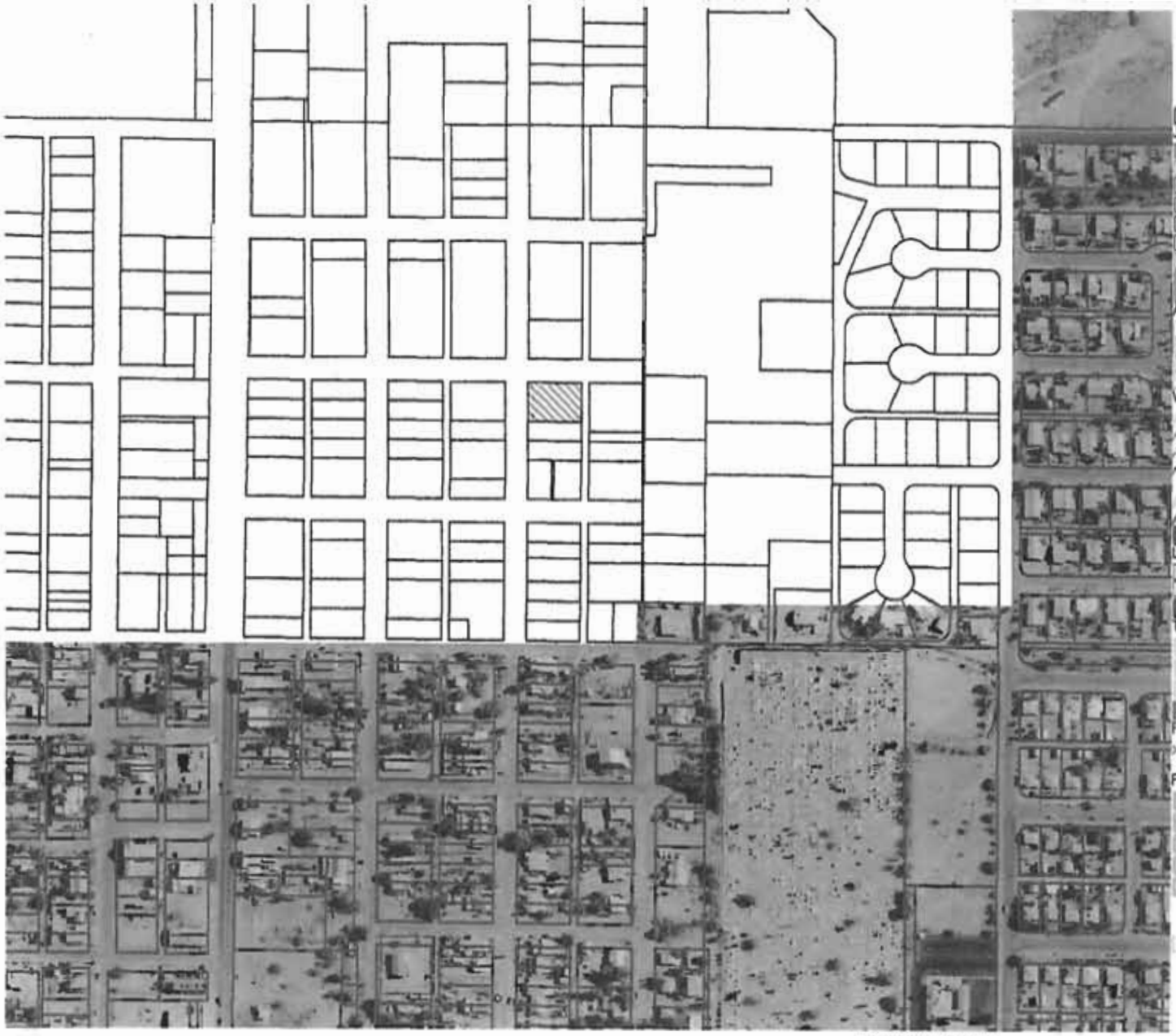
Due to the rains in July 03, property has flooded. RTH wrote a letter explaining that their residence lies across an historic flow path.

Wednesday, December 31, 2003

Tetra Tech, Inc.



Tetra Tech, Inc.



Street Network
TS.Regional Parcels
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRIC
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Wash Network
Q Unknown
100-500 CFS
500-1000 CFS
1000-2000 CFS
2000-10,000 CFS
10,000 - 25,000 CFS
> 25,000 cfs
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
Floodway
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

Tetra Tech, Inc.

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

N

Scale 1"= 400.00 feet

FCD ANALYSIS RESULTS
Parcel: 401121364
Owner: DEL VALLE MANUEL & ENRIQUETTA JT/RS
Address: 0
Legal1: HOMER BROWNS LOTS 1 & 2 BLK 11
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S06W15
FEMA Zone: ZONE X
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

Drainage Complaint: 03299

TRS	W120615	TAX_CODE	40113146Z
DATE_IN	12/31/2003		
AREA	5		
PANEL	663	ZONE	ZONE X - 500-YEAR
SUSPECT			
SUSPECT_AD			
SUSPECT_CI			
SUSPECT_ZI			
SUSPECT_PH			

LEGAL_DESC E190' OF W290' M/L OF S110' OF N530' M/L

Complaint Source

Field Date:		Complaintant:	KLINEFELTER CLARENCE D & CAROL M JT/RS		
Date Out		Address	625 N 2ND AVE	Phone	520-387-5115
Status	WAIT	City:	AJO AZ	Zip	853212003
Code:	FGE			Inv:	RTH

Nature of Problem

Two of his properties were flooded in the July 29th floods in Ajo. RTH is working on this.

Wednesday, December 31, 2003

Tetra Tech, Inc.

TS.Regional Parcels
Street Center Lines - Major
FIRM Panel Boundaries
Street Network
Jurisdictional Boundaries
MARANA
ORO VALLEY
PASCUA YAQUI NATION
PIMA COUNTY
SAHUARITA
SOUTH TUCSON
TOHONO O'ODHAM NATION
TOHONO O'ODHAM NATION SAN XAVIER DISTRI
TUCSON
Approximate Mapping
No F.P Restrictions
Elevate 1.5 feet
Elevate 2 feet
Additional analysis needed
Brawley Wash Corridor
Loma
PROPERTY
STRUCTURE
Black Wash FLDWY
Tortolita Soils
Requires engineering
May need erosion protection
Unknown
LOMR Boundary
FEMA Floodplains
Zone A
Zone AE
Zone AH
Zone A0 - Alluvial Fan
Zone A0
Zone D
Zone X
Zone X 500-year

FCD ANALYSIS RESULTS
Parcel: 401151452
Owner: KLINEFELTER CLARENCE D & CAROL M JT/RS
Address: 650 N 2ND AV
Legal1: E100' OF W290' N/L OF S110' OF N530' M/L
FIRM Boundaries: 04019C0663 K
Section Boundaries: 12S06W15
FEMA Zone: Zone X (Shaded)-500-year or less than 1 foot on 100-year or in area protected by levee
Riparian Habitats: None
Corporate Limits: PIMA COUNTY

Special Study Area: None
Photo Ref:

N

The above information is based on the best data resources currently available. Be advised that flood-hazard status is subject to change without individual notice. This document does not imply that the referenced property will or will not be free from flooding or damage. A property or structure indicated as not being in a floodplain may be damaged by a flood greater than that which is regulated or by a local drainage problem that has not been identified or is not regulated. This document does not create liability on the part of the provider, or any officer or employee thereof, for any damage that results from reliance on this document.

Tetra Tech, Inc.

APPENDIX 3

Hydrologic and Hydraulic Data

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 29, 2003

RE: Description of Storm and Flood of July 29, 2003, on the Gibson Arroyo and Tributaries in Ajo, Arizona

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Storm Description

On July 29, 2003, from approximately 7:45 to 9:00 p.m., a very strong thunderstorm occurred in Ajo, Arizona—specifically within the Gibson Arroyo Watershed. According to witnesses, the storm started near Why, Arizona, and then tracked northerly to Ajo, Arizona. In Ajo, Arizona, the storm shifted to the west, and stalled near the mountains and in the upper portions of the Gibson Arroyo Watershed. The cell then crossed the mountains in a westerly direction. The storm created very high runoff in the Gibson Arroyo and two smaller watersheds located between Ajo and the nearby Phelps-Dodge copper pit. The National Weather Service (NWS) was not able to reproduce a radar image for the storm. This is because Ajo, Arizona, is near the working limits for the Tucson, Arizona, and the Yuma, Arizona, radar stations. Furthermore, runoff patterns indicate that the intense portion of the storm was relatively small in duration, and centered over the western portion of Ajo, Arizona. The rain gauge at the Pima County Automotive services shop measured 1.75 inches of rainfall in about 30 minutes. Unofficial rainfall amounts increased to the west. These amounts ranged from 2.7 inches to 4 inches of rain in approximately one hour. The NWS called the Ajo Sheriff's Department three times in order to warn them about high winds and the possibility of brief, heavy rainfall. In reality, the amount of rain observed was more than what the NWS estimated would fall, based upon the radar data they were receiving. The NWS expects that the town received a "Wet Microburst." It is also possible that the direction the storm took over the mountains created Orographic lifting, which would have further increased precipitation. The NWS stated that they would like the assistance of a weather spotter in Ajo.

Flood Description

The majority of the flooding in Ajo, Arizona, that occurred on July 29, 2003, was associated with the Gibson Arroyo. However, flooding also occurred from two southern tributaries. The most severe flooding was at points upstream and downstream of the Phelps-Dodge Railroad, which was overtopped during the flood. Damages to public infrastructure were minimal, given the widespread extent of the flooding. Pima County was quick to remove debris from the roads, and also removed sediment under the 2nd Avenue Bridge. It was not uncommon to see from one-foot-high or two-foot-high debris lines on residential chain-link fences. It appeared that the chain-link fences slowed down the runoff on private properties, thus reducing the potential for erosion damages to existing residences. Many residences were flooded. The exact number is not known. During Pima County's investigation on July 31, it was observed that many residences had wet carpets and individual homeowners stated that some of their neighbors had water several inches deep in their residences. Photographs taken by a Richard Walker of Automotive Services in Ajo, Arizona, showed very large debris lying in the roadways immediately after the flood. Some trees were up-rooted, broken, and partially stripped of their bark. The eastern end of Arroyo Avenue, located west of the railroad, appeared to have been subjected to the greatest depth of overbank flow. Near this location, the railroad abruptly turns runoff from the Gibson Arroyo at a shape angle. The fall/slope of the channel downstream of the abrupt turn in the channel is significantly flatter than the fall/slope of the upstream channel. Along this flatter reach of the Arroyo, from 2nd Avenue south to Arroyo Avenue, the railroad was overtopped at many locations. Upstream, flows broke out across the right overbank and flowed south. Neighborhoods east of the railroad were also flooded, but were subjected to significantly less debris. In some locations, the flooded areas were wider than what is shown on the existing Flood Insurance Rate Maps. The District has prepared a bitmap image of (1) Ajo, Arizona; (2) the FEMA floodplains; and (3) the areas of inundation that were observed by the Ajo Sheriff's Department during the July 29, 2003, flood event on the Gibson Arroyo and two tributaries.

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 29, 2003

RE: Peak Discharge and Corresponding Flood Frequency and Rainfall Estimates for July 29, 2003, Flow Event on Gibson Arroyo in Ajo, Arizona, (Estimate at Sartillion Avenue, Located in Section 15 of Township 12 South, Range 6 West, G&SRB&M, Pima County, Arizona)

Computed Peak Discharge

Two methods were used to compute the July 29, 2003, peak discharge on Gibson Arroyo at Sartillion Avenue: (1) the Slope-Area Method and (2) Weir-Flow Criteria. The Slope-Area Method was applied to the two naturally occurring channel cross-sections located approximately 73 and 173 feet upstream of Sartillion Avenue; while the Weir-Flow Criteria was applied at the Sartillion Avenue Dip Crossing, using the cross-sections located at the west edge of pavement (i.e., the upstream edge) and at the east edge of pavement (i.e., the downstream edge). These two cross-sections are located about 22 feet apart.

The Slope-Area Method produced a flood-peak estimate of 3150 cfs (see Technical Memorandum to Project File dated September 24, 2003; while the Weir-Flow Criteria produced a flood peak estimate of 3050 cfs (see technical Memorandum to Project File dated September 23, 2003. Averaging these two values yields a flood peak estimate of 3100 cfs for the July 29, 2003, peak discharge on Gibson Arroyo at Sartillion Avenue in Ajo, Arizona.

Flood-Frequency Estimate—Alternate No. 1

Sartillion Avenue is located a little more than 500 feet upstream of State Highway 85, the location where Pima County/FEMA estimates for the regulatory flood peak are identically equal to 3990 cfs (i.e., essentially 4000 cfs). From purely a hydrologic perspective, though, it appears that the Pima County/FEMA estimates at State Highway 85 somewhat overstate the regulatory peak discharge—especially given that the computed size of the contributing watershed area at that location is listed as being only 1.7 square miles in size. (Note that the USGS Regional Regression Equation that is applicable to Ajo yields a regulatory peak discharge estimate of only 1775 cfs for a watershed 1.7 square miles in size.) When using the Pima County procedure with NOAA Atlas VIII rainfall data and an adjusted basin factor, a recent (September 24, 2003) Tetra Tech calculation of the regulatory flood peak produced an estimate of 3085 cfs for a contributing watershed area of 1.7 square miles at Sartillion Avenue (area calculation also by Tetra Tech).

Now, dependent upon which estimate is assumed to represent the "true" regulatory flood peak, a comparison of flood peaks indicates that for an assumed regulatory flood peak of 4000 cfs, the USGS RRE regulatory estimate would be equivalent to an event with a return interval of 15 years and the Tetra Tech regulatory estimate would be equivalent to an event with a return interval of 53 years. On the other hand, for an assumed regulatory flood peak of 1775 cfs (USGS RRE), the Pima County/FEMA estimate would be equivalent to an event with a return interval of 1170 years; and the Tetra Tech regulatory estimate would be equivalent to an event with a return interval of 510 years. Finally, for an assumed flood peak of 3085 cfs (Tetra Tech estimate), the Pima County/FEMA estimate would be equivalent to an event with a return interval of 210 years and the USGS RRE estimate would be equivalent to an event with a return interval of 26 years.

Note that the computed July 29, 2003, flood peak of 3100 cfs would have a flood frequency similar to the regulatory estimate calculated by Tetra Tech, when using the Pima County procedure with an adjusted basin factor.

Flood-Frequency Estimate—Alternate No. 2

When applying new rainfall estimates (NOAA, 2003) in conjunction with the Pima County procedure and a "default" basin factor, the predicted regulatory flood peak at Sartillion Avenue is 2370 cfs. When applying new NOAA rainfall estimates with the Pima County procedure and an "adjusted" basin factor, the predicted regulatory flood peak at Sartillion Avenue is 1816 cfs. It is interesting to note that when using the applicable USGS RRE, the latter value is very close to the computed RRE estimate of 1775 cfs for a regulatory flood peak on a watershed that is 1.7 square miles in size. If one were to assume that this latter result represents the "true" regulatory value at Sartillion Avenue, this would mean that the July 29 flood was an event with a flood-recurrence of slightly greater than once every 500 years (Note: Using USGS RRE data, the extrapolated estimate for Q_{500} is approximately 3080 cfs, which is very close to the July 29 computed peak discharge of 3100 cfs at Sartillion Avenue).

Rainfall Estimates

The older NOAA Atlas VIII estimate for the 100-year, 1-hour point rainfall at Ajo is computed to be 2.86 inches, while the older NOAA Atlas VIII estimate for the 100-year, 2-hour point rainfall is computed to be 3.26 inches. On the other hand, the newest NOAA estimate for the 100-year, 1-hour point rainfall at Ajo is 2.21 inches; and the newest NOAA estimate for the 100-year, 2-hour point rainfall at Ajo is 2.57 inches. The newest NOAA rainfall data also provides estimates for the 500-year event, which the old NOAA Atlas VIII does not. Accordingly, for the 500-year, 1-hour point rainfall at Ajo, the new NOAA estimate is 2.61 inches; and for the 500-year, 2-hour point rainfall at Ajo, the new NOAA estimate is 3.23 inches. Surprisingly, the new NOAA estimates for 500-year point-rainfall values are lower than the 100-year older point rainfall values computed when using NOAA Atlas VIII data.

According to observers who collected rainfall data at Ajo on July 29, 2003, rainfall depths generally ranged from 1.75 inches to as much as 4.0 inches over durations varying from 30 minutes to a few hours. Information received in an e-mail dated September 29, 2003, from Marilyn Chambers of the Desert Research Institute, located at the Western Regional Climate Center in Reno, Nevada, indicates that the official NWS cooperative gauge (a sophisticated recording gauge) in Ajo recorded 1.79 inches of rainfall for the entire day (in Tetra Tech's professional opinion, this amount of rainfall probably occurred in less than 1 hour). Unfortunately, due to the nature of thunderstorm rainfall, it is not possible to reliably ascertain the true areal, spatial, and temporal distributions of the rainfall event that led to the July 29, 2003, flood on the Gibson Arroyo and two tributaries in Ajo, Arizona. This becomes especially evident when considering the topography of the contributing watershed area, which likely contributed to significant orographic uplift that produced pockets of short-duration rainfall with greater intensities along the east-facing slopes of the western portion of the Little Ajo Mountains—the mountain range that comprises the vast majority of the Gibson Arroyo contributing watershed area that is located upstream of Sartillion Avenue.

Summary

Using the Slope-Area Method and applicable Weir-Flow Criteria, a flood peak of 3100 cfs was calculated for the July 29, 2003 flood on the Gibson Arroyo. The peak was calculated at Sartillion Avenue.

Tetra Tech's computation of the regulatory peak for Gibson Arroyo at Sartillion Avenue, using Pima County procedures with an adjusted basin factor and old NOAA Atlas VIII rainfall data, indicates that the flood frequency of the July 29, 2003, flood on the Gibson Arroyo is estimated to be approximately equivalent to a 100-year event.

Tetra Tech's computation of the regulatory peak for Gibson Arroyo at Sartillion Avenue, using Pima County procedures with an adjusted basin factor and New NOAA rainfall data, indicates that the flood frequency of the July 29, 2003, flood on the Gibson Arroyo is estimated to be slightly greater than a 500-year event.

Conclusions

Based upon the preceding comparisons in combination with (1) measured watershed characteristics (i.e., catchment slopes, watercourse length, catchment shape, soil types, vegetative cover, etc.); (2) local rainfall estimates, and (3) the fact that anecdotal evidence (i.e., statements from long-time Ajo residents) suggests that the July 29, 2003, flood on the Gibson Arroyo was the largest to have occurred for at least the past 60 years, it is Tetra Tech's professional opinion that (A.) the existing Pima County/FEMA regulatory peak estimates for Gibson Arroyo at State Highway 85 appear to be too high; (B.) Tetra Tech's computation of the regulatory peak using Pima County procedures with old NOAA Atlas VIII rainfall data and an adjusted basin factor indicates that the computed flood peak for the July 29 flood event was approximately equivalent to a 100-year flood event; and (C) Tetra Tech's computation of the regulatory peak using Pima County procedures with new NOAA rainfall data and an adjusted basin factor indicates that the computed flood peak for the July 29 event was slightly greater than a 500-year flood event.

Regardless of the predictive method that is used to estimate peak-discharge rates, or the regulatory value that is selected, one thing that is for certain is that the July 29, 2003, flood on the Gibson Arroyo in Ajo, Arizona, was extraordinary—from a flood-frequency standpoint likely falling somewhere in the range of a 100-year to 500-year flow event.

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT-020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 24, 2003

RE: Using Slope-Area Method to Estimate the Peak Discharge on Gibson Arroyo During the July 29, 2003, Flood in Ajo, Arizona (Estimate at Sartillion Avenue, Located in Section 15 of Township 12 South, Range 6 West, G&SRB&M, Pima County, Arizona)

The formula for computing peak discharge using the slope-area method with two cross-sections is as follows:

$$Q = K_2 \sqrt{\frac{\Delta h}{\frac{K_2}{K_1}L + \left(\frac{K_2^2}{2gA_2^2}\left[-\alpha_1\left(\frac{A_2}{A_1}\right)^2(1-k) + \alpha_2(1-k)\right]\right)}} \qquad \text{(Equation No. 1)}$$

Where,

Q	=	Discharge, in cubic feet per second (cfs)
Δh	=	WSEL difference between upstream and downstream cross-sections, in feet
K	=	Conveyance factor $\left(\frac{1.486}{n}R^{\frac{2}{3}}A\right)$
n	=	Manning roughness coefficient
R	=	Hydraulic Radius, in feet $\left(=\frac{A}{P}\right)$
A	=	Cross-sectional area of flow, in square feet
P	=	Wetted Perimeter, in feet
L	=	Reach Length, in feet
g	=	Acceleration due to gravity = 32.2 ft/sec^2
α	=	Coefficient for velocity-head adjustment = $\left(\frac{1}{A}\Sigma\left[\left(\frac{v}{V}\right)^3\right]\Delta A\right)$
k	=	A coefficient (= 0.5 if Δh_v is positive, and 0.0 if Δh_v is negative)

Using the survey information that was gathered by the Pima County Department of Transportation and Flood Control District Survey Department, after performing several iterations the following normal-depth

hydraulic data were determined for a peak discharge of approximately 3150 cfs occurring at each of two naturally occurring cross-sections—one located 73 feet (Cross-Section No. 2), and one located 173 feet (Cross-Section No. 1) upstream of the Sartillion Avenue crossing of the Gibson Arroyo in Ajo, Arizona:

$\Delta h_{CS1-CS2}$ = 1.33 feet

A_{CS1} = 350 square feet
A_{CS2} = 277 square feet

$L_{CS1-CS2}$ = 100 feet

K_{CS1} = 38,229
K_{CS2} = 33,502
K_W = 35,788 (Weighted K)

α_{CS1} = 1.52
α_{CS2} = 1.23

h_{vCS1} = 1.91
h_{vCS2} = 2.47

As verification of the reasonableness of the peak estimate, the following is calculated:

$S = h_f/L$, where $h_h = \Delta h + \Delta h_v = (1.33+[-0.56])/100 = 0.0077$ ft/ft.

Therefore:

$Q = K_W S^{1/2} = 3140$ cfs (Agrees fairly well with assumed discharge of 3150 cfs).

Now, Substituting the preceding hydraulic parameters into Equation No. 1 yields the final peak-discharge estimate using Cross-Section No. 1 and Cross-Section No. 2:

Q = 3147 cfs, say Q = **3150 cfs.**

By comparison, Pima County's Floodplain and Erosion Hazard Management Ordinance lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	Regulatory Peak Discharge (cfs)
@ 2nd Avenue	2500
@ Highway 85	3990
@ Rasmussen Road	5100

Also, FEMA lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	Regulatory Peak Discharge (cfs)
@ West 2nd Avenue	2400
@ State Highway 85	3990

For reference, Sartillion Avenue is located a little more than 500 feet upstream of State Highway 85, where the estimate for the regulatory flood peak is 3990 cfs (essentially 4000 cfs). From purely a hydrologic perspective, though, it appears that the Pima County/FEMA estimates somewhat overstate the regulatory peak discharge—especially given that the size of the contributing watershed is only 1.7 square miles. (Note that the USGS Regional Regression Equation that is applicable to Ajo yields a regulatory peak discharge estimate of only 1775 cfs for a watershed 1.7 square miles in size.)

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT-020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 23, 2003

RE: Using Weir-Flow Criteria to Estimate the Peak Discharge on Gibson Arroyo During the July 29, 2003, Flood in Ajo, Arizona (Estimate at Sartillion Avenue, Located in Section 15 of Township 12 South, Range 6 West, G&SRB&M, Pima County, Arizona)

The Pima County Flood Control District Survey Department conducted a survey of the highwater marks of the flow on Gibson Arroyo that occurred over the dip section at Sartillion Avenue during the July 29, 2003, flood. The results indicate that near the west edge of pavement the maximum flow depth and top width were 5.17 and 133.23 feet, and near the east edge of pavement 5.70 and 143.71 feet, respectively.

It is noted that during the July 29 event, the WSEL at the peak was actually 0.53 feet higher at the east edge of pavement on Sartillion Avenue than it was at the west edge of pavement—conditions indicative of flow submergence, rather than free overall, at the downstream brink of the dip crossing. Accordingly, use of the standard weir formula to compute discharge is not strictly applicable. Rather the following formula should be used:

$$Q_{sub} = Q\left[1-\left(\frac{H_d}{H}\right)^{1.5}\right]^{0.385} \qquad \text{(Equation No. 1)}$$

Where:

Q	=	Unsubmerged weir discharge rate, in cfs
H	=	Head on the weir, in feet = $Y + \alpha\frac{V^2}{2g}$ (Y = depth of flow, in feet)
H_d	=	Height of Downstream water above the weir crest, in feet
α	=	Velocity coefficient ≈ 1.15 at east edge of Sartillion Avenue

Recalling that the measured flow depth at the upstream edge of pavement on Sartillion Avenue was 5.17 feet during the July 29 event, it can determined that at the west edge of pavement on Sartillion Avenue specific head = $5.17 + (9.9\text{x}10^{-8})Q^2$.

The fall from the west edge of pavement to the east edge of pavement on Sartillion Avenue is 0.44 feet.

Because of the parabolic geometry of the weir cross-section at Sartillion Avenue, in order to estimate the unsubmerged peak discharge that occurred at Sartillion on July 29, the survey data was discretized and the amount of weir flow that would have passed through each discretized element of the cross-section under free-overfall conditions was computed. This was accomplished using the following adaptation of the broad-crested weir formula:

$$Q = \tfrac{2}{5}\frac{CL}{(h_2 - h_1)}(h_2^{5/2} - h_1^{5/2}). \qquad \text{(Equation No. 2)}$$

Where:

Q	=	Discharge, in cfs;
C	=	Weir coefficient = 3.00 (i.e., for a broad-crested weir);
L	=	Length of weir, in feet; and
H, h	=	Specific head ($d + \alpha V^2/2g$) for specified discharge, in feet (Note: $\alpha \approx 1.14$ at west edge of Sartillion Avenue).

Using Equation No. 2, the free-overfall weir discharge within each discretized element is computed to be:

Measured Distance from the North Highwater Mark (feet)	Flow Depth (feet)	Calculated Specific Head (feet)	Incremental Weir Discharge Between Measured Distances (cfs)
0	0	0	0
13.73	1.36	2.94	83.06
23.68	2.38	3.96	191.80
33.66	3.32	4.90	279.56
43.59	4.16	5.74	365.83
53.57	4.81	6.39	447.36
63.68	5.17	6.75	510.81
73.61	5.16	6.74	521.85
83.64	4.82	6.40	506.76
93.55	4.20	5.78	446.95
103.46	3.35	4.93	368.70
113.37	2.29	3.87	274.89
123.33	1.14	2.72	179.40
133.23	0	1.58	94.45
		TOTAL WEIR DISCHARGE FOR FREE OVERFALL CONDITIONS:	**4271**

The average head for a discharge of 4271 cfs is:

$$H_{avg} = \left(\frac{Q}{(3.0)L}\right)^{2/3} = 4.85 \text{ feet.}$$

The average (hydraulic) flow depth at the east edge of pavement along Sartillion Avenue is 3.39 feet.

Inserting these values into Equation No. 1, above, yields:

$$Q_{sub} = 4271\left[1-\left(\frac{3.39}{4.85}\right)^{1.5}\right]^{0.385} = 4271(0.7132) = \boxed{Q_{sub} \approx 3050 \text{ cfs}}$$

Therefore, using weir procedures it can be seen that, with the prevailing flow conditions of flow submergence, 3050 cfs represents a reasonable estimate for the peak discharge that occurred on July 29, 2003, at the Sartillion Avenue crossing of the Gibson Arroyo in Ajo, Arizona.

By comparison, Pima County's Floodplain and Erosion Hazard Management Ordinance lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	Regulatory Peak Discharge (cfs)
@ 2nd Avenue	**2500**
@ Highway 85	**3990**
@ Rasmussen Road	**5100**

Also, FEMA lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	Regulatory Peak Discharge (cfs)
@ West 2nd Avenue	**2400**
@ State Highway 85	**3990**

For reference, Sartillion Avenue is located a little more than 500 feet upstream of State Highway 85, where the estimate for the regulatory flood peak is 3990 cfs (i.e., essentially 4000 cfs). From purely a hydrologic perspective, though, it appears that the Pima County/FEMA estimates somewhat overstate the regulatory peak discharge—especially given that the size of the contributing watershed is only 1.7 square miles. (Note that the USGS Regional Regression Equation that is applicable to the Ajo area yields a regulatory peak discharge estimate of only 1775 cfs for a watershed 1.7 square miles in size.)

VELOCITY COEFFICIENTS FOR FOUR CROSS-SECTIONS AT AND UPSTREAM OF SARTILLION AVENUE CROSSING OF THE GIBSON ARROYO IN AJO, ARIZONA

V_1	A_1
9.46	422.85

v	ΔA	$(v/V)^3(\Delta A)$	
2.95	9.34	0.28	
5.78	18.61	4.25	
7.67	28.44	15.13	
9.19	37.14	34.08	
10.39	44.76	59.24	
11.16	50.45	82.89	Hydraulic Data for Cross-Section at West Edge of Sartillion Avenue
11.43	51.29	90.40	
11.16	50.05	82.25	
10.43	44.69	59.83	
9.25	37.41	34.97	
7.60	27.95	14.52	
5.46	17.08	3.28	
2.62	5.64	0.12	
		481.24	
	α_1 =	1.138092	

V_2	A_2
8.21	487.15

v	ΔA	$(v/V)^3(\Delta A)$	
1.84	4.49	0.05	
3.84	13.67	1.40	
5.50	23.28	7.01	
7.03	33.55	21.09	
8.39	43.72	46.58	
9.41	52.15	78.53	Hydraulic Data for Cross-Section at East Edge of Sartillion Avenue
9.91	55.25	97.20	
9.94	56.96	101.12	
9.60	54.19	86.57	
8.90	48.09	61.31	
7.94	40.60	36.74	
6.66	31.10	16.61	
4.99	20.18	4.54	
2.52	9.90	0.29	
		559.03	
	α_2 =	1.147557	

V_3	A_3
14.44	277

v	ΔA	$(v/V)^3(\Delta A)$	
0.52	0.02	0.00	
2.64	5.86	0.04	
3.42	11.75	0.16	
9.53	23.82	6.84	
14.40	19.08	18.90	
15.02	8.42	9.47	Hydraulic Data at First Upstream Cross-Section above Sartillion Avenue
16.76	68.40	106.96	
17.03	119.83	196.52	
6.53	19.82	1.83	
0.00	0.00	340.72	
	α =	1.230036	

V_4	A_4
11.39	350

v	ΔA	$(v/V)^3(\Delta A)$	
3.00	15.42	0.28	
6.34	21.90	3.78	
7.88	24.08	7.97	
14.13	74.01	141.34	
16.54	39.98	122.42	
16.71	74.14	234.21	Hydraulic Data at Most Upstream Cross-Section above Sartillion Avenue
9.16	23.79	12.36	
6.95	20.24	4.60	
5.84	47.41	6.39	
3.59	9.35	0.29	
		533.66	
	α_4 =	1.524743	

TECHNICAL MEMORANDUM

TO: File (PAZ-PDOT-020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: September 22, 2003

RE: Pima County and FEMA Regulatory Flood Peak Estimates for Gibson Arroyo in the Town of Ajo, Arizona

---

Pima County's Floodplain and Erosion Hazard Management Ordinance lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	**Regulatory Peak Discharge** (cfs)
@ 2nd Avenue	2500
@ Highway 85	3990
@ Rasmussen Road	5100

Also, FEMA lists the following values for regulatory flood peaks estimates for Gibson Arroyo in the Town of Ajo, Arizona:

Drainage Concentration Point	**Regulatory Peak Discharge** (cfs)
@ West 2nd Avenue	2400
@ State Highway 85	3990

Note that the drainage areas reported by FEMA at West Second Avenue and at State Highway 85 are 2.2 square miles and 1.7 square miles, respectively. This apparent dichotomy in significant flow reduction with an increase in drainage area actually reflects the high loss of discharge that occurs due to breakout flows that exist between the two referenced concentration points during a regulatory flood event. It is not clear, however, why the Pima County peak discharge for the Gibson Arroyo at Rasmussen Road balloons to 5100 cfs, since Rasmussen is well downstream of the flow breakout area and presumably the peak would be less due to attenuation as flow spreads out onto the overbank, if for no other reason.

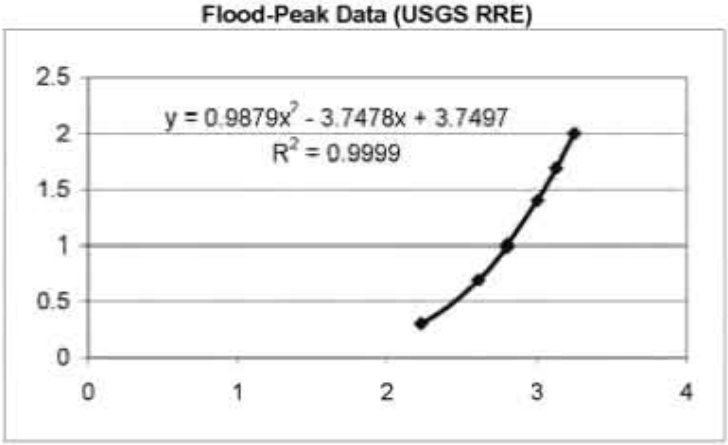
EXTRAPOLATED FLOOD-PEAK ESTIMATES USING TWO HYDROLOGIC PROCEDURES (GIBSON ARROYO AT SARTILLION AVENUE, AJO, ARIZONA)

168	2	2.225309	0.30103
405	5	2.607455	0.69897
632	10	2.800717	1
1008	25	3.003461	1.39794
1339	50	3.126781	1.69897
1775	100	3.249198	2

$T = 5619.53Q^{(-3.7478 + 0.9879[LOGQ])}$

For Q = 4000 cfs, T ≈ 1170 years.
For Q = 3085 cfs, T ≈ 510 years.

Flood-Peak Data (USGS RRE)

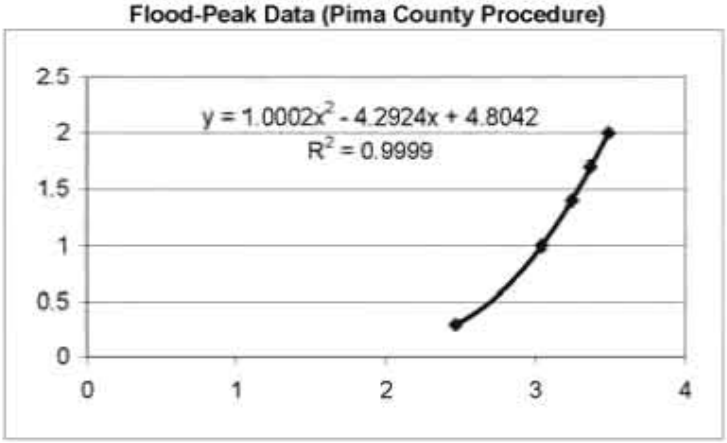


292	2	2.465383	0.30103
1098	10	3.040602	1
1752	25	3.243534	1.39794
2327	50	3.366796	1.69897
3085	100	3.489255	2

$T = 63{,}708.88Q^{(-4.2924 + 1.0002[LOGQ])}$

For Q = 4000 cfs, T ≈ 210 years.
For Q = 1775 cfs, T ≈ 26 years.

Flood-Peak Data (Pima County Procedure)



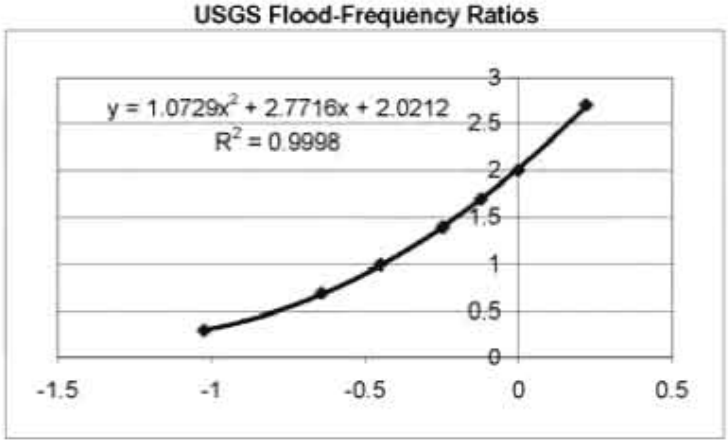
2	0.0946	-1.02411	0.30103
5	0.2282	-0.64168	0.69897
10	0.3561	-0.44843	1
25	0.5679	-0.24573	1.39794
50	0.7544	-0.1224	1.69897
100	1	0	2
500	1.6621	0.220657	2.69897

$T = 105.0026R^{(2.7716 + 1.0729[LOGR])}$

For R = 0.4438, T ≈ 15 years.
(1775/4000)

For R = 0.7713, T ≈ 53 years.
(3085/4000)

USGS Flood-Frequency Ratios



Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (Default Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- [x] Existing Conditions†
- [ ] Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	1,539	$(\Delta L_1)^3$:	3,645,153,819	ΔH_1:	480	$(\Delta L_1)^3/\Delta H_1$:	7,594,070
B. ΔL_2:	5,638	$(\Delta L_2)^3$:	179,215,354,072	ΔH_2:	280	$(\Delta L_2)^3/\Delta H_2$:	640,054,836
C. ΔL_3:	2,490	$(\Delta L_3)^3$:	15,438,249,000	ΔH_3:	80	$(\Delta L_3)^3/\Delta H_3$:	192,978,113
D. ΔL_4:	8,481	$(\Delta L_4)^3$:	610,015,948,641	ΔH_4:	180	$(\Delta L_4)^3/\Delta H_4$:	3,388,977,492

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/4} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/4} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/4} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/4} = 2.756 + 25.299 + 13.892 + 58.215 = 100.162$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3
11. Watershed Type(s):	*Suburban*		
(% of Total Area):	*100.00*		
12. Basin Factor (n_b):	*0.035*		
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D
14. Percent Impervious:	*5.00*		

Weighted Watershed Parameters

n_{bw100} = *0.035*

I_{w100} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.768* A_{S2} = *0.000* A_{S3} = *0.000* C_{w100} = *0.768*
18. **Time of Concentration (T_{c100}): *28* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61} \qquad \text{When } 5 \le T_{c100} \le 180.$$

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *4.77* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.768* x *4.77* x *1089.0* x = *3,989* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:	-	-	-	-
Q (cubic feet/second):	0	0	0	0
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (Adjusted Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- [x] Existing Conditions†
- [ ] Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	1,539	$(\Delta L_1)^3$:	3,645,153,819	ΔH_1:	480	$(\Delta L_1)^3/\Delta H_1$:	7,594,070
B. ΔL_2:	5,638	$(\Delta L_2)^3$:	179,215,354,072	ΔH_2:	280	$(\Delta L_2)^3/\Delta H_2$:	640,054,836
C. ΔL_3:	2,490	$(\Delta L_3)^3$:	15,438,249,000	ΔH_3:	80	$(\Delta L_3)^3/\Delta H_3$:	192,978,113
D. ΔL_4:	8,481	$(\Delta L_4)^3$:	610,015,948,641	ΔH_4:	180	$(\Delta L_4)^3/\Delta H_4$:	3,388,977,492

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/4} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/4} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/4} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/4}$ = *2,756* + *25,299* + *13,892* + *58,215* = *100,162*

8. Mean Slope (S_c) = $(I_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Suburban*			
(% of Total Area):	*100.00*			
12. Basin Factor (n_b):	*0.047*			n_{bw100} = *0.047*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D	
14. Percent Impervious:	*5.00*			I_{w100} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.768* A_{S2} = *0.000* A_{S3} = *0.000* C_{w100} = *0.768*
18. **Time of Concentration (T_{c100}): *42* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *3.69* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.768* x *3.69* x *1089.0* x = *3,085* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:	-	-	-	-
Q (cubic feet/second):	0	0	0	0
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (New NOAA Rainfall Applied, Using Default Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,539*	$(\Delta L_1)^3$:	*3,645,153,819*	ΔH_1:	*480*	$(\Delta L_1)^3/\Delta H_1$:	*7,594,070*
B. ΔL_2:	*5,638*	$(\Delta L_2)^3$:	*179,215,354,072*	ΔH_2:	*280*	$(\Delta L_2)^3/\Delta H_2$:	*640,054,836*
C. ΔL_3:	*2,490*	$(\Delta L_3)^3$:	*15,438,249,000*	ΔH_3:	*80*	$(\Delta L_3)^3/\Delta H_3$:	*192,978,113*
D. ΔL_4:	*8,481*	$(\Delta L_4)^3$:	*610,015,948,641*	ΔH_4:	*180*	$(\Delta L_4)^3/\Delta H_4$:	*3,388,977,492*

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/2} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/2} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/2} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/2} = 2.756 + 25.299 + 13.892 + 58.215 = 100.162$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 100-Year Rainfall: 2-hr. = *2.57* in. 3-hr. = *2.74* in. 6-hr. = *3.03* in. 24-hr. = *3.81* in.
10. New (2003) NOAA, 100-Yr, 1-Hr Rainfall Depth ($P_{1,100}$): *2.21* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Suburban*			
(% of Total Area):	*100.00*			
12. Basin Factor (n_b):	*0.035*			n_{bw100} = *0.035*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D	
14. Percent Impervious:	*5.00*			I_{w100} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *86.0* C Soils = *90.0* D Soils = *92.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.678* A_{S2} = *0.000* A_{S3} = *0.000* C_{w100} = *0.678*
18. **Time of Concentration (T_{c100}): *35* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *3.21* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.678* x *3.21* x *1089.0* x = *2,370* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:	-	-	-	-
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (New NOAA Rainfall Applied, Using Adjusted Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,539*	$(\Delta L_1)^3$:	*3,645,153,819*	ΔH_1:	*480*	$(\Delta L_1)^3/\Delta H_1$:	*7,594,070*
B. ΔL_2:	*5,638*	$(\Delta L_2)^3$:	*179,215,354,072*	ΔH_2:	*280*	$(\Delta L_2)^3/\Delta H_2$:	*640,054,836*
C. ΔL_3:	*2,490*	$(\Delta L_3)^3$:	*15,438,249,000*	ΔH_3:	*80*	$(\Delta L_3)^3/\Delta H_3$:	*192,978,113*
D. ΔL_4:	*8,481*	$(\Delta L_4)^3$:	*610,015,948,641*	ΔH_4:	*180*	$(\Delta L_4)^3/\Delta H_4$:	*3,388,977,492*

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/4} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/4} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/4} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/4} = 2.756 + 25.299 + 13.892 + 58.215 = 100.162$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 100-Year Rainfall: 2-hr. = *2.57* in. 3-hr. = *2.74* in. 6-hr. = *3.03* in. 24-hr. = *3.81* in.
10. New (2003) NOAA, 100-Yr, 1-Hr Rainfall Depth ($P_{1,100}$): *2.21* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Suburban*			
(% of Total Area):	*100.00*			
12. Basin Factor (n_b):	*0.047*			n_{bw100} = *0.047*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D	
14. Percent Impervious:	*5.00*			I_{w100} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *86.0* C Soils = *90.0* D Soils = *92.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.678* A_{S2} = *0.000* A_{S3} = *0.000* C_{w100} = *0.678*
18. **Time of Concentration (T_{c100}): *52* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *2.46* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.678* x *2.46* x *1089.0* x = *1,816* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:	-	-	-	-
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

Pima County

Hydrologic Data Sheet for Computing 500-Year Peak Discharge (Q_{p500})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (New NOAA Rainfall Applied, Using Default Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,539*	$(\Delta L_1)^3$:	*3,645,153,819*	ΔH_1:	*480*	$(\Delta L_1)^3/\Delta H_1$:	*7,594,070*
B. ΔL_2:	*5,638*	$(\Delta L_2)^3$:	*179,215,354,072*	ΔH_2:	*280*	$(\Delta L_2)^3/\Delta H_2$:	*640,054,836*
C. ΔL_3:	*2,490*	$(\Delta L_3)^3$:	*15,438,249,000*	ΔH_3:	*80*	$(\Delta L_3)^3/\Delta H_3$:	*192,978,113*
D. ΔL_4:	*8,481*	$(\Delta L_4)^3$:	*610,015,948,641*	ΔH_4:	*180*	$(\Delta L_4)^3/\Delta H_4$:	*3,388,977,492*

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3} = 2.756 + 25.299 + 13.892 + 58.215 = 100.162$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 500-Year Rainfall: 2-hr. = *3.23* in. 3-hr. = *3.60* in. 6-hr. = *3.96* in. 24-hr. = *4.85* in.
10. New (2003) NOAA, 500-Yr, 1-Hr Rainfall Depth ($P_{1,500}$): *2.61* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Suburban*			
(% of Total Area):	*100.00*			
12. Basin Factor (n_b):	*0.035*			n_{bw500} = *0.035*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D	
14. Percent Impervious:	*5.00*			I_{w500} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.1* C Soils = *90.9* D Soils = *93.2*
17. Runoff Coefficient (C_{w500}): A_{S1} = *0.740* A_{S2} = *0.000* A_{S3} = *0.000* C_{w500} = *0.740*
18. **Time of Concentration (T_{c500}): *30* minutes, Determined from:

$$T_{c500} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c500} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c500}, 500-Year Rainfall Intensity (i_{500}) = $(4P_{1,500})/(1+0.05T_{c500})$ = *4.18* inches/hour.
20. 500-Year Peak (Q_{p500}) = $(C_{w500})(i_{500})A$ = *0.740* x *4.18* x *1089.0* x = *3,367* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 500-Year Peak:	-	-	-	-
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c500} may not exceed 180 minutes. If $T_{c500} < 5$, set $T_{c500} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

Pima County

Hydrologic Data Sheet for Computing 500-Year Peak Discharge (Q_{p500})

1. Project Name and Location: *Gibson Arroyo in Ajo, Arizona (New NOAA Rainfall Applied, Using Adjusted Basin Factor)*
2. Drainage Concentration Point: *State Highway 85*
3. Watershed Area* (A) at Drainage Concentration Point: *1,089.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *18,148* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *8,695* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,539*	$(\Delta L_1)^3$:	*3,645,153,819*	ΔH_1:	*480*	$(\Delta L_1)^3/\Delta H_1$:	*7,594,070*
B. ΔL_2:	*5,638*	$(\Delta L_2)^3$:	*179,215,354,072*	ΔH_2:	*280*	$(\Delta L_2)^3/\Delta H_2$:	*640,054,836*
C. ΔL_3:	*2,490*	$(\Delta L_3)^3$:	*15,438,249,000*	ΔH_3:	*80*	$(\Delta L_3)^3/\Delta H_3$:	*192,978,113*
D. ΔL_4:	*8,481*	$(\Delta L_4)^3$:	*610,015,948,641*	ΔH_4:	*180*	$(\Delta L_4)^3/\Delta H_4$:	*3,388,977,492*

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3}$ = *2,756* + *25,299* + *13,892* + *58,215* = *100,162*

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1812*)^2 = *0.0328* ft./ft.
9. 500-Year Rainfall: 2-hr. = *3.23* in. 3-hr. = *3.60* in. 6-hr. = *3.96* in. 24-hr. = *4.85* in.
10. New (2003) NOAA, 500-Yr, 1-Hr Rainfall Depth ($P_{1,500}$): *2.61* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Suburban*			
(% of Total Area):	*100.00*			
12. Basin Factor (n_b):	*0.047*			n_{bw500} = *0.047*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, __D	__B, __C, __D	
14. Percent Impervious:	*5.00*			I_{w500} = *5.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.1* C Soils = *90.9* D Soils = *93.2*
17. Runoff Coefficient (C_{w500}): A_{S1} = *0.740* A_{S2} = *0.000* A_{S3} = *0.000* C_{w500} = *0.740*
18. **Time of Concentration (T_{c500}): *45* minutes, Determined from:

$$T_{c500} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c500} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c500}, 500-Year Rainfall Intensity (i_{500}) = $(4P_{1,500})/(1+0.05T_{c500})$ = *3.21* inches/hour.
20. 500-Year Peak (Q_{p500}) = $(C_{w500})(i_{500})A$ = *0.740* x *3.21* x *1089.0* x = *2,586* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 500-Year Peak:	-	-	-	-
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c500} may not exceed 180 minutes. If $T_{c500} < 5$, set $T_{c500} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *MEZ* Checked By: _____ Company: *Tetra Tech, Inc.* Date: *9/24/03*

CALCULATION TABLE FOR REGIONAL REGRESSION EQUATIONS

PROJECT NAME: *Flooding Investigation---Ajo, Arizona*

WATERCOURSE NAME AND CONCENTRATION POINT: *Gibson Arroyo at State Highway 85*

1984 EYCHANER: DA* (mi^2) =	1.70			1994 USGS: DA* (mi^2) =	1.70		
Rural		Urban: BDF† =	6	Rural		Urban: BDF† =	6
Q_2 =	150	Q_2 =	248	Q_2 =	168	Q_2 =	269
Q_5 =	382	Q_5 =	561	Q_5 =	405	Q_5 =	587
Q_{10} =	610	Q_{10} =	815	Q_{10} =	632	Q_{10} =	838
Q_{25} =	969	Q_{25} =	1,188	Q_{25} =	1,008	Q_{25} =	1,227
Q_{50} =	1,296	Q_{50} =	1,551	Q_{50} =	1,339	Q_{50} =	1,593
Q_{100} =	1,678	Q_{100} =	1,972	Q_{100} =	1,775	Q_{100} =	2,066
Q_{500} =	2,789	Q_{500} =	3,034	Q_{500} =	N/A‡	Q_{500} =	N/A‡

*Note: The Recommended Range for Application of the 1984 Eychaner Equations Is 0.13 Square Miles ≤ DA ≤ 4,471 Square Miles. The Range for Application of the 1994 USGS Equations Is 0.1 Square Miles ≤ DA ≤ 2,000 Square Miles—with the Recommended Maximum Area of Application Being: DA ≤ 200 Square Miles.

‡Note: The 1994 USGS Equations cannot be used to determine Q_{500}.

†Note: BDF = Basin Development Factor. For determination of the value of this factor, divide the watershed into upper, middle, and lower thirds, and then apply a number that ranges from 1 to 4 to each one-third of the watershed, based upon the following criteria. (The maximum value of the BDF cannot exceed 12.)

1— Assign this value if at least 50% of the length of the main channel and principal tributaries of the watershed are improved to some degree over natural conditions (e.g., straightening, enlarging, deepening, and clearing).

1— Assign this value if at least 50% of the length of the main channel and principal tributaries of the watershed has been lined with impervious material, such as concrete.

1— Assign this value if at least 50% of the secondary tributaries of the watershed contain storm drains (i.e., enclosed pipes that receive stormwater runoff directly from impervious areas and empty into the main channel or principal tributaries.

1— Assign this value if at least 50% of the area is covered by urban development and at least 50% of the streets in the area are constructed with curbs and gutters or have inverted crowns.

4— Total possible for each third of the watershed.

PREPARED BY: *Michael E. Zeller, P.E., P.H.* **DATE:** *9/24/03*

Tabular And Curvilinear Flood Hydrographs For:
Gibson Arroyo at Sartillion Avenue (July 29, 2003, Flood)

Contributing Watershed Area = 1,089.0 acres

Flood Frequency = 100 years.

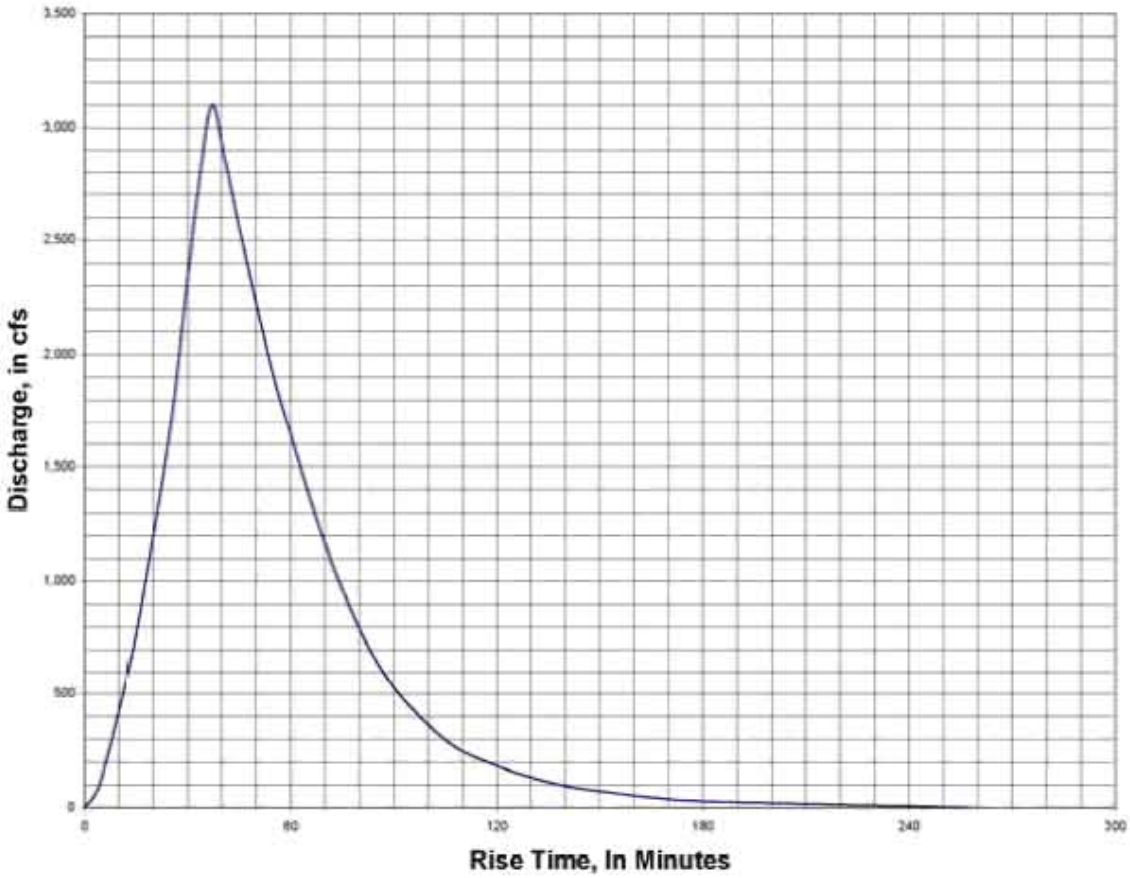
Time to Peak of the Flood Hydrograph = 37.00 minutes.

Peak Discharge = 3,100 cfs.
(Weir and Slope-Area Method)

Time to Peak of the Flood Hydrograph Can Be Computed from: $\frac{47.64 \times A(ac.) \times Pn\text{-}yr./n\text{-}hr.(in.) \times Cw}{Q_p(cfs)}$

Tabular Hydrograph

Time (minutes)	Discharge (cubic ft/s)
0.0	0
3.7	78
7.4	270
11.1	496
14.8	753
18.5	1,073
22.2	1,398
25.9	1,786
29.6	2,288
33.3	2,750
37.0	3,100
40.7	2,864
44.4	2,601
48.1	2,344
51.8	2,102
55.5	1,872
59.2	1,690
62.9	1,494
66.6	1,314
70.3	1,153
74.0	1,001
81.4	747
88.8	555
96.2	422
103.6	316
111.0	242
125.8	152
140.6	93
155.4	62
170.2	37
185.0	25
259.0	0



Prepared by: Michael E. Zeller, P.E., P.H.

Tetra Tech, Inc.
(October 2, 2001)

PROJECT NAME: GIBSON ARROYO IN AJO, ARIZONA
PROJECT DETAIL: CROSS-SECTION AT EAST EDGE OF SARTILLION AVENUE

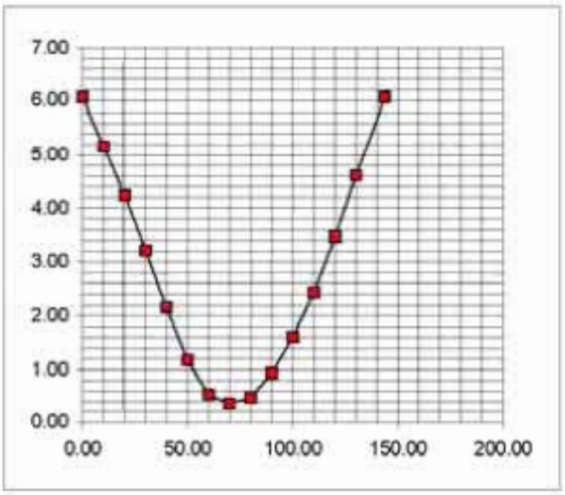
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Dishcarge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION = 15
MEASURED WSEL= 5.31
ENERGY SLOPE (FT/FT) = 0.00224

POINT DATA				SEGMENT DATA						
POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)	Manning n-value	TW (ft.)	A (sq.ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
1	0.00	6.06	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	9.97	5.16	0.15	0.0210	1.66	0.12	1.67	0.07	0.59	0
3	20.02	4.24	1.07	0.0210	10.05	6.13	10.09	0.61	2.40	15
4	29.99	3.21	2.10	0.0210	9.97	15.80	10.02	1.58	4.53	72
5	39.93	2.16	3.15	0.0210	9.94	26.09	10.00	2.61	6.34	166
6	49.89	1.18	4.13	0.0210	9.96	36.25	10.01	3.62	7.89	286
7	59.91	0.53	4.78	0.0210	10.02	44.64	10.04	4.45	9.05	404
8	69.75	0.36	4.95	0.0210	9.84	47.87	9.84	4.86	9.61	460
9	79.85	0.48	4.83	0.0210	10.10	49.39	10.10	4.89	9.64	476
10	89.97	0.93	4.38	0.0210	10.12	46.60	10.13	4.60	9.26	431
11	100.01	1.61	3.70	0.0210	10.04	40.56	10.06	4.03	8.47	344
12	110.06	2.43	2.88	0.0210	10.05	33.06	10.08	3.28	7.39	244
13	120.06	3.47	1.84	0.0210	10.00	23.60	10.05	2.35	5.91	139
14	130.05	4.61	0.70	0.0210	9.99	12.69	10.05	1.26	3.91	50
15	143.71	6.06	0.00	0.0210	6.59	2.31	6.63	0.35	1.66	4

VALUES FOR TOTAL SECTION = 128.34 | 385.13 | 128.79 | 2.99 | 8.02 | 3,090

EQUIVALENT MANNING'S "N" FOR TOTAL SECTION = 0.0182

NOTE: SEGMENT DATA SHOWN IS FOR SEGMENT BETWEEN INDICATED POINT AND PREVIOUS POINT.

NOTE: h IS THE DEPTH OF FLOW AT EACH POINT IN FEET, ALL OTHER VARIABLES ARE AS DEFINED ABOVE.

PROJECT NAME: GIBSON ARROYO IN AJO, ARIZONA
PROJECT DETAIL: CROSS-SECTION AT WEST EDGE OF SARTILLION AVENUE

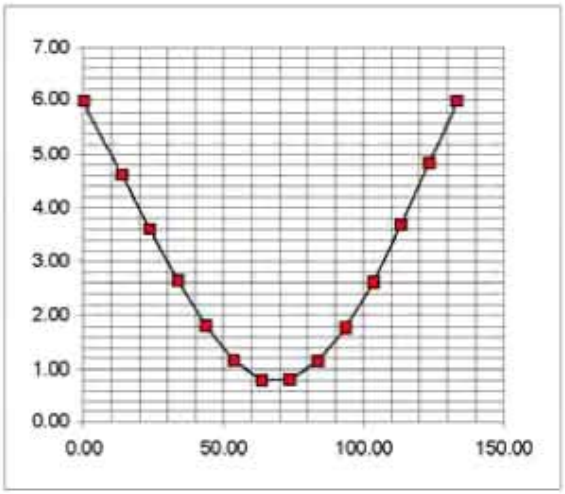
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Dishcarge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION = 14
MEASURED WSEL= 5.22
ENERGY SLOPE (FT/FT) = 0.00353

POINT DATA				SEGMENT DATA						
POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)	Manning n-value	TW (ft.)	A (sq.ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
1	0.00	5.97	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	13.73	4.61	0.61	0.0210	6.16	1.88	6.19	0.30	1.90	4
3	23.68	3.59	1.63	0.0210	9.95	11.14	10.00	1.11	4.52	50
4	33.66	2.65	2.57	0.0210	9.98	20.96	10.02	2.09	6.87	144
5	43.59	1.81	3.41	0.0210	9.93	29.69	9.97	2.98	8.70	258
6	53.57	1.16	4.06	0.0210	9.98	37.28	10.00	3.73	10.11	377
7	63.68	0.80	4.42	0.0210	10.11	42.87	10.12	4.24	11.01	472
8	73.61	0.81	4.41	0.0210	9.93	43.84	9.93	4.41	11.31	496
9	83.64	1.15	4.07	0.0210	10.03	42.53	10.04	4.24	11.01	468
10	93.55	1.77	3.45	0.0210	9.91	37.26	9.93	3.75	10.15	378
11	103.46	2.62	2.60	0.0210	9.91	29.98	9.95	3.01	8.77	263
12	113.37	3.68	1.54	0.0210	9.91	20.51	9.97	2.06	6.80	140
13	123.33	4.83	0.39	0.0210	9.96	9.61	10.03	0.96	4.09	39
14	133.23	5.97	0.00	0.0210	3.39	0.66	3.41	0.19	1.41	1

VALUES FOR TOTAL SECTION =	119.15	328.21	119.54	2.75	9.42	3,090

EQUIVALENT MANNING'S "N" FOR TOTAL SECTION = 0.0184

NOTE: SEGMENT DATA SHOWN IS FOR SEGMENT BETWEEN INDICATED POINT AND PREVIOUS POINT.

NOTE: h IS THE DEPTH OF FLOW AT EACH POINT IN FEET, ALL OTHER VARIABLES ARE AS DEFINED ABOVE.

PROJECT NAME: GIBSON ARROYO IN AJO, ARIZONA
PROJECT DETAIL: AT FIRST UPSTREAM CROSS-SECTION ABOVE SARTILLION AVENUE (approx. 73 feet upstream)

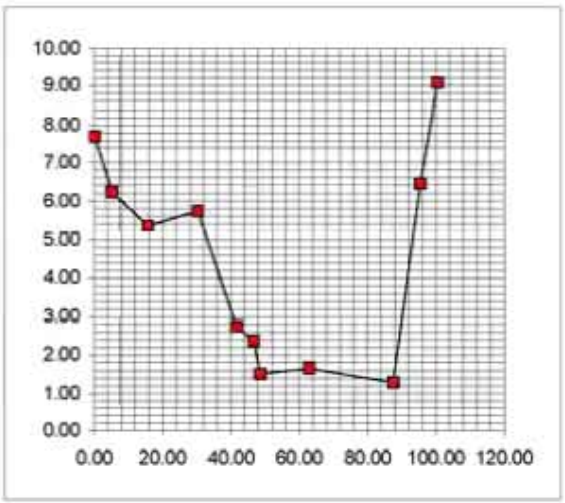
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Dishcarge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION = 11
MEASURED WSEL= 6.35
ENERGY SLOPE (FT/FT) = 0.00770
(from Slope-Area Method)

POINT DATA				SEGMENT DATA						
POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)	Manning n-value	TW (ft.)	A (sq.ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
1	0.00	7.72	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	5.06	6.25	0.10	0.0450	0.34	0.02	0.36	0.05	0.38	0
3	15.71	5.35	1.00	0.0450	10.65	5.86	10.69	0.55	1.94	11
4	30.31	5.74	0.61	0.0450	14.60	11.75	14.61	0.80	2.51	29
5	41.60	2.74	3.61	0.0279	11.29	23.82	11.68	2.04	7.53	179
6	46.62	2.36	3.99	0.0279	5.02	19.08	5.03	3.79	11.38	217
7	48.53	1.52	4.83	0.0279	1.91	8.42	2.09	4.04	11.87	100
8	62.90	1.66	4.69	0.0279	14.37	68.40	14.37	4.76	13.24	906
9	87.48	1.29	5.06	0.0279	24.58	119.83	24.58	4.87	13.46	1612
10	95.47	6.45	0.00	0.0450	7.84	19.82	9.33	2.13	4.79	95
11	100.46	9.08	0.00	0.0450	0.00	0.00	0.00	0.00	0.00	0

VALUES FOR TOTAL SECTION =	90.60	277.00	92.73	2.99	11.37	3,150

EQUIVALENT MANNING'S "N" FOR TOTAL SECTION = 0.0238

NOTE: SEGMENT DATA SHOWN IS FOR SEGMENT BETWEEN INDICATED POINT AND PREVIOUS POINT.

NOTE: h IS THE DEPTH OF FLOW AT EACH POINT IN FEET, ALL OTHER VARIABLES ARE AS DEFINED ABOVE.

PROJECT NAME: GIBSON ARROYO IN AJO, ARIZONA
PROJECT DETAIL: AT MOST UPSTREAM CROSS-SECTION ABOVE SARTILLION AVENUE (approx. 173 feet upstream)

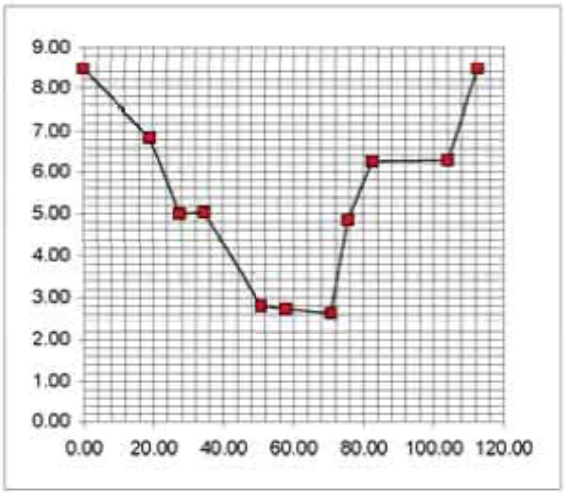
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Dishcarge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION = 11
MEASURED WSEL= 8.48
ENERGY SLOPE (FT/FT) = 0.00770
(from Slope-Area Method)

POINT DATA				SEGMENT DATA						
POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)	Manning n-value	TW (ft.)	A (sq.ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
1	0.00	8.48	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	18.92	6.85	1.63	0.0550	18.92	15.42	18.99	0.81	2.06	32
3	27.51	5.01	3.47	0.0550	8.59	21.90	8.78	2.49	4.36	95
4	34.48	5.04	3.44	0.0550	6.97	24.08	6.97	3.45	5.42	130
5	50.71	2.80	5.68	0.0305	16.23	74.01	16.38	4.52	11.67	863
6	57.70	2.72	5.76	0.0305	6.99	39.98	6.99	5.72	13.66	546
7	70.46	2.62	5.86	0.0305	12.76	74.14	12.76	5.81	13.80	1023
8	75.48	4.86	3.62	0.0550	5.02	23.79	5.50	4.33	6.30	150
9	82.41	6.26	2.22	0.0550	6.93	20.24	7.07	2.86	4.78	97
10	103.91	6.29	2.19	0.0550	21.50	47.41	21.50	2.20	4.02	190
11	112.45	8.48	0.00	0.0550	8.54	9.35	8.82	1.06	2.47	23

VALUES FOR TOTAL SECTION =	112.45	350.32	113.76	3.08	8.99	3,150

EQUIVALENT MANNING'S "N" FOR TOTAL SECTION = 0.0307

NOTE: SEGMENT DATA SHOWN IS FOR SEGMENT BETWEEN INDICATED POINT AND PREVIOUS POINT.

NOTE: h IS THE DEPTH OF FLOW AT EACH POINT IN FEET, ALL OTHER VARIABLES ARE AS DEFINED ABOVE.

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point A*
3. Watershed Area* (A) at Drainage Concentration Point: *31.6* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *2,175* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *1,088* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,625*	$(\Delta L_1)^3$:	*4,291,015,625*	ΔH_1:	*40*	$(\Delta L_1)^3/\Delta H_1$:	*107,275,391*
B. ΔL_2:	*550*	$(\Delta L_2)^3$:	*166,375,000*	ΔH_2:	*40*	$(\Delta L_2)^3/\Delta H_2$:	*4,159,375*
C. ΔL_3:		$(\Delta L_3)^3$:	*0*	ΔH_3:		$(\Delta L_3)^3/\Delta H_3$:	*??*
D. ΔL_4:		$(\Delta L_4)^3$:	*0*	ΔH_4:		$(\Delta L_4)^3/\Delta H_4$:	*??*

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3}$ = *10,357* + *2,039* + *0* + *0* = *12,396*

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1755*)^2 = *0.0308* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*High Density*		
(% of Total Area):	*65.00*	*35.00*		
12. Basin Factor (n_b):	*0.046*	*0.046*		n_{bw100} = *0.046*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, *100* D	__B, __C, __D	
14. Percent Impervious:	*5.00*	*100.00*		I_{w100} = *38.25*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.768* A_{S2} = *0.959* A_{S3} = *0.000* C_{w100} = *0.835*
18. **Time of Concentration (T_{c100}): *8* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *8.17* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.835* x *8.17* x *31.6* x = *215* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	*??*	*??*	*??*	*??*

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point B*
3. Watershed Area* (A) at Drainage Concentration Point: *54.7* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *2,650* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *1,325* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,300*	$(\Delta L_1)^3$:	*2,197,000,000*	ΔH_1:	*40*	$(\Delta L_1)^3/\Delta H_1$:	*54,925,000*
B. ΔL_2:	*600*	$(\Delta L_2)^3$:	*216,000,000*	ΔH_2:	*40*	$(\Delta L_2)^3/\Delta H_2$:	*5,400,000*
C. ΔL_3:	*750*	$(\Delta L_3)^3$:	*421,875,000*	ΔH_3:	*220*	$(\Delta L_3)^3/\Delta H_3$:	*1,917,614*
D. ΔL_4:		$(\Delta L_4)^3$:	*0*	ΔH_4:		$(\Delta L_4)^3/\Delta H_4$:	*??*

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3}$ = *7.411* + *2.324* + *1.385* + *0* = *11.120*

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.2383*)^2 = *0.0568* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*Natural*		
(% of Total Area):	*5.00*	*95.00*		
12. Basin Factor (n_b):	*0.060*	*0.060*		n_{bw100} = *0.060*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, *100* D	__B, __C, __D	
14. Percent Impervious:	*5.00*	*0.00*		I_{w100} = *0.25*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.768* A_{S2} = *0.758* A_{S3} = *0.000* C_{w100} = *0.758*
18. **Time of Concentration (T_{c100}): *10* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *7.63* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.758* x *7.63* x *54.7* x = *316* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	*??*	*??*	*??*	*??*

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point B (Future)*
3. Watershed Area* (A) at Drainage Concentration Point: *54.7* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *2,650* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *1,325* ft.

For (Check One):
- ☐ Existing Conditions†
- ☑ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,300*	$(\Delta L_1)^3$:	*2,197,000,000*	ΔH_1:	*40*	$(\Delta L_1)^3/\Delta H_1$:	*54,925,000*
B. ΔL_2:	*600*	$(\Delta L_2)^3$:	*216,000,000*	ΔH_2:	*40*	$(\Delta L_2)^3/\Delta H_2$:	*5,400,000*
C. ΔL_3:	*750*	$(\Delta L_3)^3$:	*421,875,000*	ΔH_3:	*220*	$(\Delta L_3)^3/\Delta H_3$:	*1,917,614*
D. ΔL_4:		$(\Delta L_4)^3$:	*0*	ΔH_4:		$(\Delta L_4)^3/\Delta H_4$:	*??*

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3}$ = *7.411* + *2.324* + *1.385* + *0* = *11.120*

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.2383*)^2 = *0.0568* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Mixed Suburban*	*Natural*		
(% of Total Area):	*28.00*	*72.00*		
12. Basin Factor (n_b):	*0.060*	*0.060*		n_{bw100} = *0.060*
13. Soil Types, in %:	___B, ___C, *100* D	___B, ___C, *100* D	___B, ___C, ___D	
14. Percent Impervious:	*13.00*	*0.00*		I_{w100} = *3.64*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.784* A_{S2} = *0.758* A_{S3} = *0.000* C_{w100} = *0.765*
18. **Time of Concentration (T_{c100}): *10* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *7.63* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.765* x *7.63* x *54.7* x = *319* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	*??*	*??*	*??*	*??*

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point C*
3. Watershed Area* (A) at Drainage Concentration Point: *17.6* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *1,350* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *675* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	850	$(\Delta L_1)^3$:	614,125,000	ΔH_1:	40	$(\Delta L_1)^3/\Delta H_1$:	15,353,125
B. ΔL_2:	500	$(\Delta L_2)^3$:	125,000,000	ΔH_2:	80	$(\Delta L_2)^3/\Delta H_2$:	1,562,500
C. ΔL_3:		$(\Delta L_3)^3$:	0	ΔH_3:		$(\Delta L_3)^3/\Delta H_3$:	??
D. ΔL_4:		$(\Delta L_4)^3$:	0	ΔH_4:		$(\Delta L_4)^3/\Delta H_4$:	??

7. $G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3}$ = 3.918 + 1.250 + 0 + 0 = 5.168

8. Mean Slope (S_c) = $(L_c/G)^2$ = (0.2612)^2 = 0.0682 ft./ft.
9. 100-Year Rainfall: 2-hr. = 3.26 in. 3-hr. = 3.43 in. 6-hr. = 3.80 in. 24-hr. = 4.60 in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): 2.86 inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	Low Med. Density	Natural		
(% of Total Area):	38.00	62.00		
12. Basin Factor (n_b):	0.068	0.068		n_{bw100} = 0.068
13. Soil Types, in %:	___B, ___C, 100 D	___B, ___C, 100 D	___B, ___C, ___D	
14. Percent Impervious:	20.00	0.00		I_{w100} = 7.60

15. Curve Number (CN): B Soils = 83.0 C Soils = 88.0 D Soils = 91.0
16. Adjusted CN (CN*): B Soils = 87.6 C Soils = 91.3 D Soils = 93.5
17. Runoff Coefficient (C_{w100}): A_{S1} = 0.798 A_{S2} = 0.758 A_{S3} = 0.000 C_{w100} = 0.773
18. **Time of Concentration (T_{c100}): 7 minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = 8.47 inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = 0.773 x 8.47 x 17.6 x = 115 cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	0	0	0	0
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point D*
3. Watershed Area* (A) at Drainage Concentration Point: *125.4* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *4,100* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *2,050* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	2,125	$(\Delta L_1)^3$:	9,595,703,125	ΔH_1:	70	$(\Delta L_1)^3/\Delta H_1$:	137,081,473
B. ΔL_2:	950	$(\Delta L_2)^3$:	857,375,000	ΔH_2:	80	$(\Delta L_2)^3/\Delta H_2$:	10,717,188
C. ΔL_3:	600	$(\Delta L_3)^3$:	216,000,000	ΔH_3:	160	$(\Delta L_3)^3/\Delta H_3$:	1,350,000
D. ΔL_4:	425	$(\Delta L_4)^3$:	76,765,625	ΔH_4:	200	$(\Delta L_4)^3/\Delta H_4$:	383,828

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3} = 11,708 + 3,274 + 1,162 + 620 = 16,764$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.2446*)^2 = *0.0598* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*Natural*		
(% of Total Area):	*30.00*	*70.00*		
12. Basin Factor (n_b):	*0.064*	*0.064*		n_{bw100} = *0.064*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, *100* D	__B, __C, __D	
14. Percent Impervious:	*10.00*	*0.00*		I_{w100} = *3.00*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN**): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.778* A_{S2} = *0.758* A_{S3} = *0.000* C_{w100} = *0.764*
18. **Time of Concentration (T_{c100}): *15* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *6.54* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.764* x *6.54* x *125.4* x = *626* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	0	0	0	0
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point D (Future)*
3. Watershed Area* (A) at Drainage Concentration Point: *125.4* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *4,100* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *2,050* ft.

For (Check One):
- ☐ Existing Conditions†
- ☑ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	2,125	$(\Delta L_1)^3$:	9,595,703,125	ΔH_1:	70	$(\Delta L_1)^3/\Delta H_1$:	137,081,473
B. ΔL_2:	950	$(\Delta L_2)^3$:	857,375,000	ΔH_2:	80	$(\Delta L_2)^3/\Delta H_2$:	10,717,188
C. ΔL_3:	600	$(\Delta L_3)^3$:	216,000,000	ΔH_3:	160	$(\Delta L_3)^3/\Delta H_3$:	1,350,000
D. ΔL_4:	425	$(\Delta L_4)^3$:	76,765,625	ΔH_4:	200	$(\Delta L_4)^3/\Delta H_4$:	383,828

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3} = 11,708 + 3,274 + 1,162 + 620 = 16,764$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.2446*)^2 = *0.0598* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*Natural*		
(% of Total Area):	*57.00*	*43.00*		
12. Basin Factor (n_b):	*0.064*	*0.064*		n_{bw100} = *0.064*
13. Soil Types, in %:	__B, __C, *100* D	__B, __C, *100* D	__B, __C, __D	
14. Percent Impervious:	*10.00*	*0.00*		I_{w100} = *5.70*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.778* A_{S2} = *0.758* A_{S3} = *0.000* C_{w100} = *0.769*
18. **Time of Concentration (T_{c100}): *15* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *6.54* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.769* x *6.54* x *125.4* x = *631* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	??	??	??	??

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *10/16/03*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point AG*
3. Watershed Area* (A) at Drainage Concentration Point: *101.9* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *4,550* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *2,275* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*2,350*	$(\Delta L_1)^3$:	*12,977,875,000*	ΔH_1:	*46*	$(\Delta L_1)^3/\Delta H_1$:	*282,127,717*
B. ΔL_2:	*1,050*	$(\Delta L_2)^3$:	*1,157,625,000*	ΔH_2:	*38*	$(\Delta L_2)^3/\Delta H_2$:	*30,463,816*
C. ΔL_3:	*1,150*	$(\Delta L_3)^3$:	*1,520,875,000*	ΔH_3:	*42*	$(\Delta L_3)^3/\Delta H_3$:	*36,211,310*
D. ΔL_4:		$(\Delta L_4)^3$:	*0*	ΔH_4:		$(\Delta L_4)^3/\Delta H_4$:	*??*

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/3} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/3} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/3} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/3} = 16{,}797 + 5{,}519 + 6{,}018 + 0 = 28{,}334$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1606*)^2 = *0.0258* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*High Density*	*Moderate Density*	
(% of Total Area):	*20.00*	*11.00*	*69.00*	
12. Basin Factor (n_b):	*0.046*	*0.046*	*0.046*	n_{bw100} = *0.046*
13. Soil Types, in %:	___B, ___C, *100* D	___B, ___C, *100* D	___B, ___C, *100* D	
14. Percent Impervious:	*5.00*	*100.00*	*40.00*	I_{w100} = *39.60*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.768* A_{S2} = *0.959* A_{S3} = *0.838* C_{w100} = *0.837*
18. **Time of Concentration (T_{c100}): *15* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *6.54* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.837* x *6.54* x *101.9* x = *558* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	*??*	*??*	*??*	*??*

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *3/17/04*

Pima County

Hydrologic Data Sheet for Computing 100-Year Peak Discharge (Q_{p100})

1. Project Name and Location: *Ajo Hydrologic Analysis*
2. Drainage Concentration Point: *Concentration Point BCD*
3. Watershed Area* (A) at Drainage Concentration Point: *251.0* acres.
4. Length of Hydraulically Longest Watercourse (L_c): *5,900* ft.
5. Length from Center of Watershed Area (L_{ca}), along L_c: *2,950* ft.

For (Check One):
- ☑ Existing Conditions†
- ☐ Future Conditions†

6. Change in Length Factors - ft. / Change in Elevation Factors - ft.

A. ΔL_1:	*1,800*	$(\Delta L_1)^3$:	*5,832,000,000*	ΔH_1:	*24*	$(\Delta L_1)^3/\Delta H_1$:	*243,000,000*
B. ΔL_2:	*2,125*	$(\Delta L_2)^3$:	*9,595,703,125*	ΔH_2:	*70*	$(\Delta L_2)^3/\Delta H_2$:	*137,081,473*
C. ΔL_3:	*950*	$(\Delta L_3)^3$:	*857,375,000*	ΔH_3:	*80*	$(\Delta L_3)^3/\Delta H_3$:	*10,717,188*
D. ΔL_4:	*1,025*	$(\Delta L_4)^3$:	*1,076,890,625*	ΔH_4:	*360*	$(\Delta L_4)^3/\Delta H_4$:	*2,991,363*

7. $$G = \left(\frac{\Delta L_1^3}{\Delta H_1}\right)^{1/2} + \left(\frac{\Delta L_2^3}{\Delta H_2}\right)^{1/2} + \left(\frac{\Delta L_3^3}{\Delta H_3}\right)^{1/2} + \left(\frac{\Delta L_4^3}{\Delta H_4}\right)^{1/2} = 15{,}588 + 11{,}708 + 3{,}274 + 1{,}730 = 32{,}300$$

8. Mean Slope (S_c) = $(L_c/G)^2$ = (*0.1827*)^2 = *0.0334* ft./ft.
9. 100-Year Rainfall: 2-hr. = *3.26* in. 3-hr. = *3.43* in. 6-hr. = *3.80* in. 24-hr. = *4.60* in.
10. NOAA Atlas VIII, 100-Year, 1-Hr. Rainfall Depth ($P_{1,100}$): *2.86* inches.

	Subarea 1	Subarea 2	Subarea 3	Weighted Watershed Parameters
11. Watershed Type(s):	*Low Suburban*	*Natural*	*Moderate Density*	
(% of Total Area):	*16.00*	*60.00*	*24.00*	
12. Basin Factor (n_b):	*0.064*	*0.060*	*0.060*	n_{bw100} = *0.064*
13. Soil Types, in %:	___B, ___C, *100* D	___B, ___C, *100* D	___B, ___C, *100* D	
14. Percent Impervious:	*10.00*	*0.00*	*40.00*	I_{w100} = *11.20*

15. Curve Number (CN): B Soils = *83.0* C Soils = *88.0* D Soils = *91.0*
16. Adjusted CN (CN*): B Soils = *87.6* C Soils = *91.3* D Soils = *93.5*
17. Runoff Coefficient (C_{w100}): A_{S1} = *0.778* A_{S2} = *0.758* A_{S3} = *0.838* C_{w100} = *0.780*
18. **Time of Concentration (T_{c100}): *26* minutes, Determined from:

$$T_{c100} = \left(\frac{0.23 n_{bw}(L_c L_{ca})^{0.3}}{(S_c P_{1,100} C_{w100})^{0.4}} + 1.31\right)^{1.61}$$

When $5 \le T_{c100} \le 180$.

Note: For Impervious Cover, the Base CN = Adj. CN (CN*) = 99.

19. At T_{c100}, 100-Year Rainfall Intensity (i_{100}) = $(4P_{1,100})/(1+0.05T_{c100})$ = *4.97* inches/hour.
20. 100-Year Peak (Q_{p100}) = $(C_{w100})(i_{100})A$ = *0.780* x *4.97* x *251.0* x = *973* cfs.
21. For Other Return Periods:

	2-Year	10-Year	25-Year	50-Year
Ratio to 100-Year Peak:				
Q (cubic feet/second):	*0*	*0*	*0*	*0*
T_c (minutes):	*??*	*??*	*??*	*??*

*A may not exceed 6,400 acres (10 square miles) in size. **T_{c100} may not exceed 180 minutes. If $T_{c100} < 5$, set $T_{c100} = 5$ minutes.

† NOTE: Indicate whether computations are for "Future" or "Existing" Conditions by checking the appropriate box above.

Prepared By: *Larry Roberts, P.E.* Checked By: *MEZ* Company: *Tetra Tech, Inc.* Date: *3/17/04*

PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

AJO, ARIZONA (02-0080) 32.37°N 112.87°W 1850 feet
Point Estimates
from
Precipitation-Frequency Atlas of the United States
NOAA Atlas 14, Volume I, Version 2
G.M. Bonnin, D. Todd, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2003
Extracted Mon Nov 24 12:17:12 EST 2003

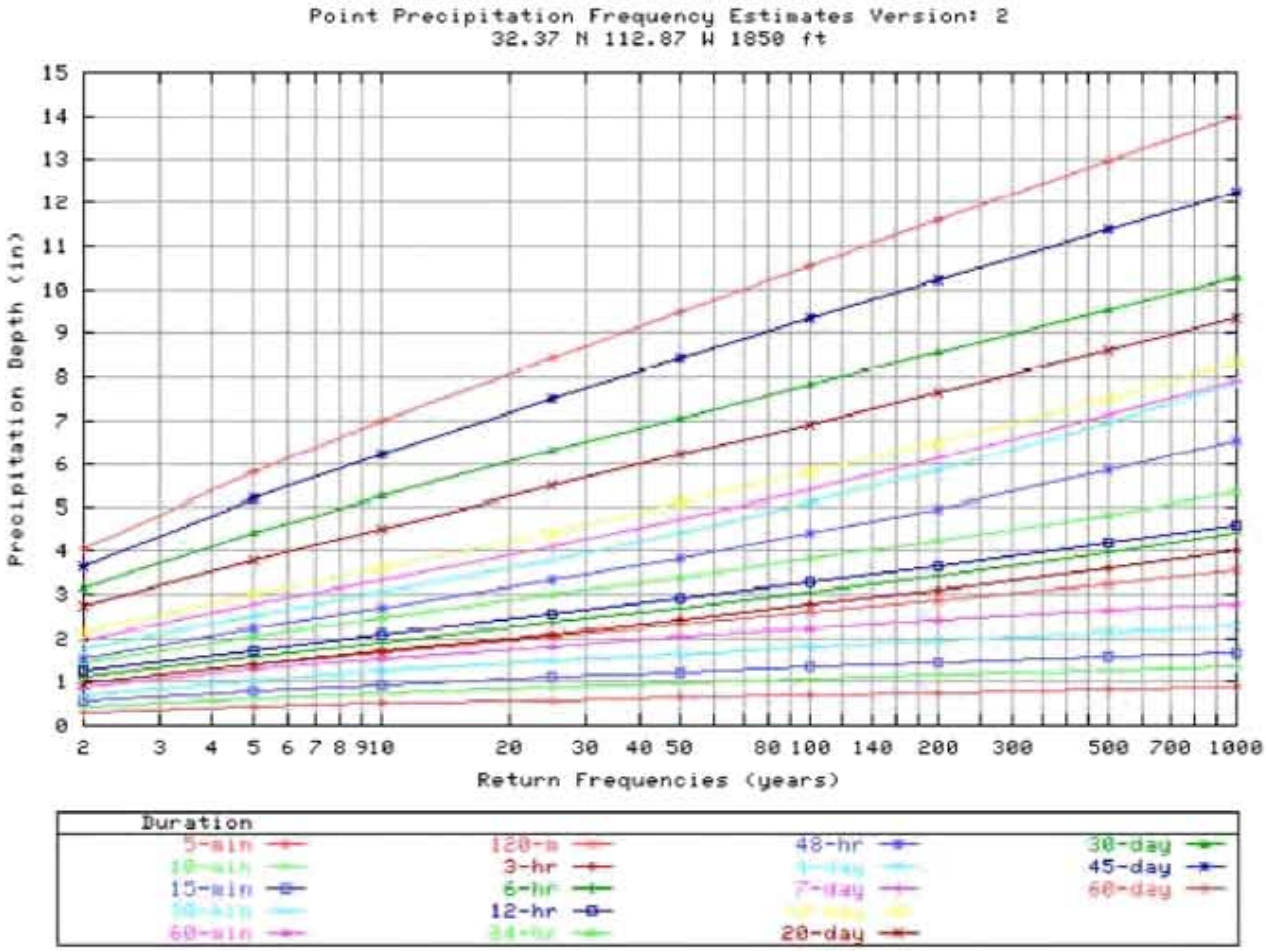
Confidence Limits | Seasonality | Location Maps | Other Info. | Grids | Maps | Help | Documentation

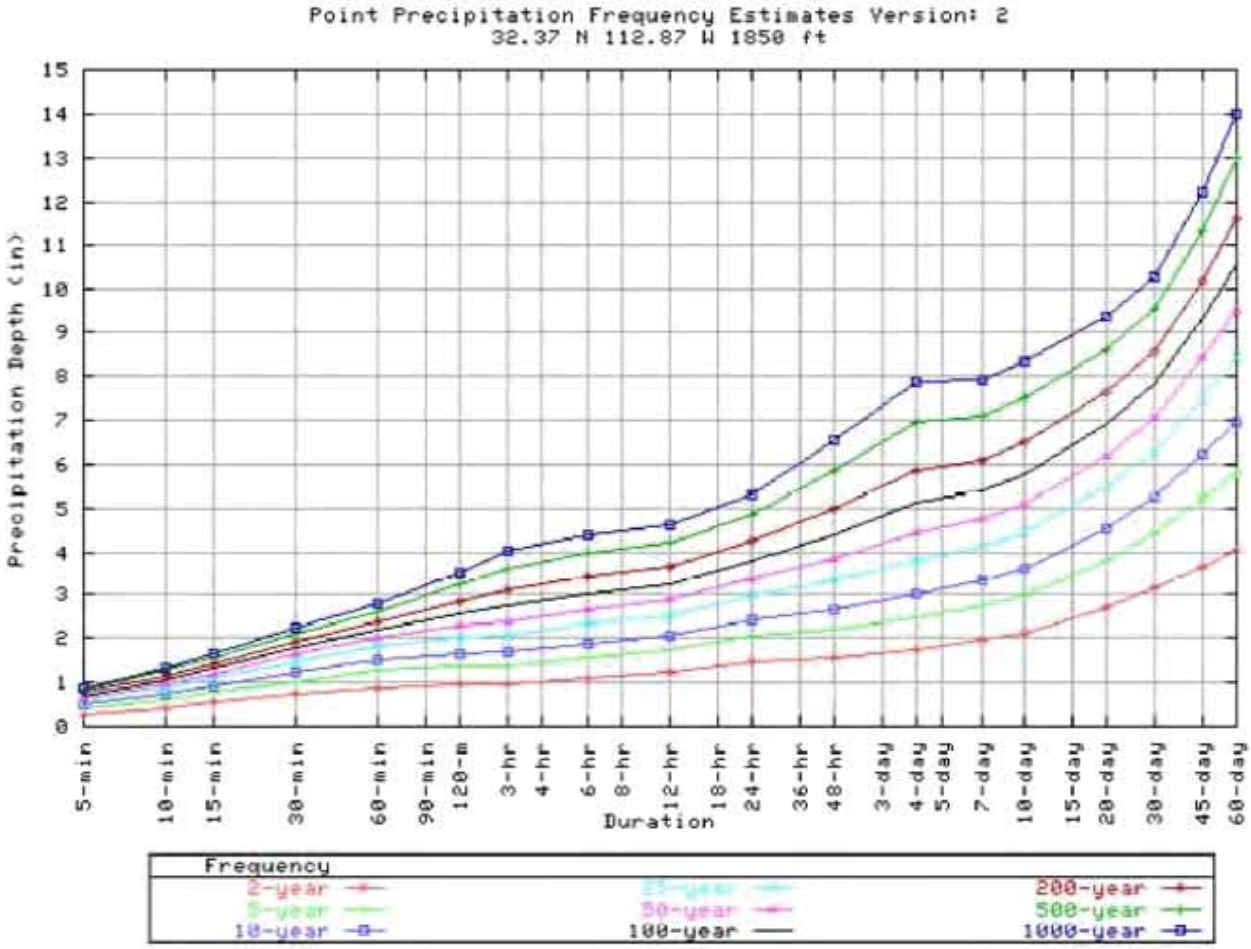
Precipitation Frequency Estimates (inches)

return period	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	0.28	0.43	0.53	0.71	0.88	0.94	0.97	1.12	1.23	1.45	1.54	1.74	1.95	2.12	2.69	3.14	3.65	4.04
5	0.40	0.61	0.76	1.03	1.27	1.36	1.39	1.57	1.72	2.04	2.19	2.48	2.75	2.98	3.79	4.42	5.22	5.80
10	0.48	0.74	0.91	1.23	1.52	1.64	1.68	1.89	2.07	2.44	2.66	3.02	3.32	3.61	4.53	5.24	6.23	6.97
25	0.57	0.88	1.08	1.46	1.81	2.01	2.08	2.33	2.52	2.97	3.32	3.79	4.11	4.44	5.48	6.29	7.50	8.42
50	0.64	0.97	1.21	1.63	2.01	2.29	2.40	2.67	2.89	3.38	3.84	4.43	4.74	5.10	6.20	7.05	8.42	9.49
100	0.70	1.07	1.32	1.78	2.21	2.57	2.74	3.03	3.25	3.81	4.40	5.11	5.40	5.78	6.92	7.81	9.32	10.55
200	0.76	1.15	1.43	1.93	2.38	2.85	3.09	3.41	3.64	4.24	4.99	5.86	6.10	6.50	7.64	8.57	10.21	11.60
500	0.83	1.26	1.56	2.11	2.61	3.23	3.60	3.96	4.18	4.85	5.84	6.94	7.11	7.51	8.61	9.54	11.36	12.97
1000	0.88	1.34	1.66	2.24	2.77	3.53	4.00	4.40	4.62	5.32	6.54	7.86	7.93	8.31	9.36	10.27	12.22	14.00

Text version of table

These precipitation frequency estimates are based on annual maxima. Please refer to the documentation for conversion to partial duration series estimates.





Tetra Tech, Inc.

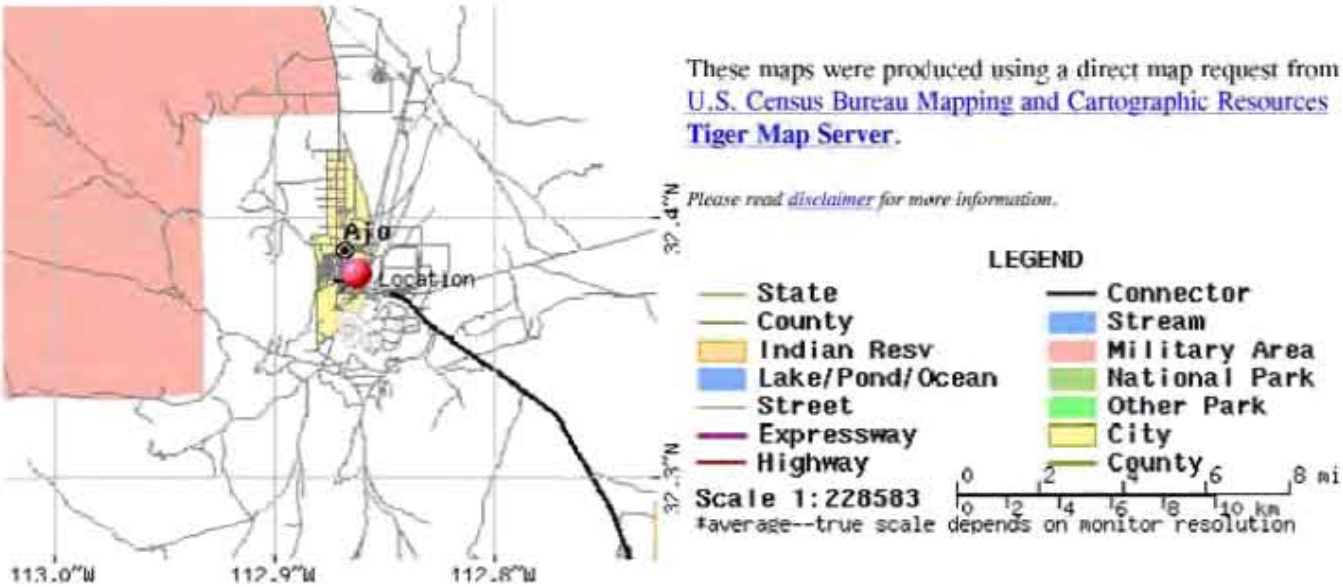
Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
return period	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**	**48 hr**	**4 day**	**7 day**	**10 day**	**20 day**	**30 day**	**45 day**	**60 day**
2	0.32	0.48	0.60	0.80	0.99	1.06	1.09	1.25	1.36	1.63	1.67	1.88	2.09	2.27	2.88	3.36	3.92	4.34
5	0.45	0.69	0.86	1.15	1.43	1.52	1.55	1.74	1.92	2.29	2.39	2.68	2.96	3.20	4.05	4.71	5.59	6.21
10	0.55	0.83	1.03	1.39	1.72	1.82	1.88	2.11	2.31	2.74	2.92	3.29	3.59	3.87	4.83	5.58	6.66	7.45
25	0.65	0.99	1.23	1.65	2.04	2.24	2.33	2.59	2.84	3.38	3.69	4.20	4.51	4.79	5.87	6.73	8.04	9.05
50	0.73	1.11	1.38	1.85	2.29	2.57	2.70	3.01	3.29	3.86	4.35	4.99	5.28	5.58	6.72	7.64	9.15	10.32
100	0.81	1.23	1.52	2.05	2.54	2.91	3.12	3.46	3.74	4.40	5.08	5.86	6.12	6.45	7.63	8.57	10.27	11.65
200	0.88	1.33	1.66	2.23	2.76	3.28	3.58	3.97	4.25	4.97	5.87	6.86	7.07	7.39	8.60	9.57	11.41	13.03
500	0.98	1.49	1.84	2.48	3.07	3.81	4.24	4.66	5.01	5.80	7.08	8.42	8.50	8.76	9.91	10.87	12.99	14.87
1000	1.05	1.60	1.99	2.67	3.31	4.25	4.80	5.29	5.63	6.49	8.12	9.80	9.89	10.12	10.95	11.91	14.19	16.35

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
return period	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**	**48 hr**	**4 day**	**7 day**	**10 day**	**20 day**	**30 day**	**45 day**	**60 day**
2	0.25	0.38	0.47	0.64	0.79	0.85	0.88	1.02	1.10	1.31	1.42	1.61	1.81	1.98	2.52	2.93	3.39	3.75
5	0.36	0.54	0.67	0.91	1.12	1.23	1.25	1.42	1.54	1.81	2.00	2.29	2.55	2.77	3.54	4.11	4.83	5.38
10	0.43	0.65	0.81	1.09	1.35	1.46	1.51	1.69	1.84	2.15	2.41	2.76	3.05	3.33	4.21	4.87	5.77	6.43
25	0.50	0.77	0.95	1.28	1.58	1.77	1.83	2.03	2.21	2.57	2.94	3.39	3.71	4.04	5.04	5.77	6.87	7.71
50	0.56	0.85	1.05	1.41	1.75	1.99	2.06	2.28	2.48	2.88	3.36	3.87	4.19	4.57	5.62	6.41	7.63	8.59
100	0.60	0.91	1.13	1.52	1.88	2.17	2.30	2.53	2.73	3.18	3.76	4.38	4.69	5.10	6.19	7.00	8.34	9.42
200	0.63	0.96	1.20	1.61	1.99	2.35	2.52	2.76	2.99	3.45	4.16	4.88	5.18	5.60	6.70	7.57	9.00	10.22
500	0.68	1.03	1.28	1.72	2.13	2.59	2.79	3.06	3.29	3.79	4.71	5.57	5.84	6.26	7.39	8.26	9.83	11.16
1000	0.71	1.07	1.33	1.79	2.22	2.75	2.98	3.26	3.52	4.04	5.14	6.10	6.35	6.76	7.86	8.74	10.39	11.86

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.The **lower** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **less than.**

Maps -



Other Maps/Photographs -

View USGS Digital Raster Graphic (DRG) covering this location from TerraServer; USGS Aerial Photograph may also be available from this site. A DRG is a digitized version of a USGS topographic map. Visit the USGS Digital Backyard for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information
about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study,
please refer to our documentation.

Using the National Climatic Data Center's (NCDC) station search engine, locate other climate stations within:

+/-30 minutes **...OR...** +/-1 degree **of this location (32.37/-112.87). Digital ASCII data can be obtained directly from NCDC.**

Tetra Tech, Inc.

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X       X    X       X   X     X  X    X
X     X  X       X            X   X    X    X   X
XXXXXXX  XXXX    X       XXX  XXXX    XXXXXX    XXXX
X     X  X       X             X  X    X    X       X
X     X  X       X    X        X   X   X    X       X
X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

Existing Split Flow Run

PROJECT DATA
Project Title: Gibson Arroyo
Project File : Floodplain.prj
Run Date and Time: 3/16/2004 5:55:35 PM

Project in English units

PLAN DATA

Plan Title: Existing split flow
Plan File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.p02

Geometry Title: Split flow, with modified overbanks, no debris/sediment
Geometry File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.g02

Flow Title : Flow 01
Flow File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.f01

Plan Summary Information:

Number of:	Cross Sections =	70	Mulitple Openings =	0
	Culverts =	2	Inline Structures =	0
	Bridges =	0	Lateral Structures =	39

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 01
Flow File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Ajo	Primary	100	3100

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Ajo	Primary	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: Split flow, with modified overbanks, no debris/sediment
Geometry File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.g02

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1862.17	17.23	1851.52	38.83	1848.37	59.55	1847.96	82.57	1848.07
93.55	1853.89	102.8	1856.86	113.79	1857.83				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	102.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	102.8	82	85	92	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1854.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.86	Wt. n-Val.		0.030	
W.S. Elev (ft)	1852.71	Reach Len. (ft)	82.00	85.00	92.00
Crit W.S. (ft)	1852.71	Flow Area (sq ft)		283.02	
E.G. Slope (ft/ft)	0.008729	Area (sq ft)		283.02	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	76.00	Top Width (ft)		76.00	
Vel Total (ft/s)	10.95	Avg. Vel. (ft/s)		10.95	
Max Chl Dpth (ft)	4.74	Hydr. Depth (ft)		3.72	
Conv. Total (cfs)	33179.8	Conv. (cfs)		33179.8	
Length Wtd. (ft)	85.00	Wetted Per. (ft)		77.72	
Min Ch El (ft)	1847.96	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		21.74	
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)	4.29	43.75	0.78
C & E Loss (ft)	0.02	Cum SA (acres)	3.68	12.74	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 99

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1860.38	11.62	1860.12	36.76	1851.06	67.23	1848.81	80.95	1847.18
110.08	1846.11	117.96	1853.79	138.69	1856	142.43	1860.28	177.96	1860.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	11.62	.03	142.43	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
11.62	142.43	104	119	130	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1853.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.78	Wt. n-Val.		0.030	
W.S. Elev (ft)	1851.96	Reach Len. (ft)	104.00	119.00	130.00

Crit W.S. (ft)	1851.96	Flow Area (sq ft)		289.27	
E.G. Slope (ft/ft)	0.009079	Area (sq ft)		289.27	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	81.80	Top Width (ft)		81.80	
Vel Total (ft/s)	10.72	Avg. Vel. (ft/s)		10.72	
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)		3.54	
Conv. Total (cfs)	32535.1	Conv. (cfs)		32535.1	
Length Wtd. (ft)	119.00	Wetted Per. (ft)		84.54	
Min Ch El (ft)	1846.11	Shear (lb/sq ft)		1.94	
Alpha	1.00	Stream Power (lb/ft s)		20.78	
Frctn Loss (ft)	1.07	Cum Volume (acre-ft)	4.29	43.19	0.78
C & E Loss (ft)	0.01	Cum SA (acres)	3.68	12.58	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 98

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1858.76	31.41	1850.52	63.91	1846.28	69.31	1843.22	88.4	1843.46
95.64	1842.76	107.78	1844.23	128.66	1851.08	150.55	1852.29		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	150.55	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	150.55	85	92	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1850.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.87	Wt. n-Val.		0.030	
W.S. Elev (ft)	1848.73	Reach Len. (ft)	85.00	92.00	100.00
Crit W.S. (ft)	1848.73	Flow Area (sq ft)		282.53	
E.G. Slope (ft/ft)	0.008849	Area (sq ft)		282.53	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	76.37	Top Width (ft)		76.37	
Vel Total (ft/s)	10.97	Avg. Vel. (ft/s)		10.97	
Max Chl Dpth (ft)	5.97	Hydr. Depth (ft)		3.70	
Conv. Total (cfs)	32955.2	Conv. (cfs)		32955.2	
Length Wtd. (ft)	92.00	Wetted Per. (ft)		78.18	
Min Ch El (ft)	1842.76	Shear (lb/sq ft)		2.00	
Alpha	1.00	Stream Power (lb/ft s)		21.90	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	4.29	42.41	0.78
C & E Loss (ft)	0.01	Cum SA (acres)	3.68	12.37	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 97

INPUT
Description:

```
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1858.27   20.19 1857.83    61.9 1848.53   86.12 1845.09   89.82 1841.57
  107.36 1840.77  132.66 1842.49  142.62 1846.89  162.21 1849.51  175.26    1848

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   20.19     .03  162.21     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          20.19  162.21             105     100      90            .1       .3
Right Levee     Station=  161.61      Elevation= 1849.52

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1848.79    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.99    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1846.80    Reach Len. (ft)            105.00     100.00      90.00
  Crit W.S. (ft)          1846.80    Flow Area (sq ft)                     273.94
  E.G. Slope (ft/ft)     0.008607    Area (sq ft)                          273.94
  Q Total (cfs)           3100.00    Flow (cfs)                           3100.00
  Top Width (ft)            68.37    Top Width (ft)                         68.37
  Vel Total (ft/s)          11.32    Avg. Vel. (ft/s)                       11.32
  Max Chl Dpth (ft)          6.03    Hydr. Depth (ft)                        4.01
  Conv. Total (cfs)       33414.7    Conv. (cfs)                         33414.7
  Length Wtd. (ft)         100.00    Wetted Per. (ft)                       70.88
  Min Ch El (ft)          1840.77    Shear (lb/sq ft)                        2.08
  Alpha                      1.00    Stream Power (lb/ft s)                 23.50
  Frctn Loss (ft)            0.89    Cum Volume (acre-ft)         4.29      41.83       0.78
  C & E Loss (ft)            0.13    Cum SA (acres)               3.68      12.22       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m), between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 96

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1854.77   10.35 1854.25   50.04 1839.65   62.44 1838.89    97.9 1840.34
  129.12 1841.25  141.08  1843.7  166.61 1845.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03  166.61     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  166.61              160     145     117            .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1845.08    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.55    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1843.53    Reach Len. (ft)            160.00     145.00     117.00
  Crit W.S. (ft)          1843.53    Flow Area (sq ft)                     310.19
  E.G. Slope (ft/ft)     0.009210    Area (sq ft)                          310.19
  Q Total (cfs)           3100.00    Flow (cfs)                           3100.00
  Top Width (ft)           100.76    Top Width (ft)                        100.76
  Vel Total (ft/s)           9.99    Avg. Vel. (ft/s)                        9.99
  Max Chl Dpth (ft)          4.64    Hydr. Depth (ft)                        3.08
  Conv. Total (cfs)       32303.0    Conv. (cfs)                         32303.0
  Length Wtd. (ft)         145.00    Wetted Per. (ft)                      101.75
  Min Ch El (ft)          1838.89    Shear (lb/sq ft)                        1.75
  Alpha                      1.00    Stream Power (lb/ft s)                 17.52
```

Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	4.29	41.16	0.78
C & E Loss (ft)	0.11	Cum SA (acres)	3.68	12.02	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 95

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1850.73	27.96	1850.25	52.9	1837.09	119.92	1837.54	138.08	1840.19
177.41	1840.06	220.39	1842.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	220.39	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	220.39	100	75	55	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1842.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.18	Wt. n-Val.		0.030	
W.S. Elev (ft)	1841.08	Reach Len. (ft)	100.00	75.00	55.00
Crit W.S. (ft)	1841.08	Flow Area (sq ft)		355.32	
E.G. Slope (ft/ft)	0.010009	Area (sq ft)		355.32	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	150.88	Top Width (ft)		150.88	
Vel Total (ft/s)	8.72	Avg. Vel. (ft/s)		8.72	
Max Chl Dpth (ft)	3.99	Hydr. Depth (ft)		2.35	
Conv. Total (cfs)	30986.0	Conv. (cfs)		30986.0	
Length Wtd. (ft)	75.00	Wetted Per. (ft)		152.09	
Min Ch El (ft)	1837.09	Shear (lb/sq ft)		1.46	
Alpha	1.00	Stream Power (lb/ft s)		12.74	
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)	4.29	40.05	0.78
C & E Loss (ft)	0.00	Cum SA (acres)	3.68	11.60	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 94

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1846.85	33.57	1847.7	58.12	1836.2	106.32	1836.49	113.96	1835.08
129.07	1834.7	137.97	1836.26	174.53	1836.28	209.28	1838.75	233.97	1838.97

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	33.57	.03	233.97	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

```
        33.57  233.97              100     105     105             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1839.86    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.17    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1838.69    Reach Len. (ft)            100.00     105.00     105.00
  Crit W.S. (ft)           1838.69    Flow Area (sq ft)                     357.30
  E.G. Slope (ft/ft)      0.010211    Area (sq ft)                          357.30
  Q Total (cfs)            3100.00    Flow (cfs)                           3100.00
  Top Width (ft)            155.65    Top Width (ft)                        155.65
  Vel Total (ft/s)            8.68    Avg. Vel. (ft/s)                        8.68
  Max Chl Dpth (ft)           3.99    Hydr. Depth (ft)                        2.30
  Conv. Total (cfs)        30677.7    Conv. (cfs)                          30677.7
  Length Wtd. (ft)          105.00    Wetted Per. (ft)                      156.56
  Min Ch El (ft)           1834.70    Shear (lb/sq ft)                        1.45
  Alpha                       1.00    Stream Power (lb/ft s)                 12.62
  Frctn Loss (ft)             1.06    Cum Volume (acre-ft)        4.29       39.43       0.78
  C & E Loss (ft)             0.00    Cum SA (acres)              3.68       11.34       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 93

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1845.08   14.99 1844.85   49.46 1833.54   91.86 1835.72  147.06 1833.78
  190.26 1834.73  195.89  1838.4     242 1838.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   14.99     .03  195.89     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         14.99  195.89              125      89      96             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1838.12    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.16    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1836.95    Reach Len. (ft)            125.00      89.00      96.00
  Crit W.S. (ft)           1836.95    Flow Area (sq ft)                     358.29
  E.G. Slope (ft/ft)      0.010063    Area (sq ft)                          358.29
  Q Total (cfs)            3100.00    Flow (cfs)                           3100.00
  Top Width (ft)            154.61    Top Width (ft)                        154.61
  Vel Total (ft/s)            8.65    Avg. Vel. (ft/s)                        8.65
  Max Chl Dpth (ft)           3.41    Hydr. Depth (ft)                        2.32
  Conv. Total (cfs)        30902.5    Conv. (cfs)                          30902.5
  Length Wtd. (ft)          89.00     Wetted Per. (ft)                      155.92
  Min Ch El (ft)           1833.54    Shear (lb/sq ft)                        1.44
  Alpha                       1.00    Stream Power (lb/ft s)                 12.49
  Frctn Loss (ft)             0.90    Cum Volume (acre-ft)        4.29       38.57       0.78
  C & E Loss (ft)             0.00    Cum SA (acres)              3.68       10.96       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
```

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 92

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1837.39	24.06	1835.67	36.4	1835.32	45.83	1832.83	82.07	1834.51
101.46	1834.15	106.23	1832.8	144.67	1832.34	181.86	1832.25	186.96	1836.6
236.11	1837.87	267.46	1837.55						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	236.11	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	236.11	150	130	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1836.71	Element			
Vel Head (ft)	1.15	Wt. n-Val.		0.030	
W.S. Elev (ft)	1835.56	Reach Len. (ft)	150.00	130.00	50.00
Crit W.S. (ft)	1835.56	Flow Area (sq ft)		360.12	
E.G. Slope (ft/ft)	0.010205	Area (sq ft)		360.12	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	157.81	Top Width (ft)		157.81	
Vel Total (ft/s)	8.61	Avg. Vel. (ft/s)		8.61	
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)		2.28	
Conv. Total (cfs)	30687.0	Conv. (cfs)		30687.0	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		159.59	
Min Ch El (ft)	1832.25	Shear (lb/sq ft)		1.44	
Alpha	1.00	Stream Power (lb/ft s)		12.38	
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	4.29	37.84	0.78
C & E Loss (ft)	0.03	Cum SA (acres)	3.68	10.65	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 91

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1837.34	36.04	1835.94	45.6	1830.31	73.79	1831.33	78.99	1829.74
103.8	1830.36	129.63	1830.05	138.35	1832.03	168.56	1836.37	199.67	1836.4

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	36.04	.03	168.56	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
36.04	168.56	107	90	65	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1835.15	Element			
Vel Head (ft)	1.47	Wt. n-Val.		0.030	
W.S. Elev (ft)	1833.68	Reach Len. (ft)	107.00	90.00	65.00
Crit W.S. (ft)	1833.68	Flow Area (sq ft)		318.44	
E.G. Slope (ft/ft)	0.009526	Area (sq ft)		318.44	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	109.92	Top Width (ft)		109.92	

Vel Total (ft/s)	9.73	Avg. Vel. (ft/s)		9.73	
Max Chl Dpth (ft)	3.94	Hydr. Depth (ft)		2.90	
Conv. Total (cfs)	31761.2	Conv. (cfs)		31761.2	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		111.44	
Min Ch El (ft)	1829.74	Shear (lb/sq ft)		1.70	
Alpha	1.00	Stream Power (lb/ft s)		16.54	
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	4.29	36.83	0.78
C & E Loss (ft)	0.07	Cum SA (acres)	3.68	10.25	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 90

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1838.49	23.44	1838.18	52.03	1827.68	79.82	1827.33	91.15	1828.03
115.6	1829.19	140	1830.63	165.56	1830.4	179.32	1831.37	193.05	1836.96

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	23.44	.03	193.05	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
23.44	193.05	140	125	95	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1832.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	Wt. n-Val.		0.030	
W.S. Elev (ft)	1831.71	Reach Len. (ft)	140.00	125.00	95.00
Crit W.S. (ft)	1831.71	Flow Area (sq ft)		345.90	
E.G. Slope (ft/ft)	0.009801	Area (sq ft)		345.90	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	139.08	Top Width (ft)		139.08	
Vel Total (ft/s)	8.96	Avg. Vel. (ft/s)		8.96	
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	31313.0	Conv. (cfs)		31313.0	
Length Wtd. (ft)	125.00	Wetted Per. (ft)		139.99	
Min Ch El (ft)	1827.33	Shear (lb/sq ft)		1.51	
Alpha	1.00	Stream Power (lb/ft s)		13.55	
Frctn Loss (ft)	1.19	Cum Volume (acre-ft)	4.29	36.14	0.78
C & E Loss (ft)	0.03	Cum SA (acres)	3.68	9.99	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 89

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1834.03	31.9	1830.63	52.95	1824.57	67.8	1824.57	85.42	1825.22
92.96	1827.55	116.97	1827.97	146.89	1830.44	161.3	1835.25	180.57	1836.18

```
Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .06        0     .03    161.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   161.3               105     100      99             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1831.38    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.50    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1829.88    Reach Len. (ft)           105.00     100.00      99.00
  Crit W.S. (ft)           1829.88    Flow Area (sq ft)                    315.24
  E.G. Slope (ft/ft)      0.009313    Area (sq ft)                         315.24
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)            105.64    Top Width (ft)                       105.64
  Vel Total (ft/s)            9.83    Avg. Vel. (ft/s)                       9.83
  Max Chl Dpth (ft)           5.31    Hydr. Depth (ft)                       2.98
  Conv. Total (cfs)        32123.2    Conv. (cfs)                         32123.2
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                     106.83
  Min Ch El (ft)           1824.57    Shear (lb/sq ft)                       1.72
  Alpha                       1.00    Stream Power (lb/ft s)                16.87
  Frctn Loss (ft)             0.92    Cum Volume (acre-ft)        4.29      35.19       0.78
  C & E Loss (ft)             0.04    Cum SA (acres)              3.68       9.64       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 88

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1830      80 1825.36   85.46 1822.78  102.37 1822.99  116.36 1823.49
  124.26 1825.21  143.08 1826.02  164.76 1829.72  166.64 1831.84  177.86  1831.9

Manning's n Values          num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .06       80     .03   166.64     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             80  166.64              100     100     110             .1       .3
Blocked Obstructions      num=        1
   Sta L   Sta R    Elev
       0      80    1832

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1830.17    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.86    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1828.31    Reach Len. (ft)           100.00     100.00     110.00
  Crit W.S. (ft)           1828.31    Flow Area (sq ft)                    283.21
  E.G. Slope (ft/ft)      0.009118    Area (sq ft)                         283.21
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)             76.50    Top Width (ft)                        76.50
  Vel Total (ft/s)           10.95    Avg. Vel. (ft/s)                      10.95
  Max Chl Dpth (ft)           5.53    Hydr. Depth (ft)                       3.70
  Conv. Total (cfs)        32465.0    Conv. (cfs)                         32465.0
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                      80.44
  Min Ch El (ft)           1822.78    Shear (lb/sq ft)                       2.00
  Alpha                       1.00    Stream Power (lb/ft s)                21.94
  Frctn Loss (ft)             0.92    Cum Volume (acre-ft)        4.29      34.50       0.78
  C & E Loss (ft)             0.10    Cum SA (acres)              3.68       9.43       1.09
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 87

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1828.67	25.29	1828.4	31.07	1825.83	44.68	1825.14	69.23	1821.68
85.1	1821.1	97.29	1821.17	106.49	1824.77	127.22	1824.98	155.94	1834.44
185.12	1836.15								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	25.29	.03	155.94	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
25.29	155.94	75	100	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1828.09	Element			
Vel Head (ft)	1.53	Wt. n-Val.		0.030	
W.S. Elev (ft)	1826.56	Reach Len. (ft)	75.00	100.00	140.00
Crit W.S. (ft)	1826.56	Flow Area (sq ft)		312.08	
E.G. Slope (ft/ft)	0.009284	Area (sq ft)		312.08	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	102.57	Top Width (ft)		102.57	
Vel Total (ft/s)	9.93	Avg. Vel. (ft/s)		9.93	
Max Chl Dpth (ft)	5.46	Hydr. Depth (ft)		3.04	
Conv. Total (cfs)	32173.8	Conv. (cfs)		32173.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		103.93	
Min Ch El (ft)	1821.10	Shear (lb/sq ft)		1.74	
Alpha	1.00	Stream Power (lb/ft s)		17.29	
Frctn Loss (ft)	0.93	Cum Volume (acre-ft)	4.29	33.82	0.78
C & E Loss (ft)	0.01	Cum SA (acres)	3.68	9.22	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 86

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1828.13	15.61	1827.64	26.4	1824.04	41.79	1823.82	53.62	1823.68
70.56	1819.74	90.19	1819.6	113.74	1819.89	124.04	1826.86		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	15.61	.03	124.04	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
15.61	124.04	100	100	98	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1826.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.61	Wt. n-Val.		0.030	
W.S. Elev (ft)	1824.67	Reach Len. (ft)	100.00	100.00	98.00
Crit W.S. (ft)	1824.67	Flow Area (sq ft)		304.43	
E.G. Slope (ft/ft)	0.009368	Area (sq ft)		304.43	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	96.31	Top Width (ft)		96.31	
Vel Total (ft/s)	10.18	Avg. Vel. (ft/s)		10.18	
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)		3.16	
Conv. Total (cfs)	32028.8	Conv. (cfs)		32028.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		98.34	
Min Ch El (ft)	1819.60	Shear (lb/sq ft)		1.81	
Alpha	1.00	Stream Power (lb/ft s)		18.44	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	4.29	33.11	0.78
C & E Loss (ft)	0.08	Cum SA (acres)	3.68	8.99	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 85

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1826.91	49.85	1827.31	92.51	1826.2	108.49	1826.46	128.64	1826.42
155.5	1825.1	223.41	1818.88	238.75	1818.42	254.41	1818.74	312.03	1824.19
368	1828.12	389.71	1828.34	413.4	1828.06	454.84	1827.49	465.81	1827.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	128.64	.03	368	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
128.64	368	125	119	118	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1824.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.36	Wt. n-Val.		0.030	
W.S. Elev (ft)	1823.06	Reach Len. (ft)	125.00	119.00	118.00
Crit W.S. (ft)	1823.06	Flow Area (sq ft)		331.60	
E.G. Slope (ft/ft)	0.009461	Area (sq ft)		331.60	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	122.27	Top Width (ft)		122.27	
Vel Total (ft/s)	9.35	Avg. Vel. (ft/s)		9.35	
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		2.71	
Conv. Total (cfs)	31870.7	Conv. (cfs)		31870.7	
Length Wtd. (ft)	119.00	Wetted Per. (ft)		122.67	
Min Ch El (ft)	1818.42	Shear (lb/sq ft)		1.60	
Alpha	1.00	Stream Power (lb/ft s)		14.93	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	4.29	32.38	0.78
C & E Loss (ft)	0.20	Cum SA (acres)	3.68	8.74	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 84

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1825.48	12.42	1825.18	19.32	1820.86	25.96	1819.39	34	1815.12
41.16	1814.5	49.73	1810.95	67.02	1813.03	140	1820		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	12.42	.03	140	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
12.42	140	140	85	30	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1820.22	Element			
Vel Head (ft)	0.70	Wt. n-Val.		0.030	
W.S. Elev (ft)	1819.52	Reach Len. (ft)	140.00	85.00	30.00
Crit W.S. (ft)		Flow Area (sq ft)		460.98	
E.G. Slope (ft/ft)	0.002790	Area (sq ft)		460.98	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	109.61	Top Width (ft)		109.61	
Vel Total (ft/s)	6.72	Avg. Vel. (ft/s)		6.72	
Max Chl Dpth (ft)	8.57	Hydr. Depth (ft)		4.21	
Conv. Total (cfs)	58690.9	Conv. (cfs)		58690.9	
Length Wtd. (ft)	85.00	Wetted Per. (ft)		111.86	
Min Ch El (ft)	1810.95	Shear (lb/sq ft)		0.72	
Alpha	1.00	Stream Power (lb/ft s)		4.83	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	4.29	31.30	0.78
C & E Loss (ft)	0.08	Cum SA (acres)	3.68	8.43	1.09

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 83

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1819.92	32.54	1819.87	72.54	1818.73	77.55	1817.5	79.15	1814.9
92.73	1813.32	110.89	1812.74	128.35	1813.11	137.05	1815.59	148.68	1817.45
185.8	1818.35	201.55	1820.48						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	32.54	.03	201.55	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
32.54	201.55	95	100	107	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1819.75	Element			
Vel Head (ft)	1.48	Wt. n-Val.		0.030	
W.S. Elev (ft)	1818.27	Reach Len. (ft)	95.00	100.00	107.00
Crit W.S. (ft)	1818.27	Flow Area (sq ft)		317.94	
E.G. Slope (ft/ft)	0.009445	Area (sq ft)		317.94	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	108.14	Top Width (ft)		108.14	
Vel Total (ft/s)	9.75	Avg. Vel. (ft/s)		9.75	
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)		2.94	
Conv. Total (cfs)	31897.1	Conv. (cfs)		31897.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		110.29	

Min Ch El (ft)	1812.74	Shear (lb/sq ft)		1.70	
Alpha	1.00	Stream Power (lb/ft s)		16.57	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)	4.29	30.54	0.78
C & E Loss (ft)	0.05	Cum SA (acres)	3.68	8.21	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 82

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1817.2	34.7	1817.86	50.6	1810.78	71.2	1810.7	85.4	1810.59
112.6	1817.61	144.7	1820.06	162.4	1821.91	184.2	1818.57	194.6	1823.57
200.8	1824.04								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	34.7	.03	112.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
34.7	112.6		86	114	135	.1	.3

Left Levee Station= 34.77 Elevation= 1817.88
Right Levee Station= 112.58 Elevation= 1817.62

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1818.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.01	Wt. n-Val.		0.030	
W.S. Elev (ft)	1816.02	Reach Len. (ft)	86.00	114.00	135.00
Crit W.S. (ft)	1816.02	Flow Area (sq ft)		272.75	
E.G. Slope (ft/ft)	0.008487	Area (sq ft)		272.75	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	67.58	Top Width (ft)		67.58	
Vel Total (ft/s)	11.37	Avg. Vel. (ft/s)		11.37	
Max Chl Dpth (ft)	5.43	Hydr. Depth (ft)		4.04	
Conv. Total (cfs)	33650.0	Conv. (cfs)		33650.0	
Length Wtd. (ft)	114.00	Wetted Per. (ft)		69.38	
Min Ch El (ft)	1810.59	Shear (lb/sq ft)		2.08	
Alpha	1.00	Stream Power (lb/ft s)		23.67	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	4.29	29.86	0.78
C & E Loss (ft)	0.02	Cum SA (acres)	3.68	8.01	1.09

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 81

INPUT
Description:

```
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1816.32    13.1 1808.85    35.4 1808.46    51.4 1808.43      68 1816.82
   103.1 1818.98   109.4 1819.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03      68     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      68              100      89     100              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1816.17    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              2.24    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1813.93    Reach Len. (ft)          100.00      89.00     100.00
  Crit W.S. (ft)          1813.93    Flow Area (sq ft)                   257.95
  E.G. Slope (ft/ft)      0.008563   Area (sq ft)                        257.95
  Q Total (cfs)           3100.00    Flow (cfs)                         3100.00
  Top Width (ft)            58.09    Top Width (ft)                       58.09
  Vel Total (ft/s)          12.02    Avg. Vel. (ft/s)                     12.02
  Max Chl Dpth (ft)          5.50    Hydr. Depth (ft)                      4.44
  Conv. Total (cfs)       33501.1    Conv. (cfs)                        33501.1
  Length Wtd. (ft)          89.00    Wetted Per. (ft)                     60.75
  Min Ch El (ft)          1808.43    Shear (lb/sq ft)                      2.27
  Alpha                      1.00    Stream Power (lb/ft s)               27.28
  Frctn Loss (ft)            0.76    Cum Volume (acre-ft)        4.29     29.17       0.78
  C & E Loss (ft)            0.01    Cum SA (acres)              3.68      7.85       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 80.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1819.19     100  1816.3

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)           1816.17    Weir Sta US (ft)
  W.S. US. (ft)           1813.93    Weir Sta DS (ft)
  E.G. DS (ft)            1814.14    Weir Max Depth (ft)
  W.S. DS (ft)            1811.93    Weir Avg Depth (ft)
  Q US (cfs)              3100.00    Weir Submerg
  Q Leaving Total (cfs)      0.00    Min El Weir Flow (ft)    1816.30
  Q DS (cfs)              3100.00    Wr Top Wdth (ft)
  Perc Q Leaving             0.00    Q Gate Group (cfs)
  Q Weir (cfs)                       Gate Open Ht (ft)
  Q Gates (cfs)                      Gate #Open
  Q Culv (cfs)                       Gate Area (sq ft)
  Q Lat RC (cfs)                     Gate Submerg
  Weir Flow Area (sq ft)             Gate Invert (ft)


LATERAL STRUCTURE
```

```
RIVER: Ajo
REACH: Primary            RS: 80.4

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1816.32     100 1812.65

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1816.17    Weir Sta US (ft)
  W.S. US. (ft)            1813.93    Weir Sta DS (ft)
  E.G. DS (ft)             1814.14    Weir Max Depth (ft)
  W.S. DS (ft)             1811.93    Weir Avg Depth (ft)
  Q US (cfs)               3100.00    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1812.65
  Q DS (cfs)               3100.00    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 80

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1812.65    17.9 1812.74      34 1805.99    51.4 1806.22    64.4 1806.21
    87.2 1815.04    98.9 1816.13   122.8  1816.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    17.9     .03    87.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          17.9    87.2              100     116     120              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1814.14    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               2.21    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1811.93    Reach Len. (ft)           100.00     116.00     120.00
  Crit W.S. (ft)           1811.93    Flow Area (sq ft)                    259.82
  E.G. Slope (ft/ft)      0.008513    Area (sq ft)                         259.82
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)             59.32    Top Width (ft)                        59.32
  Vel Total (ft/s)           11.93    Avg. Vel. (ft/s)                      11.93
  Max Chl Dpth (ft)           5.94    Hydr. Depth (ft)                       4.38
  Conv. Total (cfs)        33598.0    Conv. (cfs)                         33598.0
  Length Wtd. (ft)          116.00    Wetted Per. (ft)                      61.59
  Min Ch El (ft)           1805.99    Shear (lb/sq ft)                       2.24
  Alpha                       1.00    Stream Power (lb/ft s)                26.75
  Frctn Loss (ft)             0.54    Cum Volume (acre-ft)        4.29      28.64       0.78
  C & E Loss (ft)             0.35    Cum SA (acres)              3.68       7.73       1.09


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
```

```
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 79.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num -        2
     Sta    Elev     Sta    Elev
       0  1816.3     120 1812.19

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1814.14    Weir Sta US (ft)
  W.S. US. (ft)            1811.93    Weir Sta DS (ft)
  E.G. DS (ft)             1813.05    Weir Max Depth (ft)
  W.S. DS (ft)             1811.99    Weir Avg Depth (ft)
  Q US (cfs)               3100.00    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1812.19
  Q DS (cfs)               3077.53    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 79.4

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1812.65     100 1811.35

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1814.14    Weir Sta US (ft)          53.13
  W.S. US. (ft)            1811.93    Weir Sta DS (ft)         100.00
  E.G. DS (ft)             1813.05    Weir Max Depth (ft)        0.64
  W.S. DS (ft)             1811.99    Weir Avg Depth (ft)        0.32
  Q US (cfs)               3100.00    Weir Submerg               0.00
  Q Leaving Total (cfs)      23.85    Min El Weir Flow (ft)    1811.35
  Q DS (cfs)               3077.53    Wr Top Wdth (ft)          46.87
  Perc Q Leaving              0.72    Q Gate Group (cfs)
  Q Weir (cfs)               23.85    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
```

```
  Q Lat RC (cfs)                        Gate Submerg
  Weir Flow Area (sq ft)      14.94     Gate Invert (ft)
```

CROSS SECTION

```
RIVER: Ajo
REACH: Primary            RS: 79

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1811.35    13.3  1810.1    26.5 1802.89    38.7 1802.65    49.7 1802.49
    63.6 1811.81    82.5 1811.96   110.2 1812.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    63.6     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    63.6               60      66      62              .3       .5

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1813.05    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.06    Wt. n-Val.                            0.030     0.060
  W.S. Elev (ft)           1811.99    Reach Len. (ft)            60.00      66.00     62.00
  Crit W.S. (ft)           1809.56    Flow Area (sq ft)                    372.57      1.98
  E.G. Slope (ft/ft)      0.002934    Area (sq ft)                         372.57      1.98
  Q Total (cfs)            3077.53    Flow (cfs)                          3077.00      0.53
  Top Width (ft)             85.81    Top Width (ft)                        63.60     22.21
  Vel Total (ft/s)            8.22    Avg. Vel. (ft/s)                      8.26      0.27
  Max Chl Dpth (ft)           9.50    Hydr. Depth (ft)                      5.86      0.09
  Conv. Total (cfs)        56820.7    Conv. (cfs)                        56810.9       9.8
  Length Wtd. (ft)           66.00    Wetted Per. (ft)                      68.98     22.21
  Min Ch El (ft)           1802.49    Shear (lb/sq ft)                      0.99      0.02
  Alpha                       1.01    Stream Power (lb/ft s)                8.17      0.00
  Frctn Loss (ft)                     Cum Volume (acre-ft)        4.29     27.80      0.78
  C & E Loss (ft)                     Cum SA (acres)              3.68      7.57      1.06
```

CULVERT

```
RIVER: Ajo
REACH: Primary            RS: 78.5

INPUT
Description:
Distance from Upstream XS =       16
Deck/Roadway Width        =       40
Weir Coefficient          =      2.8
Upstream  Deck/Roadway Coordinates
    num=       16
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1811.24           106.5 1811.32           214.9 1811.33
     390  1811.4           421.4 1811.43             471  1811.5
   525.5 1811.59             574 1811.59           628.2 1811.39
   684.7 1811.23           733.3  1810.9           834.8 1809.95
   937.8 1808.81          1042.7 1807.56          1143.2  1806.5
  1243.3 1805.71

Upstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1811.35    13.3  1810.1    26.5 1802.89    38.7 1802.65    49.7 1802.49
    63.6 1811.81    82.5 1811.96   110.2 1812.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    63.6     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0    63.6              .3       .5

Downstream  Deck/Roadway Coordinates
    num=       16
```

```
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
       0 1811.24           106.5 1811.32           214.9 1811.33
     390  1811.4           421.4 1811.43             471  1811.5
   525.5 1811.59             574 1811.59           628.2 1811.39
   684.7 1811.23           733.3  1810.9           834.8 1809.95
   937.8 1808.81          1042.7 1807.56          1143.2  1806.5
  1243.3 1805.71

Downstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1811.35    13.3  1810.1    26.5 1801.73    38.7 1801.49    49.7 1801.33
    63.6 1811.81    82.5 1811.96   110.2 1812.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    63.6     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
             0    63.6             .3       .5

Upstream Embankment side slope                =       0 horiz. to 1.0 vertical
Downstream Embankment side slope              =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins           =
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       8      10
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 10      52     .013     .025        0                   .4                  1
Number of Barrels =  3
Upstream   Elevation =  1802.49
Centerline Stations
    Sta.    Sta.    Sta.
      26   36.83   47.66
Downstream Elevation =  1801.33
Centerline Stations
    Sta.    Sta.    Sta.
      26   36.83   47.66

CULVERT OUTPUT  Profile #PF 1  Culv Group:  Culvert #1

  Q Culv Group (cfs)       2635.60    Culv Full Len (ft)          1.34
  # Barrels                      3    Culv Vel US (ft/s)         14.14
  Q Barrel (cfs)            878.53    Culv Vel DS (ft/s)         10.98
  E.G. US. (ft)            1813.05    Culv Inv El Up (ft)      1802.49
  W.S. US. (ft)            1811.99    Culv Inv El Dn (ft)      1801.33
  E.G. DS (ft)             1811.23    Culv Frctn Ls (ft)          0.58
  W.S. DS (ft)             1808.53    Culv Exit Loss (ft)
  Delta EG (ft)               1.82    Culv Entr Loss (ft)         1.24
  Delta WS (ft)               3.46    Q Weir (cfs)              441.61
  E.G. IC (ft)             1812.92    Weir Sta Lft (ft)           0.00
  E.G. OC (ft)             1813.05    Weir Sta Rgt (ft)         110.20
  Culvert Control           Outlet    Weir Submerg                0.00
  Culv WS Inlet (ft)       1808.70    Weir Max Depth (ft)         1.58
  Culv WS Outlet (ft)      1809.35    Weir Avg Depth (ft)         1.24
  Culv Nml Depth (ft)         4.44    Weir Flow Area (sq ft)    136.91
  Culv Crt Depth (ft)         6.21    Min El Weir Flow (ft)    1811.25


Warning: During subcritical analysis, while trying to calculate culvert and weir flow, the program could
         not get a balance of energy within the specified tolerance and number of trials.  The program
         used the solution with the minimum error.
Warning: During the culvert outlet computations, the program could not balance the culvert/weir flow.
         The reported outlet energy grade answer may not be valid.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 78
```

```
INPUT
Description: copy of 79, lowered to culvert outlet elevation
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1811.35    13.3  1810.1    26.5 1801.73    38.7 1801.49    49.7 1801.33
    63.6 1811.81    82.5 1811.96   110.2 1812.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    63.6     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    63.6              100      98      95              .3       .5

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1811.23    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               2.70    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1808.53    Reach Len. (ft)           100.00     98.00      95.00
  Crit W.S. (ft)           1808.53    Flow Area (sq ft)                   233.56
  E.G. Slope (ft/ft)      0.008550    Area (sq ft)                        233.56
  Q Total (cfs)            3077.53    Flow (cfs)                         3077.53
  Top Width (ft)             43.47    Top Width (ft)                      43.47
  Vel Total (ft/s)           13.18    Avg. Vel. (ft/s)                    13.18
  Max Chl Dpth (ft)           7.20    Hydr. Depth (ft)                     5.37
  Conv. Total (cfs)        33283.2    Conv. (cfs)                        33283.2
  Length Wtd. (ft)           98.00    Wetted Per. (ft)                    47.86
  Min Ch El (ft)           1801.33    Shear (lb/sq ft)                     2.60
  Alpha                       1.00    Stream Power (lb/ft s)              34.32
  Frctn Loss (ft)             0.69    Cum Volume (acre-ft)        4.29    27.34       0.78
  C & E Loss (ft)             0.54    Cum SA (acres)              3.68     7.48       1.04


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 77

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1808.4    96.3 1805.63   112.7 1800.75   131.8 1800.26     147 1800.64
   157.8 1803.71   164.7 1808.02   177.7  1808.3   199.4 1807.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    96.3     .03   164.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          96.3   164.7              100     106     109              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1807.92    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.62    Wt. n-Val.                 0.060      0.030
  W.S. Elev (ft)           1806.30    Reach Len. (ft)           100.00     106.00     109.00
  Crit W.S. (ft)           1805.77    Flow Area (sq ft)           7.71     300.26
  E.G. Slope (ft/ft)      0.005830    Area (sq ft)                7.71     300.26
  Q Total (cfs)            3077.53    Flow (cfs)                  7.00    3070.53
  Top Width (ft)             88.79    Top Width (ft)             23.15      65.64
  Vel Total (ft/s)            9.99    Avg. Vel. (ft/s)            0.91      10.23
  Max Chl Dpth (ft)           6.04    Hydr. Depth (ft)            0.33       4.57
  Conv. Total (cfs)        40304.6    Conv. (cfs)                 91.7    40213.0
  Length Wtd. (ft)          105.99    Wetted Per. (ft)           23.16      67.53
  Min Ch El (ft)           1800.26    Shear (lb/sq ft)            0.12       1.62
```

Alpha	1.04	Stream Power (lb/ft s)	0.11	16.55	
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	4.28	26.74	0.78
C & E Loss (ft)	0.06	Cum SA (acres)	3.65	7.36	1.04

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 76

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1805.95	41.1	1804.46	62.8	1805.44	76	1799.62	92.1	1799.52
113.8	1799.32	124.1	1806.35	133.2	1804.9	151.8	1804.78	169.2	1804.73
219	1806								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	62.8	.03	124.1	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.8	124.1		124	132	145	.1	.3

Left Levee Station= 62.84 Elevation= 1805.42
Right Levee Station= 124.31 Elevation= 1806.36

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1807.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.22	Wt. n-Val.		0.030	
W.S. Elev (ft)	1804.90	Reach Len. (ft)	124.00	132.00	145.00
Crit W.S. (ft)	1804.90	Flow Area (sq ft)		259.01	
E.G. Slope (ft/ft)	0.008450	Area (sq ft)		259.01	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	57.94	Top Width (ft)		57.94	
Vel Total (ft/s)	11.97	Avg. Vel. (ft/s)		11.97	
Max Chl Dpth (ft)	5.58	Hydr. Depth (ft)		4.47	
Conv. Total (cfs)	33722.6	Conv. (cfs)		33722.6	
Length Wtd. (ft)	132.00	Wetted Per. (ft)		60.78	
Min Ch El (ft)	1799.32	Shear (lb/sq ft)		2.25	
Alpha	1.00	Stream Power (lb/ft s)		26.91	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)	4.27	26.06	0.78
C & E Loss (ft)	0.12	Cum SA (acres)	3.62	7.21	1.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 75

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1803.73	30.1	1803.14	54.1	1801.76	77.5	1796.87	104.3	1795.82
133.4	1797.69	138.4	1802.02	188.2	1801.29				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	54.1	.03	138.4	.06

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          54.1   138.4               81      90      95            .1        .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1802.71    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              1.82    Wt. n-Val.                          0.030
  W.S. Elev (ft)          1800.89    Reach Len. (ft)           81.00     90.00      95.00
  Crit W.S. (ft)          1800.89    Flow Area (sq ft)                  286.45
  E.G. Slope (ft/ft)     0.008788    Area (sq ft)                       286.45
  Q Total (cfs)           3100.00    Flow (cfs)                        3100.00
  Top Width (ft)            78.81    Top Width (ft)                      78.81
  Vel Total (ft/s)          10.82    Avg. Vel. (ft/s)                    10.82
  Max Chl Dpth (ft)          5.07    Hydr. Depth (ft)                     3.63
  Conv. Total (cfs)       33068.9    Conv. (cfs)                       33068.9
  Length Wtd. (ft)          90.00    Wetted Per. (ft)                    80.50
  Min Ch El (ft)          1795.82    Shear (lb/sq ft)                     1.95
  Alpha                      1.00    Stream Power (lb/ft s)              21.13
  Frctn Loss (ft)            0.78    Cum Volume (acre-ft)        4.27    25.23       0.78
  C & E Loss (ft)            0.02    Cum SA (acres)              3.62     7.00       1.04

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 74

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1802.04    26.7 1802.05    42.5 1800.94    63.3 1793.66    76.3 1793.47
    87.2  1794.6   103.3 1795.02   115.4 1800.95   153.7 1799.44

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    42.5     .03   115.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          42.5   115.4              100     100     103            .1        .3
Left Levee      Station=   42.23      Elevation= 1800.97
Right Levee     Station=  115.35      Elevation= 1800.99

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1801.37    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              2.06    Wt. n-Val.                          0.030
  W.S. Elev (ft)          1799.31    Reach Len. (ft)          100.00    100.00     103.00
  Crit W.S. (ft)          1799.31    Flow Area (sq ft)                  268.87
  E.G. Slope (ft/ft)     0.008481    Area (sq ft)                       268.87
  Q Total (cfs)           3100.00    Flow (cfs)                        3100.00
  Top Width (ft)            64.89    Top Width (ft)                      64.89
  Vel Total (ft/s)          11.53    Avg. Vel. (ft/s)                    11.53
  Max Chl Dpth (ft)          5.84    Hydr. Depth (ft)                     4.14
  Conv. Total (cfs)       33662.6    Conv. (cfs)                       33662.6
  Length Wtd. (ft)          100.00   Wetted Per. (ft)                    66.91
  Min Ch El (ft)          1793.47    Shear (lb/sq ft)                     2.13
  Alpha                      1.00    Stream Power (lb/ft s)              24.53
  Frctn Loss (ft)            0.84    Cum Volume (acre-ft)        4.27    24.66       0.78
  C & E Loss (ft)            0.01    Cum SA (acres)              3.62     6.86       1.04

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
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is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 73

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1799.93    30.6  1799.6    47.6 1791.73    67.2 1791.39    84.2 1792.93
    98.9 1799.56   140.2 1797.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    30.6     .03    98.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          30.6    98.9              111      92      81            .1        .3
Left Levee      Station=   30.88      Elevation= 1799.58
Right Levee     Station=   98.85      Elevation= 1799.61

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1799.60    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.21    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1797.39    Reach Len. (ft)            111.00     92.00      81.00
  Crit W.S. (ft)           1797.39    Flow Area (sq ft)                    259.83
  E.G. Slope (ft/ft)      0.008402    Area (sq ft)                         259.83
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)             58.71    Top Width (ft)                        58.71
  Vel Total (ft/s)           11.93    Avg. Vel. (ft/s)                      11.93
  Max Chl Dpth (ft)           6.00    Hydr. Depth (ft)                       4.43
  Conv. Total (cfs)        33819.6    Conv. (cfs)                         33819.6
  Length Wtd. (ft)           92.00    Wetted Per. (ft)                      60.99
  Min Ch El (ft)           1797.39    Shear (lb/sq ft)                       2.23
  Alpha                       1.00    Stream Power (lb/ft s)                26.66
  Frctn Loss (ft)             0.78    Cum Volume (acre-ft)        4.27      24.05       0.78
  C & E Loss (ft)             0.01    Cum SA (acres)              3.62       6.71       1.04


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 72

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1797.66      19  1796.8      22 1791.76    49.6 1790.36    67.3 1791.08
    79.9 1798.63    92.1 1795.58   129.5 1795.36     260    1796

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      19     .03    79.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           19    79.9              109     106     100            .1        .3
Left Levee      Station=   18.68      Elevation= 1796.86
```

Right Levee Station= 80 Elevation= 1798.64

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1798.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.27	Wt. n-Val.		0.030	
W.S. Elev (ft)	1796.01	Reach Len. (ft)	109.00	106.00	100.00
Crit W.S. (ft)	1796.01	Flow Area (sq ft)		256.13	
E.G. Slope (ft/ft)	0.008603	Area (sq ft)		256.13	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	56.07	Top Width (ft)		56.07	
Vel Total (ft/s)	12.10	Avg. Vel. (ft/s)		12.10	
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)		4.57	
Conv. Total (cfs)	33421.4	Conv. (cfs)		33421.4	
Length Wtd. (ft)	106.00	Wetted Per. (ft)		59.90	
Min Ch El (ft)	1790.36	Shear (lb/sq ft)		2.30	
Alpha	1.00	Stream Power (lb/ft s)		27.80	
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	4.27	23.50	0.78
C & E Loss (ft)	0.10	Cum SA (acres)	3.62	6.59	1.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 71

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1794.54	26.4	1794.77	42.2	1789.75	61.4	1789.08	70.8	1788.65
77.1	1789.5	88.7	1789.65	102.3	1795.27	117.8	1795.31	150.4	1792.9
180	1794								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	26.4	.03	102.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
26.4	102.3	104	108	108	.1	.3

Left Levee Station= 26.34 Elevation= 1794.74
Right Levee Station= 102.48 Elevation= 1795.26

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1796.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.94	Wt. n-Val.		0.030	
W.S. Elev (ft)	1794.11	Reach Len. (ft)	104.00	108.00	108.00
Crit W.S. (ft)	1794.11	Flow Area (sq ft)		277.68	
E.G. Slope (ft/ft)	0.008501	Area (sq ft)		277.68	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	71.01	Top Width (ft)		71.01	
Vel Total (ft/s)	11.16	Avg. Vel. (ft/s)		11.16	
Max Chl Dpth (ft)	5.46	Hydr. Depth (ft)		3.91	
Conv. Total (cfs)	33621.8	Conv. (cfs)		33621.8	
Length Wtd. (ft)	108.00	Wetted Per. (ft)		72.65	
Min Ch El (ft)	1788.65	Shear (lb/sq ft)		2.03	
Alpha	1.00	Stream Power (lb/ft s)		22.65	
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	4.27	22.85	0.78
C & E Loss (ft)	0.03	Cum SA (acres)	3.62	6.44	1.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

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        section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
        depth, the calculated water surface came back below critical depth.  This indicates that there
is
        not a valid subcritical answer.  The program defaulted to critical depth.
Note:   Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
        water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 70

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1792.56     6.8 1792.36    17.3 1788.76    42.9  1786.5    51.4 1787.95
    63.9 1788.15    74.1 1791.82    99.5 1791.36   125.6 1793.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08     6.8     .03    74.1     .08

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          6.8    74.1              106     105     108            .1        .3
Right Levee     Station=   73.96      Elevation= 1791.86

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1794.44    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              1.83    Wt. n-Val.                0.080      0.030     0.080
  W.S. Elev (ft)          1792.61    Reach Len. (ft)          106.00     105.00    108.00
  Crit W.S. (ft)          1792.61    Flow Area (sq ft)          1.02     278.58     34.99
  E.G. Slope (ft/ft)     0.007580    Area (sq ft)               1.02     278.58     34.99
  Q Total (cfs)           3100.00    Flow (cfs)                 0.46    3047.76     51.78
  Top Width (ft)           114.00    Top Width (ft)             6.80      67.30     39.90
  Vel Total (ft/s)           9.85    Avg. Vel. (ft/s)           0.45      10.94      1.48
  Max Chl Dpth (ft)          6.11    Hydr. Depth (ft)           0.15       4.14      0.88
  Conv. Total (cfs)       35605.3    Conv. (cfs)                 5.3    35005.3     594.7
  Length Wtd. (ft)         105.03    Wetted Per. (ft)           6.85      68.94     39.96
  Min Ch El (ft)          1786.50    Shear (lb/sq ft)           0.07       1.91      0.41
  Alpha                      1.21    Stream Power (lb/ft s)     0.03      20.92      0.61
  Frctn Loss (ft)            0.86    Cum Volume (acre-ft)       4.27      22.17      0.74
  C & E Loss (ft)            0.02    Cum SA (acres)             3.62       6.27      0.99


Warning: The energy equation could not be balanced within the specified number of iterations.  The
        program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
        section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
        depth, the calculated water surface came back below critical depth.  This indicates that there
is
        not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 69.4

INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       2
     Sta    Elev     Sta    Elev
       0 1792.56     106 1788.99

Weir crest shape                          = Broad Crested
```

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1794.44	Weir Sta US (ft)	0.00
W.S. US. (ft)	1792.61	Weir Sta DS (ft)	106.00
E.G. DS (ft)	1792.82	Weir Max Depth (ft)	1.78
W.S. DS (ft)	1790.77	Weir Avg Depth (ft)	0.91
Q US (cfs)	3100.00	Weir Submerg	0.00
Q Leaving Total (cfs)	258.16	Min El Weir Flow (ft)	1788.99
Q DS (cfs)	2841.92	Wr Top Wdth (ft)	106.00
Perc Q Leaving	8.33	Q Gate Group (cfs)	
Q Weir (cfs)	258.16	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	96.79	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 69

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1788.99	7.2	1788.66	25.3	1784.75	37.1	1784.68	46	1785.55
64.4	1792.13	84.8	1792.17	121	1792.98				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	64.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	64.4	140	140	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1792.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.05	Wt. n-Val.		0.030	
W.S. Elev (ft)	1790.77	Reach Len. (ft)	140.00	140.00	140.00
Crit W.S. (ft)	1790.77	Flow Area (sq ft)		247.21	
E.G. Slope (ft/ft)	0.008839	Area (sq ft)		247.21	
Q Total (cfs)	2841.92	Flow (cfs)		2841.92	
Top Width (ft)	60.59	Top Width (ft)		60.59	
Vel Total (ft/s)	11.50	Avg. Vel. (ft/s)		11.50	
Max Chl Dpth (ft)	6.09	Hydr. Depth (ft)		4.08	
Conv. Total (cfs)	30228.1	Conv. (cfs)		30228.1	
Length Wtd. (ft)	140.00	Wetted Per. (ft)		63.73	
Min Ch El (ft)	1784.68	Shear (lb/sq ft)		2.14	
Alpha	1.00	Stream Power (lb/ft s)		24.61	
Frctn Loss (ft)	1.09	Cum Volume (acre-ft)	4.27	21.53	0.69
C & E Loss (ft)	0.01	Cum SA (acres)	3.61	6.11	0.94

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 68.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5

```
Weir Flow Reference        = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1792.98     140  1786.2

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1792.82    Weir Sta US (ft)          101.87
  W.S. US. (ft)            1790.77    Weir Sta DS (ft)          140.00
  E.G. DS (ft)             1789.23    Weir Max Depth (ft)         0.83
  W.S. DS (ft)             1787.03    Weir Avg Depth (ft)         0.41
  Q US (cfs)               2841.92    Weir Submerg                0.00
  Q Leaving Total (cfs)      28.77    Min El Weir Flow (ft)    1786.20
  Q DS (cfs)               2537.82    Wr Top Wdth (ft)          38.13
  Perc Q Leaving              1.03    Q Gate Group (cfs)
  Q Weir (cfs)               28.77    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     15.80    Gate Invert (ft)


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 68.4

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS -       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference        = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1788.99     140  1787.4

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1792.82    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1790.77    Weir Sta DS (ft)          115.79
  E.G. DS (ft)             1789.23    Weir Max Depth (ft)         1.78
  W.S. DS (ft)             1787.03    Weir Avg Depth (ft)         0.89
  Q US (cfs)               2841.92    Weir Submerg                0.00
  Q Leaving Total (cfs)     274.05    Min El Weir Flow (ft)    1787.40
  Q DS (cfs)               2537.82    Wr Top Wdth (ft)          115.79
  Perc Q Leaving              9.67    Q Gate Group (cfs)
  Q Weir (cfs)              274.05    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)    102.82    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 68

INPUT
Description:
Station Elevation Data     num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1787.4     9.6 1787.34    17.4 1780.09    30.4 1779.87      39 1779.95
    46.1 1786.21      70  1786.2

Manning's n values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    46.1     .04
```

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	46.1	115	110	108	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1789.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.20	Wt. n-Val.		0.030	0.040
W.S. Elev (ft)	1787.03	Reach Len. (ft)	115.00	110.00	108.00
Crit W.S. (ft)	1787.03	Flow Area (sq ft)		206.79	19.69
E.G. Slope (ft/ft)	0.006867	Area (sq ft)		206.79	19.69
Q Total (cfs)	2537.82	Flow (cfs)		2485.76	52.06
Top Width (ft)	60.07	Top Width (ft)		36.17	23.90
Vel Total (ft/s)	11.21	Avg. Vel. (ft/s)		12.02	2.64
Max Chl Dpth (ft)	7.16	Hydr. Depth (ft)		5.72	0.82
Conv. Total (cfs)	30624.7	Conv. (cfs)		29996.5	628.2
Length Wtd. (ft)	109.95	Wetted Per. (ft)		41.26	24.73
Min Ch El (ft)	1779.87	Shear (lb/sq ft)		2.15	0.34
Alpha	1.13	Stream Power (lb/ft s)		25.83	0.90
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)	4.27	20.80	0.66
C & E Loss (ft)	0.23	Cum SA (acres)	3.61	5.96	0.90

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 67.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1786.2	108	1783.2

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1789.23	Weir Sta US (ft)	0.00
W.S. US. (ft)	1787.03	Weir Sta DS (ft)	63.14
E.G. DS (ft)	1784.04	Weir Max Depth (ft)	0.83
W.S. DS (ft)	1782.61	Weir Avg Depth (ft)	0.41
Q US (cfs)	2537.82	Weir Submerg	0.00
Q Leaving Total (cfs)	47.63	Min El Weir Flow (ft)	1783.20
Q DS (cfs)	2489.44	Wr Top Wdth (ft)	63.14
Perc Q Leaving	1.91	Q Gate Group (cfs)	
Q Weir (cfs)	47.63	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	26.16	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 67.4

INPUT
Description:

```
Lateral structure position      = Left overbank
Distance from Upstream XS =        0
Deck/Roadway Width         =       5
Weir Coefficient           =     2.5
Weir Flow Reference        = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0  1787.4     115  1786.1

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1789.23    Weir Sta US (ft)
  W.S. US. (ft)            1787.03    Weir Sta DS (ft)
  E.G. DS (ft)             1784.04    Weir Max Depth (ft)
  W.S. DS (ft)             1782.61    Weir Avg Depth (ft)
  Q US (cfs)               2537.82    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1786.10
  Q DS (cfs)               2489.44    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 67

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1786.1      35 1783.72    45.5 1783.16    76.3 1776.89    90.7 1776.21
   100.4 1777.68     110    1782   134.8 1781.73   154.2 1781.97     304  1783.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    45.5     .03     110     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          45.5     110             106     105     105            .1        .3
Left Levee      Station=   45.44      Elevation= 1783.16
Right Levee     Station=  109.93      Elevation= 1782.01

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1784.04    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.42    Wt. n-Val.                            0.030     0.060
  W.S. Elev (ft)           1782.61    Reach Len. (ft)            106.00    105.00    105.00
  Crit W.S. (ft)           1782.61    Flow Area (sq ft)                    249.23     58.30
  E.G. Slope (ft/ft)      0.006209    Area (sq ft)                         249.23     58.30
  Q Total (cfs)            2489.44    Flow (cfs)                          2420.01     69.43
  Top Width (ft)            184.08    Top Width (ft)                        61.80    122.28
  Vel Total (ft/s)            8.09    Avg. Vel. (ft/s)                      9.71      1.19
  Max Chl Dpth (ft)           6.40    Hydr. Depth (ft)                      4.03      0.48
  Conv. Total (cfs)        31592.0    Conv. (cfs)                        30710.9     881.1
  Length Wtd. (ft)          105.00    Wetted Per. (ft)                      63.52    122.29
  Min Ch El (ft)           1776.21    Shear (lb/sq ft)                      1.52      0.18
  Alpha                       1.40    Stream Power (lb/ft s)               14.77      0.22
  Frctn Loss (ft)             0.78    Cum Volume (acre-ft)        4.27     20.23      0.56
  C & E Loss (ft)             0.05    Cum SA (acres)              3.61      5.83      0.72


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
```

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valid,
        energy was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 66

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1782.42    27.1 1776.33    47.6 1774.11    60.5 1772.48    72.3 1773.32
    79.9 1778.58   126.3 1779.87   228.3    1781

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    79.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    79.9              100      98     100              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1780.43    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.89    Wt. n Val.                            0.030
  W.S. Elev (ft)           1778.53    Reach Len. (ft)           100.00      98.00     100.00
  Crit W.S. (ft)           1778.53    Flow Area (sq ft)                    232.39
  E.G. Slope (ft/ft)      0.009036    Area (sq ft)                         232.39
  Q Total (cfs)            2567.10    Flow (cfs)                          2567.10
  Top Width (ft)             62.54    Top Width (ft)                        62.54
  Vel Total (ft/s)           11.05    Avg. Vel. (ft/s)                      11.05
  Max Chl Dpth (ft)           6.05    Hydr. Depth (ft)                       3.72
  Conv. Total (cfs)        27006.4    Conv. (cfs)                         27006.4
  Length Wtd. (ft)           98.00    Wetted Per. (ft)                      64.66
  Min Ch El (ft)           1772.48    Shear (lb/sq ft)                       2.03
  Alpha                       1.00    Stream Power (lb/ft s)                22.40
  Frctn Loss (ft)             0.87    Cum Volume (acre-ft)        4.27      19.65       0.49
  C & E Loss (ft)             0.01    Cum SA (acres)              3.61       5.68       0.57


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 65

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1776.83    20.6 1777.63    39.6 1779.35    52.9 1774.23    57.5 1771.76
    81.8 1769.85    91.6 1770.32   112.8 1777.18   144.2 1777.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.6     .03   112.8     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.6   112.8              103     100      95              .1       .3
Left Levee      Station=   39.51      Elevation= 1779.36
Right Levee     Station=  112.77      Elevation= 1777.18

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1777.57    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.96    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1775.61    Reach Len. (ft)           103.00     100.00      95.00
  Crit W.S. (ft)           1775.61    Flow Area (sq ft)                    228.59
```

E.G. Slope (ft/ft)	0.008722	Area (sq ft)			228.59	
Q Total (cfs)	2567.10	Flow (cfs)			2567.10	
Top Width (ft)	58.63	Top Width (ft)			58.63	
Vel Total (ft/s)	11.23	Avg. Vel. (ft/s)			11.23	
Max Chl Dpth (ft)	5.76	Hydr. Depth (ft)			3.90	
Conv. Total (cfs)	27488.1	Conv. (cfs)			27488.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)			60.42	
Min Ch El (ft)	1769.85	Shear (lb/sq ft)			2.06	
Alpha	1.00	Stream Power (lb/ft s)			23.13	
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)		4.27	19.13	0.49
C & E Loss (ft)	0.01	Cum SA (acres)		3.61	5.55	0.57

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 64

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1774.04	34.4	1774.47	43.3	1776.38	53	1768.6	68.8	1769.06
72.9	1767.05	83.5	1767.18	86.9	1769.22	91.6	1769.16	105.3	1774.66
128.6	1775.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	43.3	.03	105.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.3	105.3		110	95	86	.1	.3

Left Levee Station= 43.18 Elevation= 1776.41

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1775.24	Element		Left OB	Channel	Right OB
Vel Head (ft)	2.05	Wt. n-Val.			0.030	
W.S. Elev (ft)	1773.19	Reach Len. (ft)		110.00	95.00	86.00
Crit W.S. (ft)	1773.19	Flow Area (sq ft)			223.45	
E.G. Slope (ft/ft)	0.008865	Area (sq ft)			223.45	
Q Total (cfs)	2567.10	Flow (cfs)			2567.10	
Top Width (ft)	54.36	Top Width (ft)			54.36	
Vel Total (ft/s)	11.49	Avg. Vel. (ft/s)			11.49	
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)			4.11	
Conv. Total (cfs)	27265.1	Conv. (cfs)			27265.1	
Length Wtd. (ft)	95.00	Wetted Per. (ft)			57.79	
Min Ch El (ft)	1767.05	Shear (lb/sq ft)			2.14	
Alpha	1.00	Stream Power (lb/ft s)			24.58	
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		4.27	18.61	0.49
C & E Loss (ft)	0.11	Cum SA (acres)		3.61	5.42	0.57

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

```
RIVER: Ajo
REACH: Primary            RS: 63

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1771.8    18.1 1771.81    28.2  1774.4    41.8 1766.54    58.2 1766.21
    74.3 1767.58    90.9 1769.79   104.1 1770.44   113.2 1773.74   119.8  1772.1
   144.1 1772.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    28.2     .03   113.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          28.2   113.2              99      99      98            .1        .3
Left Levee      Station=   28.16      Elevation= 1774.43
Right Levee     Station=  113.38      Elevation= 1773.71

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1773.19    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.67    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1771.52    Reach Len. (ft)             99.00     99.00      98.00
  Crit W.S. (ft)           1771.52    Flow Area (sq ft)                    247.43
  E.G. Slope (ft/ft)      0.009035    Area (sq ft)                         247.43
  Q Total (cfs)            2567.10    Flow (cfs)                          2567.10
  Top Width (ft)             73.89    Top Width (ft)                        73.89
  Vel Total (ft/s)           10.37    Avg. Vel. (ft/s)                      10.37
  Max Chl Dpth (ft)           5.31    Hydr. Depth (ft)                       3.35
  Conv. Total (cfs)        27006.7    Conv. (cfs)                         27006.7
  Length Wtd. (ft)           99.00    Wetted Per. (ft)                      75.64
  Min Ch El (ft)           1766.21    Shear (lb/sq ft)                       1.85
  Alpha                       1.00    Stream Power (lb/ft s)                19.14
  Frctn Loss (ft)             0.92    Cum Volume (acre-ft)        4.27      18.09       0.49
  C & E Loss (ft)             0.12    Cum SA (acres)              3.61       5.28       0.57


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 62

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1769.09    35.1  1771.9    49.9 1764.58    70.6 1765.44    80.6 1766.41
     102 1767.05   123.8 1767.84   142.8 1767.93   150.8    1770   184.1 1769.69
   218.3 1769.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    35.1     .03   150.8     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          35.1   150.8             110     100      90            .1        .3
Left Levee      Station=   35.24      Elevation= 1771.91
Right Levee     Station=  151.37      Elevation= 1769.98

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1770.69    Element                    Left OB    Channel   Right OB
```

Vel Head (ft)	1.29	Wt. n-Val.		0.030	
W.S. Elev (ft)	1769.40	Reach Len. (ft)	110.00	100.00	90.00
Crit W.S. (ft)	1769.40	Flow Area (sq ft)		281.90	
E.G. Slope (ft/ft)	0.009608	Area (sq ft)		281.90	
Q Total (cfs)	2567.10	Flow (cfs)		2567.10	
Top Width (ft)	108.33	Top Width (ft)		108.33	
Vel Total (ft/s)	9.11	Avg. Vel. (ft/s)		9.11	
Max Chl Dpth (ft)	4.82	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	26189.6	Conv. (cfs)		26189.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		109.73	
Min Ch El (ft)	1764.58	Shear (lb/sq ft)		1.54	
Alpha	1.00	Stream Power (lb/ft s)		14.03	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	4.27	17.49	0.49
C & E Loss (ft)	0.02	Cum SA (acres)	3.61	5.07	0.57

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 61

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1766.4	30.5	1766.65	48.4	1770.56	57.9	1765.88	69.4	1764.17
85.8	1764.65	90.4	1760.65	100.4	1760.85	104.5	1764.11	126	1766.44
137.1	1765.04	152.9	1769.56	195.5	1768.04				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	48.4	.03	152.9	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
48.4	152.9	130	125	122	.1	.3

Left Levee Station= 48.44 Elevation= 1770.54
Right Levee Station= 153.07 Elevation= 1769.55

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1768.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.45	Wt. n-Val.		0.030	
W.S. Elev (ft)	1767.45	Reach Len. (ft)	130.00	125.00	122.00
Crit W.S. (ft)	1767.45	Flow Area (sq ft)		265.85	
E.G. Slope (ft/ft)	0.009573	Area (sq ft)		265.85	
Q Total (cfs)	2567.10	Flow (cfs)		2567.10	
Top Width (ft)	90.83	Top Width (ft)		90.83	
Vel Total (ft/s)	9.66	Avg. Vel. (ft/s)		9.66	
Max Chl Dpth (ft)	6.80	Hydr. Depth (ft)		2.93	
Conv. Total (cfs)	26237.9	Conv. (cfs)		26237.9	
Length Wtd. (ft)	125.00	Wetted Per. (ft)		94.51	
Min Ch El (ft)	1760.65	Shear (lb/sq ft)		1.68	
Alpha	1.00	Stream Power (lb/ft s)		16.23	
Frctn Loss (ft)	1.15	Cum Volume (acre-ft)	4.27	16.86	0.49
C & E Loss (ft)	0.03	Cum SA (acres)	3.61	4.84	0.57

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest,

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valid,
        water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 60

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1769.15    19.1 1762.66    36.8 1762.56    43.1  1759.1    55.6 1759.39
    70.4 1761.47    86.4  1766.8   133.5 1766.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    86.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0    86.4              103     103     102             .1       .3
Left Levee      Station=     -.1      Elevation= 1769.11
Right Levee     Station=   86.24      Elevation= 1766.85

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1766.85    Element                   Left OB    Channel   Right OB
  Vel Head (ft)              1.73    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1765.12    Reach Len. (ft)          103.00     103.00     102.00
  Crit W.S. (ft)          1765.12    Flow Area (sq ft)                   242.92
  E.G. Slope (ft/ft)     0.008913    Area (sq ft)                        242.92
  Q Total (cfs)           2567.10    Flow (cfs)                         2567.10
  Top Width (ft)            69.47    Top Width (ft)                       69.47
  Vel Total (ft/s)          10.57    Avg. Vel. (ft/s)                     10.57
  Max Chl Dpth (ft)          6.02    Hydr. Depth (ft)                      3.50
  Conv. Total (cfs)       27191.1    Conv. (cfs)                       27191.1
  Length Wtd. (ft)         103.00    Wetted Per. (ft)                     71.51
  Min Ch El (ft)          1759.10    Shear (lb/sq ft)                      1.89
  Alpha                      1.00    Stream Power (lb/ft s)               19.98
  Frctn Loss (ft)            0.99    Cum Volume (acre-ft)        4.27     16.13       0.49
  C & E Loss (ft)            0.22    Cum SA (acres)              3.61      4.61       0.57


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         energy was used.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 59.4

INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1769.15     103 1761.03

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct
```

E.G. US. (ft)	1766.85	Weir Sta US (ft)	71.36
W.S. US. (ft)	1765.12	Weir Sta DS (ft)	103.00
E.G. DS (ft)	1763.81	Weir Max Depth (ft)	1.79
W.S. DS (ft)	1762.82	Weir Avg Depth (ft)	0.89
Q US (cfs)	2567.10	Weir Submerg	0.00
Q Leaving Total (cfs)	75.70	Min El Weir Flow (ft)	1761.03
Q DS (cfs)	2492.21	Wr Top Wdth (ft)	31.64
Perc Q Leaving	2.92	Q Gate Group (cfs)	
Q Weir (cfs)	75.70	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	28.30	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 59

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1761.03	49.5	1759.04	97.2	1761.23	161.5	1762.96	213.1	1763.19
264.4	1763.25	311.3	1762.78						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	161.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	161.5	90	100	112	.1	.3

Right Levee Station= 161.06 Elevation= 1762.95

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1763.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.99	Wt. n-Val.		0.030	
W.S. Elev (ft)	1762.82	Reach Len. (ft)	90.00	100.00	112.00
Crit W.S. (ft)	1762.82	Flow Area (sq ft)		312.73	
E.G. Slope (ft/ft)	0.010430	Area (sq ft)		312.73	
Q Total (cfs)	2492.21	Flow (cfs)		2492.21	
Top Width (ft)	156.26	Top Width (ft)		156.26	
Vel Total (ft/s)	7.97	Avg. Vel. (ft/s)		7.97	
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)		2.00	
Conv. Total (cfs)	24402.9	Conv. (cfs)		24402.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		158.16	
Min Ch El (ft)	1759.04	Shear (lb/sq ft)		1.29	
Alpha	1.00	Stream Power (lb/ft s)		10.26	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	4.27	15.48	0.49
C & E Loss (ft)	0.09	Cum SA (acres)	3.61	4.34	0.57

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 58.4

INPUT
Description:

```
Lateral structure position      = Left overbank
Distance from Upstream XS =        0
Deck/Roadway Width          =       5
Weir Coefficient            =     2.5
Weir Flow Reference         = Water Surface
 Weir Embankment Coordinates     num =        2
     Sta    Elev      Sta    Elev
       0 1761.03      90 1761.59

Weir crest shape                            = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1763.81    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1762.82    Weir Sta DS (ft)           35.88
  E.G. DS (ft)             1760.79    Weir Max Depth (ft)         1.79
  W.S. DS (ft)             1758.89    Weir Avg Depth (ft)         0.89
  Q US (cfs)               2492.21    Weir Submerg                0.00
  Q Leaving Total (cfs)      85.85    Min El Weir Flow (ft)    1761.03
  Q DS (cfs)               2407.40    Wr Top Wdth (ft)           35.88
  Perc Q Leaving              3.40    Q Gate Group (cfs)
  Q Weir (cfs)               85.85    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     32.09    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 58

INPUT
Description:
Station Elevation Data     num=       9
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1761.59     7.9 1755.95    20.3 1755.05    25.1 1752.96      37 1752.86
    40.4 1754.45    53.1 1756.21    62.4    1759   126.1  1760.4

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0      .1        0     .03     62.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    62.4              120     140     157              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1760.79    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.90    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1758.89    Reach Len. (ft)          120.00     140.00     157.00
  Crit W.S. (ft)           1758.89    Flow Area (sq ft)                   217.81
  E.G. Slope (ft/ft)      0.009033    Area (sq ft)                        217.81
  Q Total (cfs)            2407.40    Flow (cfs)                         2407.40
  Top Width (ft)             58.26    Top Width (ft)                       58.26
  Vel Total (ft/s)           11.05    Avg. Vel. (ft/s)                     11.05
  Max Chl Dpth (ft)           6.03    Hydr. Depth (ft)                      3.74
  Conv. Total (cfs)        25330.3    Conv. (cfs)                       25330.3
  Length Wtd. (ft)          140.07    Wetted Per. (ft)                     60.54
  Min Ch El (ft)           1752.86    Shear (lb/sq ft)                      2.03
  Alpha                       1.00    Stream Power (lb/ft s)               22.42
  Frctn Loss (ft)             1.23    Cum Volume (acre-ft)       4.27      14.87       0.49
  C & E Loss (ft)             0.16    Cum SA (acres)             3.61       4.10       0.57


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
```

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 57.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1760.4	157	1756.94

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1760.79	Weir Sta US (ft)	146.21
W.S. US. (ft)	1758.89	Weir Sta DS (ft)	157.00
E.G. DS (ft)	1758.40	Weir Max Depth (ft)	0.11
W.S. DS (ft)	1757.05	Weir Avg Depth (ft)	0.06
Q US (cfs)	2407.40	Weir Submerg	0.00
Q Leaving Total (cfs)	0.42	Min El Weir Flow (ft)	1756.94
Q DS (cfs)	2406.91	Wr Top Wdth (ft)	10.79
Perc Q Leaving	0.02	Q Gate Group (cfs)	
Q Weir (cfs)	0.42	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	0.60	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 57

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1756.35	38.2	1757.68	52.1	1754.26	67.2	1753.71	72.4	1751.18
83.4	1751.02	89.1	1753.74	103.7	1754.52	126.7	1756.6	149.8	1756.39
165.3	1756.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	38.2	.03	126.7	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.2	126.7		120	113	105	.1	.3

Left Levee Station= 38.03 Elevation= 1757.68

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1758.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.35	Wt. n-Val.		0.030	0.080
W.S. Elev (ft)	1757.05	Reach Len. (ft)	120.00	113.00	105.00
Crit W.S. (ft)	1757.05	Flow Area (sq ft)		255.13	18.84
E.G. Slope (ft/ft)	0.008579	Area (sq ft)		255.13	18.84
Q Total (cfs)	2406.91	Flow (cfs)		2386.86	20.05
Top Width (ft)	124.54	Top Width (ft)		85.94	38.60
Vel Total (ft/s)	8.79	Avg. Vel. (ft/s)		9.36	1.06
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)		2.97	0.49
Conv. Total (cfs)	25985.8	Conv. (cfs)		25769.4	216.4
Length Wtd. (ft)	112.97	Wetted Per. (ft)		87.61	38.72
Min Ch El (ft)	1751.02	Shear (lb/sq ft)		1.56	0.26
Alpha	1.12	Stream Power (lb/ft s)		14.59	0.28
Frctn Loss (ft)	1.04	Cum Volume (acre-ft)	4.27	14.11	0.46
C & E Loss (ft)	0.02	Cum SA (acres)	3.61	3.87	0.51

Warning: The energy equation could not be balanced within the specified number of iterations. The

```
         program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest,
valid,
         energy was used.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 56.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1756.94     105  1755.6

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1758.40    Weir Sta US (ft)           0.00
  W.S. US. (ft)            1757.05    Weir Sta DS (ft)         105.00
  E.G. DS (ft)             1756.96    Weir Max Depth (ft)        0.11
  W.S. DS (ft)             1755.67    Weir Avg Depth (ft)        0.09
  Q US (cfs)               2406.91    Weir Submerg               0.00
  Q Leaving Total (cfs)       7.61    Min El Weir Flow (ft)    1755.60
  Q DS (cfs)               2398.54    Wr Top Wdth (ft)         105.00
  Perc Q Leaving              0.35    Q Gate Group (cfs)
  Q Weir (cfs)                7.61    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)      9.62    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 56

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1756.94    10.4 1753.37    21.4 1752.99    26.4  1750.3    37.8 1750.64
    43.5 1753.07    66.7 1752.38    73.9 1754.46    97.3 1753.95   106.5  1755.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1       0     .03   106.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   106.5              115     120     130             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1756.96    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               1.29    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1755.67    Reach Len. (ft)          115.00     120.00     130.00
  Crit W.S. (ft)           1755.67    Flow Area (sq ft)                   263.48
  E.G. Slope (ft/ft)      0.009894    Area (sq ft)                        263.48
  Q Total (cfs)            2398.54    Flow (cfs)                         2398.54
  Top Width (ft)            102.81    Top Width (ft)                      102.81
```

Vel Total (ft/s)	9.10	Avg. Vel. (ft/s)		9.10	
Max Chl Dpth (ft)	5.37	Hydr. Depth (ft)		2.56	
Conv. Total (cfs)	24113.3	Conv. (cfs)		24113.3	
Length Wtd. (ft)	120.00	Wetted Per. (ft)		104.90	
Min Ch El (ft)	1750.30	Shear (lb/sq ft)		1.55	
Alpha	1.00	Stream Power (lb/ft s)		14.12	
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	4.27	13.44	0.44
C & E Loss (ft)	0.03	Cum SA (acres)	3.61	3.62	0.46

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 55.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1755.6	130	1753.8

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1756.96	Weir Sta US (ft)	0.00
W.S. US. (ft)	1755.67	Weir Sta DS (ft)	130.00
E.G. DS (ft)	1755.62	Weir Max Depth (ft)	0.64
W.S. DS (ft)	1754.44	Weir Avg Depth (ft)	0.36
Q US (cfs)	2398.54	Weir Submerg	0.00
Q Leaving Total (cfs)	77.80	Min El Weir Flow (ft)	1753.80
Q DS (cfs)	2318.27	Wr Top Wdth (ft)	130.00
Perc Q Leaving	3.30	Q Gate Group (cfs)	
Q Weir (cfs)	77.80	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	46.33	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 55.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1756.94	115	1754.27

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1756.96	Weir Sta US (ft)	101.34
W.S. US. (ft)	1755.67	Weir Sta DS (ft)	115.00
E.G. DS (ft)	1755.62	Weir Max Depth (ft)	0.17
W.S. DS (ft)	1754.44	Weir Avg Depth (ft)	0.09
Q US (cfs)	2398.54	Weir Submerg	0.00
Q Leaving Total (cfs)	0.96	Min El Weir Flow (ft)	1754.27
Q DS (cfs)	2318.27	Wr Top Wdth (ft)	13.66
Perc Q Leaving	0.05	Q Gate Group (cfs)	
Q Weir (cfs)	0.96	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	1.17	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 55

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1754.27	8.9	1752.59	22.4	1752.5	27	1749.98	41.6	1750.04
47	1752.06	71.2	1751.52	83.2	1753.02	105	1752.79	113.5	1753.77

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	113.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	113.5	94	96	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1755.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.18	Wt. n-Val.		0.030	
W.S. Elev (ft)	1754.44	Reach Len. (ft)	94.00	96.00	100.00
Crit W.S. (ft)	1754.44	Flow Area (sq ft)		265.87	
E.G. Slope (ft/ft)	0.010216	Area (sq ft)		265.87	
Q Total (cfs)	2318.27	Flow (cfs)		2318.27	
Top Width (ft)	113.50	Top Width (ft)		113.50	
Vel Total (ft/s)	8.72	Avg. Vel. (ft/s)		8.72	
Max Chl Dpth (ft)	4.46	Hydr. Depth (ft)		2.34	
Conv. Total (cfs)	22936.0	Conv. (cfs)		22936.0	
Length Wtd. (ft)	96.45	Wetted Per. (ft)		115.67	
Min Ch El (ft)	1749.98	Shear (lb/sq ft)		1.47	
Alpha	1.00	Stream Power (lb/ft s)		12.78	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)	4.27	12.71	0.44
C & E Loss (ft)	0.01	Cum SA (acres)	3.61	3.32	0.46

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 54.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0

```
Deck/Roadway Width          =       5
Weir Coefficient            =     2.6
Weir Flow Reference         = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0  1753.8     100 1752.15

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1755.62    Weir Sta US (ft)           0.00
  W.S. US. (ft)            1754.44    Weir Sta DS (ft)         100.00
  E.G. DS (ft)             1754.44    Weir Max Depth (ft)        0.97
  W.S. DS (ft)             1753.12    Weir Avg Depth (ft)        0.81
  Q US (cfs)               2318.27    Weir Submerg               0.00
  Q Leaving Total (cfs)     188.89    Min El Weir Flow (ft)    1752.15
  Q DS (cfs)               2054.40    Wr Top Wdth (ft)         100.00
  Perc Q Leaving              8.20    Q Gate Group (cfs)
  Q Weir (cfs)              188.89    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     80.54    Gate Invert (ft)


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 54.4

INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width          =       5
Weir Coefficient            =     2.5
Weir Flow Reference         = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1754.27      94  1752.4

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1755.62    Weir Sta US (ft)           0.00
  W.S. US. (ft)            1754.44    Weir Sta DS (ft)          94.00
  E.G. DS (ft)             1754.44    Weir Max Depth (ft)        0.72
  W.S. DS (ft)             1753.12    Weir Avg Depth (ft)        0.45
  Q US (cfs)               2318.27    Weir Submerg               0.00
  Q Leaving Total (cfs)      73.22    Min El Weir Flow (ft)    1752.40
  Q DS (cfs)               2054.40    Wr Top Wdth (ft)          94.00
  Perc Q Leaving              3.19    Q Gate Group (cfs)
  Q Weir (cfs)               73.22    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     41.87    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 54

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1752.4    16.8 1750.86    22.2 1748.74    34.6 1748.51    41.8 1748.51
    46.4 1749.99    61.3 1749.85    66.8 1750.18    80.6 1750.71    93.7 1751.44
   107.7 1751.84   112.7 1752.15

Manning's n Values        num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	46.4	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	46.4	90	81	79	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1754.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.32	Wt. n-Val.		0.030	0.080
W.S. Elev (ft)	1753.12	Reach Len. (ft)	90.00	81.00	79.00
Crit W.S. (ft)	1753.12	Flow Area (sq ft)		149.69	154.80
E.G. Slope (ft/ft)	0.009688	Area (sq ft)		149.69	154.80
Q Total (cfs)	2054.40	Flow (cfs)		1561.40	493.00
Top Width (ft)	112.70	Top Width (ft)		46.40	66.30
Vel Total (ft/s)	6.75	Avg. Vel. (ft/s)		10.43	3.18
Max Chl Dpth (ft)	4.61	Hydr. Depth (ft)		3.23	2.33
Conv. Total (cfs)	20872.4	Conv. (cfs)		15863.6	5008.8
Length Wtd. (ft)	80.74	Wetted Per. (ft)		47.83	67.33
Min Ch El (ft)	1748.51	Shear (lb/sq ft)		1.89	1.39
Alpha	1.87	Stream Power (lb/ft s)		19.75	4.43
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	4.27	12.25	0.26
C & E Loss (ft)	0.03	Cum SA (acres)	3.61	3.15	0.38

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 53.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1752.15	79	1753.45

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1754.44	Weir Sta US (ft)	0.00
W.S. US. (ft)	1753.12	Weir Sta DS (ft)	29.65
E.G. DS (ft)	1753.51	Weir Max Depth (ft)	0.97
W.S. DS (ft)	1751.84	Weir Avg Depth (ft)	0.48
Q US (cfs)	2054.40	Weir Submerg	0.00
Q Leaving Total (cfs)	29.46	Min El Weir Flow (ft)	1752.15
Q DS (cfs)	1729.53	Wr Top Wdth (ft)	29.65
Perc Q Leaving	1.44	Q Gate Group (cfs)	
Q Weir (cfs)	29.46	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	14.38	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 53.4

```
INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0  1752.4      90 1750.25

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1754.44    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1753.12    Weir Sta DS (ft)           90.00
  E.G. DS (ft)             1753.51    Weir Max Depth (ft)         1.59
  W.S. DS (ft)             1751.84    Weir Avg Depth (ft)         1.15
  Q US (cfs)               2054.40    Weir Submerg                0.44
  Q Leaving Total (cfs)     294.83    Min El Weir Flow (ft)    1750.25
  Q DS (cfs)               1729.53    Wr Top Wdth (ft)           90.00
  Perc Q Leaving             14.38    Q Gate Group (cfs)
  Q Weir (cfs)              294.83    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)    103.77    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 53

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1750.25     2.8 1748.91    15.3 1748.72    20.4 1747.87    29.4 1747.53
    37.4 1747.78    40.5 1749.22    45.8 1748.55      53 1753.45

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1       0     .03      53     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      53               80     120     165              .1       .3
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  125.45  348.25 1747.99

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1753.51    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.67    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1751.84    Reach Len. (ft)            80.00    120.00     165.00
  Crit W.S. (ft)           1751.84    Flow Area (sq ft)                   166.73
  E.G. Slope (ft/ft)      0.009750    Area (sq ft)                        166.73
  Q Total (cfs)            1729.53    Flow (cfs)                         1729.53
  Top Width (ft)             50.63    Top Width (ft)                       50.63
  Vel Total (ft/s)           10.37    Avg. Vel. (ft/s)                     10.37
  Max Chl Dpth (ft)           4.31    Hydr. Depth (ft)                      3.29
  Conv. Total (cfs)        17516.0    Conv. (cfs)                        17516.0
  Length Wtd. (ft)          113.91    Wetted Per. (ft)                     53.97
  Min Ch El (ft)           1747.53    Shear (lb/sq ft)                      1.88
  Alpha                       1.00    Stream Power (lb/ft s)               19.50
  Frctn Loss (ft)             0.97    Cum Volume (acre-ft)        4.27     11.95       0.12
  C & E Loss (ft)             0.19    Cum SA (acres)              3.61      3.06       0.32


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
```

```
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 52

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1752     215 1748.14     262 1748.24   309.1 1748.93   328.2 1749.84
   345.9  1747.1   351.1 1744.89   360.6 1745.14   369.3 1747.55   376.1 1746.55
   380.8 1751.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   328.2     .03   380.8     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          328.2   380.8              112     112     140             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1751.46    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              1.03    Wt. n-Val.                0.100      0.030
  W.S. Elev (ft)          1750.43    Reach Len. (ft)          112.00     112.00     140.00
  Crit W.S. (ft)          1750.43    Flow Area (sq ft)        357.11     174.15
  E.G. Slope (ft/ft)     0.007729    Area (sq ft)             357.11     174.15
  Q Total (cfs)           2259.53    Flow (cfs)               607.08    1652.45
  Top Width (ft)           291.83    Top Width (ft)           240.50      51.33
  Vel Total (ft/s)           4.25    Avg. Vel. (ft/s)           1.70       9.49
  Max Chl Dpth (ft)          5.54    Hydr. Depth (ft)           1.48       3.39
  Conv. Total (cfs)       25702.0    Conv. (cfs)              6905.5    18796.5
  Length Wtd. (ft)         112.00    Wetted Per. (ft)         240.55      54.14
  Min Ch El (ft)          1744.89    Shear (lb/sq ft)           0.72       1.55
  Alpha                      3.68    Stream Power (lb/ft s)     1.22      14.73
  Frctn Loss (ft)            0.82    Cum Volume (acre-ft)       3.94      11.49       0.12
  C & E Loss (ft)            0.02    Cum SA (acres)             3.39       2.92       0.32


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 51.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1751.86     140 1749.73

Weir crest shape                          = Broad Crested
```

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1751.46	Weir Sta US (ft)		
W.S. US. (ft)	1750.43	Weir Sta DS (ft)		
E.G. DS (ft)	1750.27	Weir Max Depth (ft)		
W.S. DS (ft)	1749.06	Weir Avg Depth (ft)		
Q US (cfs)	2259.53	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1749.73	
Q DS (cfs)	2259.53	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 51

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1750	220	1746.93	246	1747.2	263.5	1745.95	269.8	1744.14
278	1743.64	284.3	1743.73	293.1	1745.1	305.6	1749.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	246	.03	305.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
246	305.6		110	180	230	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1750.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.22	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1749.06	Reach Len. (ft)	110.00	180.00	230.00
Crit W.S. (ft)	1749.06	Flow Area (sq ft)	213.59	206.81	
E.G. Slope (ft/ft)	0.006880	Area (sq ft)	213.59	206.81	
Q Total (cfs)	2259.53	Flow (cfs)	296.90	1962.63	
Top Width (ft)	236.08	Top Width (ft)	178.30	57.78	
Vel Total (ft/s)	5.37	Avg. Vel. (ft/s)	1.39	9.49	
Max Chl Dpth (ft)	5.42	Hydr. Depth (ft)	1.20	3.58	
Conv. Total (cfs)	27241.3	Conv. (cfs)	3579.5	23661.9	
Length Wtd. (ft)	173.88	Wetted Per. (ft)	178.32	58.91	
Min Ch El (ft)	1743.64	Shear (lb/sq ft)	0.51	1.51	
Alpha	2.72	Stream Power (lb/ft s)	0.72	14.31	
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	3.21	11.00	0.12
C & E Loss (ft)	0.01	Cum SA (acres)	2.85	2.78	0.32

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 50.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

```
     Sta    Elev     Sta    Elev
       0 1749.73     230 1747.76

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1750.27    Weir Sta US (ft)
  W.S. US. (ft)            1749.06    Weir Sta DS (ft)
  E.G. DS (ft)             1748.45    Weir Max Depth (ft)
  W.S. DS (ft)             1747.26    Weir Avg Depth (ft)
  Q US (cfs)               2259.53    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1747.76
  Q DS (cfs)               2259.53    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 50

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1748     190  1745.9   221.8 1746.65   229.5 1743.32   236.9 1741.86
   246.2 1740.86   252.7 1740.73   259.8 1743.94   270.6  1742.9   278.8 1747.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   221.8     .03   278.8     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         221.8   278.8                85     100     111              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1748.45    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               1.19    Wt. n-Val.                0.100      0.030
  W.S. Elev (ft)           1747.26    Reach Len. (ft)           85.00     100.00     111.00
  Crit W.S. (ft)                      Flow Area (sq ft)        114.52     241.27
  E.G. Slope (ft/ft)      0.004998    Area (sq ft)             114.52     241.27
  Q Total (cfs)            2259.53    Flow (cfs)                98.49    2161.04
  Top Width (ft)            210.72    Top Width (ft)           154.57      56.15
  Vel Total (ft/s)            6.35    Avg. Vel. (ft/s)           0.86       8.96
  Max Chl Dpth (ft)           6.53    Hydr. Depth (ft)           0.74       4.30
  Conv. Total (cfs)        31962.6    Conv. (cfs)              1393.2    30569.3
  Length Wtd. (ft)           99.21    Wetted Per. (ft)         154.59      58.97
  Min Ch El (ft)           1740.73    Shear (lb/sq ft)           0.23       1.28
  Alpha                       1.90    Stream Power (lb/ft s)     0.20      11.43
  Frctn Loss (ft)             0.54    Cum Volume (acre-ft)       2.80      10.07       0.12
  C & E Loss (ft)             0.02    Cum SA (acres)             2.43       2.54       0.32


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 49.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1747.76     111  1746.4
```

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1748.45	Weir Sta US (ft)	91.45
W.S. US. (ft)	1747.26	Weir Sta DS (ft)	111.00
E.G. DS (ft)	1747.89	Weir Max Depth (ft)	0.11
W.S. DS (ft)	1746.51	Weir Avg Depth (ft)	0.05
Q US (cfs)	2259.53	Weir Submerg	0.00
Q Leaving Total (cfs)	0.72	Min El Weir Flow (ft)	1746.40
Q DS (cfs)	2258.80	Wr Top Wdth (ft)	19.55
Perc Q Leaving	0.03	Q Gate Group (cfs)	
Q Weir (cfs)	0.72	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	1.05	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 49

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1748	220	1745.03	242.9	1745.07	266.3	1746.15	274.1	1742.98
288.4	1740.13	295.7	1742.17	308	1740.61	317.3	1746.24	337.1	1746.33
342	1746.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	266.3	.03	317.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
266.3	317.3	115	130	145	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1747.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.38	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1746.51	Reach Len. (ft)	115.00	130.00	145.00
Crit W.S. (ft)	1746.51	Flow Area (sq ft)	135.24	216.70	5.11
E.G. Slope (ft/ft)	0.006055	Area (sq ft)	135.24	216.70	5.11
Q Total (cfs)	2258.80	Flow (cfs)	142.31	2113.07	3.43
Top Width (ft)	231.45	Top Width (ft)	155.75	51.00	24.70
Vel Total (ft/s)	6.33	Avg. Vel. (ft/s)	1.05	9.75	0.67
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)	0.87	4.25	0.21
Conv. Total (cfs)	29027.1	Conv. (cfs)	1828.7	27154.3	44.1
Length Wtd. (ft)	129.54	Wetted Per. (ft)	155.78	53.85	24.81
Min Ch El (ft)	1740.13	Shear (lb/sq ft)	0.33	1.52	0.08
Alpha	2.22	Stream Power (lb/ft s)	0.35	14.83	0.05
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	2.55	9.54	0.11
C & E Loss (ft)	0.06	Cum SA (acres)	2.13	2.42	0.29

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 48.5

INPUT

```
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =        0
Deck/Roadway Width        =        5
Weir Coefficient          =      2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0  1746.4     145 1745.71

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1747.89    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1746.51    Weir Sta DS (ft)            7.38
  E.G. DS (ft)             1745.69    Weir Max Depth (ft)         0.11
  W.S. DS (ft)             1743.71    Weir Avg Depth (ft)         0.05
  Q US (cfs)               2258.80    Weir Submerg                0.00
  Q Leaving Total (cfs)       0.27    Min El Weir Flow (ft)    1745.71
  Q DS (cfs)               2258.53    Wr Top Wdth (ft)            7.38
  Perc Q Leaving              0.01    Q Gate Group (cfs)
  Q Weir (cfs)                0.27    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)      0.40    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 48

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1746     155 1743.99     170 1743.97   195.8  1744.5     211 1739.71
     216  1736.9   223.2 1736.83   231.2 1736.82     235 1740.36   257.5 1745.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   195.8     .03   257.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         195.8   257.5                80      95     105             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1745.69    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.99    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1743.71    Reach Len. (ft)            80.00     95.00     105.00
  Crit W.S. (ft)           1743.71    Flow Area (sq ft)                   199.61
  E.G. Slope (ft/ft)      0.009104    Area (sq ft)                        199.61
  Q Total (cfs)            2258.53    Flow (cfs)                         2258.53
  Top Width (ft)             50.75    Top Width (ft)                       50.75
  Vel Total (ft/s)           11.31    Avg. Vel. (ft/s)                     11.31
  Max Chl Dpth (ft)           6.89    Hydr. Depth (ft)                      3.93
  Conv. Total (cfs)        23670.1    Conv. (cfs)                       23670.1
  Length Wtd. (ft)           94.90    Wetted Per. (ft)                     53.89
  Min Ch El (ft)           1736.82    Shear (lb/sq ft)                      2.11
  Alpha                       1.00    Stream Power (lb/ft s)               23.82
  Frctn Loss (ft)             0.81    Cum Volume (acre-ft)        2.37      8.92       0.10
  C & E Loss (ft)             0.17    Cum SA (acres)              1.92      2.27       0.25


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.
```

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 47.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1745.71	105	1743.94

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1745.69	Weir Sta US (ft)		
W.S. US. (ft)	1743.71	Weir Sta DS (ft)		
E.G. DS (ft)	1744.07	Weir Max Depth (ft)		
W.S. DS (ft)	1742.64	Weir Avg Depth (ft)		
Q US (cfs)	2258.53	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1743.94	
Q DS (cfs)	2258.53	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 47

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1746	255	1741.77	269.1	1742.04	279.3	1742.69	314.2	1737.04
322.5	1736.87	330	1737.27	335.2	1739.53	353.9	1743.52	376.7	1743.94

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	279.3	.03	353.9	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
279.3	353.9	82	80	83	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1744.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.43	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1742.64	Reach Len. (ft)	82.00	80.00	83.00
Crit W.S. (ft)	1742.64	Flow Area (sq ft)	36.12	230.64	
E.G. Slope (ft/ft)	0.007982	Area (sq ft)	36.12	230.64	
Q Total (cfs)	2258.53	Flow (cfs)	29.18	2229.35	
Top Width (ft)	146.27	Top Width (ft)	76.08	70.18	
Vel Total (ft/s)	8.47	Avg. Vel. (ft/s)	0.81	9.67	
Max Chl Dpth (ft)	5.77	Hydr. Depth (ft)	0.47	3.29	
Conv. Total (cfs)	25279.3	Conv. (cfs)	326.6	24952.7	
Length Wtd. (ft)	80.12	Wetted Per. (ft)	76.11	71.45	
Min Ch El (ft)	1736.87	Shear (lb/sq ft)	0.24	1.61	
Alpha	1.29	Stream Power (lb/ft s)	0.19	15.55	
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)	2.34	8.45	0.10
C & E Loss (ft)	0.12	Cum SA (acres)	1.85	2.13	0.25

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and

```
        assumed values.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 46.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev      Sta    Elev
       0 1743.94      83 1742.01

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1744.07    Weir Sta US (ft)           63.07
  W.S. US. (ft)            1742.64    Weir Sta DS (ft)           83.00
  E.G. DS (ft)             1743.46    Weir Max Depth (ft)         0.41
  W.S. DS (ft)             1742.42    Weir Avg Depth (ft)         0.21
  Q US (cfs)               2258.53    Weir Submerg                0.00
  Q Leaving Total (cfs)       5.44    Min El Weir Flow (ft)    1742.01
  Q DS (cfs)               2253.05    Wr Top Wdth (ft)           19.93
  Perc Q Leaving              0.24    Q Gate Group (cfs)
  Q Weir (cfs)                5.44    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)      4.09    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 46

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0    1746      335 1739.97   345.9 1739.82   352.8 1743.24     369 1742.35
   378.1 1738.99   380.7 1735.78   391.6 1734.75   400.1 1734.69   408.4 1739.14
   415.4 1741.53   427.8 1742.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   352.8     .03   415.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          352.8   415.4              125     124     117              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1743.46    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               1.04    Wt. n-Val.                0.100      0.030     0.060
  W.S. Elev (ft)           1742.42    Reach Len. (ft)          125.00     124.00    117.00
  Crit W.S. (ft)           1741.76    Flow Area (sq ft)        201.11     232.79      8.06
  E.G. Slope (ft/ft)      0.004072    Area (sq ft)             201.11     232.79      8.06
  Q Total (cfs)            2253.05    Flow (cfs)               228.91    2014.79      9.35
  Top Width (ft)            212.34    Top Width (ft)           152.27      47.68     12.40
  Vel Total (ft/s)            5.10    Avg. Vel. (ft/s)           1.14       8.65      1.16
  Max Chl Dpth (ft)           7.73    Hydr. Depth (ft)           1.32       4.88      0.65
  Conv. Total (cfs)        35308.1    Conv. (cfs)              3587.3    31574.2     146.6
  Length Wtd. (ft)          124.04    Wetted Per. (ft)         152.90      51.37     12.82
  Min Ch El (ft)           1734.69    Shear (lb/sq ft)           0.33       1.15      0.16
```

Alpha	2.58	Stream Power (lb/ft s)	0.38	9.97	0.19
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	2.12	8.03	0.10
C & E Loss (ft)	0.09	Cum SA (acres)	1.63	2.03	0.24

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 45.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1742.01	117	1742.01

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1743.46	Weir Sta US (ft)	0.00
W.S. US. (ft)	1742.42	Weir Sta DS (ft)	29.06
E.G. DS (ft)	1742.70	Weir Max Depth (ft)	0.41
W.S. DS (ft)	1740.77	Weir Avg Depth (ft)	0.21
Q US (cfs)	2253.05	Weir Submerg	0.00
Q Leaving Total (cfs)	7.94	Min El Weir Flow (ft)	1742.01
Q DS (cfs)	2245.07	Wr Top Wdth (ft)	29.06
Perc Q Leaving	0.35	Q Gate Group (cfs)	
Q Weir (cfs)	7.94	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	5.96	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 45

INPUT
Description: copy of 46, lowered to culvert inlet
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1742	190	1739.97	200.9	1739.82	207.8	1743.24	224	1742.35
233.1	1738.99	235.7	1734.22	246.6	1734.22	262	1734.22	263.4	1739.14
270.4	1741.53	282.8	1742.01						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	207.8	.03	270.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
207.8	270.4	75	60	60	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1742.70	Element			
Vel Head (ft)	1.94	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1740.77	Reach Len. (ft)	75.00	60.00	60.00
Crit W.S. (ft)	1740.77	Flow Area (sq ft)	40.29	196.95	
E.G. Slope (ft/ft)	0.007630	Area (sq ft)	40.29	196.95	
Q Total (cfs)	2245.07	Flow (cfs)	31.11	2213.96	
Top Width (ft)	127.46	Top Width (ft)	87.57	39.89	
Vel Total (ft/s)	9.46	Avg. Vel. (ft/s)	0.77	11.24	
Max Chl Dpth (ft)	6.55	Hydr. Depth (ft)	0.46	4.94	

```
Conv. Total (cfs)        25702.8    Conv. (cfs)                 356.1    25346.7
Length Wtd. (ft)           60.00    Wetted Per. (ft)            87.80      47.02
Min Ch El (ft)           1734.22    Shear (lb/sq ft)             0.22       1.99
Alpha                       1.39    Stream Power (lb/ft s)       0.17      22.43
Frctn Loss (ft)                     Cum Volume (acre-ft)         1.77       7.42       0.09
C & E Loss (ft)                     Cum SA (acres)               1.29       1.90       0.22

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

CULVERT


RIVER: Ajo
REACH: Primary            RS: 44.5

INPUT
Description:
Distance from Upstream XS =       8
Deck/Roadway Width        =      33
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=        9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     147 1739.15           174.5 1738.74           201.3 1739.43
   248.5  1740.8           298.1 1740.82           315.4 1740.97
     320 1740.98           339.2 1740.66           368.6 1738.98

Upstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1742     190 1739.97   200.9 1739.82   207.8 1743.24     224 1742.35
   233.1 1738.99   235.7 1734.22   246.6 1734.22     262 1734.22   263.4 1739.14
   270.4 1741.53   282.8 1742.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   207.8     .03   270.4     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
          207.8  270.4              .3       .5

Downstream  Deck/Roadway Coordinates
    num=        9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     147 1739.15           174.5 1738.74           201.3 1739.43
   248.5  1740.8           298.1 1740.82           315.4 1740.97
     320 1740.98           339.2 1740.66           368.6 1738.98

Downstream Bridge Cross Section Data
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1742     215 1736.95   221.1 1736.91   225.2  1738.5     250 1739.28
   252.3 1737.39     260 1737.36   268.1 1733.19   285.4 1733.19   299.4  1733.4
   311.3 1740.16     324 1740.27   339.2  1740.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     250     .03   311.3     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
           250   311.3              .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Box      3.4    7.33
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
```

5	40	.013	.025	0	.4	1

Number of Barrels = 3
Upstream Elevation = 1734.22
Centerline Stations

Sta.	Sta.	Sta.
238.65	248.45	258.25

Downstream Elevation = 1734.1
Centerline Stations

Sta.	Sta.	Sta.
275.75	285.55	295.35

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	638.42	Culv Full Len (ft)	40.00
# Barrels	3	Culv Vel US (ft/s)	8.54
Q Barrel (cfs)	212.81	Culv Vel DS (ft/s)	8.54
E.G. US. (ft)	1742.70	Culv Inv El Up (ft)	1734.22
W.S. US. (ft)	1740.77	Culv Inv El Dn (ft)	1734.10
E.G. DS (ft)	1741.16	Culv Frctn Ls (ft)	0.33
W.S. DS (ft)	1740.78	Culv Exit Loss (ft)	0.75
Delta EG (ft)	1.54	Culv Entr Loss (ft)	0.45
Delta WS (ft)	0.01	Q Weir (cfs)	1606.65
E.G. IC (ft)	1742.47	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	1742.70	Weir Sta Rgt (ft)	282.80
Culvert Control	Outlet	Weir Submerg	0.04
Culv WS Inlet (ft)	1737.62	Weir Max Depth (ft)	2.87
Culv WS Outlet (ft)	1737.50	Weir Avg Depth (ft)	1.71
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	463.43
Culv Crt Depth (ft)	2.97	Min El Weir Flow (ft)	1739.83

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 44

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1742	215	1736.95	221.1	1736.91	225.2	1738.5	250	1739.28
252.3	1737.39	260	1737.36	268.1	1733.19	285.4	1733.19	299.4	1733.4
311.3	1740.16	324	1740.27	339.2	1740.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	250	.03	311.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
250	311.3	152	160	160	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1741.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1740.78	Reach Len. (ft)	152.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)	395.31	360.15	13.19
E.G. Slope (ft/ft)	0.001175	Area (sq ft)	395.31	360.15	13.19
Q Total (cfs)	2245.07	Flow (cfs)	318.84	1919.48	6.75
Top Width (ft)	287.28	Top Width (ft)	198.08	61.30	27.90
Vel Total (ft/s)	2.92	Avg. Vel. (ft/s)	0.81	5.33	0.51
Max Chl Dpth (ft)	7.59	Hydr. Depth (ft)	2.00	5.88	0.47
Conv. Total (cfs)	65483.4	Conv. (cfs)	9299.9	55986.6	196.9
Length Wtd. (ft)	158.90	Wetted Per. (ft)	198.43	64.77	28.18
Min Ch El (ft)	1733.19	Shear (lb/sq ft)	0.15	0.41	0.03
Alpha	2.86	Stream Power (lb/ft s)	0.12	2.17	0.02
Frctn Loss (ft)	0.36	Cum Volume (acre-ft)	1.40	7.03	0.08
C & E Loss (ft)	0.33	Cum SA (acres)	1.04	1.83	0.20

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 43.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1740.5	160	1739.23

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1741.16	Weir Sta US (ft)	0.00
W.S. US. (ft)	1740.78	Weir Sta DS (ft)	84.14
E.G. DS (ft)	1740.47	Weir Max Depth (ft)	0.28
W.S. DS (ft)	1738.98	Weir Avg Depth (ft)	0.14
Q US (cfs)	2245.07	Weir Submerg	0.00
Q Leaving Total (cfs)	12.99	Min El Weir Flow (ft)	1739.23
Q DS (cfs)	2232.05	Wr Top Wdth (ft)	84.14
Perc Q Leaving	0.58	Q Gate Group (cfs)	
Q Weir (cfs)	12.99	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	11.80	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 43

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1740	160	1737.2	177.1	1736.8	190.6	1733.92	200.9	1738.38
208.7	1738.25	218	1732.77	225.5	1731.47	232.6	1732.24	247	1738.79
264.9	1738.89	276.8	1739.23						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	208.7	.03	247	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
208.7	247	68	59	65	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1740.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.49	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1738.98	Reach Len. (ft)	68.00	59.00	65.00
Crit W.S. (ft)	1738.98	Flow Area (sq ft)	207.17	184.10	2.59
E.G. Slope (ft/ft)	0.006143	Area (sq ft)	207.17	184.10	2.59
Q Total (cfs)	2232.05	Flow (cfs)	297.24	1933.57	1.25
Top Width (ft)	209.50	Top Width (ft)	150.25	38.30	20.95
Vel Total (ft/s)	5.67	Avg. Vel. (ft/s)	1.43	10.50	0.48
Max Chl Dpth (ft)	7.51	Hydr. Depth (ft)	1.38	4.81	0.12
Conv. Total (cfs)	28478.6	Conv. (cfs)	3792.4	24670.3	15.9
Length Wtd. (ft)	59.61	Wetted Per. (ft)	151.50	41.37	20.95
Min Ch El (ft)	1731.47	Shear (lb/sq ft)	0.52	1.71	0.05
Alpha	2.98	Stream Power (lb/ft s)	0.75	17.93	0.02
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)	0.34	6.03	0.05
C & E Loss (ft)	0.03	Cum SA (acres)	0.44	1.65	0.11

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 42.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1739.23	65	1738.07

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1740.47	Weir Sta US (ft)	
W.S. US. (ft)	1738.98	Weir Sta DS (ft)	
E.G. DS (ft)	1739.34	Weir Max Depth (ft)	
W.S. DS (ft)	1737.95	Weir Avg Depth (ft)	
Q US (cfs)	2232.05	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1738.07
Q DS (cfs)	2232.05	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 42

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1740	100	1737.43	122.8	1736.55	139.2	1735.93	158.8	1731.93
169.8	1731.03	179.3	1737.52	196.4	1737.77	206.4	1738.02	211.4	1738.07

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	100	.03	179.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
100	179.3		100	98	96	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1739.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.39	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1737.95	Reach Len. (ft)	100.00	98.00	96.00
Crit W.S. (ft)	1737.95	Flow Area (sq ft)	5.20	234.56	5.79
E.G. Slope (ft/ft)	0.008991	Area (sq ft)	5.20	234.56	5.79
Q Total (cfs)	2232.05	Flow (cfs)	2.97	2223.84	5.24
Top Width (ft)	123.59	Top Width (ft)	20.11	79.30	24.18
Vel Total (ft/s)	9.09	Avg. Vel. (ft/s)	0.57	9.48	0.91
Max Chl Dpth (ft)	6.92	Hydr. Depth (ft)	0.26	2.96	0.24
Conv. Total (cfs)	23540.1	Conv. (cfs)	31.3	23453.5	55.3
Length Wtd. (ft)	98.00	Wetted Per. (ft)	20.12	81.77	24.18
Min Ch El (ft)	1731.03	Shear (lb/sq ft)	0.15	1.61	0.13
Alpha	1.08	Stream Power (lb/ft s)	0.08	15.26	0.12

Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	0.18	5.75	0.04
C & E Loss (ft)	0.03	Cum SA (acres)	0.30	1.57	0.08

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 41.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1738.07	96	1736.54

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1739.34	Weir Sta US (ft)	
W.S. US. (ft)	1737.95	Weir Sta DS (ft)	
E.G. DS (ft)	1737.73	Weir Max Depth (ft)	
W.S. DS (ft)	1736.04	Weir Avg Depth (ft)	
Q US (cfs)	2232.05	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1736.54
Q DS (cfs)	2232.05	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 41

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1737.83	18.2	1736.99	43.2	1732.07	48.7	1730.85	56	1730.24
72.7	1732.18	86.6	1735.86	99.3	1736.42	108	1736.54		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	18.2	.03	86.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
18.2	86.6	102	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1737.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.69	Wt. n-Val.		0.030	0.060
W.S. Elev (ft)	1736.04	Reach Len. (ft)	102.00	100.00	100.00
Crit W.S. (ft)	1736.04	Flow Area (sq ft)		213.95	0.36
E.G. Slope (ft/ft)	0.009004	Area (sq ft)		213.95	0.36
Q Total (cfs)	2232.05	Flow (cfs)		2231.88	0.17
Top Width (ft)	67.60	Top Width (ft)		63.56	4.03

Vel Total (ft/s)	10.42	Avg. Vel. (ft/s)		10.43	0.47
Max Chl Dpth (ft)	5.80	Hydr. Depth (ft)		3.37	0.09
Conv. Total (cfs)	23522.9	Conv. (cfs)		23521.2	1.8
Length Wtd. (ft)	100.00	Wetted Per. (ft)		64.70	4.04
Min Ch El (ft)	1730.24	Shear (lb/sq ft)		1.86	0.05
Alpha	1.00	Stream Power (lb/ft s)		19.39	0.02
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	0.17	5.24	0.03
C & E Loss (ft)	0.13	Cum SA (acres)	0.28	1.41	0.05

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 40.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1736.54	100	1735.11

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1737.73	Weir Sta US (ft)	84.15
W.S. US. (ft)	1736.04	Weir Sta DS (ft)	100.00
E.G. DS (ft)	1736.47	Weir Max Depth (ft)	0.09
W.S. DS (ft)	1735.21	Weir Avg Depth (ft)	0.05
Q US (cfs)	2232.05	Weir Submerg	0.00
Q Leaving Total (cfs)	0.48	Min El Weir Flow (ft)	1735.11
Q DS (cfs)	2231.57	Wr Top Wdth (ft)	15.85
Perc Q Leaving	0.02	Q Gate Group (cfs)	
Q Weir (cfs)	0.48	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	0.75	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 40

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1736.53	48.1	1734.25	62.2	1733.73	70.7	1729.69	82	1729.35
91.5	1729.38	103.2	1731.49	111.2	1734.33	122.7	1735.11		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	48.1	.03	122.7	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
48.1	122.7	95	85	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1736.47	Element	Left OB	Channel	Right OB

Vel Head (ft)	1.26	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1735.21	Reach Len. (ft)	95.00	85.00	100.00
Crit W.S. (ft)	1734.90	Flow Area (sq ft)	9.61	246.28	
E.G. Slope (ft/ft)	0.006973	Area (sq ft)	9.61	246.28	
Q Total (cfs)	2231.57	Flow (cfs)	7.28	2224.29	
Top Width (ft)	94.74	Top Width (ft)	20.14	74.60	
Vel Total (ft/s)	8.72	Avg. Vel. (ft/s)	0.76	9.03	
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)	0.48	3.30	
Conv. Total (cfs)	26723.2	Conv. (cfs)	87.2	26636.0	
Length Wtd. (ft)	85.21	Wetted Per. (ft)	20.16	76.32	
Min Ch El (ft)	1729.35	Shear (lb/sq ft)	0.21	1.40	
Alpha	1.07	Stream Power (lb/ft s)	0.16	12.69	
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.16	4.72	0.03
C & E Loss (ft)	0.04	Cum SA (acres)	0.26	1.25	0.04

Warning: The cross-section end points had to be extended vertically for the computed water surface.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 39.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1735.11	100	1733.6

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1736.47	Weir Sta US (ft)	0.00
W.S. US. (ft)	1735.21	Weir Sta DS (ft)	100.00
E.G. DS (ft)	1735.86	Weir Max Depth (ft)	0.65
W.S. DS (ft)	1734.25	Weir Avg Depth (ft)	0.37
Q US (cfs)	2231.57	Weir Submerg	0.00
Q Leaving Total (cfs)	62.63	Min El Weir Flow (ft)	1733.60
Q DS (cfs)	2168.86	Wr Top Wdth (ft)	100.00
Perc Q Leaving	2.81	Q Gate Group (cfs)	
Q Weir (cfs)	62.63	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	36.99	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 39

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1736	120	1733.69	170.3	1733.03	192.3	1727.48	198.5	1727.19
216.4	1733.31	235.2	1733.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	170.3	.03	216.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
170.3	216.4	100	115	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1735.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.62	Wt. n-Val.	0.100	0.030	0.060

W.S. Elev (ft)	1734.25	Reach Len. (ft)	100.00	115.00	100.00
Crit W.S. (ft)	1734.25	Flow Area (sq ft)	52.53	202.14	14.85
E.G. Slope (ft/ft)	0.006415	Area (sq ft)	52.53	202.14	14.85
Q Total (cfs)	2168.86	Flow (cfs)	47.56	2096.67	24.62
Top Width (ft)	144.04	Top Width (ft)	79.14	46.10	18.80
Vel Total (ft/s)	8.05	Avg. Vel. (ft/s)	0.91	10.37	1.66
Max Chl Dpth (ft)	7.06	Hydr. Depth (ft)	0.66	4.38	0.79
Conv. Total (cfs)	27078.3	Conv. (cfs)	593.9	26177.1	307.4
Length Wtd. (ft)	114.75	Wetted Per. (ft)	79.15	47.81	19.45
Min Ch El (ft)	1727.19	Shear (lb/sq ft)	0.27	1.69	0.31
Alpha	1.61	Stream Power (lb/ft s)	0.24	17.56	0.51
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	0.09	4.28	0.02
C & E Loss (ft)	0.01	Cum SA (acres)	0.15	1.13	0.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 38.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS - 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1733.6	100	1732.27

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1735.86	Weir Sta US (ft)	0.00
W.S. US. (ft)	1734.25	Weir Sta DS (ft)	15.50
E.G. DS (ft)	1730.49	Weir Max Depth (ft)	0.65
W.S. DS (ft)	1728.75	Weir Avg Depth (ft)	0.32
Q US (cfs)	2168.86	Weir Submerg	0.00
Q Leaving Total (cfs)	8.36	Min El Weir Flow (ft)	1732.27
Q DS (cfs)	2160.48	Wr Top Wdth (ft)	15.50
Perc Q Leaving	0.39	Q Gate Group (cfs)	
Q Weir (cfs)	8.36	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	5.00	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 38

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1732.86	15.2	1729.86	22.9	1731.6	40.9	1724.21	61.3	1724.42
81.8	1725.53	93.7	1731.07	111.3	1732.27				

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	22.9	.03	93.7	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
22.9	93.7	108	100	104	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1730.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.030	
W.S. Elev (ft)	1728.75	Reach Len. (ft)	108.00	100.00	104.00
Crit W.S. (ft)	1728.75	Flow Area (sq ft)		204.34	
E.G. Slope (ft/ft)	0.008998	Area (sq ft)		204.34	
Q Total (cfs)	2160.48	Flow (cfs)		2160.48	
Top Width (ft)	58.89	Top Width (ft)		58.89	
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)		10.57	
Max Chl Dpth (ft)	4.54	Hydr. Depth (ft)		3.47	
Conv. Total (cfs)	22775.6	Conv. (cfs)		22775.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		60.54	
Min Ch El (ft)	1724.21	Shear (lb/sq ft)		1.90	
Alpha	1.00	Stream Power (lb/ft s)		20.05	
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.03	3.74	
C & E Loss (ft)	0.02	Cum SA (acres)	0.06	0.99	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 37.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1732.27	104	1730.96

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1730.49	Weir Sta US (ft)	
W.S. US. (ft)	1728.75	Weir Sta DS (ft)	
E.G. DS (ft)	1728.60	Weir Max Depth (ft)	
W.S. DS (ft)	1726.95	Weir Avg Depth (ft)	
Q US (cfs)	2160.48	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1730.96
Q DS (cfs)	2160.48	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 37

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1731.05	32	1730.45	41.6	1724.05	70	1722.67	88.5	1722.93

```
   108.2 1729.42   117.1 1730.31   127.9 1730.96

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .08       32     .03    108.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             32   108.2               89     100     100              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1728.60    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.65    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1726.95    Reach Len. (ft)            89.00     100.00     100.00
  Crit W.S. (ft)           1726.95    Flow Area (sq ft)                    209.39
  E.G. Slope (ft/ft)      0.009121    Area (sq ft)                         209.39
  Q Total (cfs)            2160.48    Flow (cfs)                          2160.48
  Top Width (ft)             63.44    Top Width (ft)                        63.44
  Vel Total (ft/s)           10.32    Avg. Vel. (ft/s)                      10.32
  Max Chl Dpth (ft)           4.28    Hydr. Depth (ft)                       3.30
  Conv. Total (cfs)        22622.2    Conv. (cfs)                        22622.2
  Length Wtd. (ft)           99.98    Wetted Per. (ft)                      65.00
  Min Ch El (ft)           1722.67    Shear (lb/sq ft)                       1.83
  Alpha                       1.00    Stream Power (lb/ft s)                18.93
  Frctn Loss (ft)             0.34    Cum Volume (acre-ft)        0.03       3.27
  C & E Loss (ft)             0.36    Cum SA (acres)              0.06       0.85


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 36.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1730.96     100 1728.69

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1728.60    Weir Sta US (ft)
  W.S. US. (ft)            1726.95    Weir Sta DS (ft)
  E.G. DS (ft)             1726.11    Weir Max Depth (ft)
  W.S. DS (ft)             1725.66    Weir Avg Depth (ft)
  Q US (cfs)               2160.48    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1728.69
  Q DS (cfs)               2160.48    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION
```

```
RIVER: Ajo
REACH: Primary            RS: 36

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1728      35 1723.86    45.3 1721.87    50.9 1723.26    71.4 1722.06
    76.4 1720.54   100.1  1719.1   119.7 1720.73   131.5 1727.91   148.7 1728.69

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08      35     .03   131.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             35   131.5              102     100      99              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1726.11    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.45    Wt. n-Val.                  0.080      0.030
  W.S. Elev (ft)           1725.66    Reach Len. (ft)            102.00     100.00      99.00
  Crit W.S. (ft)                      Flow Area (sq ft)           13.69     400.34
  E.G. Slope (ft/ft)      0.001726    Area (sq ft)                13.69     400.34
  Q Total (cfs)            2160.48    Flow (cfs)                   9.80    2150.68
  Top Width (ft)            108.01    Top Width (ft)              15.21      92.80
  Vel Total (ft/s)            5.22    Avg. Vel. (ft/s)             0.72       5.37
  Max Chl Dpth (ft)           6.56    Hydr. Depth (ft)             0.90       4.31
  Conv. Total (cfs)        51999.5    Conv. (cfs)                 235.8    51763.7
  Length Wtd. (ft)          100.00    Wetted Per. (ft)            15.32      94.92
  Min Ch El (ft)           1719.10    Shear (lb/sq ft)             0.10       0.45
  Alpha                       1.06    Stream Power (lb/ft s)       0.07       2.44
  Frctn Loss (ft)             0.33    Cum Volume (acre-ft)         0.02       2.57
  C & E Loss (ft)             0.14    Cum SA (acres)               0.04       0.67


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 35.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1728.69      99 1727.49

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1726.11    Weir Sta US (ft)
  W.S. US. (ft)            1725.66    Weir Sta DS (ft)
  E.G. DS (ft)             1725.63    Weir Max Depth (ft)
  W.S. DS (ft)             1723.79    Weir Avg Depth (ft)
  Q US (cfs)               2160.48    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1727.49
  Q DS (cfs)               2160.48    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)
```

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 35

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1726.07	29.5	1726.75	44	1725.41	55.5	1725.67	77.8	1718.25
89.3	1718.5	101.5	1719.26	123.7	1726.85	134	1727.42	139.1	1727.49

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	55.5	.03	123.7	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
55.5	123.7	109	97	102	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1725.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.85	Wt. n-Val.		0.030	
W.S. Elev (ft)	1723.79	Reach Len. (ft)	109.00	97.00	102.00
Crit W.S. (ft)	1723.79	Flow Area (sq ft)		198.01	
E.G. Slope (ft/ft)	0.008846	Area (sq ft)		198.01	
Q Total (cfs)	2160.48	Flow (cfs)		2160.48	
Top Width (ft)	53.57	Top Width (ft)		53.57	
Vel Total (ft/s)	10.91	Avg. Vel. (ft/s)		10.91	
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)		3.70	
Conv. Total (cfs)	22971.1	Conv. (cfs)		22971.1	
Length Wtd. (ft)	97.00	Wetted Per. (ft)		55.24	
Min Ch El (ft)	1718.25	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		21.60	
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	0.00	1.88	
C & E Loss (ft)	0.02	Cum SA (acres)	0.02	0.51	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 34.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1727.49	102	1726.07

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1725.63	Weir Sta US (ft)	
W.S. US. (ft)	1723.79	Weir Sta DS (ft)	
E.G. DS (ft)	1723.61	Weir Max Depth (ft)	
W.S. DS (ft)	1721.61	Weir Avg Depth (ft)	
Q US (cfs)	2160.48	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1726.07
Q DS (cfs)	2160.48	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	

```
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 34

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1723.96    32.2 1724.62    46.3 1723.89      58 1724.08    77.1 1715.56
    82.5 1715.14    86.9 1715.31   105.2 1719.24   122.9 1725.45   133.7 1726.07

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05      58     .03   122.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             58   122.9               77      90     100              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1723.61    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               2.00    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1721.61    Reach Len. (ft)            77.00      90.00     100.00
  Crit W.S. (ft)           1721.61    Flow Area (sq ft)                    190.37
  E.G. Slope (ft/ft)      0.008963    Area (sq ft)                         190.37
  Q Total (cfs)            2160.48    Flow (cfs)                          2160.48
  Top Width (ft)             48.43    Top Width (ft)                        48.43
  Vel Total (ft/s)           11.35    Avg. Vel. (ft/s)                      11.35
  Max Chl Dpth (ft)           6.47    Hydr. Depth (ft)                       3.93
  Conv. Total (cfs)        22820.4    Conv. (cfs)                         22820.4
  Length Wtd. (ft)           90.00    Wetted Per. (ft)                      50.56
  Min Ch El (ft)           1715.14    Shear (lb/sq ft)                       2.11
  Alpha                       1.00    Stream Power (lb/ft s)                23.91
  Frctn Loss (ft)             0.79    Cum Volume (acre-ft)        0.00       1.45
  C & E Loss (ft)             0.00    Cum SA (acres)              0.02       0.39


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 33.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1726.07    100 1724.86

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1723.61    Weir Sta US (ft)
  W.S. US. (ft)            1721.61    Weir Sta DS (ft)
  E.G. DS (ft)             1722.70    Weir Max Depth (ft)
```

W.S. DS (ft)	1720.70	Weir Avg Depth (ft)	
Q US (cfs)	2160.48	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1724.86
Q DS (cfs)	2160.48	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 33

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1722.39	27.6	1721.33	47	1720.41	60.9	1721.35	77.1	1714.59
85.1	1714.25	91.8	1714.41	107.2	1720.24	121	1724.02	131.2	1724.8
136.3	1724.86								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	60.9	.03	121	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60.9	121	130	125	110	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1722.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.	0.050	0.030	
W.S. Elev (ft)	1720.70	Reach Len. (ft)	130.00	125.00	110.00
Crit W.S. (ft)	1720.70	Flow Area (sq ft)	1.54	190.15	
E.G. Slope (ft/ft)	0.008573	Area (sq ft)	1.54	190.15	
Q Total (cfs)	2160.48	Flow (cfs)	1.18	2159.31	
Top Width (ft)	56.95	Top Width (ft)	10.51	46.44	
Vel Total (ft/s)	11.27	Avg. Vel. (ft/s)	0.76	11.36	
Max Chl Dpth (ft)	6.45	Hydr. Depth (ft)	0.15	4.09	
Conv. Total (cfs)	23333.9	Conv. (cfs)	12.7	23321.2	
Length Wtd. (ft)	125.00	Wetted Per. (ft)	10.53	48.80	
Min Ch El (ft)	1714.25	Shear (lb/sq ft)	0.08	2.09	
Alpha	1.01	Stream Power (lb/ft s)	0.06	23.68	
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	0.00	1.06	
C & E Loss (ft)	0.02	Cum SA (acres)	0.02	0.29	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 32.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1724.86	110	1723.67

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1722.70	Weir Sta US (ft)		
W.S. US. (ft)	1720.70	Weir Sta DS (ft)		
E.G. DS (ft)	1721.04	Weir Max Depth (ft)		
W.S. DS (ft)	1719.11	Weir Avg Depth (ft)		
Q US (cfs)	2160.48	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1723.67	
Q DS (cfs)	2160.48	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 32

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1718.61	22.6	1717.14	30	1719.18	52.3	1718.65	68.4	1718.13
74.5	1719.73	81.1	1719.23	92.1	1713.46	102	1713.43	109.4	1713.36
125.7	1717.45	144.3	1722.96	152.5	1723.67				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	74.5	.03	144.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.5	144.3	99	105	95	.1	.3

Left Levee Station= 74.5 Elevation= 1719.73

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1721.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.93	Wt. n-Val.		0.030	
W.S. Elev (ft)	1719.11	Reach Len. (ft)	99.00	105.00	95.00
Crit W.S. (ft)	1719.11	Flow Area (sq ft)		193.85	
E.G. Slope (ft/ft)	0.008785	Area (sq ft)		193.85	
Q Total (cfs)	2160.48	Flow (cfs)		2160.48	
Top Width (ft)	49.98	Top Width (ft)		49.98	
Vel Total (ft/s)	11.15	Avg. Vel. (ft/s)		11.15	
Max Chl Dpth (ft)	5.75	Hydr. Depth (ft)		3.88	
Conv. Total (cfs)	23050.9	Conv. (cfs)		23050.9	
Length Wtd. (ft)	105.00	Wetted Per. (ft)		52.11	
Min Ch El (ft)	1713.36	Shear (lb/sq ft)		2.04	
Alpha	1.00	Stream Power (lb/ft s)		22.74	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)		0.50	
C & E Loss (ft)	0.15	Cum SA (acres)		0.16	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 31.5

```
INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1723.67      95 1722.43

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1721.04    Weir Sta US (ft)
  W.S. US. (ft)            1719.11    Weir Sta DS (ft)
  E.G. DS (ft)             1717.92    Weir Max Depth (ft)
  W.S. DS (ft)             1716.49    Weir Avg Depth (ft)
  Q US (cfs)               2160.48    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1722.43
  Q DS (cfs)               2160.48    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 31

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1724.11    27.3 1724.12    44.5 1716.39    65.8 1714.52    81.5 1712.71
   101.9 1712.21   115.5 1712.25   132.2 1720.71   151.4 1722.34   156.5 1722.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    27.3     .03   132.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          27.3   132.2              116     105     100             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1717.92    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.43    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1716.49    Reach Len. (ft)
  Crit W.S. (ft)           1716.49    Flow Area (sq ft)                    224.79
  E.G. Slope (ft/ft)      0.009623    Area (sq ft)                         224.79
  Q Total (cfs)            2160.48    Flow (cfs)                          2160.48
  Top Width (ft)             79.58    Top Width (ft)                        79.58
  Vel Total (ft/s)            9.61    Avg. Vel. (ft/s)                       9.61
  Max Chl Dpth (ft)           4.28    Hydr. Depth (ft)                       2.82
  Conv. Total (cfs)        22024.4    Conv. (cfs)                         22024.4
  Length Wtd. (ft)                    Wetted Per. (ft)                      80.80
  Min Ch El (ft)           1712.21    Shear (lb/sq ft)                       1.67
  Alpha                       1.00    Stream Power (lb/ft s)                16.06
  Frctn Loss (ft)                     Cum Volume (acre-ft)
  C & E Loss (ft)                     Cum SA (acres)


SUMMARY OF MANNING'S N VALUES

River:Ajo

      Reach          River Sta.       n1        n2        n3

 Primary              100                .06       .03       .06
```

Primary	99	.06	.03	.06
Primary	98	.06	.03	.06
Primary	97	.06	.03	.06
Primary	96	.06	.03	.06
Primary	95	.06	.03	.06
Primary	94	.06	.03	.06
Primary	93	.06	.03	.06
Primary	92	.06	.03	.06
Primary	91	.06	.03	.06
Primary	90	.06	.03	.06
Primary	89	.06	.03	.06
Primary	88	.06	.03	.06
Primary	87	.06	.03	.06
Primary	86	.06	.03	.06
Primary	85	.06	.03	.06
Primary	84	.06	.03	.06
Primary	83	.06	.03	.06
Primary	82	.06	.03	.06
Primary	81	.06	.03	.06
Primary	80.5	Lat Struct		
Primary	80.4	Lat Struct		
Primary	80	.06	.03	.06
Primary	79.5	Lat Struct		
Primary	79.4	Lat Struct		
Primary	79	.06	.03	.06
Primary	78.5	Culvert		
Primary	78	.06	.03	.06
Primary	77	.06	.03	.06
Primary	76	.06	.03	.06
Primary	75	.06	.03	.06
Primary	74	.06	.03	.06
Primary	73	.06	.03	.06
Primary	72	.06	.03	.06
Primary	71	.06	.03	.06
Primary	70	.08	.03	.08
Primary	69.4	Lat Struct		
Primary	69	.06	.03	.06
Primary	68.5	Lat Struct		
Primary	68.4	Lat Struct		
Primary	68	.06	.03	.04
Primary	67.5	Lat Struct		
Primary	67.4	Lat Struct		
Primary	67	.06	.03	.06
Primary	66	.06	.03	.06
Primary	65	.06	.03	.06
Primary	64	.06	.03	.06
Primary	63	.06	.03	.06
Primary	62	.06	.03	.06
Primary	61	.06	.03	.06
Primary	60	.06	.03	.06
Primary	59.4	Lat Struct		
Primary	59	.06	.03	.06
Primary	58.4	Lat Struct		
Primary	58	.1	.03	.06
Primary	57.5	Lat Struct		
Primary	57	.1	.03	.08
Primary	56.5	Lat Struct		
Primary	56	.1	.03	.06
Primary	55.5	Lat Struct		
Primary	55.4	Lat Struct		
Primary	55	.1	.03	.06
Primary	54.5	Lat Struct		
Primary	54.4	Lat Struct		
Primary	54	.1	.03	.08
Primary	53.5	Lat Struct		
Primary	53.4	Lat Struct		
Primary	53	.1	.03	.06
Primary	52	.1	.03	.06
Primary	51.5	Lat Struct		
Primary	51	.1	.03	.06
Primary	50.5	Lat Struct		
Primary	50	.1	.03	.06
Primary	49.5	Lat Struct		
Primary	49	.1	.03	.06
Primary	48.5	Lat Struct		
Primary	48	.1	.03	.06
Primary	47.5	Lat Struct		
Primary	47	.1	.03	.06
Primary	46.5	Lat Struct		

existing split flow.rep

Primary	46	.1	.03	.06
Primary	45.5	Lat Struct		
Primary	45	.1	.03	.06
Primary	44.5	Culvert		
Primary	44	.1	.03	.06
Primary	43.5	Lat Struct		
Primary	43	.1	.03	.06
Primary	42.5	Lat Struct		
Primary	42	.1	.03	.06
Primary	41.5	Lat Struct		
Primary	41	.1	.03	.06
Primary	40.5	Lat Struct		
Primary	40	.1	.03	.06
Primary	39.5	Lat Struct		
Primary	39	.1	.03	.06
Primary	38.5	Lat Struct		
Primary	38	.08	.03	.06
Primary	37.5	Lat Struct		
Primary	37	.08	.03	.06
Primary	36.5	Lat Struct		
Primary	36	.08	.03	.06
Primary	35.5	Lat Struct		
Primary	35	.05	.03	.06
Primary	34.5	Lat Struct		
Primary	34	.05	.03	.06
Primary	33.5	Lat Struct		
Primary	33	.05	.03	.06
Primary	32.5	Lat Struct		
Primary	32	.05	.03	.06
Primary	31.5	Lat Struct		
Primary	31	.05	.03	.06

SUMMARY OF REACH LENGTHS

River: Ajo

Reach	River Sta.	Left	Channel	Right
Primary	100	82	85	92
Primary	99	104	119	130
Primary	98	85	92	100
Primary	97	105	100	90
Primary	96	160	145	117
Primary	95	100	75	55
Primary	94	100	105	105
Primary	93	125	89	96
Primary	92	150	130	50
Primary	91	107	90	65
Primary	90	140	125	95
Primary	89	105	100	99
Primary	88	100	100	110
Primary	87	75	100	140
Primary	86	100	100	98
Primary	85	125	119	118
Primary	84	140	85	30
Primary	83	95	100	107
Primary	82	86	114	135
Primary	81	100	89	100
Primary	80.5	Lat Struct		
Primary	80.4	Lat Struct		
Primary	80	100	116	120
Primary	79.5	Lat Struct		
Primary	79.4	Lat Struct		
Primary	79	60	66	62
Primary	78.5	Culvert		
Primary	78	100	98	95
Primary	77	100	106	109
Primary	76	124	132	145
Primary	75	81	90	95
Primary	74	100	100	103
Primary	73	111	92	81
Primary	72	109	106	100
Primary	71	104	108	108
Primary	70	106	105	108
Primary	69.4	Lat Struct		
Primary	69	140	140	140

Primary	68.5	Lat Struct			
Primary	68.4	Lat Struct			
Primary	68		115	110	108
Primary	67.5	Lat Struct			
Primary	67.4	Lat Struct			
Primary	67		106	105	105
Primary	66		100	98	100
Primary	65		103	100	95
Primary	64		110	95	86
Primary	63		99	99	98
Primary	62		110	100	90
Primary	61		130	125	122
Primary	60		103	103	102
Primary	59.4	Lat Struct			
Primary	59		90	100	112
Primary	58.4	Lat Struct			
Primary	58		120	140	157
Primary	57.5	Lat Struct			
Primary	57		120	113	105
Primary	56.5	Lat Struct			
Primary	56		115	120	130
Primary	55.5	Lat Struct			
Primary	55.4	Lat Struct			
Primary	55		94	96	100
Primary	54.5	Lat Struct			
Primary	54.4	Lat Struct			
Primary	54		90	81	79
Primary	53.5	Lat Struct			
Primary	53.4	Lat Struct			
Primary	53		80	120	165
Primary	52		112	112	140
Primary	51.5	Lat Struct			
Primary	51		110	180	230
Primary	50.5	Lat Struct			
Primary	50		85	100	111
Primary	49.5	Lat Struct			
Primary	49		115	130	145
Primary	48.5	Lat Struct			
Primary	48		80	95	105
Primary	47.5	Lat Struct			
Primary	47		82	80	83
Primary	46.5	Lat Struct			
Primary	46		125	124	117
Primary	45.5	Lat Struct			
Primary	45		75	60	60
Primary	44.5	Culvert			
Primary	44		152	160	160
Primary	43.5	Lat Struct			
Primary	43		68	59	65
Primary	42.5	Lat Struct			
Primary	42		100	98	96
Primary	41.5	Lat Struct			
Primary	41		102	100	100
Primary	40.5	Lat Struct			
Primary	40		95	85	100
Primary	39.5	Lat Struct			
Primary	39		100	115	100
Primary	38.5	Lat Struct			
Primary	38		108	100	104
Primary	37.5	Lat Struct			
Primary	37		89	100	100
Primary	36.5	Lat Struct			
Primary	36		102	100	99
Primary	35.5	Lat Struct			
Primary	35		109	97	102
Primary	34.5	Lat Struct			
Primary	34		77	90	100
Primary	33.5	Lat Struct			
Primary	33		130	125	110
Primary	32.5	Lat Struct			
Primary	32		99	105	95
Primary	31.5	Lat Struct			
Primary	31		116	105	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Ajo

Reach	River Sta.	Contr.	Expan.
Primary	100	.1	.3
Primary	99	.1	.3
Primary	98	.1	.3
Primary	97	.1	.3
Primary	96	.1	.3
Primary	95	.1	.3
Primary	94	.1	.3
Primary	93	.1	.3
Primary	92	.1	.3
Primary	91	.1	.3
Primary	90	.1	.3
Primary	89	.1	.3
Primary	88	.1	.3
Primary	87	.1	.3
Primary	86	.1	.3
Primary	85	.1	.3
Primary	84	.1	.3
Primary	83	.1	.3
Primary	82	.1	.3
Primary	81	.1	.3
Primary	80.5	Lat Struct	
Primary	80.4	Lat Struct	
Primary	80	.1	.3
Primary	79.5	Lat Struct	
Primary	79.4	Lat Struct	
Primary	79	.3	.5
Primary	78.5	Culvert	
Primary	78	.3	.5
Primary	77	.1	.3
Primary	76	.1	.3
Primary	75	.1	.3
Primary	74	.1	.3
Primary	73	.1	.3
Primary	72	.1	.3
Primary	71	.1	.3
Primary	70	.1	.3
Primary	69.4	Lat Struct	
Primary	69	.1	.3
Primary	68.5	Lat Struct	
Primary	68.4	Lat Struct	
Primary	68	.1	.3
Primary	67.5	Lat Struct	
Primary	67.4	Lat Struct	
Primary	67	.1	.3
Primary	66	.1	.3
Primary	65	.1	.3
Primary	64	.1	.3
Primary	63	.1	.3
Primary	62	.1	.3
Primary	61	.1	.3
Primary	60	.1	.3
Primary	59.4	Lat Struct	
Primary	59	.1	.3
Primary	58.4	Lat Struct	
Primary	58	.1	.3
Primary	57.5	Lat Struct	
Primary	57	.1	.3
Primary	56.5	Lat Struct	
Primary	56	.1	.3
Primary	55.5	Lat Struct	
Primary	55.4	Lat Struct	
Primary	55	.1	.3
Primary	54.5	Lat Struct	
Primary	54.4	Lat Struct	
Primary	54	.1	.3
Primary	53.5	Lat Struct	
Primary	53.4	Lat Struct	
Primary	53	.1	.3
Primary	52	.1	.3
Primary	51.5	Lat Struct	
Primary	51	.1	.3
Primary	50.5	Lat Struct	
Primary	50	.1	.3
Primary	49.5	Lat Struct	
Primary	49	.1	.3

Primary	48.5	Lat Struct		
Primary	48	.1	.3	
Primary	47.5	Lat Struct		
Primary	47	.1	.3	
Primary	46.5	Lat Struct		
Primary	46	.1	.3	
Primary	45.5	Lat Struct		
Primary	45	.3	.5	
Primary	44.5	Culvert		
Primary	44	.3	.5	
Primary	43.5	Lat Struct		
Primary	43	.1	.3	
Primary	42.5	Lat Struct		
Primary	42	.1	.3	
Primary	41.5	Lat Struct		
Primary	41	.1	.3	
Primary	40.5	Lat Struct		
Primary	40	.1	.3	
Primary	39.5	Lat Struct		
Primary	39	.1	.3	
Primary	38.5	Lat Struct		
Primary	38	.1	.3	
Primary	37.5	Lat Struct		
Primary	37	.1	.3	
Primary	36.5	Lat Struct		
Primary	36	.1	.3	
Primary	35.5	Lat Struct		
Primary	35	.1	.3	
Primary	34.5	Lat Struct		
Primary	34	.1	.3	
Primary	33.5	Lat Struct		
Primary	33	.1	.3	
Primary	32.5	Lat Struct		
Primary	32	.1	.3	
Primary	31.5	Lat Struct		
Primary	31	.1	.3	

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Primary	31	PF 1	2160.48	1712.21	1716.49	1716.49	1717.92	0.009623	9.61	224.79	79.58	1.01
Primary	31.5											Lat Struct
Primary	32	PF 1	2160.48	1713.36	1719.11	1719.11	1721.04	0.008785	11.15	193.85	49.98	1.00
Primary	32.5											Lat Struct
Primary	33	PF 1	2160.48	1714.25	1720.70	1720.70	1722.70	0.008573	11.36	191.69	56.95	0.99
Primary	33.5											Lat Struct
Primary	34	PF 1	2160.48	1715.14	1721.61	1721.61	1723.61	0.008963	11.35	190.37	48.43	1.01
Primary	34.5											Lat Struct
Primary	35	PF 1	2160.48	1718.25	1723.79	1723.79	1725.63	0.008846	10.91	198.01	53.57	1.00
Primary	35.5											Lat Struct
Primary	36	PF 1	2160.48	1719.10	1725.66		1726.11	0.001726	5.37	414.02	108.01	0.46
Primary	36.5											Lat Struct
Primary	37	PF 1	2160.48	1722.67	1726.95	1726.95	1728.60	0.009121	10.32	209.39	63.44	1.00
Primary	37.5											Lat Struct
Primary	38	PF 1	2160.48	1724.21	1728.75	1728.75	1730.49	0.008998	10.57	204.34	58.89	1.00
Primary	38.5											Lat Struct

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  Primary        39            PF 1                2168.86    1727.19    1734.25    1734.25    1735.86
0.006415      10.37      269.52      144.04          0.87
  Primary      39.5                            Lat Struct

  Primary        40            PF 1                2231.57    1729.35    1735.21    1734.90    1736.47
0.006973       9.03      255.89       94.74          0.88
  Primary      40.5                            Lat Struct

  Primary        41            PF 1                2232.05    1730.24    1736.04    1736.04    1737.73
0.009004      10.43      214.31       67.60          1.00
  Primary      41.5                            Lat Struct

  Primary        42            PF 1                2232.05    1731.03    1737.95    1737.95    1739.34
0.008991       9.48      245.54      123.59          0.97
  Primary      42.5                            Lat Struct

  Primary        43            PF 1                2232.05    1731.47    1738.98    1738.98    1740.47
0.006143      10.50      393.85      209.50          0.84
  Primary      43.5                            Lat Struct

  Primary        44            PF 1                2245.07    1733.19    1740.78               1741.16
0.001175       5.33      768.65      287.28          0.39
  Primary      44.5                                Culvert

  Primary        45            PF 1                2245.07    1734.22    1740.77    1740.77    1742.70
0.007630      11.24      237.23      127.46          0.89
  Primary      45.5                            Lat Struct

  Primary        46            PF 1                2253.05    1734.69    1742.42    1741.76    1743.46
0.004072       8.65      441.96      212.34          0.69
  Primary      46.5                            Lat Struct

  Primary        47            PF 1                2258.53    1736.87    1742.64    1742.64    1744.07
0.007982       9.67      266.76      146.27          0.94
  Primary      47.5                            Lat Struct

  Primary        48            PF 1                2258.53    1736.82    1743.71    1743.71    1745.69
0.009104      11.31      199.61       50.75          1.01
  Primary      48.5                            Lat Struct

  Primary        49            PF 1                2258.80    1740.13    1746.51    1746.51    1747.89
0.006055       9.75      357.04      231.45          0.83
  Primary      49.5                            Lat Struct

  Primary        50            PF 1                2259.53    1740.73    1747.26               1748.45
0.004998       8.96      355.80      210.72          0.76
  Primary      50.5                            Lat Struct

  Primary        51            PF 1                2259.53    1743.64    1749.06    1749.06    1750.27
0.006880       9.49      420.40      236.08          0.88
  Primary      51.5                            Lat Struct

  Primary        52            PF 1                2259.53    1744.89    1750.43    1750.43    1751.46
0.007729       9.49      531.26      291.83          0.91
  Primary        53            PF 1                1729.53    1747.53    1751.84    1751.84    1753.51
0.009750      10.37      166.73       50.63          1.01
  Primary      53.4                            Lat Struct

  Primary      53.5                            Lat Struct

  Primary        54            PF 1                2054.40    1748.51    1753.12    1753.12    1754.44
0.009688      10.43      304.49      112.70          1.02
  Primary      54.4                            Lat Struct

  Primary      54.5                            Lat Struct

  Primary        55            PF 1                2318.27    1749.98    1754.44    1754.44    1755.62
0.010216       8.72      265.87      113.50          1.00
  Primary      55.4                            Lat Struct

  Primary      55.5                            Lat Struct

  Primary        56            PF 1                2398.54    1750.30    1755.67    1755.67    1756.96
0.009894       9.10      263.48      102.81          1.00
  Primary      56.5                            Lat Struct

  Primary        57            PF 1                2406.91    1751.02    1757.05    1757.05    1758.40
0.008579       9.36      273.96      124.54          0.96
  Primary      57.5                            Lat Struct
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  Primary        58            PF 1                2407.40    1752.86    1758.89    1758.89    1760.79
0.009033     11.05     217.81       58.26            1.01
  Primary      58.4                              Lat Struct

  Primary        59            PF 1                2492.21    1759.04    1762.82    1762.82    1763.81
0.010430      7.97     312.73      156.26            0.99
  Primary      59.4                              Lat Struct

  Primary        60            PF 1                2567.10    1759.10    1765.12    1765.12    1766.85
0.008913     10.57     242.92       69.47            1.00
  Primary        61            PF 1                2567.10    1760.65    1767.45    1767.45    1768.90
0.009573      9.66     265.85       90.83            0.99
  Primary        62            PF 1                2567.10    1764.58    1769.40    1769.40    1770.69
0.009608      9.11     281.90      108.33            0.99
  Primary        63            PF 1                2567.10    1766.21    1771.52    1771.52    1773.19
0.009035     10.37     247.43       73.89            1.00
  Primary        64            PF 1                2567.10    1767.05    1773.19    1773.19    1775.24
0.008865     11.49     223.45       54.36            1.00
  Primary        65            PF 1                2567.10    1769.85    1775.61    1775.61    1777.57
0.008722     11.23     228.59       58.63            1.00
  Primary        66            PF 1                2567.10    1772.48    1778.53    1778.53    1780.43
0.009036     11.05     232.39       62.54            1.01
  Primary        67            PF 1                2489.44    1776.21    1782.61    1782.61    1784.04
0.006209      9.71     307.53      184.08            0.85
  Primary      67.4                              Lat Struct

  Primary      67.5                              Lat Struct

  Primary        68            PF 1                2537.82    1779.87    1787.03    1787.03    1789.23
0.006867     12.02     226.48       60.07            0.89
  Primary      68.4                              Lat Struct

  Primary      68.5                              Lat Struct

  Primary        69            PF 1                2841.92    1784.68    1790.77    1790.77    1792.82
0.008839     11.50     247.21       60.59            1.00
  Primary      69.4                              Lat Struct

  Primary        70            PF 1                3100.00    1786.50    1792.61    1792.61    1794.44
0.007580     10.94     314.59      114.00            0.95
  Primary        71            PF 1                3100.00    1788.65    1794.11    1794.11    1796.04
0.008501     11.16     277.68       71.01            0.99
  Primary        72            PF 1                3100.00    1790.36    1796.01    1796.01    1798.29
0.008603     12.10     256.13       56.07            1.00
  Primary        73            PF 1                3100.00    1791.39    1797.39    1797.39    1799.60
0.008402     11.93     259.83       58.71            1.00
  Primary        74            PF 1                3100.00    1793.47    1799.31    1799.31    1801.37
0.008481     11.53     268.87       64.89            1.00
  Primary        75            PF 1                3100.00    1795.82    1800.89    1800.89    1802.71
0.008788     10.82     286.45       78.81            1.00
  Primary        76            PF 1                3100.00    1799.32    1804.90    1804.90    1807.12
0.008450     11.97     259.01       57.94            1.00
  Primary        77            PF 1                3077.53    1800.26    1806.30    1805.77    1807.92
0.005830     10.23     307.97       88.79            0.84
  Primary        78            PF 1                3077.53    1801.33    1808.53    1808.53    1811.23
0.008550     13.18     233.56       43.47            1.00
  Primary      78.5                              Culvert

  Primary        79            PF 1                3077.53    1802.49    1811.99    1809.56    1813.05
0.002934      8.26     374.56       85.81            0.60
  Primary      79.4                              Lat Struct

  Primary      79.5                              Lat Struct

  Primary        80            PF 1                3100.00    1805.99    1811.93    1811.93    1814.14
0.008513     11.93     259.82       59.32            1.00
  Primary      80.4                              Lat Struct

  Primary      80.5                              Lat Struct

  Primary        81            PF 1                3100.00    1808.43    1813.93    1813.93    1816.17
0.008563     12.02     257.95       58.09            1.01
  Primary        82            PF 1                3100.00    1810.59    1816.02    1816.02    1818.02
0.008487     11.37     272.75       67.58            1.00
  Primary        83            PF 1                3100.00    1812.74    1818.27    1818.27    1819.75
0.009445      9.75     317.94      108.14            1.00
  Primary        84            PF 1                3100.00    1810.95    1819.52               1820.22
0.002790      6.72     460.98      109.61            0.58
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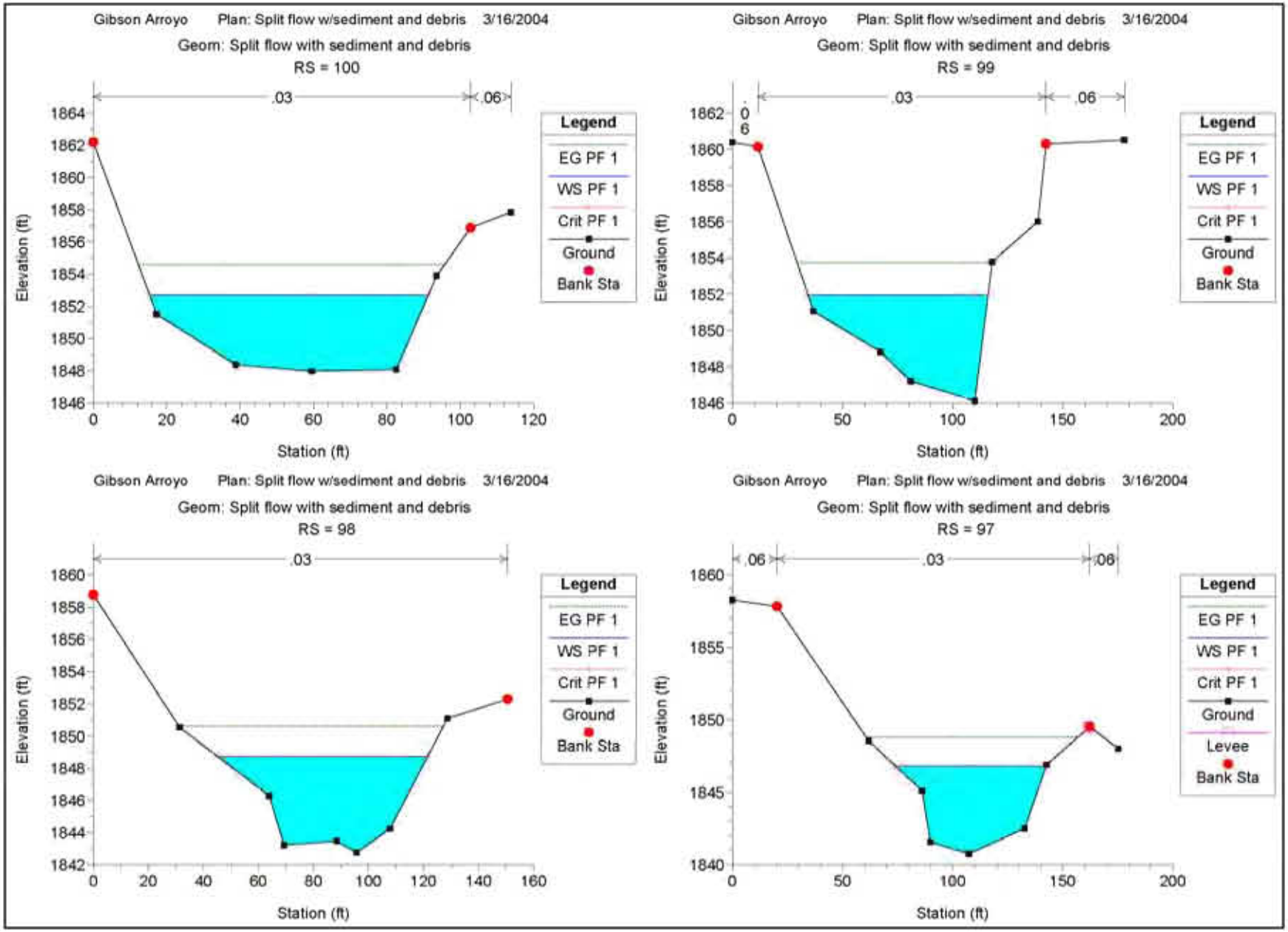
Primary	85	PF 1		3100.00	1818.42	1823.06	1823.06	1824.42		
0.009461	9.35	331.60	122.27	1.00						
Primary	86	PF 1		3100.00	1819.60	1824.67	1824.67	1826.28		
0.009368	10.18	304.43	96.31	1.01						
Primary	87	PF 1		3100.00	1821.10	1826.56	1826.56	1828.09		
0.009284	9.93	312.08	102.57	1.00						
Primary	88	PF 1		3100.00	1822.78	1828.31	1828.31	1830.17		
0.009118	10.95	283.21	76.50	1.00						
Primary	89	PF 1		3100.00	1824.57	1829.88	1829.88	1831.38		
0.009313	9.83	315.24	105.64	1.00						
Primary	90	PF 1		3100.00	1827.33	1831.71	1831.71	1832.95		
0.009801	8.96	345.90	139.08	1.00						
Primary	91	PF 1		3100.00	1829.74	1833.68	1833.68	1835.15		
0.009526	9.73	318.44	109.92	1.01						
Primary	92	PF 1		3100.00	1832.25	1835.56	1835.56	1836.71		
0.010205	8.61	360.12	157.81	1.00						
Primary	93	PF 1		3100.00	1833.54	1836.95	1836.95	1838.12		
0.010063	8.65	358.29	154.61	1.00						
Primary	94	PF 1		3100.00	1834.70	1838.69	1838.69	1839.86		
0.010211	8.68	357.30	155.65	1.01						
Primary	95	PF 1		3100.00	1837.09	1841.08	1841.08	1842.27		
0.010009	8.72	355.32	150.88	1.00						
Primary	96	PF 1		3100.00	1838.89	1843.53	1843.53	1845.08		
0.009210	9.99	310.19	100.76	1.00						
Primary	97	PF 1		3100.00	1840.77	1846.80	1846.80	1848.79		
0.008607	11.32	273.94	68.37	1.00						
Primary	98	PF 1		3100.00	1842.76	1848.73	1848.73	1850.60		
0.008849	10.97	282.53	76.37	1.01						
Primary	99	PF 1		3100.00	1846.11	1851.96	1851.96	1853.74		
0.009079	10.72	289.27	81.80	1.00						
Primary	100	PF 1		3100.00	1847.96	1852.71	1852.71	1854.57		
0.008729	10.95	283.02	76.00	1.00						

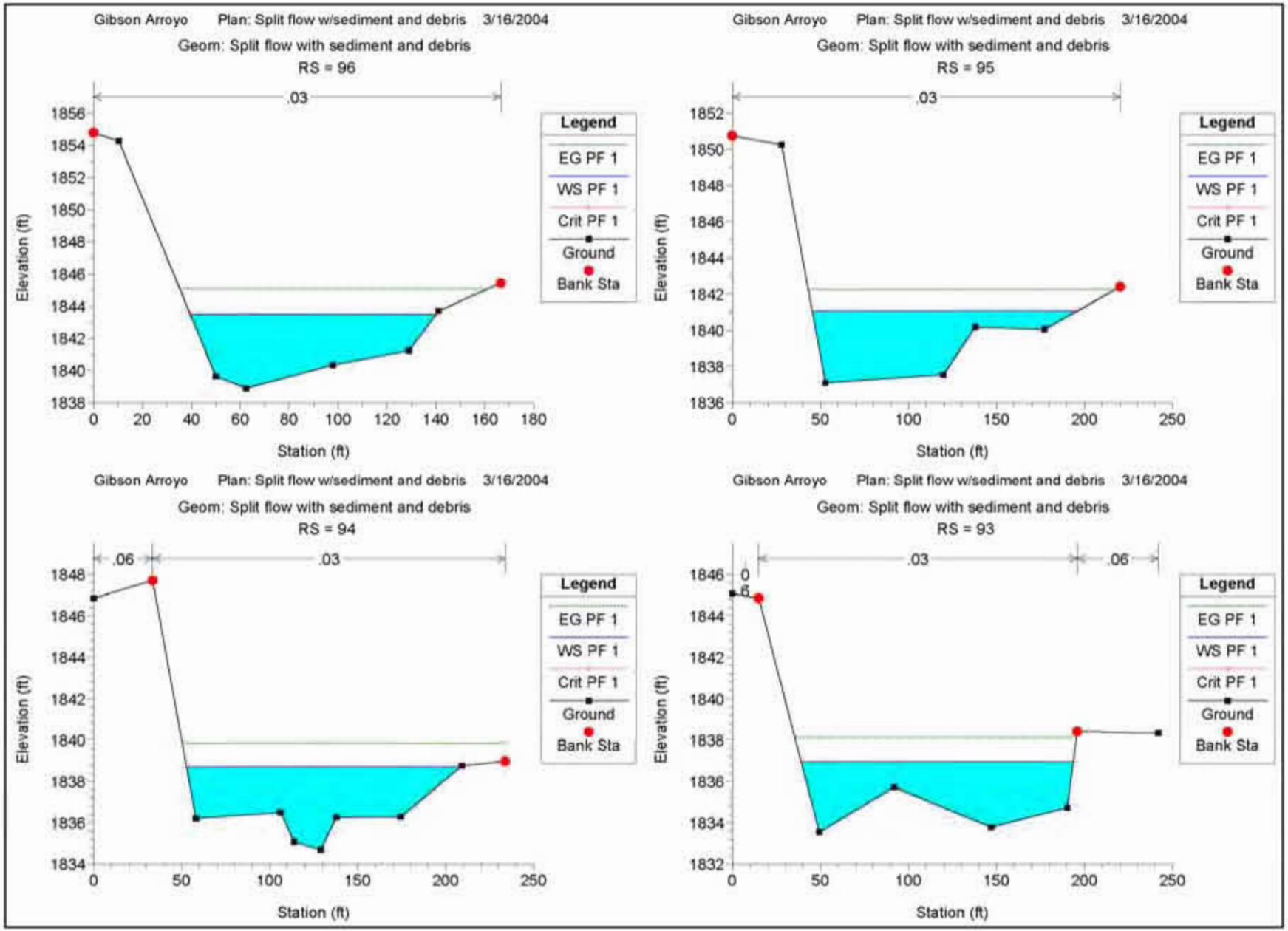
Profile Output Table - Gibson Arroyo Split Flow

Reach	River Sta	Profile	Q US	Q Leaving	Total	Q DS	Weir Max Depth	Weir
Avg Depth	W.S. US.	W.S. DS						
			(cfs)		(cfs)	(cfs)	(ft)	
(ft)	(ft)	(ft)						
Primary	31.5	PF 1	2160		0	2160		
	1719.1	1716.5						
Primary	32.5	PF 1	2160		0	2160		
	1720.7	1719.1						
Primary	33.5	PF 1	2160		0	2160		
	1721.6	1720.7						
Primary	34.5	PF 1	2160		0	2160		
	1723.8	1721.6						
Primary	35.5	PF 1	2160		0	2160		
	1725.7	1723.8						
Primary	36.5	PF 1	2160		0	2160		
	1726.9	1725.7						
Primary	37.5	PF 1	2160		0	2160		
	1728.8	1726.9						
Primary	38.5	PF 1	2169		8	2160	0.6	
0.3	1734.2	1728.8						
Primary	39.5	PF 1	2232		63	2169	0.6	
0.4	1735.2	1734.2						
Primary	40.5	PF 1	2232		0	2232	0.1	
0.0	1736.0	1735.2						
Primary	41.5	PF 1	2232		0	2232		
	1737.9	1736.0						
Primary	42.5	PF 1	2232		0	2232		
	1739.0	1737.9						
Primary	43.5	PF 1	2245		13	2232	0.3	
0.1	1740.8	1739.0						
Primary	45.5	PF 1	2253		8	2245	0.4	
0.2	1742.4	1740.8						
Primary	46.5	PF 1	2259		5	2253	0.4	
0.2	1742.6	1742.4						
Primary	47.5	PF 1	2259		0	2259		
	1743.7	1742.6						
Primary	48.5	PF 1	2259		0	2259	0.1	
0.1	1746.5	1743.7						
Primary	49.5	PF 1	2260		1	2259	0.1	

0.1	1747.3	1746.5					
Primary	50.5		PF 1	2260	0	2260	
	1749.1	1747.3					
Primary	51.5		PF 1	2260	0	2260	
	1750.4	1749.1					
Primary	53.4		PF 1	2054	295	1730	1.6
1.2	1753.1	1751.8					
Primary	53.5		PF 1	2054	29	1730	1.0
0.5	1753.1	1751.8					
Primary	54.4		PF 1	2318	73	2054	0.7
0.4	1754.4	1753.1					
Primary	54.5		PF 1	2318	189	2054	1.0
0.8	1754.4	1753.1					
Primary	55.4		PF 1	2399	1	2318	0.2
0.1	1755.7	1754.4					
Primary	55.5		PF 1	2399	78	2318	0.6
0.4	1755.7	1754.4					
Primary	56.5		PF 1	2407	8	2399	0.1
0.1	1757.1	1755.7					
Primary	57.5		PF 1	2407	0	2407	0.1
0.1	1758.9	1757.1					
Primary	58.4		PF 1	2492	86	2407	1.8
0.9	1762.8	1758.9					
Primary	59.4		PF 1	2567	76	2492	1.8
0.9	1765.1	1762.8					
Primary	67.4		PF 1	2538	0	2489	
	1787.0	1782.6					
Primary	67.5		PF 1	2538	48	2489	0.8
0.4	1787.0	1782.6					
Primary	68.4		PF 1	2842	274	2538	1.8
0.9	1790.8	1787.0					
Primary	68.5		PF 1	2842	29	2538	0.8
0.4	1790.8	1787.0					
Primary	69.4		PF 1	3100	258	2842	1.8
0.9	1792.6	1790.8					
Primary	79.4		PF 1	3100	24	3078	0.6
0.3	1811.9	1812.0					
Primary	79.5		PF 1	3100	0	3078	
	1811.9	1812.0					
Primary	80.4		PF 1	3100	0	3100	
	1813.9	1811.9					
Primary	80.5		PF 1	3100	0	3100	
	1813.9	1811.9					



Tetra Tech, Inc.



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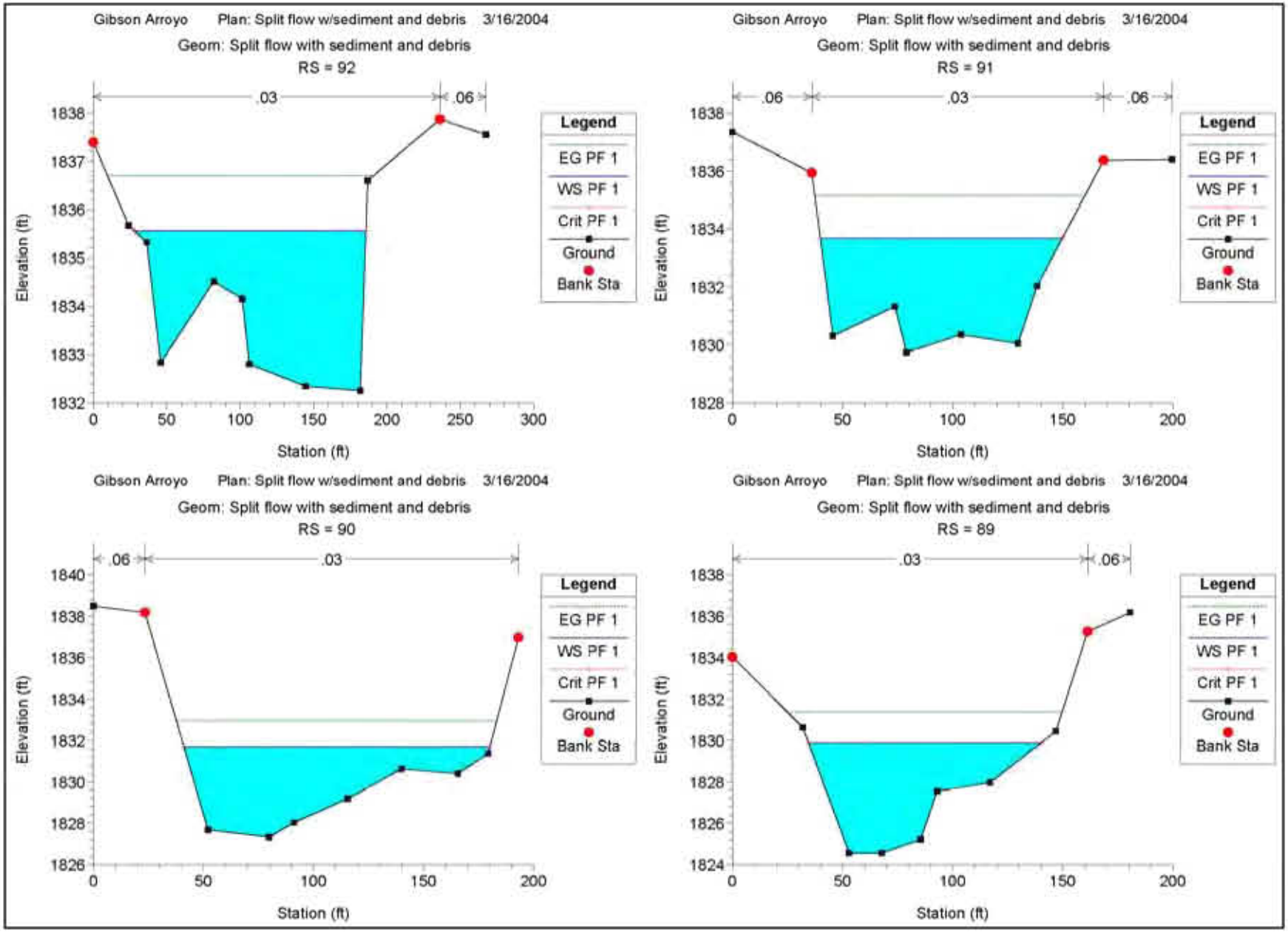
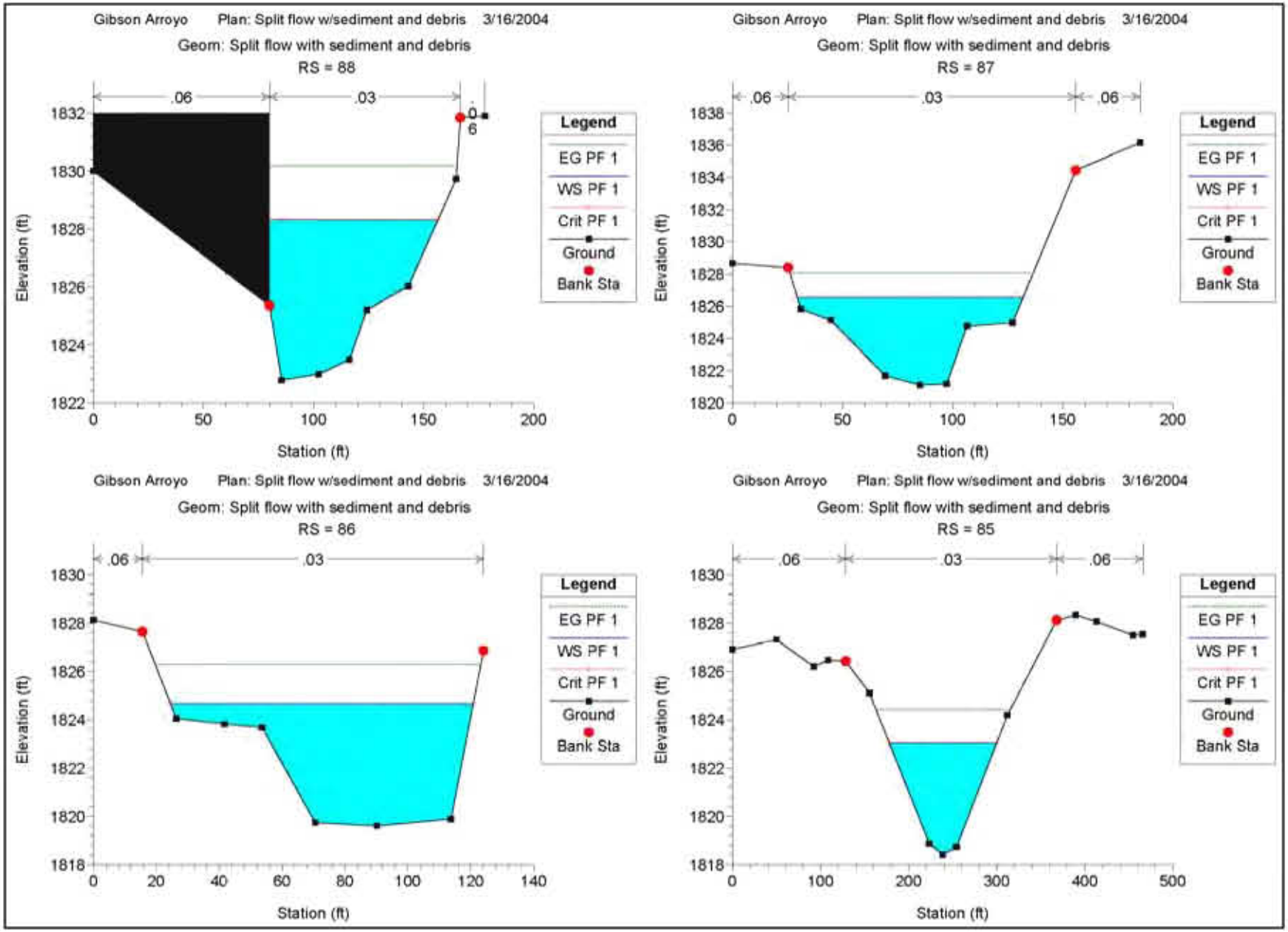
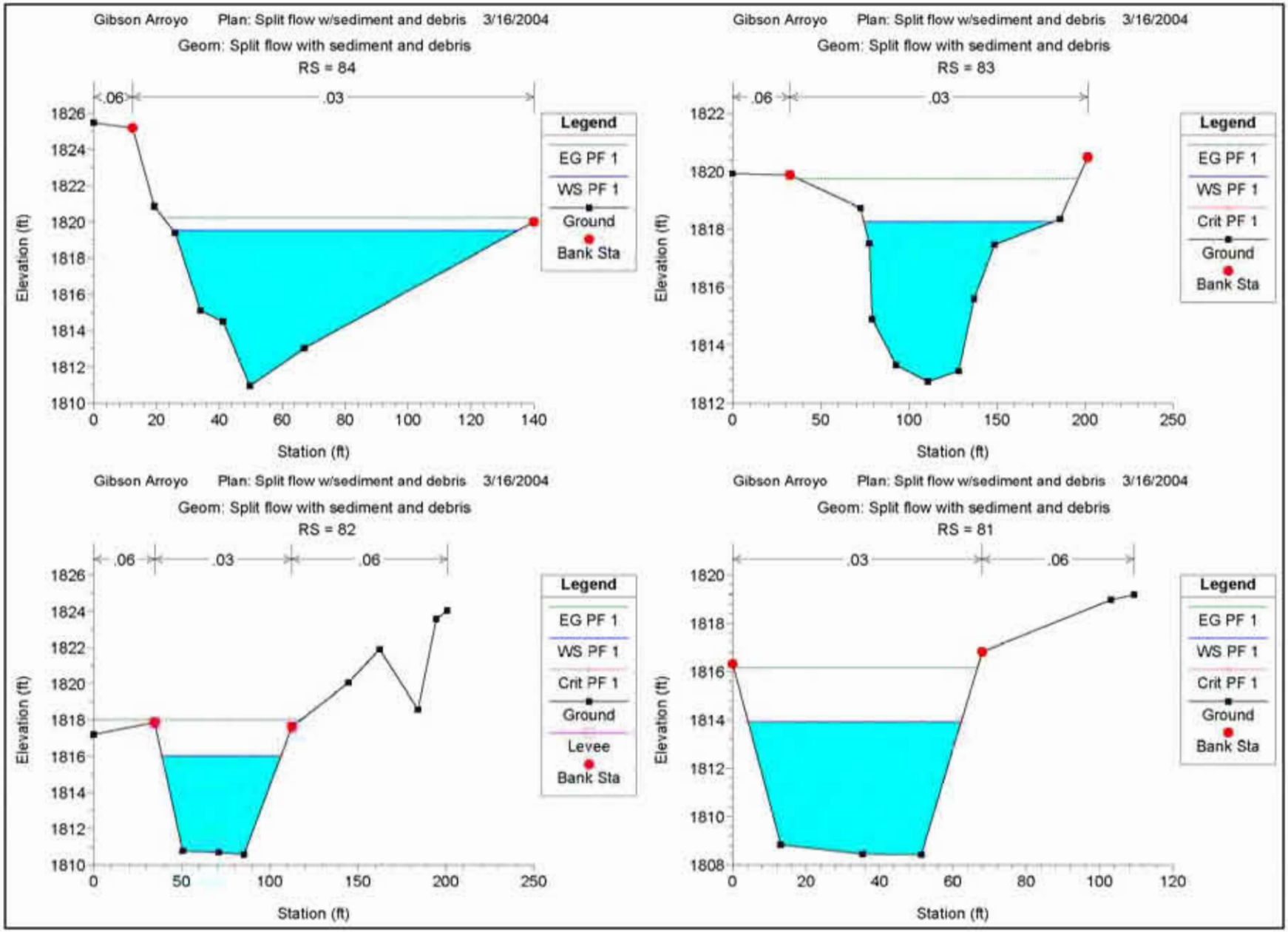
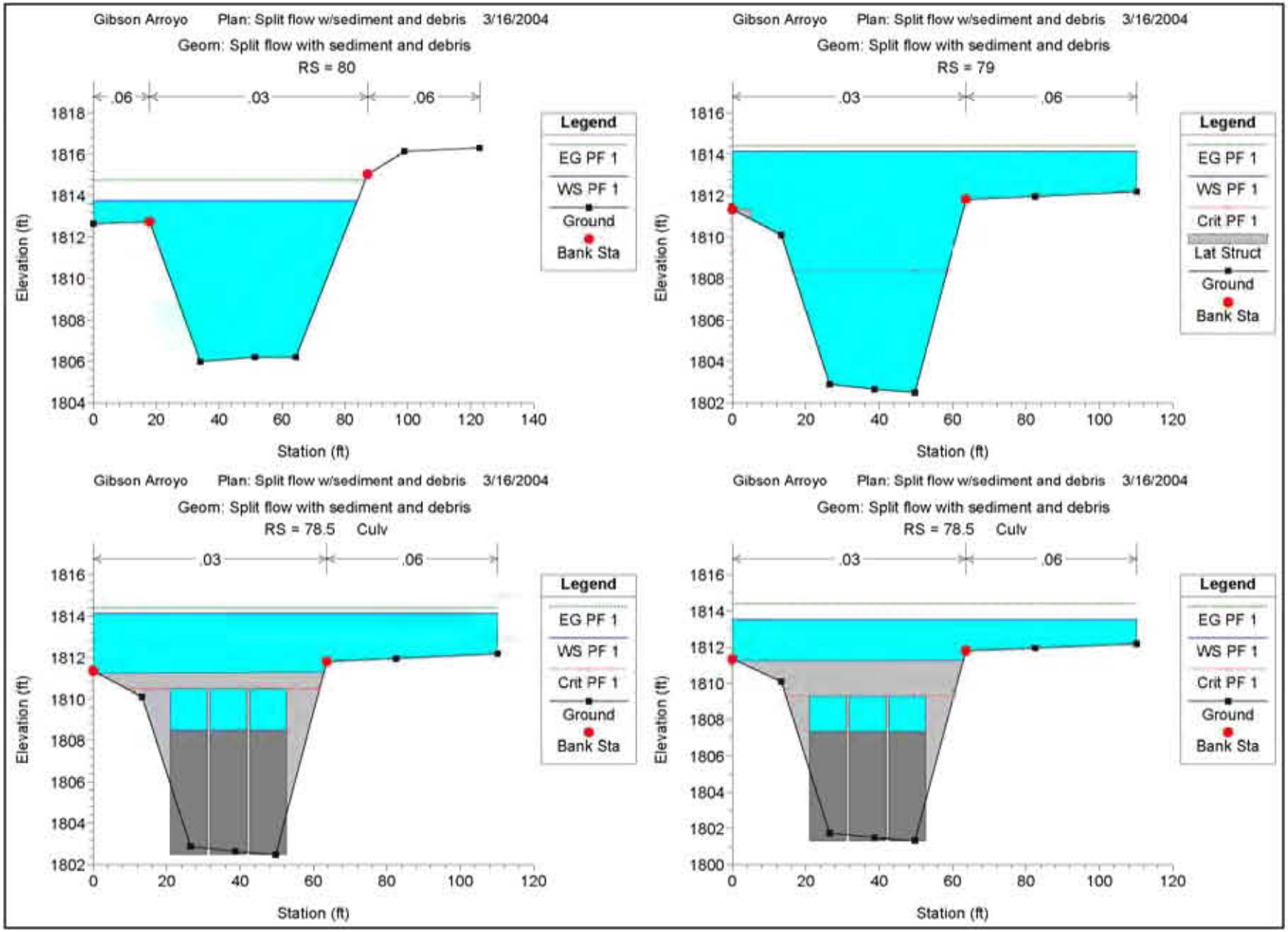


Tetra Tech, Inc.

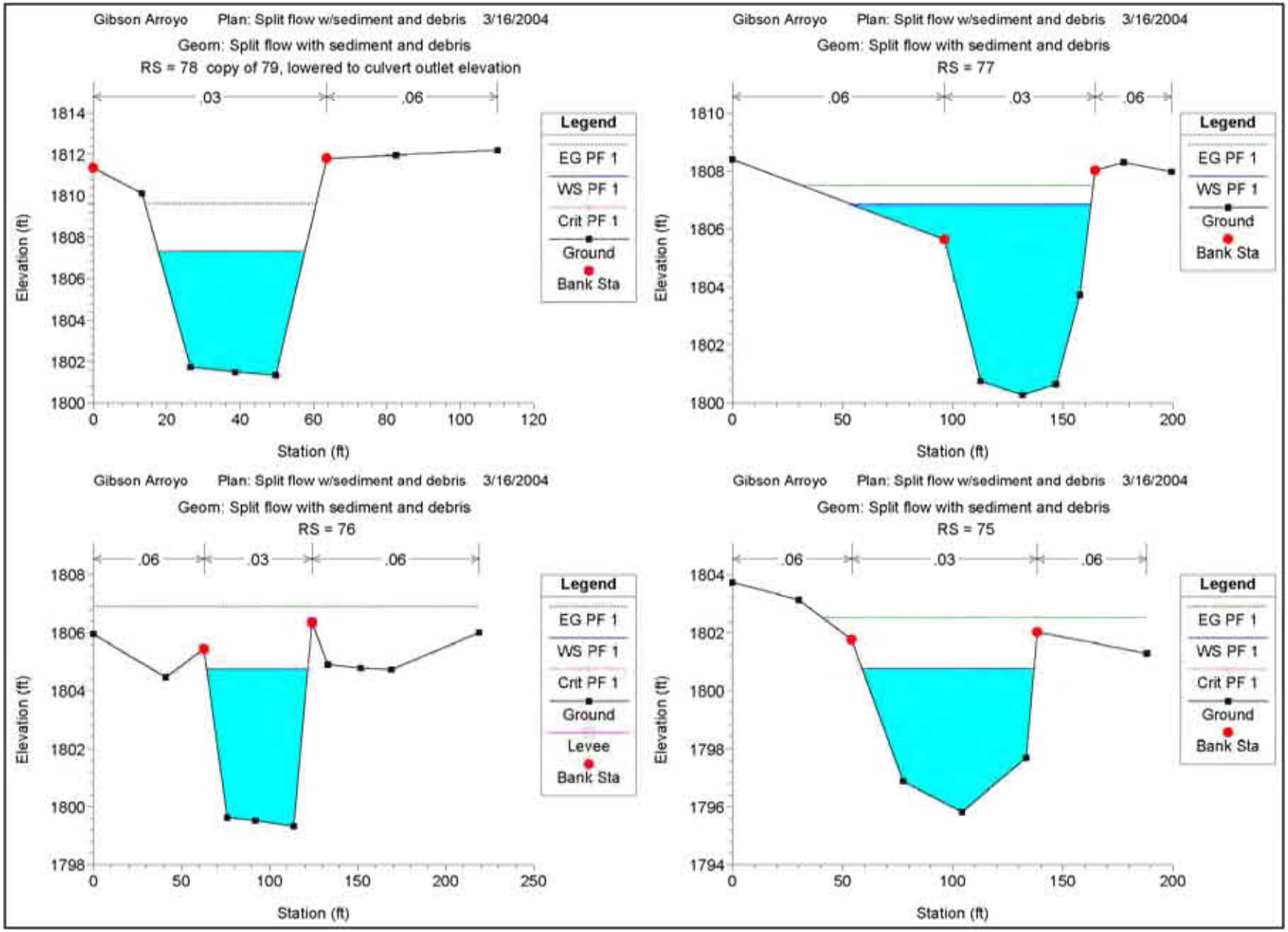


Tetra Tech, Inc.


Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 84
.06
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 83
.06
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 82
.06
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 81
.03
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)



Tetra Tech, Inc.



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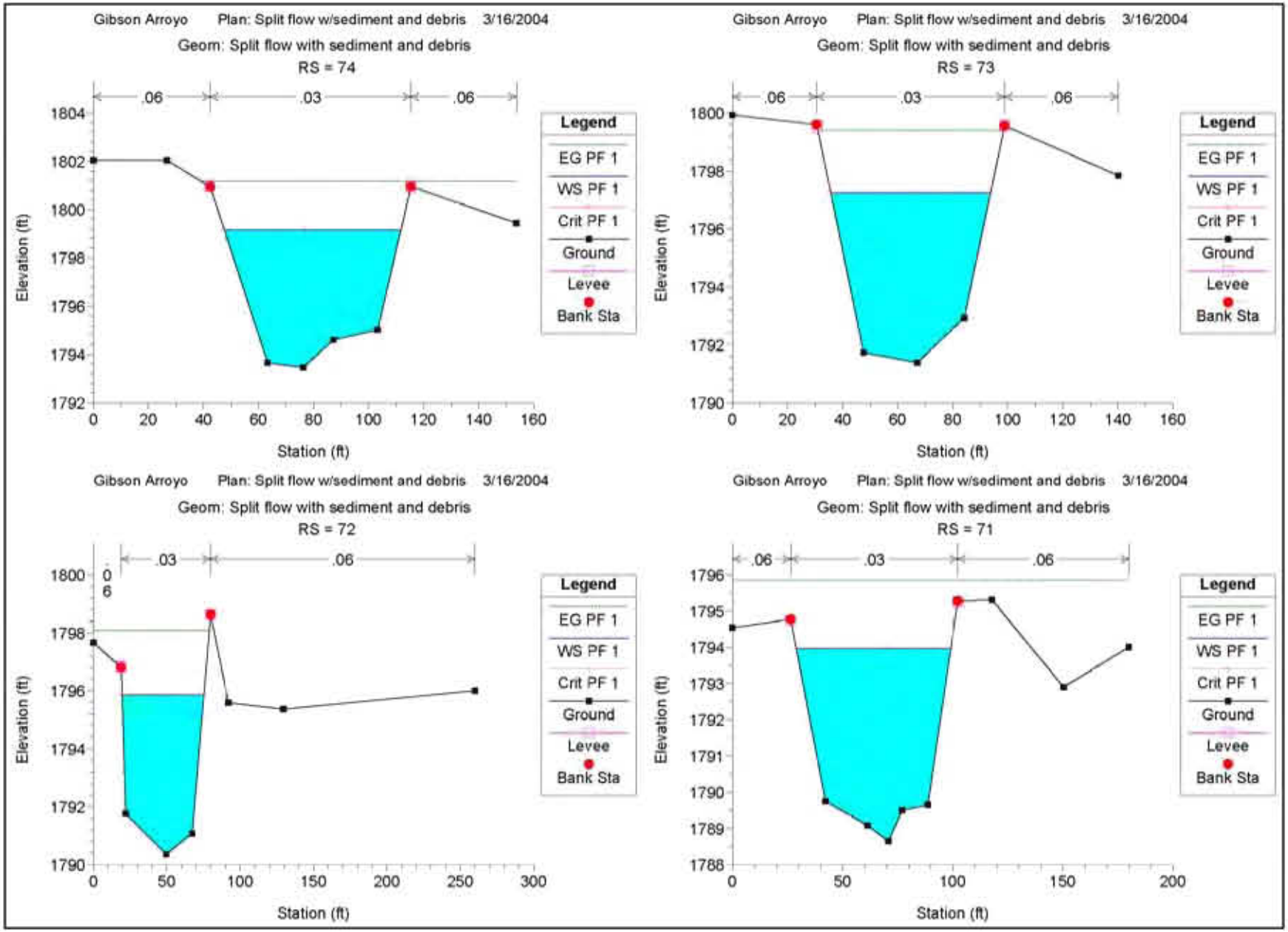

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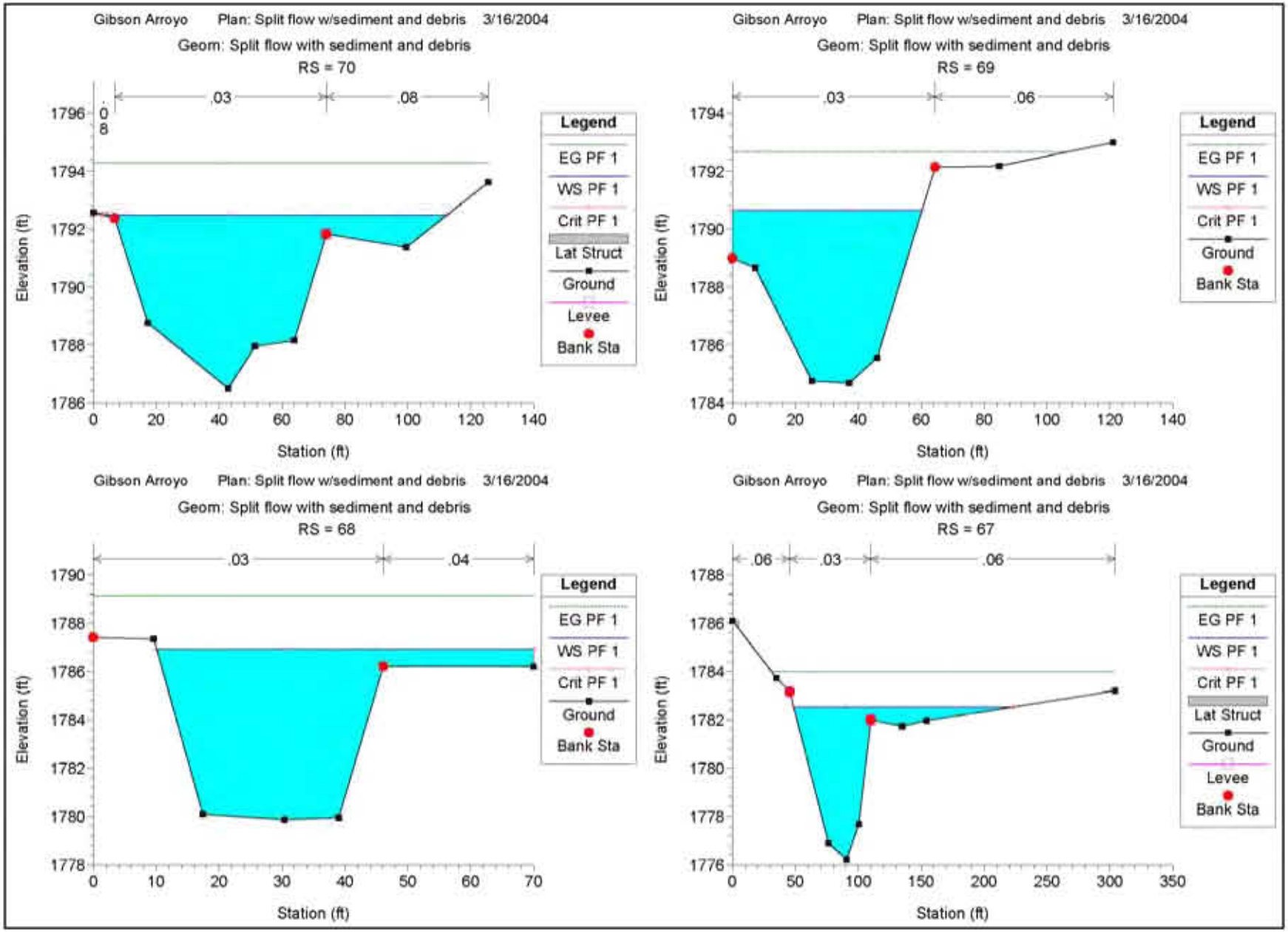

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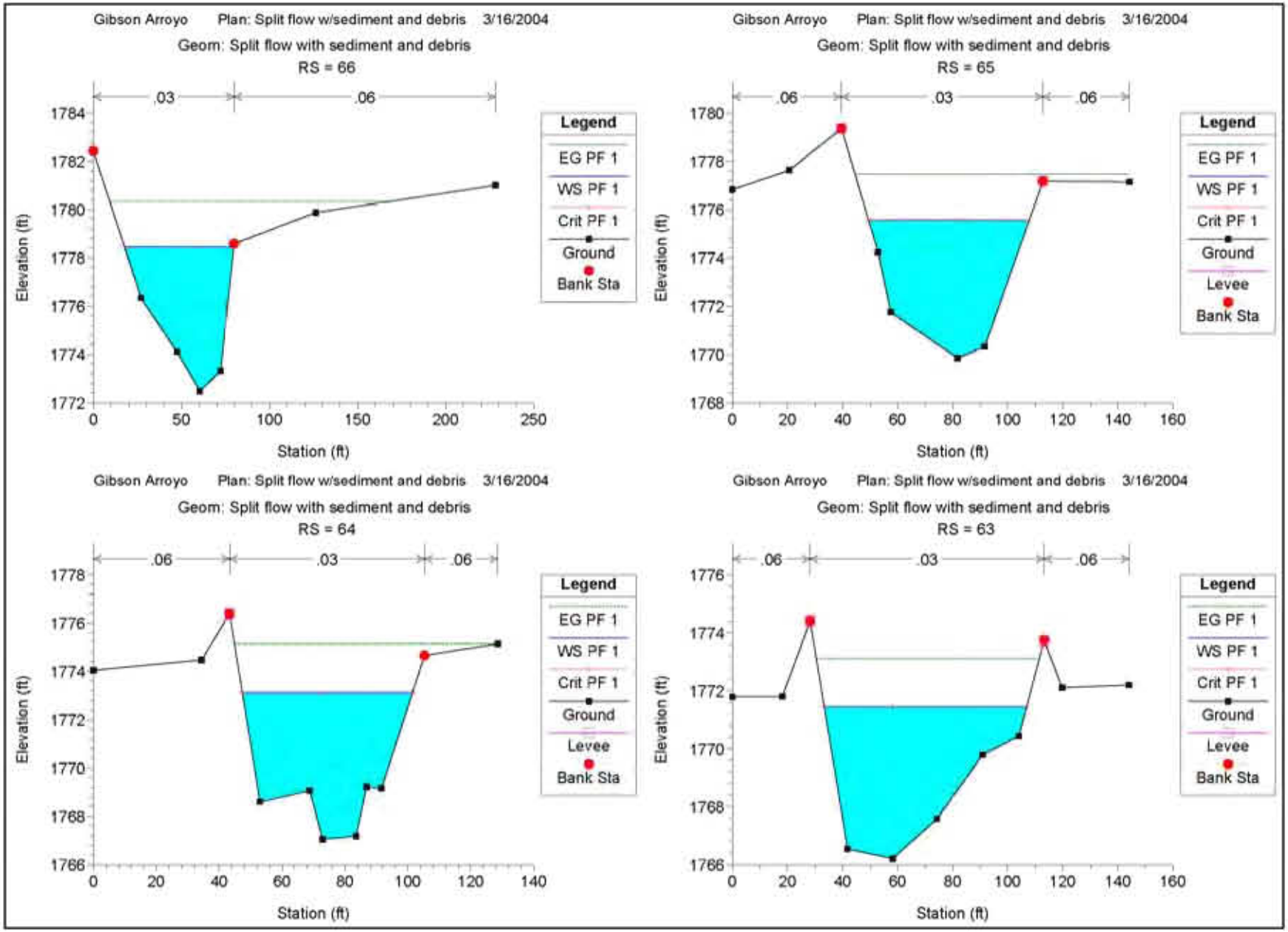

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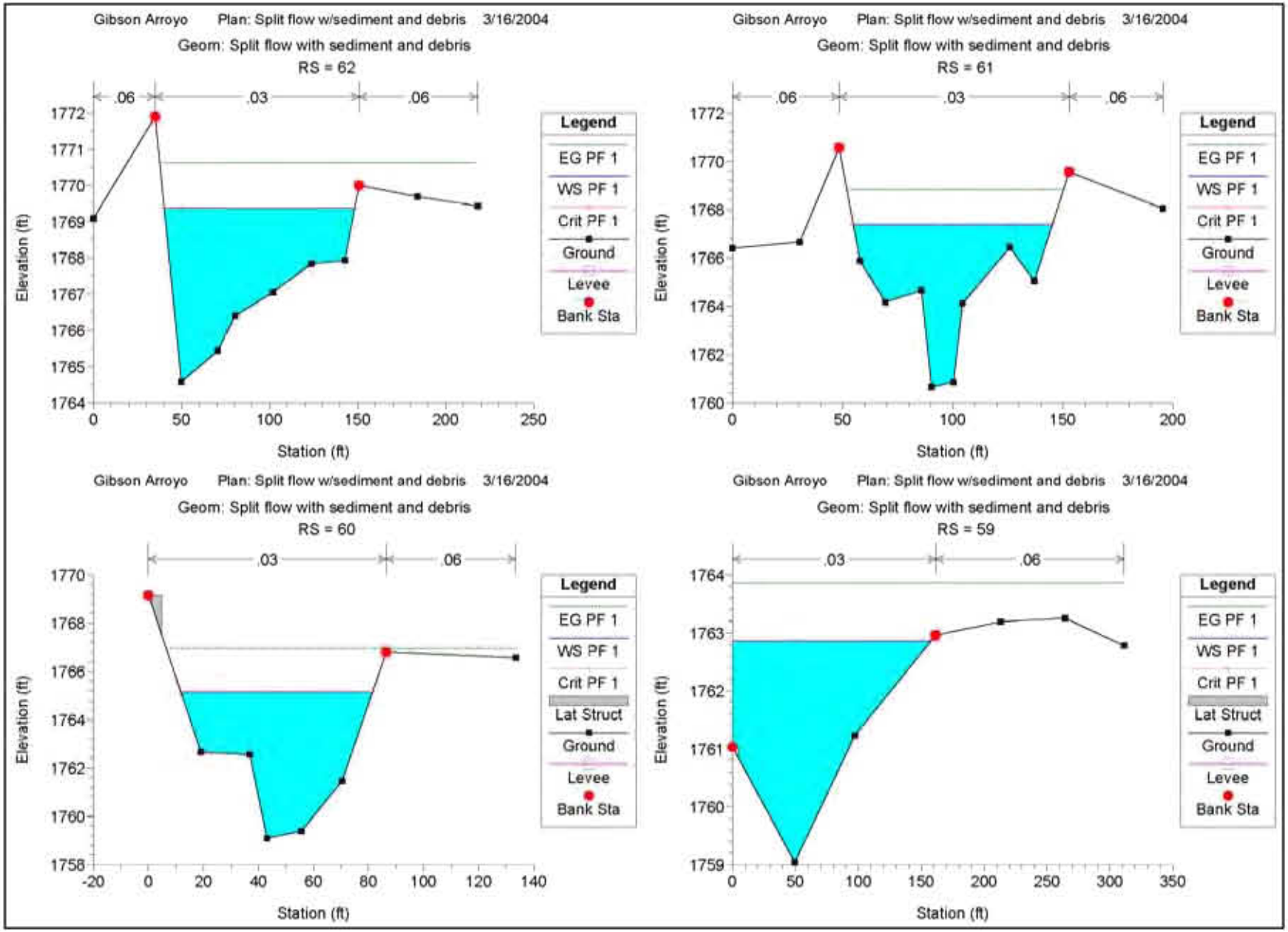
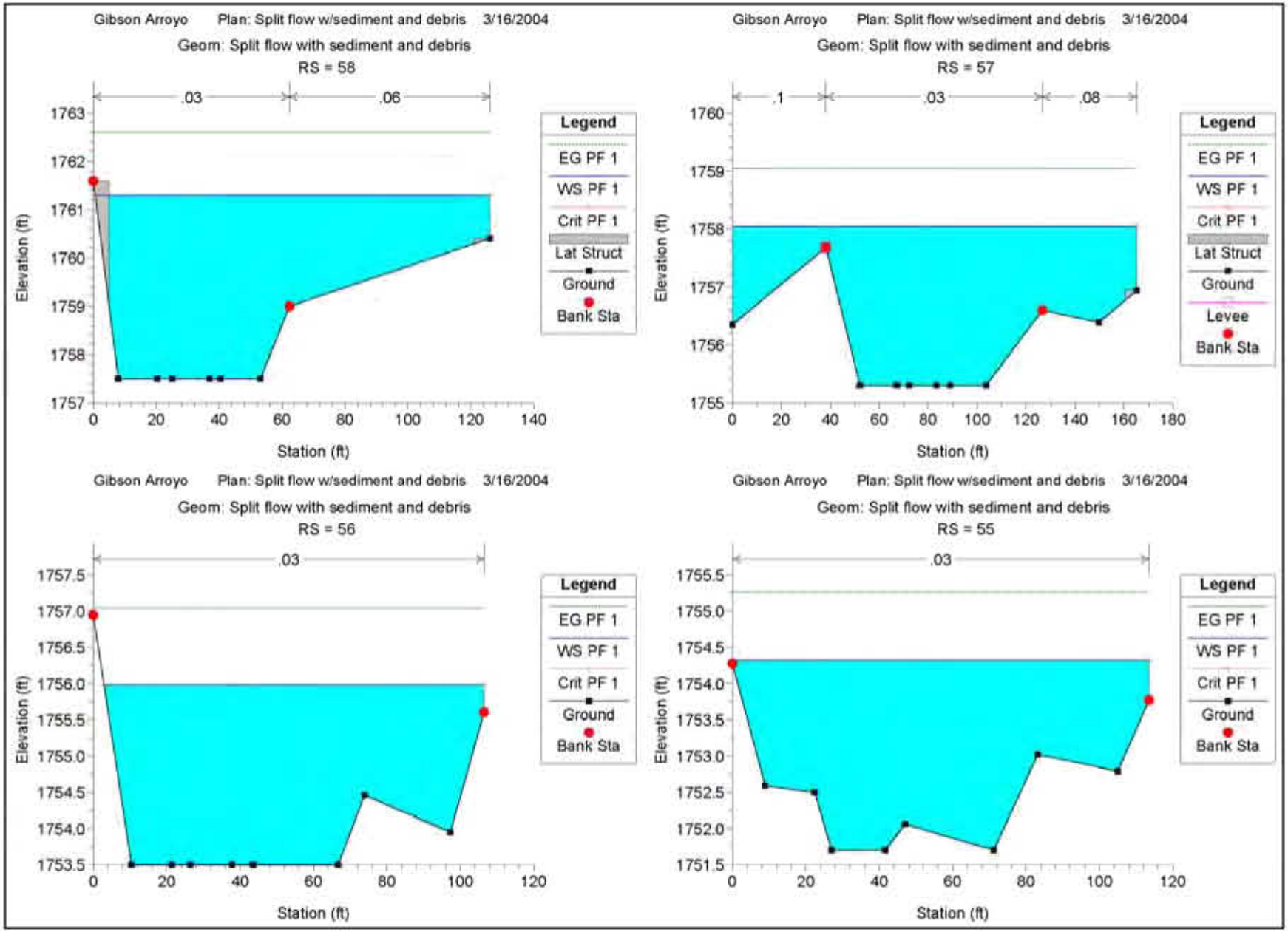

Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 62
.06
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 61
.06
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 60
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Levee
Bank Sta
Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 59
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Levee
Bank Sta



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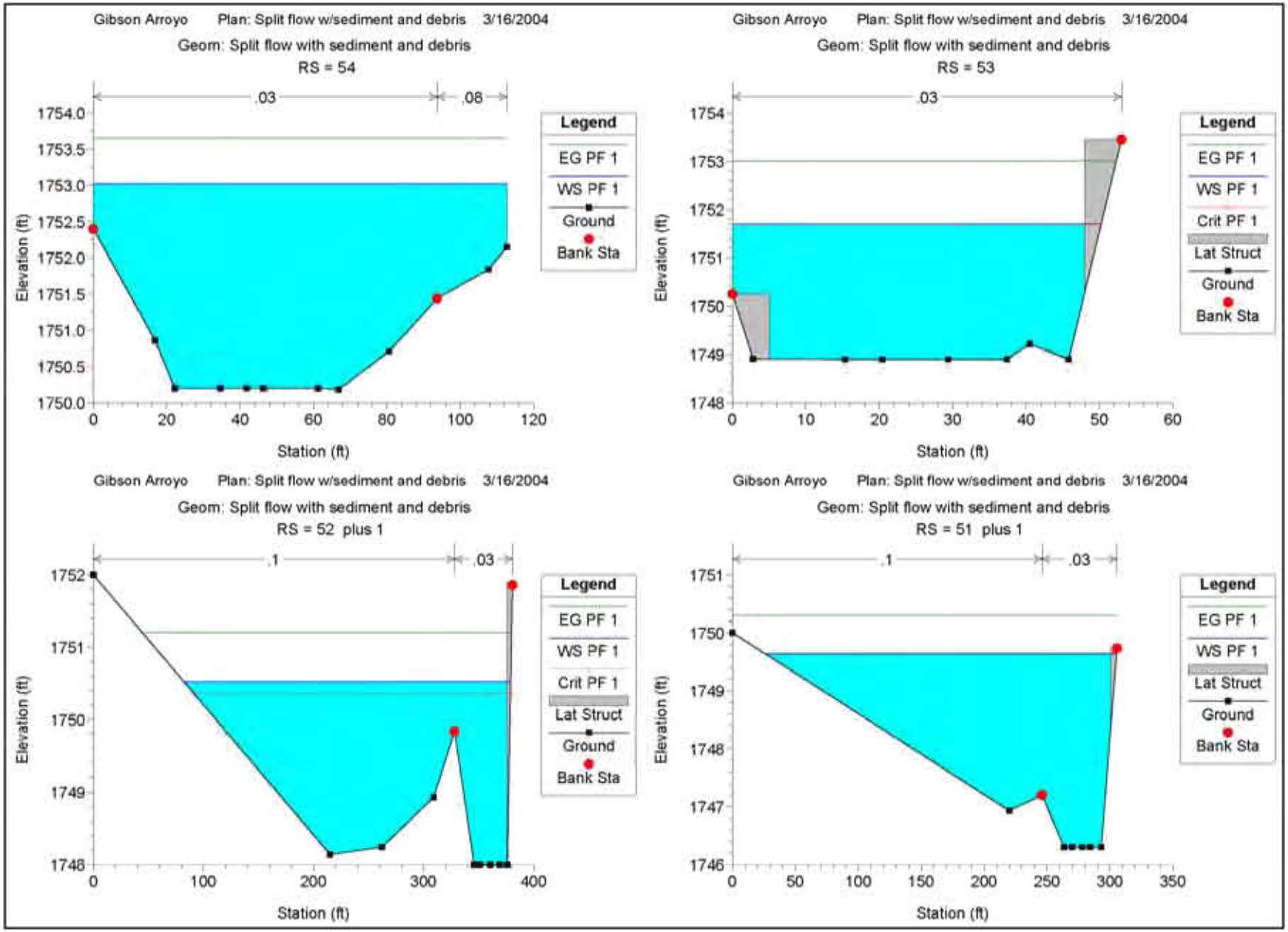

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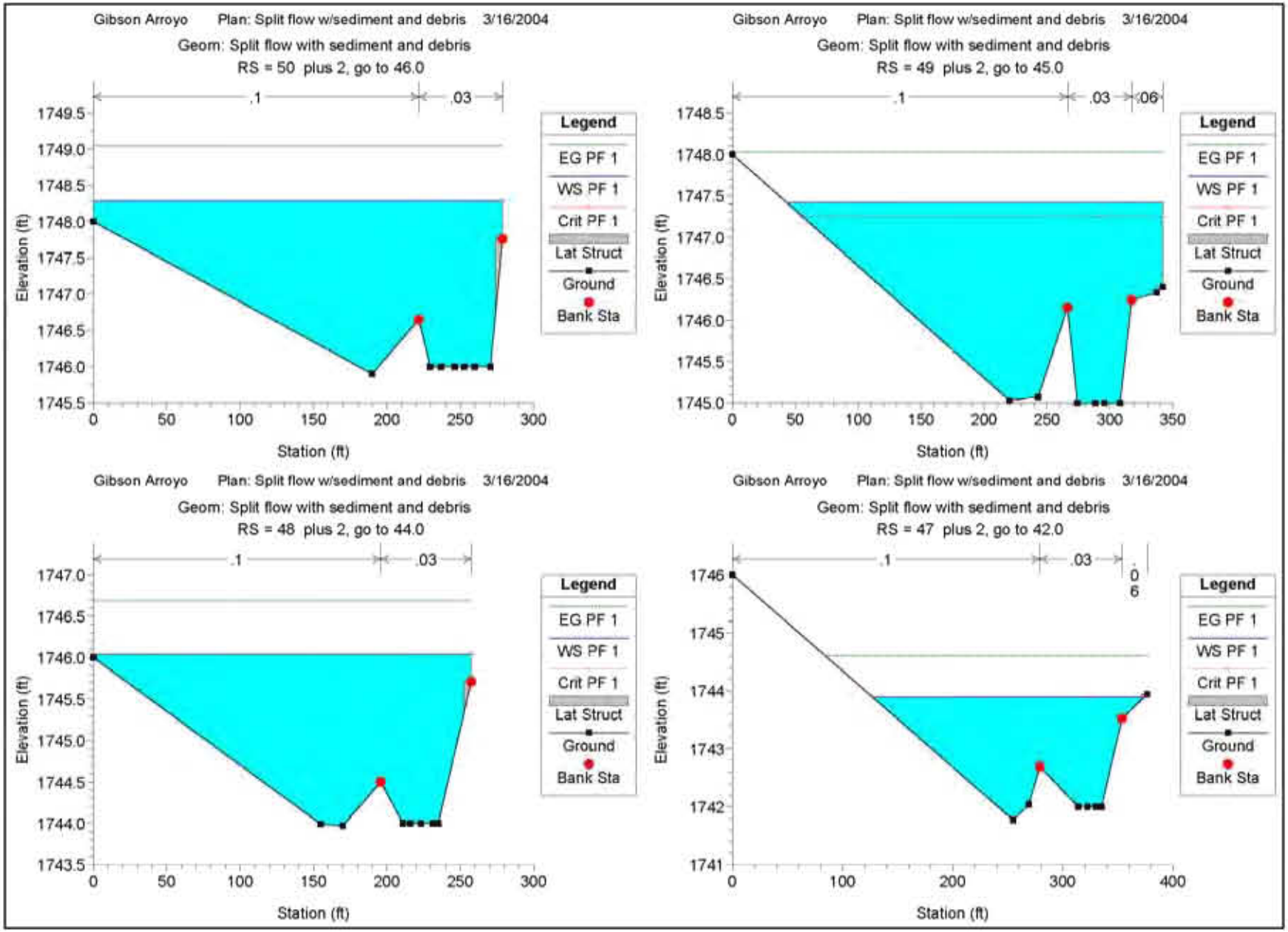

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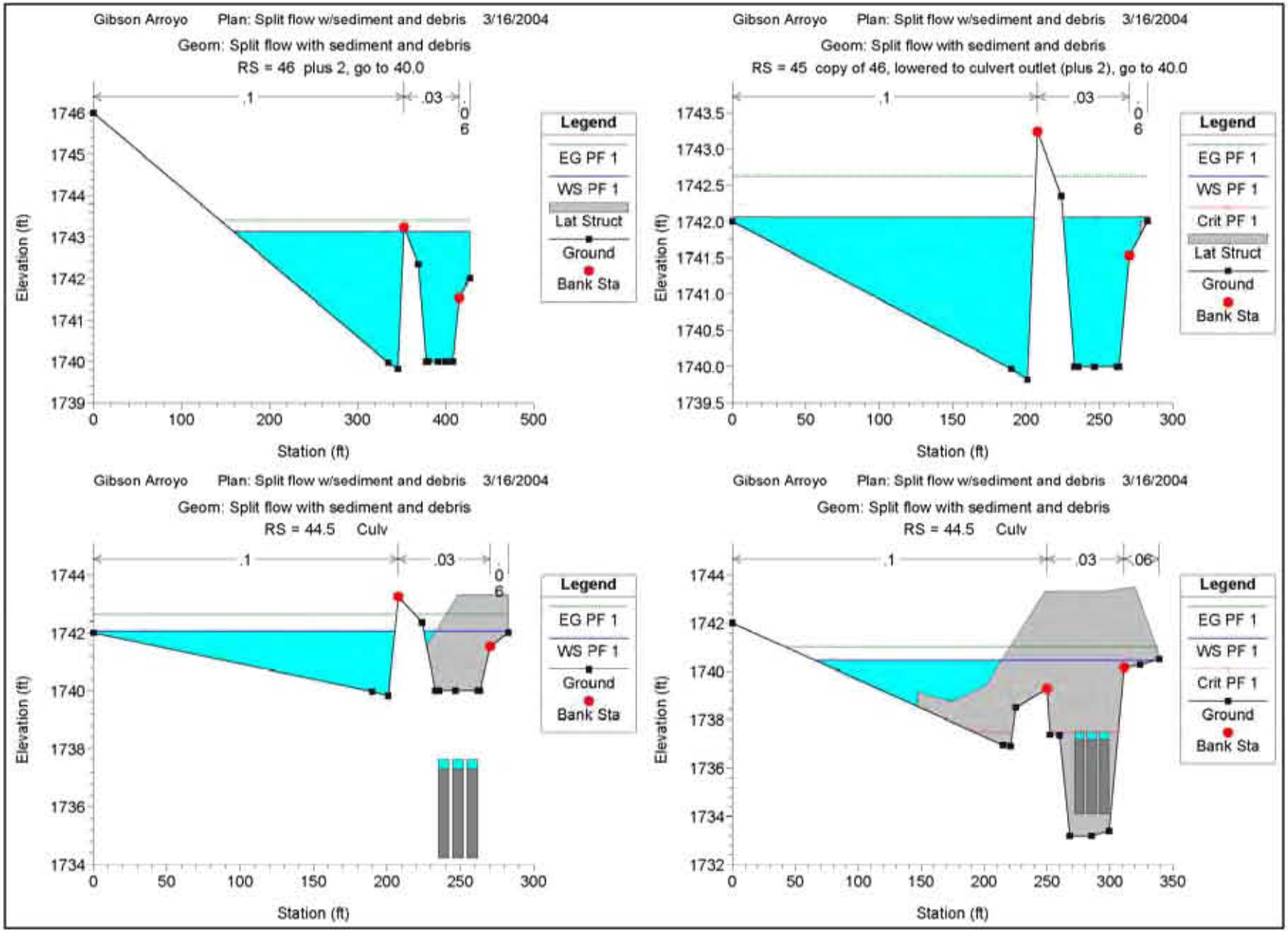

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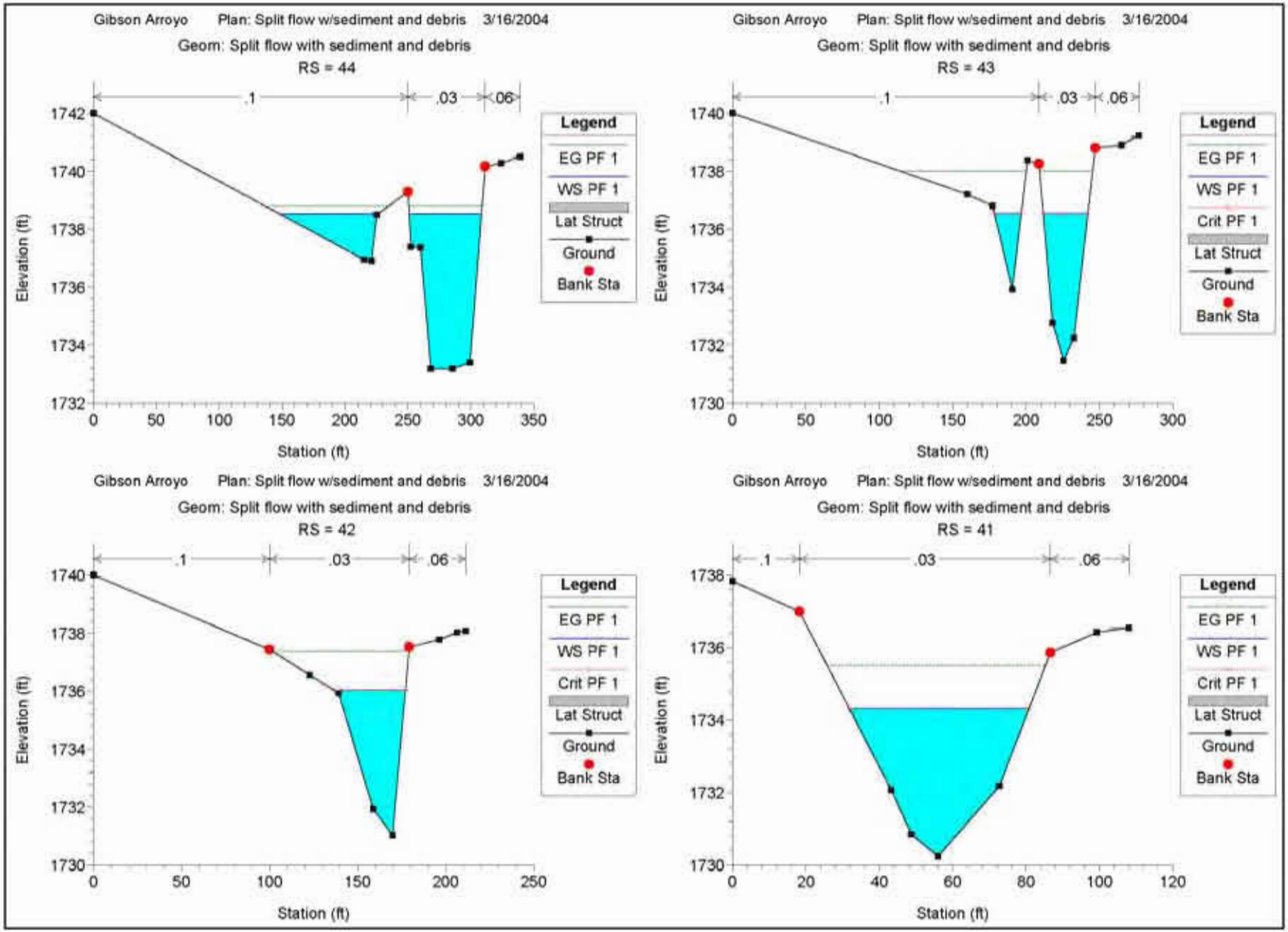
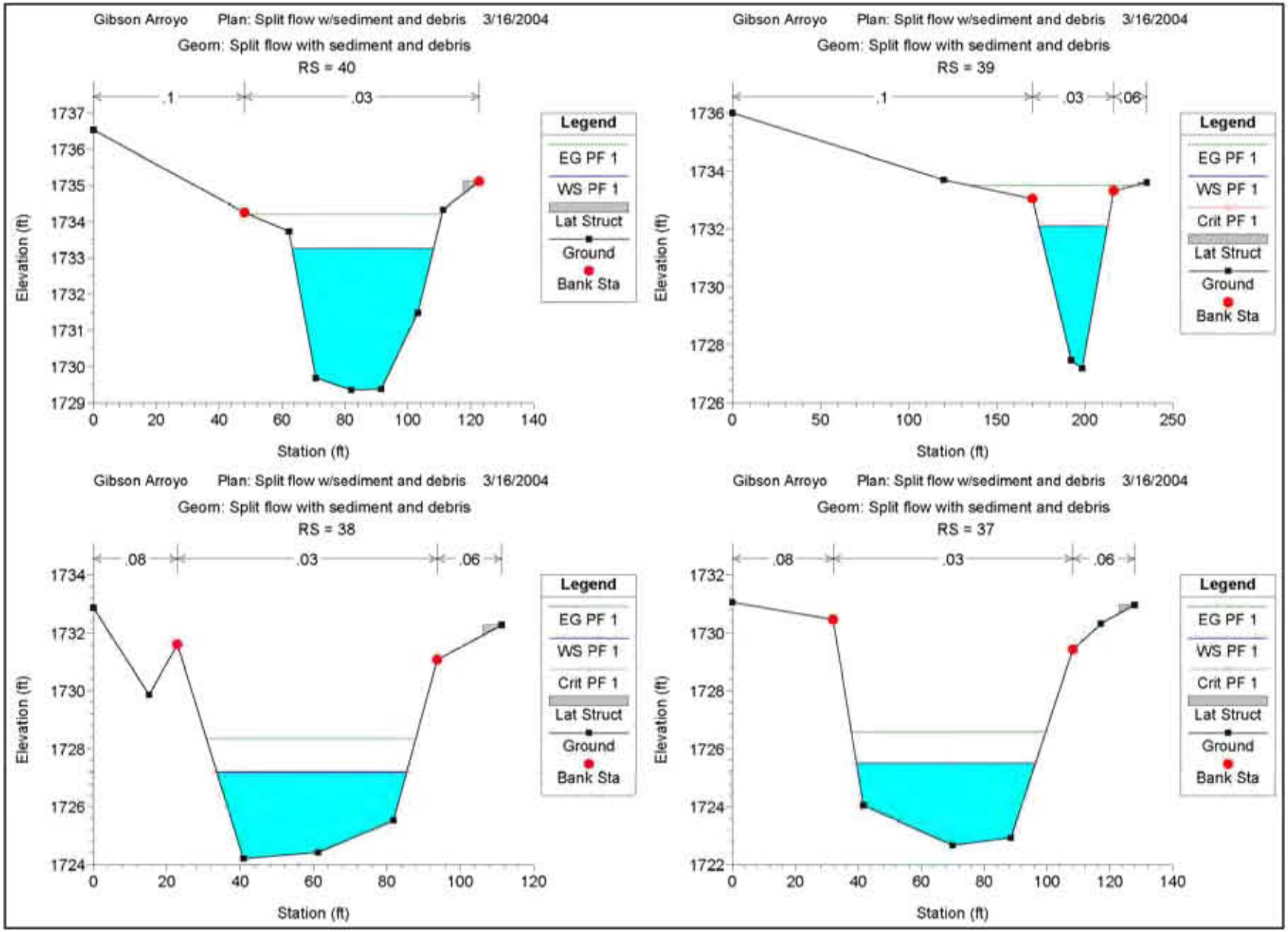


Tetra Tech, Inc.



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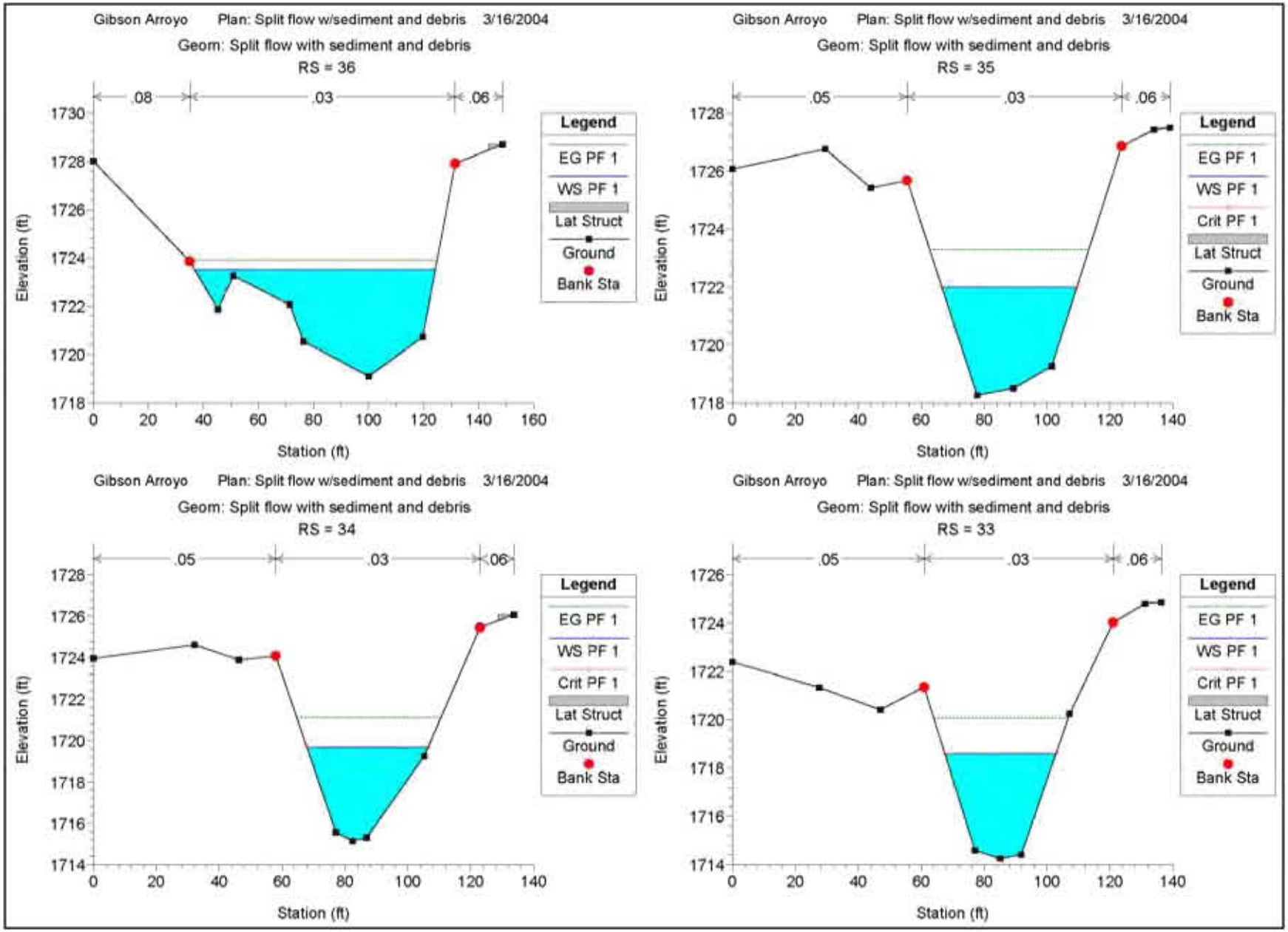
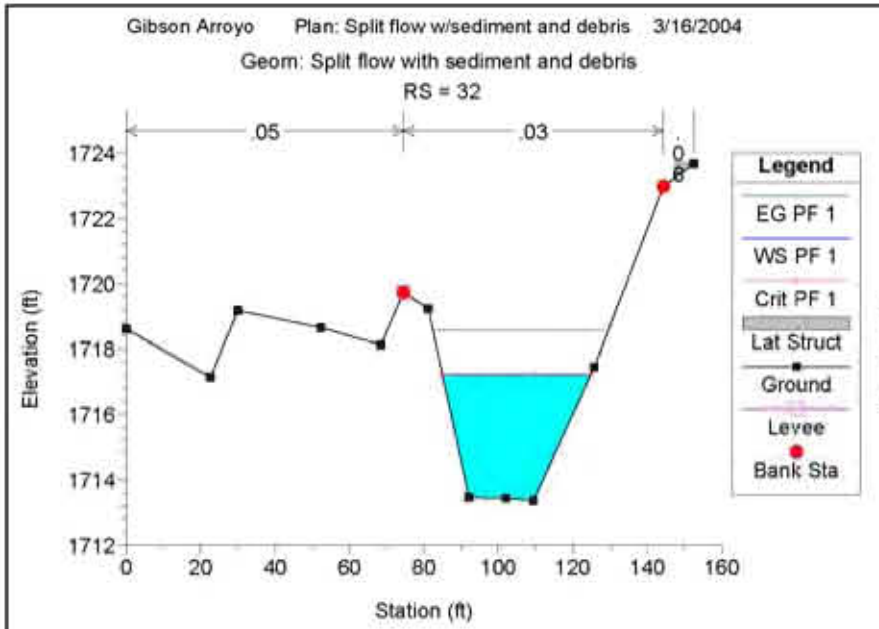
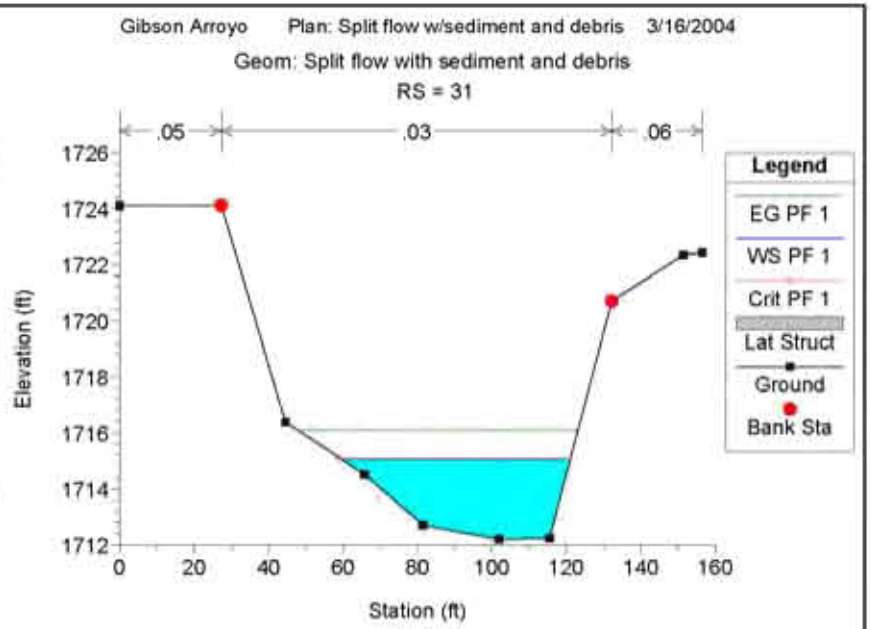


Tetra Tech, Inc.


Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 32
.05
.03
.0
.6
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Levee
Bank Sta


Gibson Arroyo Plan: Split flow w/sediment and debris 3/16/2004
Geom: Split flow with sediment and debris
RS = 31
.05
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Bank Sta

```
HEC-RAS Version 3.1.1 May 2003
 U.S. Army Corp of Engineers
Hydrologic Engineering Center
  609 Second Street, Suite D
 Davis, California 95616-4687
        (916) 756-1104
```

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X       X    X       X   X     X  X    X
X     X  X       X            X   X    X    X   X
XXXXXXX  XXXX    X       XXX  XXXX     XXXXXX    XXXX
X     X  X       X            X  X     X    X       X
X     X  X       X    X       X   X    X    X       X
X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

Split Flow Run, Considering Sediment and Debris

PROJECT DATA
Project Title: Gibson Arroyo
Project File : Floodplain.prj
Run Date and Time: 3/16/2004 5:58:21 PM

Project in English units

PLAN DATA

Plan Title: Split flow w/sediment and debris
Plan File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.p05

Geometry Title: Split flow with sediment and debris
Geometry File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.g05

Flow Title : Flow 01
Flow File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.f01

Plan Summary Information:

Number of:	Cross Sections =	70	Mulitple Openings =	0
	Culverts =	2	Inline Structures =	0
	Bridges =	0	Lateral Structures =	39

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow 01
Flow File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Ajo	Primary	100	3100

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Ajo	Primary	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: Split flow with sediment and debris

Geometry File : p:\PAZPDOT020-01 (AJO)\Water Resources\HECRAS\Floodplain.g05

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1862.17	17.23	1851.52	38.83	1848.37	59.55	1847.96	82.57	1848.07
93.55	1853.89	102.8	1856.86	113.79	1857.83				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	102.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	102.8	82	85	92	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1854.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.86	Wt. n-Val.		0.030	
W.S. Elev (ft)	1852.71	Reach Len. (ft)	82.00	85.00	92.00
Crit W.S. (ft)	1852.71	Flow Area (sq ft)		283.02	
E.G. Slope (ft/ft)	0.008729	Area (sq ft)		283.02	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	76.00	Top Width (ft)		76.00	
Vel Total (ft/s)	10.95	Avg. Vel. (ft/s)		10.95	
Max Chl Dpth (ft)	4.74	Hydr. Depth (ft)		3.72	
Conv. Total (cfs)	33179.8	Conv. (cfs)		33179.8	
Length Wtd. (ft)	85.00	Wetted Per. (ft)		77.72	
Min Ch El (ft)	1847.96	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		21.74	
Frctn Loss (ft)	0.76	Cum Volume (acre ft)	5.72	38.58	1.13
C & E Loss (ft)	0.02	Cum SA (acres)	4.27	12.56	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 99

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1860.38	11.62	1860.12	36.76	1851.06	67.23	1848.81	80.95	1847.18
110.08	1846.11	117.96	1853.79	138.69	1856	142.43	1860.28	177.96	1860.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	11.62	.03	142.43	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
11.62	142.43	104	119	130	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1853.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.78	Wt. n-Val.		0.030	
W.S. Elev (ft)	1851.96	Reach Len. (ft)	104.00	119.00	130.00
Crit W.S. (ft)	1851.96	Flow Area (sq ft)		289.27	
E.G. Slope (ft/ft)	0.009079	Area (sq ft)		289.27	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	81.80	Top Width (ft)		81.80	
Vel Total (ft/s)	10.72	Avg. Vel. (ft/s)		10.72	
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)		3.54	
Conv. Total (cfs)	32535.1	Conv. (cfs)		32535.1	
Length Wtd. (ft)	119.00	Wetted Per. (ft)		84.54	
Min Ch El (ft)	1846.11	Shear (lb/sq ft)		1.94	
Alpha	1.00	Stream Power (lb/ft s)		20.78	
Frctn Loss (ft)	1.07	Cum Volume (acre-ft)	5.72	38.02	1.13

C & E Loss (ft)	0.01	Cum SA (acres)	4.27	12.41	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 98

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1858.76	31.41	1850.52	63.91	1846.28	69.31	1843.22	88.4	1843.46
95.64	1842.76	107.78	1844.23	128.66	1851.08	150.55	1852.29		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	150.55	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	150.55	85	92	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1850.60	Element			
Vel Head (ft)	1.87	Wt. n-Val.		0.030	
W.S. Elev (ft)	1848.73	Reach Len. (ft)	85.00	92.00	100.00
Crit W.S. (ft)	1848.73	Flow Area (sq ft)		282.53	
E.G. Slope (ft/ft)	0.008849	Area (sq ft)		282.53	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	76.37	Top Width (ft)		76.37	
Vel Total (ft/s)	10.97	Avg. Vel. (ft/s)		10.97	
Max Chl Dpth (ft)	5.97	Hydr. Depth (ft)		3.70	
Conv. Total (cfs)	32955.2	Conv. (cfs)		32955.2	
Length Wtd. (ft)	92.00	Wetted Per. (ft)		78.18	
Min Ch El (ft)	1842.76	Shear (lb/sq ft)		2.00	
Alpha	1.00	Stream Power (lb/ft s)		21.90	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	5.72	37.24	1.13
C & E Loss (ft)	0.01	Cum SA (acres)	4.27	12.19	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 97

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1858.27	20.19	1857.83	61.9	1848.53	86.12	1845.09	89.82	1841.57
107.36	1840.77	132.66	1842.49	142.62	1846.89	162.21	1849.51	175.26	1848

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	20.19	.03	162.21	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
20.19	162.21	105	100	90	.1	.3

Right Levee Station= 161.61 Elevation= 1849.52

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1848.79	Element			
Vel Head (ft)	1.99	Wt. n-Val.		0.030	
W.S. Elev (ft)	1846.80	Reach Len. (ft)	105.00	100.00	90.00

Crit W.S. (ft)	1846.80	Flow Area (sq ft)			273.94	
E.G. Slope (ft/ft)	0.008607	Area (sq ft)			273.94	
Q Total (cfs)	3100.00	Flow (cfs)			3100.00	
Top Width (ft)	68.37	Top Width (ft)			68.37	
Vel Total (ft/s)	11.32	Avg. Vel. (ft/s)			11.32	
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)			4.01	
Conv. Total (cfs)	33414.7	Conv. (cfs)			33414.7	
Length Wtd. (ft)	100.00	Wetted Per. (ft)			70.88	
Min Ch El (ft)	1840.77	Shear (lb/sq ft)			2.08	
Alpha	1.00	Stream Power (lb/ft s)			23.50	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)		5.72	36.65	1.13
C & E Loss (ft)	0.13	Cum SA (acres)		4.27	12.04	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 96

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1854.77	10.35	1854.25	50.04	1839.65	62.44	1838.89	97.9	1840.34
129.12	1841.25	141.08	1843.7	166.61	1845.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	166.61	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	166.61	160	145	117	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1845.08	Element	Left OB	Channel	Right OB	
Vel Head (ft)	1.55	Wt. n-Val.		0.030		
W.S. Elev (ft)	1843.53	Reach Len. (ft)	160.00	145.00	117.00	
Crit W.S. (ft)	1843.53	Flow Area (sq ft)		310.19		
E.G. Slope (ft/ft)	0.009210	Area (sq ft)		310.19		
Q Total (cfs)	3100.00	Flow (cfs)		3100.00		
Top Width (ft)	100.76	Top Width (ft)		100.76		
Vel Total (ft/s)	9.99	Avg. Vel. (ft/s)		9.99		
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		3.08		
Conv. Total (cfs)	32303.0	Conv. (cfs)		32303.0		
Length Wtd. (ft)	145.00	Wetted Per. (ft)		101.75		
Min Ch El (ft)	1838.89	Shear (lb/sq ft)		1.75		
Alpha	1.00	Stream Power (lb/ft s)		17.52		
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	5.72	35.98	1.13	
C & E Loss (ft)	0.11	Cum SA (acres)	4.27	11.84	1.06	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 95

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1850.73	27.96	1850.25	52.9	1837.09	119.92	1837.54	138.08	1840.19
177.41	1840.06	220.39	1842.4						

```
Manning's n Values          num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
       0     .06        0     .03  220.39     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0  220.39               100      75      55             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1842.27    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.18    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1841.08    Reach Len. (ft)            100.00     75.00     55.00
  Crit W.S. (ft)           1841.08    Flow Area (sq ft)                    355.32
  E.G. Slope (ft/ft)      0.010009    Area (sq ft)                         355.32
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)            150.88    Top Width (ft)                       150.88
  Vel Total (ft/s)            8.72    Avg. Vel. (ft/s)                       8.72
  Max Chl Dpth (ft)           3.99    Hydr. Depth (ft)                       2.35
  Conv. Total (cfs)        30986.0    Conv. (cfs)                         30986.0
  Length Wtd. (ft)           75.00    Wetted Per. (ft)                     152.09
  Min Ch El (ft)           1837.09    Shear (lb/sq ft)                       1.46
  Alpha                       1.00    Stream Power (lb/ft s)                12.74
  Frctn Loss (ft)             0.76    Cum Volume (acre-ft)        5.72      34.87      1.13
  C & E Loss (ft)             0.00    Cum SA (acres)              4.27      11.43      1.06

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 94

INPUT
Description:
Station Elevation Data      num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1846.85   33.57  1847.7   58.12  1836.2  106.32 1836.49  113.96 1835.08
  129.07  1834.7  137.97 1836.26  174.53 1836.28  209.28 1838.75  233.97 1838.97

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val     Sta   n Val
       0     .06    33.57     .03  233.97     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          33.57  233.97               100     105     105             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1839.86    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.17    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1838.69    Reach Len. (ft)            100.00    105.00    105.00
  Crit W.S. (ft)           1838.69    Flow Area (sq ft)                    357.30
  E.G. Slope (ft/ft)      0.010211    Area (sq ft)                         357.30
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)            155.65    Top Width (ft)                       155.65
  Vel Total (ft/s)            8.68    Avg. Vel. (ft/s)                       8.68
  Max Chl Dpth (ft)           3.99    Hydr. Depth (ft)                       2.30
  Conv. Total (cfs)        30677.7    Conv. (cfs)                         30677.7
  Length Wtd. (ft)          105.00    Wetted Per. (ft)                     156.56
  Min Ch El (ft)           1834.70    Shear (lb/sq ft)                       1.45
  Alpha                       1.00    Stream Power (lb/ft s)                12.62
  Frctn Loss (ft)             1.06    Cum Volume (acre-ft)        5.72      34.26      1.13
  C & E Loss (ft)             0.00    Cum SA (acres)              4.27      11.16      1.06

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION
```

RIVER: Ajo
REACH: Primary RS: 93

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1845.08	14.99	1844.85	49.46	1833.54	91.86	1835.72	147.06	1833.78
190.26	1834.73	195.89	1838.4	242	1838.33				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	14.99	.03	195.89	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
14.99	195.89	125	89	96	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1838.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.16	Wt. n-Val.		0.030	
W.S. Elev (ft)	1836.95	Reach Len. (ft)	125.00	89.00	96.00
Crit W.S. (ft)	1836.95	Flow Area (sq ft)		358.29	
E.G. Slope (ft/ft)	0.010063	Area (sq ft)		358.29	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	154.61	Top Width (ft)		154.61	
Vel Total (ft/s)	8.65	Avg. Vel. (ft/s)		8.65	
Max Chl Dpth (ft)	3.41	Hydr. Depth (ft)		2.32	
Conv. Total (cfs)	30902.5	Conv. (cfs)		30902.5	
Length Wtd. (ft)	89.00	Wetted Per. (ft)		155.92	
Min Ch El (ft)	1833.54	Shear (lb/sq ft)		1.44	
Alpha	1.00	Stream Power (lb/ft s)		12.49	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	5.72	33.40	1.13
C & E Loss (ft)	0.00	Cum SA (acres)	4.27	10.79	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 92

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1837.39	24.06	1835.67	36.4	1835.32	45.83	1832.83	82.07	1834.51
101.46	1834.15	106.23	1832.8	144.67	1832.34	181.86	1832.25	186.96	1836.6
236.11	1837.87	267.46	1837.55						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	236.11	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	236.11	150	130	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1836.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.		0.030	
W.S. Elev (ft)	1835.56	Reach Len. (ft)	150.00	130.00	50.00
Crit W.S. (ft)	1835.56	Flow Area (sq ft)		360.12	
E.G. Slope (ft/ft)	0.010205	Area (sq ft)		360.12	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	157.81	Top Width (ft)		157.81	
Vel Total (ft/s)	8.61	Avg. Vel. (ft/s)		8.61	
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)		2.28	
Conv. Total (cfs)	30687.0	Conv. (cfs)		30687.0	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		159.59	
Min Ch El (ft)	1832.25	Shear (lb/sq ft)		1.44	
Alpha	1.00	Stream Power (lb/ft s)		12.38	
Frctn Loss (ft)	1.28	Cum Volume (acre-ft)	5.72	32.67	1.13
C & E Loss (ft)	0.03	Cum SA (acres)	4.27	10.47	1.06

```
Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 91

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1837.34   36.04 1835.94    45.6 1830.31   73.79 1831.33   78.99 1829.74
   103.8 1830.36  129.63 1830.05  138.35 1832.03  168.56 1836.37  199.67  1836.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   36.04     .03  168.56     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         36.04  168.56              107      90      65              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1835.15    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.47    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1833.68    Reach Len. (ft)            107.00     90.00      65.00
  Crit W.S. (ft)           1833.68    Flow Area (sq ft)                     318.44
  E.G. Slope (ft/ft)      0.009526    Area (sq ft)                          318.44
  Q Total (cfs)            3100.00    Flow (cfs)                           3100.00
  Top Width (ft)            109.92    Top Width (ft)                        109.92
  Vel Total (ft/s)            9.73    Avg. Vel. (ft/s)                        9.73
  Max Chl Dpth (ft)           3.94    Hydr. Depth (ft)                        2.90
  Conv. Total (cfs)        31761.2    Conv. (cfs)                          31761.2
  Length Wtd. (ft)           90.00    Wetted Per. (ft)                      111.44
  Min Ch El (ft)           1829.74    Shear (lb/sq ft)                        1.70
  Alpha                       1.00    Stream Power (lb/ft s)                 16.54
  Frctn Loss (ft)             0.87    Cum Volume (acre-ft)        5.72       31.65       1.13
  C & E Loss (ft)             0.07    Cum SA (acres)              4.27       10.07       1.06


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 90

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1838.49   23.44 1838.18   52.03 1827.68   79.82 1827.33   91.15 1828.03
   115.6 1829.19     140 1830.63  165.56  1830.4  179.32 1831.37  193.05 1836.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   23.44     .03  193.05     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         23.44  193.05              140     125      95              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1832.95    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.25    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1831.71    Reach Len. (ft)            140.00    125.00      95.00
  Crit W.S. (ft)           1831.71    Flow Area (sq ft)                     345.90
  E.G. Slope (ft/ft)      0.009801    Area (sq ft)                          345.90
```

Q Total (cfs)	3100.00	Flow (cfs)			3100.00	
Top Width (ft)	139.08	Top Width (ft)			139.08	
Vel Total (ft/s)	8.96	Avg. Vel. (ft/s)			8.96	
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)			2.49	
Conv. Total (cfs)	31313.0	Conv. (cfs)			31313.0	
Length Wtd. (ft)	125.00	Wetted Per. (ft)			139.99	
Min Ch El (ft)	1827.33	Shear (lb/sq ft)			1.51	
Alpha	1.00	Stream Power (lb/ft s)			13.55	
Frctn Loss (ft)	1.19	Cum Volume (acre-ft)		5.72	30.97	1.13
C & E Loss (ft)	0.03	Cum SA (acres)		4.27	9.81	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 89

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1834.03	31.9	1830.63	52.95	1824.57	67.8	1824.57	85.42	1825.22
92.96	1827.55	116.97	1827.97	146.89	1830.44	161.3	1835.25	180.57	1836.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	161.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	161.3	105	100	99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1831.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.50	Wt. n-Val.		0.030	
W.S. Elev (ft)	1829.88	Reach Len. (ft)	105.00	100.00	99.00
Crit W.S. (ft)	1829.88	Flow Area (sq ft)		315.24	
E.G. Slope (ft/ft)	0.009313	Area (sq ft)		315.24	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	105.64	Top Width (ft)		105.64	
Vel Total (ft/s)	9.83	Avg. Vel. (ft/s)		9.83	
Max Chl Dpth (ft)	5.31	Hydr. Depth (ft)		2.98	
Conv. Total (cfs)	32123.2	Conv. (cfs)		32123.2	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		106.83	
Min Ch El (ft)	1824.57	Shear (lb/sq ft)		1.72	
Alpha	1.00	Stream Power (lb/ft s)		16.87	
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	5.72	30.02	1.13
C & E Loss (ft)	0.04	Cum SA (acres)	4.27	9.46	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 88

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1830	80	1825.36	85.46	1822.78	102.37	1822.99	116.36	1823.49
124.26	1825.21	143.08	1826.02	164.76	1829.72	166.64	1831.84	177.86	1831.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	80	.03	166.64	.06

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           80  166.64               100     100     110              .1       .3
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
       0      80    1832

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1830.17    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.86    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1828.31    Reach Len. (ft)            100.00     100.00     110.00
  Crit W.S. (ft)          1828.31    Flow Area (sq ft)                     283.16
  E.G. Slope (ft/ft)     0.009122    Area (sq ft)                          283.16
  Q Total (cfs)           3100.00    Flow (cfs)                           3100.00
  Top Width (ft)            76.50    Top Width (ft)                         76.50
  Vel Total (ft/s)          10.95    Avg. Vel. (ft/s)                       10.95
  Max Chl Dpth (ft)          5.53    Hydr. Depth (ft)                        3.70
  Conv. Total (cfs)       32457.2    Conv. (cfs)                         32457.2
  Length Wtd. (ft)         100.00    Wetted Per. (ft)                       80.43
  Min Ch El (ft)          1822.78    Shear (lb/sq ft)                        2.00
  Alpha                      1.00    Stream Power (lb/ft s)                 21.95
  Frctn Loss (ft)            0.92    Cum Volume (acre-ft)        5.72       29.33       1.13
  C & E Loss (ft)            0.10    Cum SA (acres)              4.27        9.25       1.06

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Aju
REACH: Primary            RS: 87

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1828.67   25.29  1828.4   31.07 1825.83   44.68 1825.14   69.23 1821.68
    85.1  1821.1   97.29 1821.17  106.49 1824.77  127.22 1824.98  155.94 1834.44
  185.12 1836.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   25.29     .03  155.94     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          25.29  155.94               75     100     140              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1828.09    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.53    Wt. n-Val.                            0.030
  W.S. Elev (ft)          1826.56    Reach Len. (ft)             75.00     100.00     140.00
  Crit W.S. (ft)          1826.56    Flow Area (sq ft)                     312.08
  E.G. Slope (ft/ft)     0.009284    Area (sq ft)                          312.08
  Q Total (cfs)           3100.00    Flow (cfs)                           3100.00
  Top Width (ft)           102.57    Top Width (ft)                        102.57
  Vel Total (ft/s)           9.93    Avg. Vel. (ft/s)                        9.93
  Max Chl Dpth (ft)          5.46    Hydr. Depth (ft)                        3.04
  Conv. Total (cfs)       32173.8    Conv. (cfs)                         32173.8
  Length Wtd. (ft)         100.00    Wetted Per. (ft)                      103.93
  Min Ch El (ft)          1821.10    Shear (lb/sq ft)                        1.74
  Alpha                      1.00    Stream Power (lb/ft s)                 17.29
  Frctn Loss (ft)            0.93    Cum Volume (acre-ft)        5.72       28.65       1.13
  C & E Loss (ft)            0.01    Cum SA (acres)              4.27        9.05       1.06

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION
```

RIVER: Ajo
REACH: Primary RS: 86

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1828.13	15.61	1827.64	26.4	1824.04	41.79	1823.82	53.62	1823.68
70.56	1819.74	90.19	1819.6	113.74	1819.89	124.04	1826.86		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	15.61	.03	124.04	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
15.61	124.04	100	100	98	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1826.28	Element			
Vel Head (ft)	1.61	Wt. n-Val.		0.030	
W.S. Elev (ft)	1824.67	Reach Len. (ft)	100.00	100.00	98.00
Crit W.S. (ft)	1824.67	Flow Area (sq ft)		304.43	
E.G. Slope (ft/ft)	0.009368	Area (sq ft)		304.43	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	96.31	Top Width (ft)		96.31	
Vel Total (ft/s)	10.18	Avg. Vel. (ft/s)		10.18	
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)		3.16	
Conv. Total (cfs)	32028.8	Conv. (cfs)		32028.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		98.34	
Min Ch El (ft)	1819.60	Shear (lb/sq ft)		1.81	
Alpha	1.00	Stream Power (lb/ft s)		18.44	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	5.72	27.94	1.13
C & E Loss (ft)	0.08	Cum SA (acres)	4.27	8.82	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 85

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1826.91	49.85	1827.31	92.51	1826.2	108.49	1826.46	128.64	1826.42
155.5	1825.1	223.41	1818.88	238.75	1818.42	254.41	1818.74	312.03	1824.19
368	1828.12	389.71	1828.34	413.4	1828.06	454.84	1827.49	465.81	1827.53

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	128.64	.03	368	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
128.64	368	125	119	118	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1824.42	Element			
Vel Head (ft)	1.36	Wt. n-Val.		0.030	
W.S. Elev (ft)	1823.06	Reach Len. (ft)	125.00	119.00	118.00
Crit W.S. (ft)	1823.06	Flow Area (sq ft)		331.60	
E.G. Slope (ft/ft)	0.009461	Area (sq ft)		331.60	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	122.27	Top Width (ft)		122.27	
Vel Total (ft/s)	9.35	Avg. Vel. (ft/s)		9.35	
Max Chl Dpth (ft)	4.64	Hydr. Depth (ft)		2.71	
Conv. Total (cfs)	31870.7	Conv. (cfs)		31870.7	
Length Wtd. (ft)	119.00	Wetted Per. (ft)		122.67	
Min Ch El (ft)	1818.42	Shear (lb/sq ft)		1.60	
Alpha	1.00	Stream Power (lb/ft s)		14.93	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	5.72	27.21	1.13
C & E Loss (ft)	0.20	Cum SA (acres)	4.27	8.57	1.06

```
Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 84

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1825.48   12.42 1825.18   19.32 1820.86   25.96 1819.39      34 1815.12
   41.16  1814.5   49.73 1810.95   67.02 1813.03     140    1820

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   12.42     .03     140     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          12.42    140              140      85      30             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1820.22    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.70    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1819.52    Reach Len. (ft)            140.00     85.00      30.00
  Crit W.S. (ft)                      Flow Area (sq ft)                    460.98
  E.G. Slope (ft/ft)      0.002790    Area (sq ft)                         460.98
  Q Total (cfs)            3100.00    Flow (cfs)                          3100.00
  Top Width (ft)            109.61    Top Width (ft)                       109.61
  Vel Total (ft/s)            6.72    Avg. Vel. (ft/s)                       6.72
  Max Chl Dpth (ft)           8.57    Hydr. Depth (ft)                       4.21
  Conv. Total (cfs)        58690.9    Conv. (cfs)                         58690.9
  Length Wtd. (ft)           85.00    Wetted Per. (ft)                     111.86
  Min Ch El (ft)           1810.95    Shear (lb/sq ft)                       0.72
  Alpha                       1.00    Stream Power (lb/ft s)                 4.83
  Frctn Loss (ft)             0.40    Cum Volume (acre-ft)        5.72      26.13       1.13
  C & E Loss (ft)             0.08    Cum SA (acres)              4.27       8.25       1.06


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 83

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1819.92   32.54 1819.87   72.54 1818.73   77.55  1817.5   79.15  1814.9
   92.73 1813.32  110.89 1812.74  128.35 1813.11  137.05 1815.59  148.68 1817.45
   185.8 1818.35  201.55 1820.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06   32.54     .03  201.55     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          32.54  201.55             95     100     107             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1819.75    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.48    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1818.27    Reach Len. (ft)             95.00    100.00     107.00
  Crit W.S. (ft)           1818.27    Flow Area (sq ft)                    317.91
```

E.G. Slope (ft/ft)	0.009447	Area (sq ft)		317.91	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	108.13	Top Width (ft)		108.13	
Vel Total (ft/s)	9.75	Avg. Vel. (ft/s)		9.75	
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)		2.94	
Conv. Total (cfs)	31894.8	Conv. (cfs)		31894.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		110.28	
Min Ch El (ft)	1812.74	Shear (lb/sq ft)		1.70	
Alpha	1.00	Stream Power (lb/ft s)		16.58	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)	5.72	25.37	1.13
C & E Loss (ft)	0.05	Cum SA (acres)	4.27	8.04	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 82

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1817.2	34.7	1817.86	50.6	1810.78	71.2	1810.7	85.4	1810.59
112.6	1817.61	144.7	1820.06	162.4	1821.91	184.2	1818.57	194.6	1823.57
200.8	1824.04								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	34.7	.03	112.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
34.7	112.6		86	114	135	.1	.3

Left Levee Station= 34.77 Elevation= 1817.88
Right Levee Station= 112.58 Elevation= 1817.62

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1818.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.01	Wt. n-Val.		0.030	
W.S. Elev (ft)	1816.02	Reach Len. (ft)	86.00	114.00	135.00
Crit W.S. (ft)	1816.02	Flow Area (sq ft)		272.75	
E.G. Slope (ft/ft)	0.008487	Area (sq ft)		272.75	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	67.58	Top Width (ft)		67.58	
Vel Total (ft/s)	11.37	Avg. Vel. (ft/s)		11.37	
Max Chl Dpth (ft)	5.43	Hydr. Depth (ft)		4.04	
Conv. Total (cfs)	33650.0	Conv. (cfs)		33650.0	
Length Wtd. (ft)	114.00	Wetted Per. (ft)		69.38	
Min Ch El (ft)	1810.59	Shear (lb/sq ft)		2.08	
Alpha	1.00	Stream Power (lb/ft s)		23.67	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	5.72	24.69	1.13
C & E Loss (ft)	0.02	Cum SA (acres)	4.27	7.84	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 81

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1816.32	13.1	1808.85	35.4	1808.46	51.4	1808.43	68	1816.82
103.1	1818.98	109.4	1819.19						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	68	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	68	100	89	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1816.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.		0.030	
W.S. Elev (ft)	1813.93	Reach Len. (ft)	100.00	89.00	100.00
Crit W.S. (ft)	1813.93	Flow Area (sq ft)		257.94	
E.G. Slope (ft/ft)	0.008564	Area (sq ft)		257.94	
Q Total (cfs)	3100.00	Flow (cfs)		3100.00	
Top Width (ft)	58.09	Top Width (ft)		58.09	
Vel Total (ft/s)	12.02	Avg. Vel. (ft/s)		12.02	
Max Chl Dpth (ft)	5.50	Hydr. Depth (ft)		4.44	
Conv. Total (cfs)	33498.4	Conv. (cfs)		33498.4	
Length Wtd. (ft)	89.04	Wetted Per. (ft)		60.75	
Min Ch El (ft)	1808.43	Shear (lb/sq ft)		2.27	
Alpha	1.00	Stream Power (lb/ft s)		27.28	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	5.72	23.99	1.13
C & E Loss (ft)	0.37	Cum SA (acres)	4.27	7.67	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 80.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1819.19	100	1816.3

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1816.17	Weir Sta US (ft)	
W.S. US. (ft)	1813.93	Weir Sta DS (ft)	
E.G. DS (ft)	1814.76	Weir Max Depth (ft)	
W.S. DS (ft)	1813.75	Weir Avg Depth (ft)	
Q US (cfs)	3100.00	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1816.30
Q DS (cfs)	3063.64	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 80.4

```
INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1816.32     100 1812.65

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1816.17    Weir Sta US (ft)          68.56
  W.S. US. (ft)            1813.93    Weir Sta DS (ft)         100.00
  E.G. DS (ft)             1814.76    Weir Max Depth (ft)        1.10
  W.S. DS (ft)             1813.75    Weir Avg Depth (ft)        0.55
  Q US (cfs)               3100.00    Weir Submerg               0.00
  Q Leaving Total (cfs)      36.09    Min El Weir Flow (ft)    1812.65
  Q DS (cfs)               3063.64    Wr Top Wdth (ft)          31.44
  Perc Q Leaving              1.17    Q Gate Group (cfs)
  Q Weir (cfs)               36.09    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     17.23    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 80

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1812.65    17.9 1812.74      34 1805.99    51.4 1806.22    64.4 1806.21
    87.2 1815.04    98.9 1816.13   122.8  1816.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    17.9     .03    87.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          17.9    87.2              100     116     120             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1814.76    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               1.01    Wt. n-Val.                0.060      0.030
  W.S. Elev (ft)           1813.75    Reach Len. (ft)          100.00     116.00     120.00
  Crit W.S. (ft)                      Flow Area (sq ft)         18.82     374.73
  E.G. Slope (ft/ft)      0.002794    Area (sq ft)              18.82     374.73
  Q Total (cfs)            3063.64    Flow (cfs)                24.48    3039.16
  Top Width (ft)             83.86    Top Width (ft)            17.90      65.96
  Vel Total (ft/s)            7.78    Avg. Vel. (ft/s)           1.30       8.11
  Max Chl Dpth (ft)           7.76    Hydr. Depth (ft)           1.05       5.68
  Conv. Total (cfs)        57960.3    Conv. (cfs)               463.1    57497.2
  Length Wtd. (ft)          115.99    Wetted Per. (ft)          19.00      68.73
  Min Ch El (ft)           1805.99    Shear (lb/sq ft)           0.17       0.95
  Alpha                       1.08    Stream Power (lb/ft s)     0.22       7.71
  Frctn Loss (ft)             0.13    Cum Volume (acre-ft)       5.70      23.35       1.13
  C & E Loss (ft)             0.22    Cum SA (acres)             4.25       7.55       1.06


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 79.5

INPUT
```

```
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0  1816.3     120 1812.19

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1814.76    Weir Sta US (ft)          68.10
  W.S. US. (ft)            1813.75    Weir Sta DS (ft)         120.00
  E.G. DS (ft)             1814.40    Weir Max Depth (ft)        1.95
  W.S. DS (ft)             1814.14    Weir Avg Depth (ft)        0.97
  Q US (cfs)               3063.64    Weir Submerg               0.00
  Q Leaving Total (cfs)     140.96    Min El Weir Flow (ft)    1812.19
  Q DS (cfs)               2232.85    Wr Top Wdth (ft)          51.90
  Perc Q Leaving              4.59    Q Gate Group (cfs)
  Q Weir (cfs)              140.96    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     50.52    Gate Invert (ft)


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 79.4

INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1812.65     100 1811.35

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1814.76    Weir Sta US (ft)           0.00
  W.S. US. (ft)            1813.75    Weir Sta DS (ft)         100.00
  E.G. DS (ft)             1814.40    Weir Max Depth (ft)        2.79
  W.S. DS (ft)             1814.14    Weir Avg Depth (ft)        1.94
  Q US (cfs)               3063.64    Weir Submerg               0.00
  Q Leaving Total (cfs)     692.37    Min El Weir Flow (ft)    1811.35
  Q DS (cfs)               2232.85    Wr Top Wdth (ft)         100.00
  Perc Q Leaving             22.52    Q Gate Group (cfs)
  Q Weir (cfs)              692.37    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)    194.13    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 79

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1811.35    13.3  1810.1    26.5 1802.89    38.7 1802.65    49.7 1802.49
    63.6 1811.81    82.5 1811.96   110.2 1812.19

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    63.6     .06
```

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	63.6	60	66	62	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1814.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.		0.030	0.060
W.S. Elev (ft)	1814.14	Reach Len. (ft)	60.00	66.00	62.00
Crit W.S. (ft)	1808.39	Flow Area (sq ft)		509.25	99.66
E.G. Slope (ft/ft)	0.000522	Area (sq ft)		509.25	99.66
Q Total (cfs)	2232.85	Flow (cfs)		2141.74	91.12
Top Width (ft)	110.20	Top Width (ft)		63.60	46.60
Vel Total (ft/s)	3.67	Avg. Vel. (ft/s)		4.21	0.91
Max Chl Dpth (ft)	11.65	Hydr. Depth (ft)		8.01	2.14
Conv. Total (cfs)	97688.8	Conv. (cfs)		93702.4	3986.3
Length Wtd. (ft)	66.00	Wetted Per. (ft)		71.12	48.55
Min Ch El (ft)	1802.49	Shear (lb/sq ft)		0.23	0.07
Alpha	1.26	Stream Power (lb/ft s)		0.98	0.06
Frctn Loss (ft)		Cum Volume (acre-ft)	5.68	22.17	0.99
C & E Loss (ft)		Cum SA (acres)	4.23	7.37	1.00

CULVERT

RIVER: Ajo
REACH: Primary RS: 78.5

INPUT
Description:
Distance from Upstream XS = 16
Deck/Roadway Width = 40
Weir Coefficient = 2.8
Upstream Deck/Roadway Coordinates
num= 16

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1811.24		106.5	1811.32		214.9	1811.33	
390	1811.4		421.4	1811.43		471	1811.5	
525.5	1811.59		574	1811.59		628.2	1811.39	
684.7	1811.23		733.3	1810.9		834.8	1809.95	
937.8	1808.81		1042.7	1807.56		1143.2	1806.5	
1243.3	1805.71							

Upstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1811.35	13.3	1810.1	26.5	1802.89	38.7	1802.65	49.7	1802.49
63.6	1811.81	82.5	1811.96	110.2	1812.19				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	63.6	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	63.6	.3	.5

Downstream Deck/Roadway Coordinates
num= 16

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1811.24		106.5	1811.32		214.9	1811.33	
390	1811.4		421.4	1811.43		471	1811.5	
525.5	1811.59		574	1811.59		628.2	1811.39	
684.7	1811.23		733.3	1810.9		834.8	1809.95	
937.8	1808.81		1042.7	1807.56		1143.2	1806.5	
1243.3	1805.71							

Downstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1811.35	13.3	1810.1	26.5	1801.73	38.7	1801.49	49.7	1801.33
63.6	1811.81	82.5	1811.96	110.2	1812.19				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	63.6	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	63.6	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =

Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	8	10

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
10	52	.013	.025	6	.4	1

Number of Barrels = 3
Upstream Elevation = 1802.49
Centerline Stations

Sta.	Sta.	Sta.
26	36.83	47.66

Downstream Elevation = 1801.33
Centerline Stations

Sta.	Sta.	Sta.
26	36.83	47.66

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	755.92	Culv Full Len (ft)	52.00
# Barrels	3	Culv Vel US (ft/s)	12.60
Q Barrel (cfs)	251.97	Culv Vel DS (ft/s)	12.60
E.G. US. (ft)	1814.41	Culv Inv El Up (ft)	1802.49
W.S. US. (ft)	1814.14	Culv Inv El Dn (ft)	1801.33
E.G. DS (ft)	1809.63	Culv Frctn Ls (ft)	1.63
W.S. DS (ft)	1807.32	Culv Exit Loss (ft)	2.17
Delta EG (ft)	4.78	Culv Entr Loss (ft)	0.99
Delta WS (ft)	6.82	Q Weir (cfs)	1476.94
E.G. IC (ft)	1814.53	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	1814.41	Weir Sta Rgt (ft)	110.20
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1810.49	Weir Max Depth (ft)	3.16
Culv WS Outlet (ft)	1809.33	Weir Avg Depth (ft)	2.83
Culv Nml Depth (ft)	7.98	Weir Flow Area (sq ft)	311.67
Culv Crt Depth (ft)	8.00	Min El Weir Flow (ft)	1811.25

Note: Culvert critical depth exceeds the height of the culvert.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 78

INPUT
Description: copy of 79, lowered to culvert outlet elevation
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1811.35	13.3	1810.1	26.5	1801.73	38.7	1801.49	49.7	1801.33
63.6	1811.81	82.5	1811.96	110.2	1812.19				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	0	.03	63.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	63.6	100	98	95	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1809.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.31	Wt. n-Val.		0.030	
W.S. Elev (ft)	1807.32	Reach Len. (ft)	100.00	98.00	95.00
Crit W.S. (ft)	1807.32	Flow Area (sq ft)		183.02	
E.G. Slope (ft/ft)	0.008956	Area (sq ft)		183.02	
Q Total (cfs)	2232.85	Flow (cfs)		2232.85	
Top Width (ft)	39.95	Top Width (ft)		39.95	
Vel Total (ft/s)	12.20	Avg. Vel. (ft/s)		12.20	
Max Chl Dpth (ft)	5.99	Hydr. Depth (ft)		4.58	
Conv. Total (cfs)	23594.4	Conv. (cfs)		23594.4	
Length Wtd. (ft)	98.01	Wetted Per. (ft)		43.58	
Min Ch El (ft)	1801.33	Shear (lb/sq ft)		2.35	
Alpha	1.00	Stream Power (lb/ft s)		28.64	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	5.68	21.65	0.92
C & E Loss (ft)	0.82	Cum SA (acres)	4.23	7.29	0.96

Warning: The energy equation could not be balanced within the specified number of iterations. The

```
        program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
        additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
        0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
        section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
        depth, the calculated water surface came back below critical depth.  This indicates that there is
        not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 77

INPUT
Description:
Station Elevation Data    num=      9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1808.4    96.3 1805.63   112.7 1800.75   131.8 1800.26     147 1800.64
   157.8 1803.71   164.7 1808.02   177.7  1808.3   199.4 1807.97

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    96.3     .03   164.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          96.3   164.7              100     106     109            .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1807.51    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               0.67    Wt. n-Val.                 0.060      0.030
  W.S. Elev (ft)           1806.84    Reach Len. (ft)           100.00     106.00     109.00
  Crit W.S. (ft)                      Flow Area (sq ft)          25.39     336.12
  E.G. Slope (ft/ft)      0.002120    Area (sq ft)               25.39     336.12
  Q Total (cfs)            2232.85    Flow (cfs)                 20.69    2212.17
  Top Width (ft)            108.53    Top Width (ft)             42.02      66.51
  Vel Total (ft/s)            6.18    Avg. Vel. (ft/s)            0.81       6.58
  Max Chl Dpth (ft)           6.58    Hydr. Depth (ft)            0.60       5.05
  Conv. Total (cfs)        48496.7    Conv. (cfs)                449.4    48047.3
  Length Wtd. (ft)          105.98    Wetted Per. (ft)           42.04      68.56
  Min Ch El (ft)           1800.26    Shear (lb/sq ft)            0.08       0.65
  Alpha                       1.13    Stream Power (lb/ft s)      0.07       4.27
  Frctn Loss (ft)             0.44    Cum Volume (acre-ft)        5.65      21.06       0.92
  C & E Loss (ft)             0.15    Cum SA (acres)              4.18       7.17       0.96


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
        additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
        0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 76

INPUT
Description:
Station Elevation Data    num=     11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1805.95    41.1 1804.46    62.8 1805.44      76 1799.62    92.1 1799.52
   113.8 1799.32   124.1 1806.35   133.2  1804.9   151.8 1804.78   169.2 1804.73
     219    1806

Manning's n Values        num=      3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    62.8     .03   124.1     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          62.8   124.1              124     132     145            .1       .3
Left Levee      Station=   62.84      Elevation= 1805.42
Right Levee     Station=  124.31      Elevation= 1806.36

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1806.92    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               2.16    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1804.76    Reach Len. (ft)           124.00     132.00     145.00
  Crit W.S. (ft)           1804.76    Flow Area (sq ft)                    250.84
```

E.G. Slope (ft/ft)	0.008456	Area (sq ft)		250.84	
Q Total (cfs)	2959.27	Flow (cfs)		2959.27	
Top Width (ft)	57.41	Top Width (ft)		57.41	
Vel Total (ft/s)	11.80	Avg. Vel. (ft/s)		11.80	
Max Chl Dpth (ft)	5.44	Hydr. Depth (ft)		4.37	
Conv. Total (cfs)	32180.6	Conv. (cfs)		32180.6	
Length Wtd. (ft)	132.00	Wetted Per. (ft)		60.17	
Min Ch El (ft)	1799.32	Shear (lb/sq ft)		2.20	
Alpha	1.00	Stream Power (lb/ft s)		25.96	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)	5.62	20.35	0.92
C & E Loss (ft)	0.12	Cum SA (acres)	4.13	7.02	0.96

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 75

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1803.73	30.1	1803.14	54.1	1801.76	77.5	1796.87	104.3	1795.82
133.4	1797.69	138.4	1802.02	188.2	1801.29				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	54.1	.03	138.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
54.1	138.4	81	90	95	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1802.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.77	Wt. n-Val.		0.030	
W.S. Elev (ft)	1800.77	Reach Len. (ft)	81.00	90.00	95.00
Crit W.S. (ft)	1800.77	Flow Area (sq ft)		277.48	
E.G. Slope (ft/ft)	0.008796	Area (sq ft)		277.48	
Q Total (cfs)	2959.27	Flow (cfs)		2959.27	
Top Width (ft)	78.13	Top Width (ft)		78.13	
Vel Total (ft/s)	10.66	Avg. Vel. (ft/s)		10.66	
Max Chl Dpth (ft)	4.95	Hydr. Depth (ft)		3.55	
Conv. Total (cfs)	31553.7	Conv. (cfs)		31553.7	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		79.77	
Min Ch El (ft)	1795.82	Shear (lb/sq ft)		1.91	
Alpha	1.00	Stream Power (lb/ft s)		20.37	
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	5.62	19.55	0.92
C & E Loss (ft)	0.02	Cum SA (acres)	4.13	6.82	0.96

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 74

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1802.04	26.7	1802.05	42.5	1800.94	63.3	1793.66	76.3	1793.47
87.2	1794.6	103.3	1795.02	115.4	1800.95	153.7	1799.44		

```
Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    42.5     .03   115.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          42.5   115.4              100     100     103          .1          .3
Left Levee      Station=   42.23     Elevation= 1800.97
Right Levee     Station=  115.35     Elevation= 1800.99

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1801.18    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.02    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1799.17    Reach Len. (ft)            100.00     100.00     103.00
  Crit W.S. (ft)           1799.17    Flow Area (sq ft)                     259.77
  E.G. Slope (ft/ft)      0.008539    Area (sq ft)                          259.77
  Q Total (cfs)            2959.27    Flow (cfs)                           2959.27
  Top Width (ft)             64.20    Top Width (ft)                         64.20
  Vel Total (ft/s)           11.39    Avg. Vel. (ft/s)                       11.39
  Max Chl Dpth (ft)           5.70    Hydr. Depth (ft)                        4.05
  Conv. Total (cfs)        32024.2    Conv. (cfs)                          32024.2
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                       66.16
  Min Ch El (ft)           1793.47    Shear (lb/sq ft)                        2.09
  Alpha                       1.00    Stream Power (lb/ft s)                 23.85
  Frctn Loss (ft)             0.85    Cum Volume (acre-ft)         5.62      18.99       0.92
  C & E Loss (ft)             0.01    Cum SA (acres)               4.13       6.67       0.96

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: Ajó
REACH: Primary              RS: 73

INPUT
Description:
Station Elevation Data      num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1799.93    30.6  1799.6    47.6 1791.73    67.2 1791.39    84.2 1792.93
    98.9 1799.56   140.2 1797.84

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    30.6     .03    98.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          30.6    98.9              111      92      81          .1          .3
Left Levee      Station=   30.88     Elevation= 1799.58
Right Levee     Station=   98.85     Elevation= 1799.61

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1799.40    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.15    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1797.25    Reach Len. (ft)            111.00      92.00      81.00
  Crit W.S. (ft)           1797.25    Flow Area (sq ft)                     251.45
  E.G. Slope (ft/ft)      0.008412    Area (sq ft)                          251.45
  Q Total (cfs)            2959.27    Flow (cfs)                           2959.27
  Top Width (ft)             58.09    Top Width (ft)                         58.09
  Vel Total (ft/s)           11.77    Avg. Vel. (ft/s)                       11.77
  Max Chl Dpth (ft)           5.86    Hydr. Depth (ft)                        4.33
  Conv. Total (cfs)        32265.9    Conv. (cfs)                          32265.9
  Length Wtd. (ft)           92.00    Wetted Per. (ft)                       60.30
  Min Ch El (ft)           1791.39    Shear (lb/sq ft)                        2.19
  Alpha                       1.00    Stream Power (lb/ft s)                 25.77
  Frctn Loss (ft)             0.79    Cum Volume (acre-ft)         5.62      18.41       0.92
  C & E Loss (ft)             0.01    Cum SA (acres)               4.13       6.53       0.96

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
```

```
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 72

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1797.66      19  1796.8      22 1791.76    49.6 1790.36    67.3 1791.08
    79.9 1798.63    92.1 1795.58   129.5 1795.36     260    1796

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06      19     .03    79.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             19    79.9              109     106     100             .1       .3
Left Levee      Station=   18.68      Elevation= 1796.86
Right Levee     Station=      80      Elevation= 1798.64

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1798.08    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.22    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1795.86    Reach Len. (ft)            109.00     106.00     100.00
  Crit W.S. (ft)           1795.86    Flow Area (sq ft)                     247.51
  E.G. Slope (ft/ft)      0.008695    Area (sq ft)                          247.51
  Q Total (cfs)            2959.27    Flow (cfs)                           2959.27
  Top Width (ft)             55.72    Top Width (ft)                         55.72
  Vel Total (ft/s)           11.96    Avg. Vel. (ft/s)                       11.96
  Max Chl Dpth (ft)           5.50    Hydr. Depth (ft)                        4.44
  Conv. Total (cfs)        31736.7    Conv. (cfs)                          31736.7
  Length Wtd. (ft)          106.00    Wetted Per. (ft)                       59.42
  Min Ch El (ft)           1790.36    Shear (lb/sq ft)                        2.26
  Alpha                       1.00    Stream Power (lb/ft s)                 27.03
  Frctn Loss (ft)             0.92    Cum Volume (acre-ft)         5.62      17.88       0.92
  C & E Loss (ft)             0.10    Cum SA (acres)               4.13       6.41       0.96


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 71

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1794.54    26.4 1794.77    42.2 1789.75    61.4 1789.08    70.8 1788.65
    77.1  1789.5    88.7 1789.65   102.3 1795.27   117.8 1795.31   150.4  1792.9
     180    1794

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    26.4     .03   102.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          26.4   102.3              104     108     108             .1       .3
Left Levee      Station=   26.34      Elevation= 1794.74
Right Levee     Station=  102.48      Elevation= 1795.26

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1795.87    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.89    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1793.97    Reach Len. (ft)            104.00     108.00     108.00
```

Crit W.S. (ft)	1793.97	Flow Area (sq ft)		268.08	
E.G. Slope (ft/ft)	0.008582	Area (sq ft)		268.08	
Q Total (cfs)	2959.27	Flow (cfs)		2959.27	
Top Width (ft)	70.25	Top Width (ft)		70.25	
Vel Total (ft/s)	11.04	Avg. Vel. (ft/s)		11.04	
Max Chl Dpth (ft)	5.32	Hydr. Depth (ft)		3.82	
Conv. Total (cfs)	31943.9	Conv. (cfs)		31943.9	
Length Wtd. (ft)	108.00	Wetted Per. (ft)		71.85	
Min Ch El (ft)	1788.65	Shear (lb/sq ft)		2.00	
Alpha	1.00	Stream Power (lb/ft s)		22.07	
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	5.62	17.25	0.92
C & E Loss (ft)	0.03	Cum SA (acres)	4.13	6.26	0.96

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 70

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1792.56	6.8	1792.36	17.3	1788.76	42.9	1786.5	51.4	1787.95
63.9	1788.15	74.1	1791.82	99.5	1791.36	125.6	1793.61		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	6.8	.03	74.1	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
6.8	74.1	106	105	108	.1	.3

Right Levee Station= 73.96 Elevation= 1791.86

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1794.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.79	Wt. n-Val.	0.080	0.030	0.080
W.S. Elev (ft)	1792.49	Reach Len. (ft)	106.00	105.00	108.00
Crit W.S. (ft)	1792.49	Flow Area (sq ft)	0.27	270.22	30.12
E.G. Slope (ft/ft)	0.007689	Area (sq ft)	0.27	270.22	30.12
Q Total (cfs)	2959.27	Flow (cfs)	0.07	2917.56	41.63
Top Width (ft)	110.05	Top Width (ft)	4.29	67.30	38.46
Vel Total (ft/s)	9.84	Avg. Vel. (ft/s)	0.26	10.80	1.38
Max Chl Dpth (ft)	5.99	Hydr. Depth (ft)	0.06	4.02	0.78
Conv. Total (cfs)	33747.0	Conv. (cfs)	0.8	33271.4	474.8
Length Wtd. (ft)	105.02	Wetted Per. (ft)	4.29	68.94	38.52
Min Ch El (ft)	1786.50	Shear (lb/sq ft)	0.03	1.88	0.38
Alpha	1.19	Stream Power (lb/ft s)	0.01	20.31	0.52
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	5.62	16.59	0.88
C & E Loss (ft)	0.02	Cum SA (acres)	4.12	6.09	0.92

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 69.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0

```
Deck/Roadway Width          =       5
Weir Coefficient            =     2.5
Weir Flow Reference         = Water Surface
 Weir Embankment Coordinates     num =        2
     Sta    Elev      Sta    Elev
       0 1792.56     106 1788.99

Weir crest shape                            = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1794.27    Weir Sta US (ft)           4.53
  W.S. US. (ft)            1792.49    Weir Sta DS (ft)         106.00
  E.G. DS (ft)             1792.68    Weir Max Depth (ft)        1.66
  W.S. DS (ft)             1790.65    Weir Avg Depth (ft)        0.83
  Q US (cfs)               2959.27    Weir Submerg               0.00
  Q Leaving Total (cfs)     216.40    Min El Weir Flow (ft)    1788.99
  Q DS (cfs)               2742.82    Wr Top Wdth (ft)         101.47
  Perc Q Leaving              7.31    Q Gate Group (cfs)
  Q Weir (cfs)              216.40    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     84.06    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 69

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1788.99      7.2 1788.66     25.3 1784.75     37.1 1784.68       46 1785.55
    64.4 1792.13     84.8 1792.17      121 1792.98

Manning's n Values        num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .06        0     .03     64.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    64.4               140     140     140             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1792.68    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.03    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1790.65    Reach Len. (ft)            140.00     140.00     140.00
  Crit W.S. (ft)           1790.65    Flow Area (sq ft)                     240.01
  E.G. Slope (ft/ft)      0.008996    Area (sq ft)                          240.01
  Q Total (cfs)            2742.82    Flow (cfs)                           2742.82
  Top Width (ft)             60.25    Top Width (ft)                         60.25
  Vel Total (ft/s)           11.43    Avg. Vel. (ft/s)                       11.43
  Max Chl Dpth (ft)           5.97    Hydr. Depth (ft)                        3.98
  Conv. Total (cfs)        28918.6    Conv. (cfs)                          28918.6
  Length Wtd. (ft)          140.00    Wetted Per. (ft)                       63.26
  Min Ch El (ft)           1784.68    Shear (lb/sq ft)                        2.13
  Alpha                       1.00    Stream Power (lb/ft s)                 24.35
  Frctn Loss (ft)             1.11    Cum Volume (acre-ft)         5.62      15.97       0.84
  C & E Loss (ft)             0.02    Cum SA (acres)               4.12       5.93       0.87


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 68.5

INPUT
Description:
Lateral structure position     = Right overbank
```

```
Distance from Upstream XS =        0
Deck/Roadway Width        =        5
Weir Coefficient          =      2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1792.98     140  1786.2

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1792.68    Weir Sta US (ft)          106.48
  W.S. US. (ft)            1790.65    Weir Sta DS (ft)          140.00
  E.G. DS (ft)             1789.14    Weir Max Depth (ft)         0.73
  W.S. DS (ft)             1786.93    Weir Avg Depth (ft)         0.37
  Q US (cfs)               2742.82    Weir Submerg                0.00
  Q Leaving Total (cfs)      21.09    Min El Weir Flow (ft)    1786.20
  Q DS (cfs)               2487.70    Wr Top Wdth (ft)           33.52
  Perc Q Leaving              0.77    Q Gate Group (cfs)
  Q Weir (cfs)               21.09    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     12.31    Gate Invert (ft)


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 68.4

INPUT
Description:
Lateral structure position     = Left overbank
Distance from Upstream XS =        0
Deck/Roadway Width        =        5
Weir Coefficient          =      2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1788.99     140  1787.4

Weir crest shape                           = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1792.68    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1790.65    Weir Sta DS (ft)          109.28
  E.G. DS (ft)             1789.14    Weir Max Depth (ft)         1.66
  W.S. DS (ft)             1786.93    Weir Avg Depth (ft)         0.83
  Q US (cfs)               2742.82    Weir Submerg                0.00
  Q Leaving Total (cfs)     233.07    Min El Weir Flow (ft)    1787.40
  Q DS (cfs)               2487.70    Wr Top Wdth (ft)          109.28
  Perc Q Leaving              8.53    Q Gate Group (cfs)
  Q Weir (cfs)              233.07    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     90.53    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 68

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1787.4     9.6 1787.34    17.4 1780.09    30.4 1779.87      39 1779.95
    46.1 1786.21      70  1786.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    46.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    46.1              115     110     108            .1        .3
```

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1789.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.21	Wt. n-Val.		0.030	0.040
W.S. Elev (ft)	1786.93	Reach Len. (ft)	115.00	110.00	108.00
Crit W.S. (ft)	1786.93	Flow Area (sq ft)		203.38	17.43
E.G. Slope (ft/ft)	0.006989	Area (sq ft)		203.38	17.43
Q Total (cfs)	2487.70	Flow (cfs)		2444.71	42.99
Top Width (ft)	59.96	Top Width (ft)		36.06	23.90
Vel Total (ft/s)	11.27	Avg. Vel. (ft/s)		12.02	2.47
Max Chl Dpth (ft)	7.06	Hydr. Depth (ft)		5.64	0.73
Conv. Total (cfs)	29756.9	Conv. (cfs)		29242.6	514.2
Length Wtd. (ft)	109.96	Wetted Per. (ft)		41.12	24.63
Min Ch El (ft)	1779.87	Shear (lb/sq ft)		2.16	0.31
Alpha	1.12	Stream Power (lb/ft s)		25.94	0.76
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)	5.62	15.26	0.82
C & E Loss (ft)	0.23	Cum SA (acres)	4.12	5.78	0.83

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 67.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1786.2	108	1783.2

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1789.14	Weir Sta US (ft)	0.00
W.S. US. (ft)	1786.93	Weir Sta DS (ft)	56.85
E.G. DS (ft)	1783.99	Weir Max Depth (ft)	0.73
W.S. DS (ft)	1782.54	Weir Avg Depth (ft)	0.37
Q US (cfs)	2487.70	Weir Submerg	0.00
Q Leaving Total (cfs)	35.78	Min El Weir Flow (ft)	1783.20
Q DS (cfs)	2451.84	Wr Top Wdth (ft)	56.85
Perc Q Leaving	1.44	Q Gate Group (cfs)	
Q Weir (cfs)	35.78	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	20.88	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 67.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1787.4	115	1786.1

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1789.14	Weir Sta US (ft)		
W.S. US. (ft)	1786.93	Weir Sta DS (ft)		
E.G. DS (ft)	1783.99	Weir Max Depth (ft)		
W.S. DS (ft)	1782.54	Weir Avg Depth (ft)		
Q US (cfs)	2487.70	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1786.10	
Q DS (cfs)	2451.84	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 67

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1786.1	35	1783.72	45.5	1783.16	76.3	1776.89	90.7	1776.21
100.4	1777.68	110	1782	134.8	1781.73	154.2	1781.97	304	1783.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	45.5	.03	110	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.5	110		106	105	.1	.3

Left Levee Station= 45.44 Elevation= 1783.16
Right Levee Station= 109.93 Elevation= 1782.01

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1783.99	Element			
Vel Head (ft)	1.45	Wt. n-Val.		0.030	0.060
W.S. Elev (ft)	1782.54	Reach Len. (ft)	106.00	105.00	105.00
Crit W.S. (ft)	1782.54	Flow Area (sq ft)		244.81	49.83
E.G. Slope (ft/ft)	0.006406	Area (sq ft)		244.81	49.83
Q Total (cfs)	2451.84	Flow (cfs)		2394.79	57.05
Top Width (ft)	174.99	Top Width (ft)		61.45	113.54
Vel Total (ft/s)	8.32	Avg. Vel. (ft/s)		9.78	1.14
Max Chl Dpth (ft)	6.33	Hydr. Depth (ft)		3.98	0.44
Conv. Total (cfs)	30633.7	Conv. (cfs)		29921.0	712.8
Length Wtd. (ft)	105.00	Wetted Per. (ft)		63.16	113.55
Min Ch El (ft)	1776.21	Shear (lb/sq ft)		1.55	0.18
Alpha	1.35	Stream Power (lb/ft s)		15.16	0.20
Frctn Loss (ft)	0.80	Cum Volume (acre ft)	5.62	14.69	0.73
C & E Loss (ft)	0.04	Cum SA (acres)	4.12	5.66	0.66

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 66

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1782.42	27.1	1776.33	47.6	1774.11	60.5	1772.48	72.3	1773.32
79.9	1778.58	126.3	1779.87	228.3	1781				

```
Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    79.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    79.9              100      98     100             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1780.34    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.88    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1778.46    Reach Len. (ft)            100.00     98.00     100.00
  Crit W.S. (ft)           1778.46    Flow Area (sq ft)                     228.02
  E.G. Slope (ft/ft)      0.009110    Area (sq ft)                          228.02
  Q Total (cfs)            2508.88    Flow (cfs)                           2508.88
  Top Width (ft)             62.12    Top Width (ft)                         62.12
  Vel Total (ft/s)           11.00    Avg. Vel. (ft/s)                       11.00
  Max Chl Dpth (ft)           5.98    Hydr. Depth (ft)                        3.67
  Conv. Total (cfs)        26286.0    Conv. (cfs)                          26286.0
  Length Wtd. (ft)           98.00    Wetted Per. (ft)                       64.22
  Min Ch El (ft)           1772.48    Shear (lb/sq ft)                        2.02
  Alpha                       1.00    Stream Power (lb/ft s)                 22.22
  Frctn Loss (ft)             0.87    Cum Volume (acre-ft)        5.62       14.12       0.67
  C & E Loss (ft)             0.00    Cum SA (acres)              4.12        5.51       0.52

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 65

INPUT
Description:
Station Elevation Data      num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1776.83    20.6 1777.63    39.6 1779.35    52.9 1774.23    57.5 1771.76
    81.8 1769.85    91.6 1770.32   112.8 1777.18   144.2 1777.15

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    39.6     .03   112.8     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          39.6   112.8             103     100      95             .1       .3
Left Levee       Station=   39.51      Elevation= 1779.36
Right Levee      Station=  112.77      Elevation= 1777.18

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1777.48    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.91    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1775.57    Reach Len. (ft)            103.00    100.00      95.00
  Crit W.S. (ft)           1775.57    Flow Area (sq ft)                     226.02
  E.G. Slope (ft/ft)      0.008599    Area (sq ft)                          226.02
  Q Total (cfs)            2508.88    Flow (cfs)                           2508.88
  Top Width (ft)             58.38    Top Width (ft)                         58.38
  Vel Total (ft/s)           11.10    Avg. Vel. (ft/s)                       11.10
  Max Chl Dpth (ft)           5.72    Hydr. Depth (ft)                        3.87
  Conv. Total (cfs)        27055.2    Conv. (cfs)                          27055.2
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                       60.16
  Min Ch El (ft)           1769.85    Shear (lb/sq ft)                        2.02
  Alpha                       1.00    Stream Power (lb/ft s)                 22.39
  Frctn Loss (ft)             0.87    Cum Volume (acre-ft)        5.62       13.61       0.67
  C & E Loss (ft)             0.01    Cum SA (acres)              4.12        5.37       0.52

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
```

water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 64

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1774.04	34.4	1774.47	43.3	1776.38	53	1768.6	68.8	1769.06
72.9	1767.05	83.5	1767.18	86.9	1769.22	91.6	1769.16	105.3	1774.66
128.6	1775.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	43.3	.03	105.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.3	105.3	110	95	86	.1	.3

Left Levee Station= 43.18 Elevation= 1776.41

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1775.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.01	Wt. n-Val.		0.030	
W.S. Elev (ft)	1773.13	Reach Len. (ft)	110.00	95.00	86.00
Crit W.S. (ft)	1773.13	Flow Area (sq ft)		220.37	
E.G. Slope (ft/ft)	0.008819	Area (sq ft)		220.37	
Q Total (cfs)	2508.88	Flow (cfs)		2508.88	
Top Width (ft)	54.15	Top Width (ft)		54.15	
Vel Total (ft/s)	11.38	Avg. Vel. (ft/s)		11.38	
Max Chl Dpth (ft)	6.08	Hydr. Depth (ft)		4.07	
Conv. Total (cfs)	26716.6	Conv. (cfs)		26716.6	
Length Wtd. (ft)	95.00	Wetted Per. (ft)		57.55	
Min Ch El (ft)	1767.05	Shear (lb/sq ft)		2.11	
Alpha	1.00	Stream Power (lb/ft s)		24.00	
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)	5.62	13.10	0.67
C & E Loss (ft)	0.11	Cum SA (acres)	4.12	5.24	0.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 63

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1771.8	18.1	1771.81	28.2	1774.4	41.8	1766.54	58.2	1766.21
74.3	1767.58	90.9	1769.79	104.1	1770.44	113.2	1773.74	119.8	1772.1
144.1	1772.19								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	28.2	.03	113.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
28.2	113.2	99	99	98	.1	.3

Left Levee Station= 28.16 Elevation= 1774.43
Right Levee Station= 113.38 Elevation= 1773.71

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1773.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.65	Wt. n-Val.		0.030	
W.S. Elev (ft)	1771.47	Reach Len. (ft)	99.00	99.00	98.00
Crit W.S. (ft)	1771.47	Flow Area (sq ft)		243.43	
E.G. Slope (ft/ft)	0.009069	Area (sq ft)		243.43	
Q Total (cfs)	2508.88	Flow (cfs)		2508.88	

Top Width (ft)	73.65	Top Width (ft)		73.65	
Vel Total (ft/s)	10.31	Avg. Vel. (ft/s)		10.31	
Max Chl Dpth (ft)	5.25	Hydr. Depth (ft)		3.31	
Conv. Total (cfs)	26345.4	Conv. (cfs)		26345.4	
Length Wtd. (ft)	99.00	Wetted Per. (ft)		75.37	
Min Ch El (ft)	1766.21	Shear (lb/sq ft)		1.83	
Alpha	1.00	Stream Power (lb/ft s)		18.85	
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	5.62	12.59	0.67
C & E Loss (ft)	0.12	Cum SA (acres)	4.12	5.10	0.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 62

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1769.09	35.1	1771.9	49.9	1764.58	70.6	1765.44	80.6	1766.41
102	1767.05	123.8	1767.84	142.8	1767.93	150.8	1770	184.1	1769.69
218.3	1769.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	35.1	.03	150.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
35.1	150.8	110	100	90	.1	.3

Left Levee Station= 35.24 Elevation= 1771.91
Right Levee Station= 151.37 Elevation= 1769.98

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1770.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.27	Wt. n-Val.		0.030	
W.S. Elev (ft)	1769.36	Reach Len. (ft)	110.00	100.00	90.00
Crit W.S. (ft)	1769.36	Flow Area (sq ft)		277.88	
E.G. Slope (ft/ft)	0.009600	Area (sq ft)		277.88	
Q Total (cfs)	2508.88	Flow (cfs)		2508.88	
Top Width (ft)	108.11	Top Width (ft)		108.11	
Vel Total (ft/s)	9.03	Avg. Vel. (ft/s)		9.03	
Max Chl Dpth (ft)	4.78	Hydr. Depth (ft)		2.57	
Conv. Total (cfs)	25606.8	Conv. (cfs)		25606.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		109.50	
Min Ch El (ft)	1764.58	Shear (lb/sq ft)		1.52	
Alpha	1.00	Stream Power (lb/ft s)		13.73	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	5.62	12.00	0.67
C & E Loss (ft)	0.02	Cum SA (acres)	4.12	4.90	0.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 61

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1766.4	30.5	1766.65	48.4	1770.56	57.9	1765.88	69.4	1764.17

```
   85.8 1764.65    90.4 1760.65   100.4 1760.85   104.5 1764.11     126 1766.44
  137.1 1765.04   152.9 1769.56   195.5 1768.04

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06    48.4     .03   152.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          48.4   152.9             130     125     122            .1        .3
Left Levee      Station=   48.44      Elevation= 1770.54
Right Levee     Station=  153.07      Elevation= 1769.55

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1768.83    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.45    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1767.39    Reach Len. (ft)            130.00     125.00     122.00
  Crit W.S. (ft)           1767.39    Flow Area (sq ft)                     259.88
  E.G. Slope (ft/ft)      0.009808    Area (sq ft)                          259.88
  Q Total (cfs)            2508.88    Flow (cfs)                           2508.88
  Top Width (ft)             90.46    Top Width (ft)                         90.46
  Vel Total (ft/s)            9.65    Avg. Vel. (ft/s)                        9.65
  Max Chl Dpth (ft)           6.74    Hydr. Depth (ft)                        2.87
  Conv. Total (cfs)        25333.6    Conv. (cfs)                          25333.6
  Length Wtd. (ft)          125.00    Wetted Per. (ft)                       94.13
  Min Ch El (ft)           1760.65    Shear (lb/sq ft)                        1.69
  Alpha                       1.00    Stream Power (lb/ft s)                 16.32
  Frctn Loss (ft)             1.19    Cum Volume (acre-ft)         5.62      11.38       0.67
  C & E Loss (ft)             0.04    Cum SA (acres)               4.12       4.67       0.52


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         water surface was used.

CROSS SECTION


RIVER: Ajo
REACH: Primary              RS: 60

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1769.15    19.1 1762.66    36.8 1762.56    43.1  1759.1    55.6 1759.39
    70.4 1761.47    86.4  1766.8   133.5 1766.56

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03    86.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    86.4             103     103     102            .1        .3
Left Levee      Station=     -.1      Elevation= 1769.11
Right Levee     Station=   86.24      Elevation= 1766.85

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1766.96    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               1.81    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1765.15    Reach Len. (ft)            103.00     103.00     102.00
  Crit W.S. (ft)           1765.15    Flow Area (sq ft)                     245.42
  E.G. Slope (ft/ft)      0.009216    Area (sq ft)                          245.42
  Q Total (cfs)            2649.62    Flow (cfs)                           2649.62
  Top Width (ft)             69.69    Top Width (ft)                         69.69
  Vel Total (ft/s)           10.80    Avg. Vel. (ft/s)                       10.80
  Max Chl Dpth (ft)           6.05    Hydr. Depth (ft)                        3.52
  Conv. Total (cfs)        27600.6    Conv. (cfs)                          27600.6
  Length Wtd. (ft)          103.00    Wetted Per. (ft)                       71.73
  Min Ch El (ft)           1759.10    Shear (lb/sq ft)                        1.97
  Alpha                       1.00    Stream Power (lb/ft s)                 21.25
  Frctn Loss (ft)             1.01    Cum Volume (acre-ft)         5.62      10.66       0.67
  C & E Loss (ft)             0.24    Cum SA (acres)               4.12       4.44       0.52


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 59.4

INPUT
Description:
Lateral structure position      = Left overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.5
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1769.15     103 1761.03

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1766.96    Weir Sta US (ft)          70.66
  W.S. US. (ft)            1765.15    Weir Sta DS (ft)         103.00
  E.G. DS (ft)             1763.87    Weir Max Depth (ft)        1.83
  W.S. DS (ft)             1762.86    Weir Avg Depth (ft)        0.92
  Q US (cfs)               2649.62    Weir Submerg               0.00
  Q Leaving Total (cfs)      80.07    Min El Weir Flow (ft)    1761.03
  Q DS (cfs)               2569.23    Wr Top Wdth (ft)          32.34
  Perc Q Leaving              3.03    Q Gate Group (cfs)
  Q Weir (cfs)               80.07    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)      29.59   Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 59

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1761.03    49.5 1759.04    97.2 1761.23   161.5 1762.96   213.1 1763.19
   264.4 1763.25   311.3 1762.78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .06       0     .03   161.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   161.5               90     100     112             .1       .3
Right Levee     Station=  161.06      Elevation= 1762.95

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1763.87    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.01    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1762.86    Reach Len. (ft)            90.00     100.00     112.00
  Crit W.S. (ft)           1762.86    Flow Area (sq ft)                    319.21
  E.G. Slope (ft/ft)      0.010490    Area (sq ft)                         319.21
  Q Total (cfs)            2569.23    Flow (cfs)                          2569.23
  Top Width (ft)            157.79    Top Width (ft)                       157.79
  Vel Total (ft/s)            8.05    Avg. Vel. (ft/s)                       8.05
  Max Chl Dpth (ft)           3.82    Hydr. Depth (ft)                       2.02
  Conv. Total (cfs)        25084.9    Conv. (cfs)                         25084.9
  Length Wtd. (ft)          100.72    Wetted Per. (ft)                     159.73
  Min Ch El (ft)           1759.04    Shear (lb/sq ft)                       1.31
  Alpha                       1.00    Stream Power (lb/ft s)                10.53
  Frctn Loss (ft)             0.89    Cum Volume (acre-ft)        5.62       9.99       0.67
```

C & E Loss (ft)	0.03	Cum SA (acres)	4.12	4.17	0.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 58.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1761.03	90	1761.59

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1763.87	Weir Sta US (ft)	0.00
W.S. US. (ft)	1762.86	Weir Sta DS (ft)	77.64
E.G. DS (ft)	1762.60	Weir Max Depth (ft)	1.83
W.S. DS (ft)	1761.30	Weir Avg Depth (ft)	0.92
Q US (cfs)	2569.23	Weir Submerg	0.00
Q Leaving Total (cfs)	192.22	Min El Weir Flow (ft)	1761.03
Q DS (cfs)	2377.11	Wr Top Wdth (ft)	77.64
Perc Q Leaving	7.48	Q Gate Group (cfs)	
Q Weir (cfs)	192.22	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	71.05	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 58

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1761.59	7.9	1757.5	20.3	1757.5	25.1	1757.5	37	1757.5
40.4	1757.5	53.1	1757.5	62.4	1759	126.1	1760.4		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	62.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	62.4	120	140	157	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1762.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.		0.030	0.060
W.S. Elev (ft)	1761.30	Reach Len. (ft)	120.00	140.00	157.00
Crit W.S. (ft)	1761.30	Flow Area (sq ft)		213.99	101.84
E.G. Slope (ft/ft)	0.007529	Area (sq ft)		213.99	101.84
Q Total (cfs)	2377.11	Flow (cfs)		2080.74	296.37
Top Width (ft)	125.54	Top Width (ft)		61.84	63.70
Vel Total (ft/s)	7.53	Avg. Vel. (ft/s)		9.72	2.91
Max Chl Dpth (ft)	3.80	Hydr. Depth (ft)		3.46	1.60
Conv. Total (cfs)	27395.4	Conv. (cfs)		23979.8	3415.6
Length Wtd. (ft)	141.41	Wetted Per. (ft)		62.88	64.61

Min Ch El (ft)	1757.50	Shear (lb/sq ft)		1.60	0.74
Alpha	1.48	Stream Power (lb/ft s)		15.55	2.16
Frctn Loss (ft)	1.16	Cum Volume (acre-ft)	5.62	9.38	0.54
C & E Loss (ft)	0.09	Cum SA (acres)	4.12	3.92	0.44

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 57.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1760.4	157	1756.94

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1762.60	Weir Sta US (ft)	0.00
W.S. US. (ft)	1761.30	Weir Sta DS (ft)	157.00
E.G. DS (ft)	1759.05	Weir Max Depth (ft)	1.10
W.S. DS (ft)	1758.04	Weir Avg Depth (ft)	1.00
Q US (cfs)	2377.11	Weir Submerg	0.00
Q Leaving Total (cfs)	409.10	Min El Weir Flow (ft)	1756.94
Q DS (cfs)	1966.78	Wr Top Wdth (ft)	157.00
Perc Q Leaving	17.26	Q Gate Group (cfs)	
Q Weir (cfs)	409.10	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	157.10	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 57

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1756.35	38.2	1757.68	52.1	1755.3	67.2	1755.3	72.4	1755.3
83.4	1755.3	89.1	1755.3	103.7	1755.3	126.7	1756.6	149.8	1756.39
165.3	1756.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	38.2	.03	126.7	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.2	126.7		120	113	105	.1	.3

Left Levee Station= 38.03 Elevation= 1757.68

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1759.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.01	Wt. n-Val.	0.100	0.030	0.080
W.S. Elev (ft)	1758.04	Reach Len. (ft)	120.00	113.00	105.00
Crit W.S. (ft)	1758.04	Flow Area (sq ft)	39.25	211.22	57.10
E.G. Slope (ft/ft)	0.009136	Area (sq ft)	39.25	211.22	57.10
Q Total (cfs)	1966.78	Flow (cfs)	55.11	1782.54	129.13
Top Width (ft)	165.30	Top Width (ft)	38.20	88.50	38.60
Vel Total (ft/s)	6.39	Avg. Vel. (ft/s)	1.40	8.44	2.26

Max Chl Dpth (ft)	2.74	Hydr. Depth (ft)	1.03	2.39	1.48
Conv. Total (cfs)	20577.3	Conv. (cfs)	576.6	18649.7	1351.0
Length Wtd. (ft)	112.83	Wetted Per. (ft)	39.93	88.74	39.71
Min Ch El (ft)	1755.30	Shear (lb/sq ft)	0.56	1.36	0.82
Alpha	1.59	Stream Power (lb/ft s)	0.79	11.46	1.85
Frctn Loss (ft)	1.10	Cum Volume (acre-ft)	5.57	8.70	0.25
C & E Loss (ft)	0.00	Cum SA (acres)	4.07	3.68	0.26

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 56.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1756.94	105	1755.6

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1759.05	Weir Sta US (ft)	0.00
W.S. US. (ft)	1758.04	Weir Sta DS (ft)	105.00
E.G. DS (ft)	1757.04	Weir Max Depth (ft)	1.10
W.S. DS (ft)	1755.99	Weir Avg Depth (ft)	0.74
Q US (cfs)	1966.78	Weir Submerg	0.00
Q Leaving Total (cfs)	180.27	Min El Weir Flow (ft)	1755.60
Q DS (cfs)	1785.50	Wr Top Wdth (ft)	105.00
Perc Q Leaving	9.22	Q Gate Group (cfs)	
Q Weir (cfs)	180.27	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	78.10	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 56

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1756.94	10.4	1753.5	21.4	1753.5	26.4	1753.5	37.8	1753.5
43.5	1753.5	66.7	1753.5	73.9	1754.46	97.3	1753.95	106.5	1755.6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	106.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	106.5	115	120	130	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1757.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.		0.030	
W.S. Elev (ft)	1755.99	Reach Len. (ft)	115.00	120.00	130.00
Crit W.S. (ft)	1755.99	Flow Area (sq ft)		216.47	
E.G. Slope (ft/ft)	0.010517	Area (sq ft)		216.47	
Q Total (cfs)	1785.50	Flow (cfs)		1785.50	
Top Width (ft)	103.61	Top Width (ft)		103.61	

Vel Total (ft/s)	8.25	Avg. Vel. (ft/s)		8.25	
Max Chl Dpth (ft)	2.49	Hydr. Depth (ft)		2.09	
Conv. Total (cfs)	17410.8	Conv. (cfs)		17410.8	
Length Wtd. (ft)	120.00	Wetted Per. (ft)		104.61	
Min Ch El (ft)	1753.50	Shear (lb/sq ft)		1.36	
Alpha	1.00	Stream Power (lb/ft s)		11.21	
Frctn Loss (ft)	1.27	Cum Volume (acre-ft)	5.51	8.14	0.19
C & E Loss (ft)	0.03	Cum SA (acres)	4.01	3.43	0.21

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 55.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1755.6	130	1753.8

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1757.04	Weir Sta US (ft)	0.00
W.S. US. (ft)	1755.99	Weir Sta DS (ft)	130.00
E.G. DS (ft)	1755.26	Weir Max Depth (ft)	0.52
W.S. DS (ft)	1754.32	Weir Avg Depth (ft)	0.45
Q US (cfs)	1785.50	Weir Submerg	0.00
Q Leaving Total (cfs)	103.41	Min El Weir Flow (ft)	1753.80
Q DS (cfs)	1681.78	Wr Top Wdth (ft)	130.00
Perc Q Leaving	5.81	Q Gate Group (cfs)	
Q Weir (cfs)	103.41	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	58.91	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 55.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1756.94	115	1754.27

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1757.04	Weir Sta US (ft)	109.14
W.S. US. (ft)	1755.99	Weir Sta DS (ft)	115.00
E.G. DS (ft)	1755.26	Weir Max Depth (ft)	0.05
W.S. DS (ft)	1754.32	Weir Avg Depth (ft)	0.03
Q US (cfs)	1785.50	Weir Submerg	0.00
Q Leaving Total (cfs)	0.07	Min El Weir Flow (ft)	1754.27

Q DS (cfs)	1681.78	Wr Top Wdth (ft)	5.86
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)	0.07	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	0.15	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 55

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1754.27	8.9	1752.59	22.4	1752.5	27	1751.7	41.6	1751.7
47	1752.06	71.2	1751.7	83.2	1753.02	105	1752.79	113.5	1753.77

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	113.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	113.5	94	96	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1755.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.94	Wt. n-Val.		0.030	
W.S. Elev (ft)	1754.32	Reach Len. (ft)	94.00	96.00	100.00
Crit W.S. (ft)	1754.32	Flow Area (sq ft)		215.93	
E.G. Slope (ft/ft)	0.010610	Area (sq ft)		215.93	
Q Total (cfs)	1681.78	Flow (cfs)		1681.78	
Top Width (ft)	113.50	Top Width (ft)		113.50	
Vel Total (ft/s)	7.79	Avg. Vel. (ft/s)		7.79	
Max Chl Dpth (ft)	2.62	Hydr. Depth (ft)		1.90	
Conv. Total (cfs)	16327.1	Conv. (cfs)		16327.1	
Length Wtd. (ft)	96.05	Wetted Per. (ft)		114.47	
Min Ch El (ft)	1751.70	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		9.73	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)	5.51	7.55	0.19
C & E Loss (ft)	0.09	Cum SA (acres)	4.01	3.13	0.21

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 54.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1753.8	100	1752.15

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1755.26	Weir Sta US (ft)	0.00
W.S. US. (ft)	1754.32	Weir Sta DS (ft)	100.00
E.G. DS (ft)	1753.65	Weir Max Depth (ft)	0.87

W.S. DS (ft)	1753.02	Weir Avg Depth (ft)	0.70
Q US (cfs)	1681.78	Weir Submerg	0.00
Q Leaving Total (cfs)	152.30	Min El Weir Flow (ft)	1752.15
Q DS (cfs)	1479.25	Wr Top Wdth (ft)	100.00
Perc Q Leaving	9.06	Q Gate Group (cfs)	
Q Weir (cfs)	152.30	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	69.64	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 54.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.5
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1754.27	94	1752.4

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1755.26	Weir Sta US (ft)	0.00
W.S. US. (ft)	1754.32	Weir Sta DS (ft)	94.00
E.G. DS (ft)	1753.65	Weir Max Depth (ft)	0.62
W.S. DS (ft)	1753.02	Weir Avg Depth (ft)	0.34
Q US (cfs)	1681.78	Weir Submerg	0.00
Q Leaving Total (cfs)	50.11	Min El Weir Flow (ft)	1752.40
Q DS (cfs)	1479.25	Wr Top Wdth (ft)	94.00
Perc Q Leaving	2.98	Q Gate Group (cfs)	
Q Weir (cfs)	50.11	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	31.62	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 54

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1752.4	16.8	1750.86	22.2	1750.2	34.6	1750.2	41.8	1750.2
46.4	1750.2	61.3	1750.2	66.8	1750.18	80.6	1750.71	93.7	1751.44
107.7	1751.84	112.7	1752.15						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	93.7	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	93.7	90	81	79	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1753.65	Element			
Vel Head (ft)	0.63	Wt. n-Val.		0.030	0.080
W.S. Elev (ft)	1753.02	Reach Len. (ft)	90.00	81.00	79.00
Crit W.S. (ft)		Flow Area (sq ft)		223.79	24.48
E.G. Slope (ft/ft)	0.005351	Area (sq ft)		223.79	24.48
Q Total (cfs)	1479.25	Flow (cfs)		1441.05	38.19
Top Width (ft)	112.70	Top Width (ft)		93.70	19.00
Vel Total (ft/s)	5.96	Avg. Vel. (ft/s)		6.44	1.56
Max Chl Dpth (ft)	2.84	Hydr. Depth (ft)		2.39	1.29
Conv. Total (cfs)	20221.1	Conv. (cfs)		19698.9	522.1
Length Wtd. (ft)	80.97	Wetted Per. (ft)		94.46	19.89
Min Ch El (ft)	1750.18	Shear (lb/sq ft)		0.79	0.41

Alpha	1.14	Stream Power (lb/ft s)		5.10	0.64
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	5.51	7.06	0.16
C & E Loss (ft)	0.07	Cum SA (acres)	4.01	2.90	0.19

```
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
```

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 53.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1752.15	79	1753.45

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1753.65	Weir Sta US (ft)	0.00
W.S. US. (ft)	1753.02	Weir Sta DS (ft)	26.23
E.G. DS (ft)	1753.01	Weir Max Depth (ft)	0.87
W.S. DS (ft)	1751.70	Weir Avg Depth (ft)	0.44
Q US (cfs)	1479.25	Weir Submerg	0.00
Q Leaving Total (cfs)	22.19	Min El Weir Flow (ft)	1752.15
Q DS (cfs)	1206.29	Wr Top Wdth (ft)	26.23
Perc Q Leaving	1.50	Q Gate Group (cfs)	
Q Weir (cfs)	22.19	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	11.43	Gate Invert (ft)	

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 53.4

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1752.4	90	1750.25

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1753.65	Weir Sta US (ft)	0.00
W.S. US. (ft)	1753.02	Weir Sta DS (ft)	90.00
E.G. DS (ft)	1753.01	Weir Max Depth (ft)	1.45
W.S. DS (ft)	1751.70	Weir Avg Depth (ft)	1.03
Q US (cfs)	1479.25	Weir Submerg	0.36
Q Leaving Total (cfs)	250.89	Min El Weir Flow (ft)	1750.25
Q DS (cfs)	1206.29	Wr Top Wdth (ft)	90.00
Perc Q Leaving	16.95	Q Gate Group (cfs)	
Q Weir (cfs)	250.89	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	93.04	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 53

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1750.25	2.8	1748.91	15.3	1748.9	20.4	1748.9	29.4	1748.9
37.4	1748.9	40.5	1749.22	45.8	1748.9	53	1753.45		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	0	.03	53	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	53	80	120	165	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
125.45	348.25	1747.99

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1753.01	Element			
Vel Head (ft)	1.32	Wt. n-Val.		0.030	
W.S. Elev (ft)	1751.70	Reach Len. (ft)	80.00	120.00	165.00
Crit W.S. (ft)	1751.70	Flow Area (sq ft)		130.93	
E.G. Slope (ft/ft)	0.010311	Area (sq ft)		130.93	
Q Total (cfs)	1206.29	Flow (cfs)		1206.29	
Top Width (ft)	50.22	Top Width (ft)		50.22	
Vel Total (ft/s)	9.21	Avg. Vel. (ft/s)		9.21	
Max Chl Dpth (ft)	2.80	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	11879.8	Conv. (cfs)		11879.8	
Length Wtd. (ft)	108.95	Wetted Per. (ft)		52.81	
Min Ch El (ft)	1748.90	Shear (lb/sq ft)		1.60	
Alpha	1.00	Stream Power (lb/ft s)		14.70	
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	5.51	6.73	0.14
C & E Loss (ft)	0.19	Cum SA (acres)	4.01	2.77	0.17

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 52

INPUT
Description: plus 1
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1752	215	1748.14	262	1748.24	309.1	1748.93	328.2	1749.84
345.9	1748	351.1	1748	360.6	1748	369.3	1748	376.1	1748
380.8	1751.86								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	328.2	.03	380.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
328.2	380.8	112	112	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1751.20	Element			
Vel Head (ft)	0.68	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1750.53	Reach Len. (ft)	112.00	112.00	140.00
Crit W.S. (ft)	1750.37	Flow Area (sq ft)	381.91	108.67	
E.G. Slope (ft/ft)	0.011771	Area (sq ft)	381.91	108.67	
Q Total (cfs)	1779.78	Flow (cfs)	824.97	954.81	

Top Width (ft)	297.16	Top Width (ft)	246.18	50.98	
Vel Total (ft/s)	3.63	Avg. Vel. (ft/s)	2.16	8.79	
Max Chl Dpth (ft)	2.53	Hydr. Depth (ft)	1.55	2.13	
Conv. Total (cfs)	16404.8	Conv. (cfs)	7604.0	8800.7	
Length Wtd. (ft)	112.00	Wetted Per. (ft)	246.23	51.98	
Min Ch El (ft)	1748.00	Shear (lb/sq ft)	1.14	1.54	
Alpha	3.31	Stream Power (lb/ft s)	2.46	13.50	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	5.16	6.40	0.14
C & E Loss (ft)	0.01	Cum SA (acres)	3.79	2.63	0.17

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 51.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1751.86	140	1749.73

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1751.20	Weir Sta US (ft)	
W.S. US. (ft)	1750.53	Weir Sta DS (ft)	
E.G. DS (ft)	1750.30	Weir Max Depth (ft)	
W.S. DS (ft)	1749.64	Weir Avg Depth (ft)	
Q US (cfs)	1779.78	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1749.73
Q DS (cfs)	1779.78	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 51

INPUT
Description: plus 1
plus 1
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1750	220	1746.93	246	1747.2	263.5	1746.3	269.8	1746.3
278	1746.3	284.3	1746.3	293.1	1746.3	305.6	1749.73		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	246	.03	305.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
246	305.6	110	180	230	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1750.30	Element			
Vel Head (ft)	0.66	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1749.64	Reach Len. (ft)	110.00	180.00	230.00
Crit W.S. (ft)		Flow Area (sq ft)	330.36	169.84	
E.G. Slope (ft/ft)	0.005829	Area (sq ft)	330.36	169.84	
Q Total (cfs)	1779.78	Flow (cfs)	491.01	1288.78	
Top Width (ft)	279.57	Top Width (ft)	220.29	59.28	
Vel Total (ft/s)	3.56	Avg. Vel. (ft/s)	1.49	7.59	
Max Chl Dpth (ft)	3.34	Hydr. Depth (ft)	1.50	2.87	
Conv. Total (cfs)	23311.1	Conv. (cfs)	6431.1	16880.1	
Length Wtd. (ft)	157.10	Wetted Per. (ft)	220.31	59.75	
Min Ch El (ft)	1746.30	Shear (lb/sq ft)	0.55	1.03	
Alpha	3.34	Stream Power (lb/ft s)	0.81	7.85	

Frctn Loss (ft)	1.24	Cum Volume (acre-ft)	4.24	6.04	0.14
C & E Loss (ft)	0.01	Cum SA (acres)	3.19	2.48	0.17

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 50.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1749.73	230	1747.76

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1750.30	Weir Sta US (ft)	33.01
W.S. US. (ft)	1749.64	Weir Sta DS (ft)	230.00
E.G. DS (ft)	1749.05	Weir Max Depth (ft)	0.53
W.S. DS (ft)	1748.29	Weir Avg Depth (ft)	0.26
Q US (cfs)	1779.78	Weir Submerg	0.00
Q Leaving Total (cfs)	78.94	Min El Weir Flow (ft)	1747.76
Q DS (cfs)	1700.99	Wr Top Wdth (ft)	196.99
Perc Q Leaving	4.43	Q Gate Group (cfs)	
Q Weir (cfs)	78.94	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	52.16	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 50

INPUT
Description: plus 2, go to 46.0
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1748	190	1745.9	221.8	1746.65	229.5	1746	236.9	1746
246.2	1746	252.7	1746	259.8	1746	270.6	1746	278.8	1747.76

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	221.8	.03	278.8	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
221.8	278.8	85	100	111	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1749.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1748.29	Reach Len. (ft)	85.00	100.00	111.00
Crit W.S. (ft)	1748.29	Flow Area (sq ft)	318.57	120.79	
E.G. Slope (ft/ft)	0.011582	Area (sq ft)	318.57	120.79	
Q Total (cfs)	1700.99	Flow (cfs)	647.93	1053.06	
Top Width (ft)	278.80	Top Width (ft)	221.80	57.00	
Vel Total (ft/s)	3.87	Avg. Vel. (ft/s)	2.03	8.72	
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)	1.44	2.12	
Conv. Total (cfs)	15805.6	Conv. (cfs)	6020.5	9785.1	
Length Wtd. (ft)		Wetted Per. (ft)	222.11	57.74	
Min Ch El (ft)	1746.00	Shear (lb/sq ft)	1.04	1.51	
Alpha	3.24	Stream Power (lb/ft s)	2.11	13.19	
Frctn Loss (ft)		Cum Volume (acre-ft)	3.43	5.44	0.14
C & E Loss (ft)		Cum SA (acres)	2.63	2.24	0.17

```
Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 49.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1747.76     111  1746.4

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1749.05    Weir Sta US (ft)           0.00
  W.S. US. (ft)            1748.29    Weir Sta DS (ft)         111.00
  E.G. DS (ft)             1748.03    Weir Max Depth (ft)        1.01
  W.S. DS (ft)             1747.41    Weir Avg Depth (ft)        0.77
  Q US (cfs)               1700.99    Weir Submerg               0.00
  Q Leaving Total (cfs)     197.93    Min El Weir Flow (ft)   1746.40
  Q DS (cfs)               1503.03    Wr Top Wdth (ft)         111.00
  Perc Q Leaving             11.64    Q Gate Group (cfs)
  Q Weir (cfs)              197.93    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     85.62    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 49

INPUT
Description: plus 2, go to 45.0
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1748     220 1745.03   242.9 1745.07   266.3 1746.15   274.1    1745
   288.4    1745   295.7    1745     308    1745   317.3 1746.24   337.1 1746.33
     342  1746.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   266.3     .03   317.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          266.3  317.3              115     130     145            .1        .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1748.03    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               0.61    Wt. n-Val.                0.100      0.030     0.060
  W.S. Elev (ft)           1747.41    Reach Len. (ft)          115.00     130.00    145.00
  Crit W.S. (ft)           1747.24    Flow Area (sq ft)        306.67     112.82     27.48
  E.G. Slope (ft/ft)      0.009032    Area (sq ft)             306.67     112.82     27.48
  Q Total (cfs)            1503.03    Flow (cfs)               535.75     899.70     67.59
  Top Width (ft)            298.53    Top Width (ft)           222.83      51.00     24.70
  Vel Total (ft/s)            3.36    Avg. Vel. (ft/s)           1.75       7.97      2.46
  Max Chl Dpth (ft)           2.41    Hydr. Depth (ft)           1.38       2.21      1.11
  Conv. Total (cfs)        15815.4    Conv. (cfs)              5637.3     9466.9     711.2
  Length Wtd. (ft)          124.97    Wetted Per. (ft)         222.87      51.17     25.71
  Min Ch El (ft)           1745.00    Shear (lb/sq ft)           0.78       1.24      0.60
  Alpha                       3.49    Stream Power (lb/ft s)     1.36       9.91      1.48
  Frctn Loss (ft)             1.33    Cum Volume (acre-ft)       2.82       5.17      0.10
  C & E Loss (ft)             0.00    Cum SA (acres)             2.20       2.12      0.14
```

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 48.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1746.4	145	1745.71

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1748.03	Weir Sta US (ft)	0.00
W.S. US. (ft)	1747.41	Weir Sta DS (ft)	145.00
E.G. DS (ft)	1746.69	Weir Max Depth (ft)	1.01
W.S. DS (ft)	1746.04	Weir Avg Depth (ft)	0.67
Q US (cfs)	1503.03	Weir Submerg	0.00
Q Leaving Total (cfs)	214.75	Min El Weir Flow (ft)	1745.71
Q DS (cfs)	1288.28	Wr Top Wdth (ft)	145.00
Perc Q Leaving	14.29	Q Gate Group (cfs)	
Q Weir (cfs)	214.75	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	97.55	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 48

INPUT
Description: plus 2, go to 44.0
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1746	155	1743.99	170	1743.97	195.8	1744.5	211	1744
216	1744	223.2	1744	231.2	1744	235	1744	257.5	1745.71

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	195.8	.03	257.5	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
195.8	257.5		80	95	105	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1746.69	Element			
Vel Head (ft)	0.65	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1746.04	Reach Len. (ft)	80.00	95.00	105.00
Crit W.S. (ft)	1746.04	Flow Area (sq ft)	239.88	102.97	
E.G. Slope (ft/ft)	0.013173	Area (sq ft)	239.88	102.97	
Q Total (cfs)	1288.28	Flow (cfs)	468.31	819.97	
Top Width (ft)	257.50	Top Width (ft)	195.80	61.70	
Vel Total (ft/s)	3.76	Avg. Vel. (ft/s)	1.95	7.96	
Max Chl Dpth (ft)	2.07	Hydr. Depth (ft)	1.23	1.67	
Conv. Total (cfs)	11224.7	Conv. (cfs)	4080.3	7144.4	
Length Wtd. (ft)	90.18	Wetted Per. (ft)	195.86	62.11	
Min Ch El (ft)	1744.00	Shear (lb/sq ft)	1.01	1.36	
Alpha	2.96	Stream Power (lb/ft s)	1.97	10.86	
Frctn Loss (ft)	1.24	Cum Volume (acre-ft)	2.09	4.85	0.05
C & E Loss (ft)	0.01	Cum SA (acres)	1.64	1.95	0.10

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and

```
        assumed values.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 47.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1745.71     105 1743.94

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1746.69    Weir Sta US (ft)            0.00
  W.S. US. (ft)            1746.04    Weir Sta DS (ft)           92.62
  E.G. DS (ft)             1744.61    Weir Max Depth (ft)         0.33
  W.S. DS (ft)             1743.90    Weir Avg Depth (ft)         0.17
  Q US (cfs)               1288.28    Weir Submerg                0.00
  Q Leaving Total (cfs)      18.45    Min El Weir Flow (ft)    1743.94
  Q DS (cfs)               1269.88    Wr Top Wdth (ft)           92.62
  Perc Q Leaving              1.43    Q Gate Group (cfs)
  Q Weir (cfs)               18.45    Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)     15.39    Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 47

INPUT
Description: plus 2, go to 42.0
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1746     255 1741.77   269.1 1742.04   279.3 1742.69   314.2    1742
   322.5    1742     330    1742   335.2    1742   353.9 1743.52   376.7 1743.94

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   279.3     .03   353.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         279.3   353.9                82      80      83             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1744.61    Element                  Left OB    Channel   Right OB
  Vel Head (ft)               0.71    Wt. n-Val.                0.100      0.030     0.060
  W.S. Elev (ft)           1743.90    Reach Len. (ft)           82.00      80.00     83.00
  Crit W.S. (ft)           1743.90    Flow Area (sq ft)        179.85     115.15      3.83
  E.G. Slope (ft/ft)      0.014277    Area (sq ft)             179.85     115.15      3.83
  Q Total (cfs)            1269.88    Flow (cfs)               356.48     909.69      3.71
  Top Width (ft)            247.42    Top Width (ft)           152.43      74.60     20.39
  Vel Total (ft/s)            4.25    Avg. Vel. (ft/s)           1.98       7.90      0.97
  Max Chl Dpth (ft)           2.13    Hydr. Depth (ft)           1.18       1.54      0.19
  Conv. Total (cfs)        10627.8    Conv. (cfs)              2983.4     7613.4      31.1
  Length Wtd. (ft)           80.68    Wetted Per. (ft)         152.47      74.67     20.39
  Min Ch El (ft)           1742.00    Shear (lb/sq ft)           1.05       1.37      0.17
  Alpha                       2.54    Stream Power (lb/ft s)     2.08      10.86      0.16
  Frctn Loss (ft)             0.56    Cum Volume (acre-ft)       1.71       4.61      0.05
  C & E Loss (ft)             0.13    Cum SA (acres)             1.32       1.80      0.07
```

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 46.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1743.94	83	1742.01

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1744.61	Weir Sta US (ft)	3.15
W.S. US. (ft)	1743.90	Weir Sta DS (ft)	83.00
E.G. DS (ft)	1743.41	Weir Max Depth (ft)	1.12
W.S. DS (ft)	1743.14	Weir Avg Depth (ft)	0.56
Q US (cfs)	1269.88	Weir Submerg	0.00
Q Leaving Total (cfs)	99.07	Min El Weir Flow (ft)	1742.01
Q DS (cfs)	1170.97	Wr Top Wdth (ft)	79.85
Perc Q Leaving	7.79	Q Gate Group (cfs)	
Q Weir (cfs)	99.07	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	44.91	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 46

INPUT
Description: plus 2, go to 40.0
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1746	335	1739.97	345.9	1739.82	352.8	1743.24	369	1742.35
378.1	1740	380.7	1740	391.6	1740	400.1	1740	408.4	1740
415.4	1741.53	427.8	1742.01						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	352.8	.03	415.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
352.8	415.4	125	124	117	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1743.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1743.14	Reach Len. (ft)	125.00	124.00	117.00
Crit W.S. (ft)		Flow Area (sq ft)	324.64	135.02	16.92
E.G. Slope (ft/ft)	0.003956	Area (sq ft)	324.64	135.02	16.92
Q Total (cfs)	1170.97	Flow (cfs)	427.33	713.05	30.60
Top Width (ft)	266.50	Top Width (ft)	193.42	60.69	12.40
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	1.32	5.28	1.81
Max Chl Dpth (ft)	3.31	Hydr. Depth (ft)	1.68	2.22	1.36
Conv. Total (cfs)	18617.5	Conv. (cfs)	6794.1	11336.8	486.5
Length Wtd. (ft)	124.27	Wetted Per. (ft)	194.22	61.17	13.53
Min Ch El (ft)	1740.00	Shear (lb/sq ft)	0.41	0.55	0.31
Alpha	2.93	Stream Power (lb/ft s)	0.54	2.88	0.56
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	1.23	4.38	0.03

C & E Loss (ft)	0.03	Cum SA (acres)	1.00	1.68	0.04

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 45.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1742.01	117	1742.01

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1743.41	Weir Sta US (ft)	0.00
W.S. US. (ft)	1743.14	Weir Sta DS (ft)	117.00
E.G. DS (ft)	1742.63	Weir Max Depth (ft)	1.12
W.S. DS (ft)	1742.06	Weir Avg Depth (ft)	0.59
Q US (cfs)	1170.97	Weir Submerg	0.00
Q Leaving Total (cfs)	152.22	Min El Weir Flow (ft)	1742.01
Q DS (cfs)	1018.77	Wr Top Wdth (ft)	117.00
Perc Q Leaving	13.00	Q Gate Group (cfs)	
Q Weir (cfs)	152.22	Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)	68.88	Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 45

INPUT
Description: copy of 46, lowered to culvert outlet (plus 2), go to 40.0
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1742	190	1739.97	200.9	1739.82	207.8	1743.24	224	1742.35
233.1	1740	235.7	1740	246.6	1740	262	1740	263.4	1740
270.4	1741.53	282.8	1742.01						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	207.8	.03	270.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
207.8	270.4		75	60	60	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1742.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.030	0.060
W.S. Elev (ft)	1742.06	Reach Len. (ft)	75.00	60.00	60.00
Crit W.S. (ft)	1742.06	Flow Area (sq ft)	233.45	79.82	3.63
E.G. Slope (ft/ft)	0.011399	Area (sq ft)	233.45	79.82	3.63
Q Total (cfs)	1018.77	Flow (cfs)	402.54	612.02	4.21
Top Width (ft)	263.11	Top Width (ft)	205.42	45.29	12.40
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)	1.72	7.67	1.16
Max Chl Dpth (ft)	2.24	Hydr. Depth (ft)	1.14	1.76	0.29
Conv. Total (cfs)	9542.2	Conv. (cfs)	3770.3	5732.4	39.5
Length Wtd. (ft)	60.00	Wetted Per. (ft)	206.02	45.71	12.46
Min Ch El (ft)	1740.00	Shear (lb/sq ft)	0.81	1.24	0.21
Alpha	3.53	Stream Power (lb/ft s)	1.39	9.53	0.24
Frctn Loss (ft)		Cum Volume (acre-ft)	0.43	4.08	0.00
C & E Loss (ft)		Cum SA (acres)	0.43	1.53	0.01

```
Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

CULVERT


RIVER: Ajo
REACH: Primary            RS: 44.5

INPUT
Description:
Distance from Upstream XS =       8
Deck/Roadway Width        =      33
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=        9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     147 1739.15           174.5 1738.74           201.3 1739.43
   248.5  1743.3           298.1 1743.32           315.4 1743.47
     320 1743.48           339.2 1740.66           368.6 1738.98

Upstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1742     190 1739.97   200.9 1739.82   207.8 1743.24     224 1742.35
   233.1    1740   235.7    1740   246.6    1740     262    1740   263.4    1740
   270.4 1741.53   282.8 1742.01

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1   207.8     .03   270.4     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
          207.8   270.4             .3       .5

Downstream  Deck/Roadway Coordinates
    num=        9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     147 1739.15           174.5 1738.74           201.3 1739.43
   248.5  1743.3           298.1 1743.32           315.4 1743.47
     320 1743.48           339.2 1740.66           368.6 1738.98

Downstream Bridge Cross Section Data
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1742     215 1736.95   221.1 1736.91   225.2  1738.5     250 1739.28
   252.3 1737.39     260 1737.36   268.1 1733.19   285.4 1733.19   299.4  1733.4
   311.3 1740.16     324 1740.27   339.2  1740.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     250     .03   311.3     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
           250   311.3             .3       .5

Upstream Embankment side slope              =      0 horiz. to 1.0 vertical
Downstream Embankment side slope            =      0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box      3.4    7.33
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                   5      40     .013     .025      3.1                   .4                 1
Number of Barrels =  3
Upstream   Elevation =  1734.22
Centerline Stations
    Sta.    Sta.    Sta.
  238.65  248.45  258.25
Downstream Elevation =  1734.1
Centerline Stations
    Sta.    Sta.    Sta.
  275.75  285.55  295.35

CULVERT OUTPUT  Profile #PF 1  Culv Group:  Culvert #1
```

Q Culv Group (cfs)	39.12	Culv Full Len (ft)	40.00
# Barrels	3	Culv Vel US (ft/s)	5.93
Q Barrel (cfs)	13.04	Culv Vel DS (ft/s)	5.93
E.G. US. (ft)	1742.41	Culv Inv El Up (ft)	1734.22
W.S. US. (ft)	1742.06	Culv Inv El Dn (ft)	1734.10
E.G. DS (ft)	1738.81	Culv Frctn Ls (ft)	3.12
W.S. DS (ft)	1738.52	Culv Exit Loss (ft)	0.26
Delta EG (ft)	3.60	Culv Entr Loss (ft)	0.22
Delta WS (ft)	3.54	Q Weir (cfs)	982.18
E.G. IC (ft)	1742.37	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	1742.41	Weir Sta Rgt (ft)	237.63
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1737.62	Weir Max Depth (ft)	2.59
Culv WS Outlet (ft)	1737.50	Weir Avg Depth (ft)	1.41
Culv Nml Depth (ft)	3.40	Weir Flow Area (sq ft)	310.61
Culv Crt Depth (ft)	3.40	Min El Weir Flow (ft)	1739.83

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.
Note: Culvert critical depth exceeds the height of the culvert.

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 44

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1742	215	1736.95	221.1	1736.91	225.2	1738.5	250	1739.28
252.3	1737.39	260	1737.36	268.1	1733.19	285.4	1733.19	299.4	1733.4
311.3	1740.16	324	1740.27	339.2	1740.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	250	.03	311.3	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
250	311.3	152	160	160	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1738.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1738.52	Reach Len. (ft)	152.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)	65.65	224.40	
E.G. Slope (ft/ft)	0.001365	Area (sq ft)	65.65	224.40	
Q Total (cfs)	1018.77	Flow (cfs)	32.10	986.67	
Top Width (ft)	135.29	Top Width (ft)	77.80	57.49	
Vel Total (ft/s)	3.51	Avg. Vel. (ft/s)	0.49	4.40	
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)	0.84	3.90	
Conv. Total (cfs)	27571.4	Conv. (cfs)	868.6	26702.7	
Length Wtd. (ft)	159.72	Wetted Per. (ft)	78.11	60.26	
Min Ch El (ft)	1733.19	Shear (lb/sq ft)	0.07	0.32	
Alpha	1.52	Stream Power (lb/ft s)	0.04	1.40	
Frctn Loss (ft)	0.45	Cum Volume (acre ft)	0.18	3.87	
C & E Loss (ft)	0.35	Cum SA (acres)	0.18	1.46	

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 43.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1740.5	160	1739.23

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1738.81	Weir Sta US (ft)		
W.S. US. (ft)	1738.52	Weir Sta DS (ft)		
E.G. DS (ft)	1738.01	Weir Max Depth (ft)		
W.S. DS (ft)	1736.54	Weir Avg Depth (ft)		
Q US (cfs)	1018.77	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1739.23	
Q DS (cfs)	1018.77	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 43

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1740	160	1737.2	177.1	1736.8	190.6	1733.92	200.9	1738.38
208.7	1738.25	218	1732.77	225.5	1731.47	232.6	1732.24	247	1738.79
264.9	1738.89	276.8	1739.23						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	208.7	.03	247	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
208.7	247	68	59	65	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1738.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.46	Wt. n-Val.	0.100	0.030	
W.S. Elev (ft)	1736.54	Reach Len. (ft)	68.00	59.00	65.00
Crit W.S. (ft)	1736.54	Flow Area (sq ft)	24.08	98.90	
E.G. Slope (ft/ft)	0.009087	Area (sq ft)	24.08	98.90	
Q Total (cfs)	1018.77	Flow (cfs)	39.69	979.08	
Top Width (ft)	48.82	Top Width (ft)	18.36	30.46	
Vel Total (ft/s)	8.28	Avg. Vel. (ft/s)	1.65	9.90	
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)	1.31	3.25	
Conv. Total (cfs)	10687.0	Conv. (cfs)	416.4	10270.6	
Length Wtd. (ft)	59.18	Wetted Per. (ft)	19.18	32.58	
Min Ch El (ft)	1731.47	Shear (lb/sq ft)	0.71	1.72	
Alpha	1.37	Stream Power (lb/ft s)	1.17	17.05	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	0.02	3.28	
C & E Loss (ft)	0.03	Cum SA (acres)	0.01	1.30	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: Divided flow computed for this cross-section.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 42.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev

```
      0 1739.23      65 1738.07

Weir Crest Shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1738.01    Weir Sta US (ft)
  W.S. US. (ft)            1736.54    Weir Sta DS (ft)
  E.G. DS (ft)             1737.37    Weir Max Depth (ft)
  W.S. DS (ft)             1736.02    Weir Avg Depth (ft)
  Q US (cfs)               1018.77    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1738.07
  Q DS (cfs)               1018.77    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 42

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1740     100 1737.43   122.8 1736.55   139.2 1735.93   158.8 1731.93
   169.8 1731.03   179.3 1737.52   196.4 1737.77   206.4 1738.02   211.4 1738.07

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     100     .03   179.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           100   179.3              100      98      96              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1737.37    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.35    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1736.02    Reach Len. (ft)           100.00     98.00     96.00
  Crit W.S. (ft)           1736.02    Flow Area (sq ft)                    109.14
  E.G. Slope (ft/ft)      0.010005    Area (sq ft)                         109.14
  Q Total (cfs)            1018.77    Flow (cfs)                          1018.77
  Top Width (ft)             40.22    Top Width (ft)                        40.22
  Vel Total (ft/s)            9.33    Avg. Vel. (ft/s)                       9.33
  Max Chl Dpth (ft)           4.99    Hydr. Depth (ft)                       2.71
  Conv. Total (cfs)        10185.0    Conv. (cfs)                         10185.0
  Length Wtd. (ft)           98.00    Wetted Per. (ft)                      42.20
  Min Ch El (ft)           1731.03    Shear (lb/sq ft)                       1.62
  Alpha                       1.00    Stream Power (lb/ft s)                15.08
  Frctn Loss (ft)             0.98    Cum Volume (acre-ft)                   3.13
  C & E Loss (ft)             0.05    Cum SA (acres)                         1.25


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 41.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       2
     Sta    Elev     Sta    Elev
```

```
      0 1738.07      96 1736.54

Weir Crest Shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1737.37    Weir Sta US (ft)
  W.S. US. (ft)            1736.02    Weir Sta DS (ft)
  E.G. DS (ft)             1735.50    Weir Max Depth (ft)
  W.S. DS (ft)             1734.32    Weir Avg Depth (ft)
  Q US (cfs)               1018.77    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1736.54
  Q DS (cfs)               1018.77    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 41

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1737.83    18.2 1736.99    43.2 1732.07    48.7 1730.85      56 1730.24
    72.7 1732.18    86.6 1735.86    99.3 1736.42     108 1736.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1    18.2     .03    86.6     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          18.2    86.6              102     100     100             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1735.50    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.18    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1734.32    Reach Len. (ft)           102.00     100.00     100.00
  Crit W.S. (ft)           1734.32    Flow Area (sq ft)                    116.73
  E.G. Slope (ft/ft)      0.009967    Area (sq ft)                         116.73
  Q Total (cfs)            1018.77    Flow (cfs)                          1018.77
  Top Width (ft)             49.02    Top Width (ft)                        49.02
  Vel Total (ft/s)            8.73    Avg. Vel. (ft/s)                       8.73
  Max Chl Dpth (ft)           4.08    Hydr. Depth (ft)                       2.38
  Conv. Total (cfs)        10204.7    Conv. (cfs)                        10204.7
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                      49.78
  Min Ch El (ft)           1730.24    Shear (lb/sq ft)                       1.46
  Alpha                       1.00    Stream Power (lb/ft s)                12.73
  Frctn Loss (ft)             0.78    Cum Volume (acre-ft)                   2.88
  C & E Loss (ft)             0.07    Cum SA (acres)                         1.15


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 40.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       2
     Sta    Elev     Sta    Elev
```

```
      0 1736.54     100 1735.11

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1735.50    Weir Sta US (ft)
  W.S. US. (ft)            1734.32    Weir Sta DS (ft)
  E.G. DS (ft)             1734.21    Weir Max Depth (ft)
  W.S. DS (ft)             1733.26    Weir Avg Depth (ft)
  Q US (cfs)               1018.77    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1735.11
  Q DS (cfs)               1018.77    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 40

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1736.53    48.1 1734.25    62.2 1733.73    70.7 1729.69      82 1729.35
    91.5 1729.38   103.2 1731.49   111.2 1734.33   122.7 1735.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1    48.1     .03   122.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          48.1   122.7                 95      85     100             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1734.21    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               0.95    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1733.26    Reach Len. (ft)            95.00     85.00     100.00
  Crit W.S. (ft)                      Flow Area (sq ft)                   129.96
  E.G. Slope (ft/ft)      0.006322    Area (sq ft)                        129.96
  Q Total (cfs)            1018.77    Flow (cfs)                         1018.77
  Top Width (ft)             44.98    Top Width (ft)                      44.98
  Vel Total (ft/s)            7.84    Avg. Vel. (ft/s)                     7.84
  Max Chl Dpth (ft)           3.91    Hydr. Depth (ft)                     2.89
  Conv. Total (cfs)        12812.7    Conv. (cfs)                        12812.7
  Length Wtd. (ft)           85.00    Wetted Per. (ft)                    46.28
  Min Ch El (ft)           1729.35    Shear (lb/sq ft)                     1.11
  Alpha                       1.00    Stream Power (lb/ft s)               8.69
  Frctn Loss (ft)             0.66    Cum Volume (acre-ft)                 2.60
  C & E Loss (ft)             0.04    Cum SA (acres)                       1.04


LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 39.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1735.11     100  1733.6

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1734.21    Weir Sta US (ft)
```

W.S. US. (ft)	1733.26	Weir Sta DS (ft)	
E.G. DS (ft)	1733.51	Weir Max Depth (ft)	
W.S. DS (ft)	1732.11	Weir Avg Depth (ft)	
Q US (cfs)	1018.77	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1733.60
Q DS (cfs)	1018.77	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 39

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1736	120	1733.69	170.3	1733.03	192.3	1727.48	198.5	1727.19
216.4	1733.31	235.2	1733.6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	170.3	.03	216.4	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
170.3	216.4	100	115	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1733.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.40	Wt. n-Val.		0.030	
W.S. Elev (ft)	1732.11	Reach Len. (ft)	100.00	115.00	100.00
Crit W.S. (ft)	1732.11	Flow Area (sq ft)		107.48	
E.G. Slope (ft/ft)	0.009914	Area (sq ft)		107.48	
Q Total (cfs)	1018.77	Flow (cfs)		1018.77	
Top Width (ft)	38.94	Top Width (ft)		38.94	
Vel Total (ft/s)	9.48	Avg. Vel. (ft/s)		9.48	
Max Chl Dpth (ft)	4.92	Hydr. Depth (ft)		2.76	
Conv. Total (cfs)	10231.5	Conv. (cfs)		10231.5	
Length Wtd. (ft)	115.00	Wetted Per. (ft)		40.34	
Min Ch El (ft)	1727.19	Shear (lb/sq ft)		1.65	
Alpha	1.00	Stream Power (lb/ft s)		15.63	
Frctn Loss (ft)	1.16	Cum Volume (acre-ft)		2.37	
C & E Loss (ft)	0.07	Cum SA (acres)		0.96	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 38.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1733.6	100	1732.27

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1733.51	Weir Sta US (ft)	

```
  W.S. US. (ft)            1732.11    Weir Sta DS (ft)
  E.G. DS (ft)             1728.35    Weir Max Depth (ft)
  W.S. DS (ft)             1727.20    Weir Avg Depth (ft)
  Q US (cfs)               1018.77    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1732.27
  Q DS (cfs)               1018.77    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 38

INPUT
Description:
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1732.86    15.2 1729.86    22.9  1731.6    40.9 1724.21    61.3 1724.42
    81.8 1725.53    93.7 1731.07   111.3 1732.27

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08    22.9     .03    93.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          22.9    93.7              108     100     104             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1728.35    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.15    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1727.20    Reach Len. (ft)           108.00     100.00     104.00
  Crit W.S. (ft)           1727.20    Flow Area (sq ft)                    118.30
  E.G. Slope (ft/ft)      0.010301    Area (sq ft)                         118.30
  Q Total (cfs)            1018.77    Flow (cfs)                          1018.77
  Top Width (ft)             51.77    Top Width (ft)                        51.77
  Vel Total (ft/s)            8.61    Avg. Vel. (ft/s)                       8.61
  Max Chl Dpth (ft)           2.99    Hydr. Depth (ft)                       2.29
  Conv. Total (cfs)        10037.9    Conv. (cfs)                         10037.9
  Length Wtd. (ft)          100.00    Wetted Per. (ft)                      52.76
  Min Ch El (ft)           1724.21    Shear (lb/sq ft)                       1.44
  Alpha                       1.00    Stream Power (lb/ft s)                12.42
  Frctn Loss (ft)             1.04    Cum Volume (acre-ft)                   2.07
  C & E Loss (ft)             0.02    Cum SA (acres)                         0.84


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 37.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1732.27     104 1730.96

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1728.35    Weir Sta US (ft)
```

W.S. US. (ft)	1727.20	Weir Sta DS (ft)	
E.G. DS (ft)	1726.58	Weir Max Depth (ft)	
W.S. DS (ft)	1725.50	Weir Avg Depth (ft)	
Q US (cfs)	1018.77	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1730.96
Q DS (cfs)	1018.77	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 37

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1731.05	32	1730.45	41.6	1724.05	70	1722.67	88.5	1722.93
108.2	1729.42	117.1	1730.31	127.9	1730.96				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	32	.03	108.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
32	108.2	89	100	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1726.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.		0.030	
W.S. Elev (ft)	1725.50	Reach Len. (ft)	89.00	100.00	100.00
Crit W.S. (ft)	1725.50	Flow Area (sq ft)		122.23	
E.G. Slope (ft/ft)	0.010422	Area (sq ft)		122.23	
Q Total (cfs)	1018.77	Flow (cfs)		1018.77	
Top Width (ft)	56.87	Top Width (ft)		56.87	
Vel Total (ft/s)	8.34	Avg. Vel. (ft/s)		8.34	
Max Chl Dpth (ft)	2.83	Hydr. Depth (ft)		2.15	
Conv. Total (cfs)	9979.3	Conv. (cfs)		9979.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		57.75	
Min Ch El (ft)	1722.67	Shear (lb/sq ft)		1.38	
Alpha	1.00	Stream Power (lb/ft s)		11.48	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)		1.79	
C & E Loss (ft)	0.21	Cum SA (acres)		0.71	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 36.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1730.96	100	1728.69

Weir crest shape = Broad Crested

```
LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)             1726.58    Weir Sta US (ft)
  W.S. US. (ft)             1725.50    Weir Sta DS (ft)
  E.G. DS (ft)              1723.90    Weir Max Depth (ft)
  W.S. DS (ft)              1723.52    Weir Avg Depth (ft)
  Q US (cfs)                1018.77    Weir Submerg
  Q Leaving Total (cfs)        0.00    Min El Weir Flow (ft)    1728.69
  Q DS (cfs)                1018.77    Wr Top Wdth (ft)
  Perc Q Leaving               0.00    Q Gate Group (cfs)
  Q Weir (cfs)                         Gate Open Ht (ft)
  Q Gates (cfs)                        Gate #Open
  Q Culv (cfs)                         Gate Area (sq ft)
  Q Lat RC (cfs)                       Gate Submerg
  Weir Flow Area (sq ft)               Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 36

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1728      35 1723.86    45.3 1721.87    50.9 1723.26    71.4 1722.06
    76.4 1720.54   100.1  1719.1   119.7 1720.73   131.5 1727.91   148.7 1728.69

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08      35     .03   131.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             35   131.5              102     100      99             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)            1723.90    Element                   Left OB    Channel   Right OB
  Vel Head (ft)                0.38    Wt. n-Val.                           0.030
  W.S. Elev (ft)            1723.52    Reach Len. (ft)           102.00     100.00      99.00
  Crit W.S. (ft)                       Flow Area (sq ft)                    206.17
  E.G. Slope (ft/ft)       0.003249    Area (sq ft)                         206.17
  Q Total (cfs)             1018.77    Flow (cfs)                          1018.77
  Top Width (ft)              87.55    Top Width (ft)                        87.55
  Vel Total (ft/s)             4.94    Avg. Vel. (ft/s)                      4.94
  Max Chl Dpth (ft)            4.42    Hydr. Depth (ft)                      2.35
  Conv. Total (cfs)         17873.6    Conv. (cfs)                        17873.6
  Length Wtd. (ft)           100.00    Wetted Per. (ft)                      89.03
  Min Ch El (ft)            1719.10    Shear (lb/sq ft)                      0.47
  Alpha                        1.00    Stream Power (lb/ft s)                2.32
  Frctn Loss (ft)              0.52    Cum Volume (acre-ft)                  1.41
  C & E Loss (ft)              0.09    Cum SA (acres)                        0.55


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 35.5

INPUT
Description:
Lateral structure position      = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1728.69      99 1727.49

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct
```

E.G. US. (ft)	1723.90	Weir Sta US (ft)		
W.S. US. (ft)	1723.52	Weir Sta DS (ft)		
E.G. DS (ft)	1723.29	Weir Max Depth (ft)		
W.S. DS (ft)	1722.00	Weir Avg Depth (ft)		
Q US (cfs)	1018.77	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1727.49	
Q DS (cfs)	1018.77	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 35

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1726.07	29.5	1726.75	44	1725.41	55.5	1725.67	77.8	1718.25
89.3	1718.5	101.5	1719.26	123.7	1726.85	134	1727.42	139.1	1727.49

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	55.5	.03	123.7	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
55.5	123.7	109	97	102	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1723.29	Element			
Vel Head (ft)	1.29	Wt. n-Val.		0.030	
W.S. Elev (ft)	1722.00	Reach Len. (ft)	109.00	97.00	102.00
Crit W.S. (ft)	1722.00	Flow Area (sq ft)		111.72	
E.G. Slope (ft/ft)	0.009802	Area (sq ft)		111.72	
Q Total (cfs)	1018.77	Flow (cfs)		1018.77	
Top Width (ft)	42.96	Top Width (ft)		42.96	
Vel Total (ft/s)	9.12	Avg. Vel. (ft/s)		9.12	
Max Chl Dpth (ft)	3.75	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	10290.1	Conv. (cfs)		10290.1	
Length Wtd. (ft)	97.00	Wetted Per. (ft)		44.05	
Min Ch El (ft)	1718.25	Shear (lb/sq ft)		1.55	
Alpha	1.00	Stream Power (lb/ft s)		14.15	
Frctn Loss (ft)	0.96	Cum Volume (acre-ft)		1.05	
C & E Loss (ft)	0.01	Cum SA (acres)		0.40	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 34.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1727.49	102	1726.07

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1723.29	Weir Sta US (ft)		
W.S. US. (ft)	1722.00	Weir Sta DS (ft)		
E.G. DS (ft)	1721.11	Weir Max Depth (ft)		
W.S. DS (ft)	1719.69	Weir Avg Depth (ft)		
Q US (cfs)	1018.77	Weir Submerg		
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1726.07	
Q DS (cfs)	1018.77	Wr Top Wdth (ft)		
Perc Q Leaving	0.00	Q Gate Group (cfs)		
Q Weir (cfs)		Gate Open Ht (ft)		
Q Gates (cfs)		Gate #Open		
Q Culv (cfs)		Gate Area (sq ft)		
Q Lat RC (cfs)		Gate Submerg		
Weir Flow Area (sq ft)		Gate Invert (ft)		

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 34

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1723.96	32.2	1724.62	46.3	1723.89	58	1724.08	77.1	1715.56
82.5	1715.14	86.9	1715.31	105.2	1719.24	122.9	1725.45	133.7	1726.07

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	58	.03	122.9	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58	122.9	77	90	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1721.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.		0.030	
W.S. Elev (ft)	1719.69	Reach Len. (ft)	77.00	90.00	100.00
Crit W.S. (ft)	1719.69	Flow Area (sq ft)		106.85	
E.G. Slope (ft/ft)	0.010017	Area (sq ft)		106.85	
Q Total (cfs)	1018.77	Flow (cfs)		1018.77	
Top Width (ft)	38.66	Top Width (ft)		38.66	
Vel Total (ft/s)	9.53	Avg. Vel. (ft/s)		9.53	
Max Chl Dpth (ft)	4.55	Hydr. Depth (ft)		2.76	
Conv. Total (cfs)	10179.1	Conv. (cfs)		10179.1	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		40.06	
Min Ch El (ft)	1715.14	Shear (lb/sq ft)		1.67	
Alpha	1.00	Stream Power (lb/ft s)		15.90	
Frctn Loss (ft)	0.89	Cum Volume (acre-ft)		0.81	
C & E Loss (ft)	0.01	Cum SA (acres)		0.31	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

LATERAL STRUCTURE

RIVER: Ajo
REACH: Primary RS: 33.5

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS = 0
Deck/Roadway Width = 5
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 2

Sta	Elev	Sta	Elev
0	1726.07	100	1724.86

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

```
  E.G. US. (ft)             1721.11    Weir Sta US (ft)
  W.S. US. (ft)             1719.69    Weir Sta DS (ft)
  E.G. DS (ft)              1720.08    Weir Max Depth (ft)
  W.S. DS (ft)              1718.59    Weir Avg Depth (ft)
  Q US (cfs)                1018.77    Weir Submerg
  Q Leaving Total (cfs)        0.00    Min El Weir Flow (ft)    1724.86
  Q DS (cfs)                1018.77    Wr Top Wdth (ft)
  Perc Q Leaving               0.00    Q Gate Group (cfs)
  Q Weir (cfs)                         Gate Open Ht (ft)
  Q Gates (cfs)                        Gate #Open
  Q Culv (cfs)                         Gate Area (sq ft)
  Q Lat RC (cfs)                       Gate Submerg
  Weir Flow Area (sq ft)               Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 33

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1722.39    27.6 1721.33      47 1720.41    60.9 1721.35    77.1 1714.59
    85.1 1714.25    91.8 1714.41   107.2 1720.24     121 1724.02   131.2  1724.8
   136.3 1724.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    60.9     .03     121     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          60.9     121              130     125     110              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1720.08    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.48    Wt. n-Val.                            0.030
  W.S. Elev (ft)           1718.59    Reach Len. (ft)          130.00     125.00     110.00
  Crit W.S. (ft)           1718.59    Flow Area (sq ft)                   104.23
  E.G. Slope (ft/ft)      0.009759    Area (sq ft)                        104.23
  Q Total (cfs)            1018.77    Flow (cfs)                         1018.77
  Top Width (ft)             35.34    Top Width (ft)                       35.34
  Vel Total (ft/s)            9.77    Avg. Vel. (ft/s)                      9.77
  Max Chl Dpth (ft)           4.34    Hydr. Depth (ft)                      2.95
  Conv. Total (cfs)        10312.9    Conv. (cfs)                       10312.9
  Length Wtd. (ft)          125.00    Wetted Per. (ft)                     36.91
  Min Ch El (ft)           1714.25    Shear (lb/sq ft)                      1.72
  Alpha                       1.00    Stream Power (lb/ft s)               16.81
  Frctn Loss (ft)             1.22    Cum Volume (acre-ft)                  0.59
  C & E Loss (ft)             0.04    Cum SA (acres)                        0.23


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 32.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
       0 1724.86     110 1723.67

Weir crest shape                          = Broad Crested
```

```
LATERAL STRUCTURE OUTPUT  Profile #PF 1  Lat Struct

  E.G. US. (ft)            1720.08    Weir Sta US (ft)
  W.S. US. (ft)            1718.59    Weir Sta DS (ft)
  E.G. DS (ft)             1718.58    Weir Max Depth (ft)
  W.S. DS (ft)             1717.22    Weir Avg Depth (ft)
  Q US (cfs)               1018.77    Weir Submerg
  Q Leaving Total (cfs)       0.00    Min El Weir Flow (ft)    1723.67
  Q DS (cfs)               1018.77    Wr Top Wdth (ft)
  Perc Q Leaving              0.00    Q Gate Group (cfs)
  Q Weir (cfs)                        Gate Open Ht (ft)
  Q Gates (cfs)                       Gate #Open
  Q Culv (cfs)                        Gate Area (sq ft)
  Q Lat RC (cfs)                      Gate Submerg
  Weir Flow Area (sq ft)              Gate Invert (ft)


CROSS SECTION


RIVER: Ajo
REACH: Primary            RS: 32

INPUT
Description:
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1718.61    22.6 1717.14      30 1719.18    52.3 1718.65    68.4 1718.13
    74.5 1719.73    81.1 1719.23    92.1 1713.46     102 1713.43   109.4 1713.36
   125.7 1717.45   144.3 1722.96   152.5 1723.67

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .05    74.5     .03   144.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          74.5   144.3               99     105      95            .1        .3
Left Levee      Station=    74.5      Elevation= 1719.73

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1718.58    Element                   Left OB    Channel   Right OB
  Vel Head (ft)               1.36    Wt. n-Val.                           0.030
  W.S. Elev (ft)           1717.22    Reach Len. (ft)            99.00     105.00      95.00
  Crit W.S. (ft)           1717.22    Flow Area (sq ft)                    108.91
  E.G. Slope (ft/ft)      0.009779    Area (sq ft)                         108.91
  Q Total (cfs)            1018.77    Flow (cfs)                          1018.77
  Top Width (ft)             39.86    Top Width (ft)                        39.86
  Vel Total (ft/s)            9.35    Avg. Vel. (ft/s)                       9.35
  Max Chl Dpth (ft)           3.86    Hydr. Depth (ft)                       2.73
  Conv. Total (cfs)        10302.3    Conv. (cfs)                         10302.3
  Length Wtd. (ft)          105.00    Wetted Per. (ft)                      41.27
  Min Ch El (ft)           1713.36    Shear (lb/sq ft)                       1.61
  Alpha                       1.00    Stream Power (lb/ft s)                15.07
  Frctn Loss (ft)             1.07    Cum Volume (acre-ft)                   0.28
  C & E Loss (ft)             0.10    Cum SA (acres)                         0.12


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid,
         energy was used.

LATERAL STRUCTURE


RIVER: Ajo
REACH: Primary            RS: 31.5

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =       0
Deck/Roadway Width        =       5
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =        2
     Sta    Elev     Sta    Elev
```

0 1723.67 95 1722.43

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #PF 1 Lat Struct

E.G. US. (ft)	1718.58	Weir Sta US (ft)	
W.S. US. (ft)	1717.22	Weir Sta DS (ft)	
E.G. DS (ft)	1716.11	Weir Max Depth (ft)	
W.S. DS (ft)	1715.09	Weir Avg Depth (ft)	
Q US (cfs)	1018.77	Weir Submerg	
Q Leaving Total (cfs)	0.00	Min El Weir Flow (ft)	1722.43
Q DS (cfs)	1018.77	Wr Top Wdth (ft)	
Perc Q Leaving	0.00	Q Gate Group (cfs)	
Q Weir (cfs)		Gate Open Ht (ft)	
Q Gates (cfs)		Gate #Open	
Q Culv (cfs)		Gate Area (sq ft)	
Q Lat RC (cfs)		Gate Submerg	
Weir Flow Area (sq ft)		Gate Invert (ft)	

CROSS SECTION

RIVER: Ajo
REACH: Primary RS: 31

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1724.11	27.3	1724.12	44.5	1716.39	65.8	1714.52	81.5	1712.71
101.9	1712.21	115.5	1712.25	132.2	1720.71	151.4	1722.34	156.5	1722.43

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	27.3	.03	132.2	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
27.3	132.2	116	105	100	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1716.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.030	
W.S. Elev (ft)	1715.09	Reach Len. (ft)			
Crit W.S. (ft)	1715.09	Flow Area (sq ft)		125.37	
E.G. Slope (ft/ft)	0.010657	Area (sq ft)		125.37	
Q Total (cfs)	1018.77	Flow (cfs)		1018.77	
Top Width (ft)	61.77	Top Width (ft)		61.77	
Vel Total (ft/s)	8.13	Avg. Vel. (ft/s)		8.13	
Max Chl Dpth (ft)	2.88	Hydr. Depth (ft)		2.03	
Conv. Total (cfs)	9868.6	Conv. (cfs)		9868.6	
Length Wtd. (ft)		Wetted Per. (ft)		62.58	
Min Ch El (ft)	1712.21	Shear (lb/sq ft)		1.33	
Alpha	1.00	Stream Power (lb/ft s)		10.83	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Ajo

Reach	River Sta.	n1	n2	n3
Primary	100	.06	.03	.06
Primary	99	.06	.03	.06
Primary	98	.06	.03	.06
Primary	97	.06	.03	.06
Primary	96	.06	.03	.06
Primary	95	.06	.03	.06
Primary	94	.06	.03	.06
Primary	93	.06	.03	.06
Primary	92	.06	.03	.06
Primary	91	.06	.03	.06
Primary	90	.06	.03	.06
Primary	89	.06	.03	.06
Primary	88	.06	.03	.06
Primary	87	.06	.03	.06
Primary	86	.06	.03	.06

Primary	85	.06	.03	.06
Primary	84	.06	.03	.06
Primary	83	.06	.03	.06
Primary	82	.06	.03	.06
Primary	81	.06	.03	.06
Primary	80.5	Lat Struct		
Primary	80.4	Lat Struct		
Primary	80	.06	.03	.06
Primary	79.5	Lat Struct		
Primary	79.4	Lat Struct		
Primary	79	.06	.03	.06
Primary	78.5	Culvert		
Primary	78	.06	.03	.06
Primary	77	.06	.03	.06
Primary	76	.06	.03	.06
Primary	75	.06	.03	.06
Primary	74	.06	.03	.06
Primary	73	.06	.03	.06
Primary	72	.06	.03	.06
Primary	71	.06	.03	.06
Primary	70	.08	.03	.08
Primary	69.4	Lat Struct		
Primary	69	.06	.03	.06
Primary	68.5	Lat Struct		
Primary	68.4	Lat Struct		
Primary	68	.06	.03	.04
Primary	67.5	Lat Struct		
Primary	67.4	Lat Struct		
Primary	67	.06	.03	.06
Primary	66	.06	.03	.06
Primary	65	.06	.03	.06
Primary	64	.06	.03	.06
Primary	63	.06	.03	.06
Primary	62	.06	.03	.06
Primary	61	.06	.03	.06
Primary	60	.06	.03	.06
Primary	59.4	Lat Struct		
Primary	59	.06	.03	.06
Primary	58.4	Lat Struct		
Primary	58	.1	.03	.06
Primary	57.5	Lat Struct		
Primary	57	.1	.03	.08
Primary	56.5	Lat Struct		
Primary	56	.1	.03	.06
Primary	55.5	Lat Struct		
Primary	55.4	Lat Struct		
Primary	55	.1	.03	.06
Primary	54.5	Lat Struct		
Primary	54.4	Lat Struct		
Primary	54	.1	.03	.08
Primary	53.5	Lat Struct		
Primary	53.4	Lat Struct		
Primary	53	.1	.03	.06
Primary	52	.1	.03	.06
Primary	51.5	Lat Struct		
Primary	51	.1	.03	.06
Primary	50.5	Lat Struct		
Primary	50	.1	.03	.06
Primary	49.5	Lat Struct		
Primary	49	.1	.03	.06
Primary	48.5	Lat Struct		
Primary	48	.1	.03	.06
Primary	47.5	Lat Struct		
Primary	47	.1	.03	.06
Primary	46.5	Lat Struct		
Primary	46	.1	.03	.06
Primary	45.5	Lat Struct		
Primary	45	.1	.03	.06
Primary	44.5	Culvert		
Primary	44	.1	.03	.06
Primary	43.5	Lat Struct		
Primary	43	.1	.03	.06
Primary	42.5	Lat Struct		
Primary	42	.1	.03	.06
Primary	41.5	Lat Struct		
Primary	41	.1	.03	.06
Primary	40.5	Lat Struct		
Primary	40	.1	.03	.06
Primary	39.5	Lat Struct		
Primary	39	.1	.03	.06
Primary	38.5	Lat Struct		
Primary	38	.08	.03	.06
Primary	37.5	Lat Struct		
Primary	37	.08	.03	.06

Primary	36.5	Lat Struct		
Primary	36	.08	.03	.06
Primary	35.5	Lat Struct		
Primary	35	.05	.03	.06
Primary	34.5	Lat Struct		
Primary	34	.05	.03	.06
Primary	33.5	Lat Struct		
Primary	33	.05	.03	.06
Primary	32.5	Lat Struct		
Primary	32	.05	.03	.06
Primary	31.5	Lat Struct		
Primary	31	.05	.03	.06

SUMMARY OF REACH LENGTHS

River: Ajo

Reach	River Sta.	Left	Channel	Right
Primary	100	82	85	92
Primary	99	104	119	130
Primary	98	85	92	100
Primary	97	105	100	90
Primary	96	160	145	117
Primary	95	100	75	55
Primary	94	100	105	105
Primary	93	125	89	96
Primary	92	150	130	50
Primary	91	107	90	65
Primary	90	140	125	95
Primary	89	105	100	99
Primary	88	100	100	110
Primary	87	75	100	140
Primary	86	100	100	98
Primary	85	125	119	118
Primary	84	140	85	30
Primary	83	95	100	107
Primary	82	86	114	135
Primary	81	100	89	100
Primary	80.5	Lat Struct		
Primary	80.4	Lat Struct		
Primary	80	100	116	120
Primary	79.5	Lat Struct		
Primary	79.4	Lat Struct		
Primary	79	60	66	62
Primary	78.5	Culvert		
Primary	78	100	98	95
Primary	77	100	106	109
Primary	76	124	132	145
Primary	75	81	90	95
Primary	74	100	100	103
Primary	73	111	92	81
Primary	72	109	106	100
Primary	71	104	108	108
Primary	70	106	105	108
Primary	69.4	Lat Struct		
Primary	69	140	140	140
Primary	68.5	Lat Struct		
Primary	68.4	Lat Struct		
Primary	68	115	110	108
Primary	67.5	Lat Struct		
Primary	67.4	Lat Struct		
Primary	67	106	105	105
Primary	66	100	98	100
Primary	65	103	100	95
Primary	64	110	95	86
Primary	63	99	99	98
Primary	62	110	100	90
Primary	61	130	125	122
Primary	60	103	103	102
Primary	59.4	Lat Struct		
Primary	59	90	100	112
Primary	58.4	Lat Struct		
Primary	58	120	140	157
Primary	57.5	Lat Struct		
Primary	57	120	113	105
Primary	56.5	Lat Struct		
Primary	56	115	120	130
Primary	55.5	Lat Struct		
Primary	55.4	Lat Struct		
Primary	55	94	96	100

Primary	54.5	Lat Struct		
Primary	54.4	Lat Struct		
Primary	54	90	81	79
Primary	53.5	Lat Struct		
Primary	53.4	Lat Struct		
Primary	53	80	120	165
Primary	52	112	112	140
Primary	51.5	Lat Struct		
Primary	51	110	180	230
Primary	50.5	Lat Struct		
Primary	50	85	100	111
Primary	49.5	Lat Struct		
Primary	49	115	130	145
Primary	48.5	Lat Struct		
Primary	48	80	95	105
Primary	47.5	Lat Struct		
Primary	47	82	80	83
Primary	46.5	Lat Struct		
Primary	46	125	124	117
Primary	45.5	Lat Struct		
Primary	45	75	60	60
Primary	44.5	Culvert		
Primary	44	152	160	160
Primary	43.5	Lat Struct		
Primary	43	68	59	65
Primary	42.5	Lat Struct		
Primary	42	100	98	96
Primary	41.5	Lat Struct		
Primary	41	102	100	100
Primary	40.5	Lat Struct		
Primary	40	95	85	100
Primary	39.5	Lat Struct		
Primary	39	100	115	100
Primary	38.5	Lat Struct		
Primary	38	108	100	104
Primary	37.5	Lat Struct		
Primary	37	89	100	100
Primary	36.5	Lat Struct		
Primary	36	102	100	99
Primary	35.5	Lat Struct		
Primary	35	109	97	102
Primary	34.5	Lat Struct		
Primary	34	77	90	100
Primary	33.5	Lat Struct		
Primary	33	130	125	110
Primary	32.5	Lat Struct		
Primary	32	99	105	95
Primary	31.5	Lat Struct		
Primary	31	116	105	100

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Ajo

Reach	River Sta.	Contr.	Expan.
Primary	100	.1	.3
Primary	99	.1	.3
Primary	98	.1	.3
Primary	97	.1	.3
Primary	96	.1	.3
Primary	95	.1	.3
Primary	94	.1	.3
Primary	93	.1	.3
Primary	92	.1	.3
Primary	91	.1	.3
Primary	90	.1	.3
Primary	89	.1	.3
Primary	88	.1	.3
Primary	87	.1	.3
Primary	86	.1	.3
Primary	85	.1	.3
Primary	84	.1	.3
Primary	83	.1	.3
Primary	82	.1	.3
Primary	81	.1	.3
Primary	80.5	Lat Struct	
Primary	80.4	Lat Struct	
Primary	80	.1	.3
Primary	79.5	Lat Struct	
Primary	79.4	Lat Struct	

Primary	79		.3	.5
Primary	78.5	Culvert		
Primary	78		.3	.5
Primary	77		.1	.3
Primary	76		.1	.3
Primary	75		.1	.3
Primary	74		.1	.3
Primary	73		.1	.3
Primary	72		.1	.3
Primary	71		.1	.3
Primary	70		.1	.3
Primary	69.4	Lat Struct		
Primary	69		.1	.3
Primary	68.5	Lat Struct		
Primary	68.4	Lat Struct		
Primary	68		.1	.3
Primary	67.5	Lat Struct		
Primary	67.4	Lat Struct		
Primary	67		.1	.3
Primary	66		.1	.3
Primary	65		.1	.3
Primary	64		.1	.3
Primary	63		.1	.3
Primary	62		.1	.3
Primary	61		.1	.3
Primary	60		.1	.3
Primary	59.4	Lat Struct		
Primary	59		.1	.3
Primary	58.4	Lat Struct		
Primary	58		.1	.3
Primary	57.5	Lat Struct		
Primary	57		.1	.3
Primary	56.5	Lat Struct		
Primary	56		.1	.3
Primary	55.5	Lat Struct		
Primary	55.4	Lat Struct		
Primary	55		.1	.3
Primary	54.5	Lat Struct		
Primary	54.4	Lat Struct		
Primary	54		.1	.3
Primary	53.5	Lat Struct		
Primary	53.4	Lat Struct		
Primary	53		.1	.3
Primary	52		.1	.3
Primary	51.5	Lat Struct		
Primary	51		.1	.3
Primary	50.5	Lat Struct		
Primary	50		.1	.3
Primary	49.5	Lat Struct		
Primary	49		.1	.3
Primary	48.5	Lat Struct		
Primary	48		.1	.3
Primary	47.5	Lat Struct		
Primary	47		.1	.3
Primary	46.5	Lat Struct		
Primary	46		.1	.3
Primary	45.5	Lat Struct		
Primary	45		.3	.5
Primary	44.5	Culvert		
Primary	44		.3	.5
Primary	43.5	Lat Struct		
Primary	43		.1	.3
Primary	42.5	Lat Struct		
Primary	42		.1	.3
Primary	41.5	Lat Struct		
Primary	41		.1	.3
Primary	40.5	Lat Struct		
Primary	40		.1	.3
Primary	39.5	Lat Struct		
Primary	39		.1	.3
Primary	38.5	Lat Struct		
Primary	38		.1	.3
Primary	37.5	Lat Struct		
Primary	37		.1	.3
Primary	36.5	Lat Struct		
Primary	36		.1	.3
Primary	35.5	Lat Struct		
Primary	35		.1	.3
Primary	34.5	Lat Struct		
Primary	34		.1	.3
Primary	33.5	Lat Struct		
Primary	33		.1	.3
Primary	32.5	Lat Struct		
Primary	32		.1	.3

```
Primary              31.5     Lat Struct
Primary              31              .1        .3
```

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope
Vel Chnl	Flow Area	Top Width	Froude # Chl					
(ft/s)	(sq ft)	(ft)		(cfs)	(ft)	(ft)	(ft)	(ft/ft)
Primary	31	PF 1		1018.77	1712.21	1715.09	1715.09	1716.11	0.010657
8.13	125.37	61.77	1.01					
Primary	31.5			Lat Struct				
Primary	32	PF 1		1018.77	1713.36	1717.22	1717.22	1718.58	0.009779
9.35	108.91	39.86	1.00					
Primary	32.5			Lat Struct				
Primary	33	PF 1		1018.77	1714.25	1718.59	1718.59	1720.08	0.009759
9.77	104.23	35.34	1.00					
Primary	33.5			Lat Struct				
Primary	34	PF 1		1018.77	1715.14	1719.69	1719.69	1721.11	0.010017
9.53	106.85	38.66	1.01					
Primary	34.5			Lat Struct				
Primary	35	PF 1		1018.77	1718.25	1722.00	1722.00	1723.29	0.009802
9.12	111.72	42.96	1.00					
Primary	35.5			Lat Struct				
Primary	36	PF 1		1018.77	1719.10	1723.52		1723.90	0.003249
4.94	206.17	87.55	0.57					
Primary	36.5			Lat Struct				
Primary	37	PF 1		1018.77	1722.67	1725.50	1725.50	1726.58	0.010422
8.34	122.23	56.87	1.00					
Primary	37.5			Lat Struct				
Primary	38	PF 1		1018.77	1724.21	1727.20	1727.20	1728.35	0.010301
8.61	118.30	51.77	1.00					
Primary	38.5			Lat Struct				
Primary	39	PF 1		1018.77	1727.19	1732.11	1732.11	1733.51	0.009914
9.48	107.48	38.94	1.01					
Primary	39.5			Lat Struct				
Primary	40	PF 1		1018.77	1729.35	1733.26		1734.21	0.006322
7.84	129.96	44.98	0.81					
Primary	40.5			Lat Struct				
Primary	41	PF 1		1018.77	1730.24	1734.32	1734.32	1735.50	0.009967
8.73	116.73	49.02	1.00					
Primary	41.5			Lat Struct				
Primary	42	PF 1		1018.77	1731.03	1736.02	1736.02	1737.37	0.010005
9.33	109.14	40.22	1.00					
Primary	42.5			Lat Struct				
Primary	43	PF 1		1018.77	1731.47	1736.54	1736.54	1738.01	0.009087
9.90	122.98	48.82	0.97					
Primary	43.5			Lat Struct				
Primary	44	PF 1		1018.77	1733.19	1738.52		1738.81	0.001365
4.40	290.05	135.29	0.39					
Primary	44.5			Culvert				
Primary	45	PF 1		1018.77	1740.00	1742.06	1742.06	1742.63	0.011399
7.67	316.90	263.11	1.02					
Primary	45.5			Lat Struct				
Primary	46	PF 1		1170.97	1740.00	1743.14		1743.41	0.003956
5.28	476.58	266.50	0.62					
Primary	46.5			Lat Struct				
Primary	47	PF 1		1269.88	1742.00	1743.90	1743.90	1744.61	0.014277
7.90	298.83	247.42	1.12					
Primary	47.5			Lat Struct				
Primary	48	PF 1		1288.28	1744.00	1746.04	1746.04	1746.69	0.013173
7.96	342.85	257.50	1.09					
Primary	48.5			Lat Struct				

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Primary      49          PF 1          1503.03    1745.00    1747.41    1747.24    1748.03    0.009032
   7.97    446.97     298.53      0.94
Primary      49.5                     Lat Struct

Primary      50          PF 1          1700.99    1746.00    1748.29    1748.29    1749.05    0.011582
   8.72    439.36     278.80      1.06
Primary      50.5                     Lat Struct

Primary      51          PF 1          1779.78    1746.30    1749.64               1750.30    0.005829
   7.59    500.20     279.57      0.79
Primary      51.5                     Lat Struct

Primary      52          PF 1          1779.78    1748.00    1750.53    1750.37    1751.20    0.011771
   8.79    490.58     297.16      1.06
Primary      53          PF 1          1206.29    1748.90    1751.70    1751.70    1753.01    0.010311
   9.21    130.93      50.22      1.01
Primary      53.4                     Lat Struct

Primary      53.5                     Lat Struct

Primary      54          PF 1          1479.25    1750.18    1753.02               1753.65    0.005351
   6.44    248.27     112.70      0.73
Primary      54.4                     Lat Struct

Primary      54.5                     Lat Struct

Primary      55          PF 1          1681.78    1751.70    1754.32    1754.32    1755.26    0.010610
   7.79    215.93     113.50      1.00
Primary      55.4                     Lat Struct

Primary      55.5                     Lat Struct

Primary      56          PF 1          1785.50    1753.50    1755.99    1755.99    1757.04    0.010517
   8.25    216.47     103.61      1.01
Primary      56.5                     Lat Struct

Primary      57          PF 1          1966.78    1755.30    1758.04    1758.04    1759.05    0.009136
   8.44    307.56     165.30      0.96
Primary      57.5                     Lat Struct

Primary      58          PF 1          2377.11    1757.50    1761.30    1761.30    1762.60    0.007529
   9.72    315.83     125.54      0.92
Primary      58.4                     Lat Struct

Primary      59          PF 1          2569.23    1759.04    1762.86    1762.86    1763.87    0.010490
   8.05    319.21     157.79      1.00
Primary      59.4                     Lat Struct

Primary      60          PF 1          2649.62    1759.10    1765.15    1765.15    1766.96    0.009216
  10.80    245.42      69.69      1.01
Primary      61          PF 1          2508.88    1760.65    1767.39    1767.39    1768.83    0.009808
   9.65    259.88      90.46      1.00
Primary      62          PF 1          2508.88    1764.58    1769.36    1769.36    1770.63    0.009600
   9.03    277.88     108.11      0.99
Primary      63          PF 1          2508.88    1766.21    1771.47    1771.47    1773.11    0.009069
  10.31    243.43      73.65      1.00
Primary      64          PF 1          2508.88    1767.05    1773.13    1773.13    1775.15    0.008819
  11.38    220.37      54.15      0.99
Primary      65          PF 1          2508.88    1769.85    1775.57    1775.57    1777.48    0.008599
  11.10    226.02      58.38      0.99
Primary      66          PF 1          2508.88    1772.48    1778.46    1778.46    1780.34    0.009110
  11.00    228.02      62.12      1.01
Primary      67          PF 1          2451.84    1776.21    1782.54    1782.54    1783.99    0.006406
   9.78    294.65     174.99      0.86
Primary      67.4                     Lat Struct

Primary      67.5                     Lat Struct

Primary      68          PF 1          2487.70    1779.87    1786.93    1786.93    1789.14    0.006989
  12.02    220.81      59.96      0.89
Primary      68.4                     Lat Struct

Primary      68.5                     Lat Struct

Primary      69          PF 1          2742.82    1784.68    1790.65    1790.65    1792.68    0.008996
  11.43    240.01      60.25      1.01
Primary      69.4                     Lat Struct

Primary      70          PF 1          2959.27    1786.50    1792.49    1792.49    1794.27    0.007689
  10.80    300.61     110.05      0.95
Primary      71          PF 1          2959.27    1788.65    1793.97    1793.97    1795.87    0.008582
  11.04    268.08      70.25      1.00
Primary      72          PF 1          2959.27    1790.36    1795.86    1795.86    1798.08    0.008695
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11.96	247.51	55.72	1.00						
Primary	73	PF 1		2959.27	1791.39	1797.25	1797.25	1799.40	0.008412
11.77	251.45	58.09	1.00						
Primary	74	PF 1		2959.27	1793.47	1799.17	1799.17	1801.18	0.008539
11.39	259.77	64.20	1.00						
Primary	75	PF 1		2959.27	1795.82	1800.77	1800.77	1802.54	0.008796
10.66	277.48	78.13	1.00						
Primary	76	PF 1		2959.27	1799.32	1804.76	1804.76	1806.92	0.008456
11.80	250.84	57.41	0.99						
Primary	77	PF 1		2232.85	1800.26	1806.84		1807.51	0.002120
6.58	361.51	108.53	0.52						
Primary	78	PF 1		2232.85	1801.33	1807.32	1807.32	1809.63	0.008956
12.20	183.02	39.95	1.00						
Primary	78.5			Culvert					
Primary	79	PF 1		2232.85	1802.49	1814.14	1808.39	1814.40	0.000522
4.21	608.91	110.20	0.26						
Primary	79.4			Lat Struct					
Primary	79.5			Lat Struct					
Primary	80	PF 1		3063.64	1805.99	1813.75		1814.76	0.002794
8.11	393.54	83.86	0.60						
Primary	80.4			Lat Struct					
Primary	80.5			Lat Struct					
Primary	81	PF 1		3100.00	1808.43	1813.93	1813.93	1816.17	0.008564
12.02	257.94	58.09	1.01						
Primary	82	PF 1		3100.00	1810.59	1816.02	1816.02	1818.02	0.008487
11.37	272.75	67.58	1.00						
Primary	83	PF 1		3100.00	1812.74	1818.27	1818.27	1819.75	0.009447
9.75	317.91	108.13	1.00						
Primary	84	PF 1		3100.00	1810.95	1819.52		1820.22	0.002790
6.72	460.98	109.61	0.58						
Primary	85	PF 1		3100.00	1818.42	1823.06	1823.06	1824.42	0.009461
9.35	331.60	122.27	1.00						
Primary	86	PF 1		3100.00	1819.60	1824.67	1824.67	1826.28	0.009368
10.18	304.43	96.31	1.01						
Primary	87	PF 1		3100.00	1821.10	1826.56	1826.56	1828.09	0.009284
9.93	312.08	102.57	1.00						
Primary	88	PF 1		3100.00	1822.78	1828.31	1828.31	1830.17	0.009122
10.95	283.16	76.50	1.00						
Primary	89	PF 1		3100.00	1824.57	1829.88	1829.88	1831.38	0.009313
9.83	315.24	105.64	1.00						
Primary	90	PF 1		3100.00	1827.33	1831.71	1831.71	1832.95	0.009801
8.96	345.90	139.08	1.00						
Primary	91	PF 1		3100.00	1829.74	1833.68	1833.68	1835.15	0.009526
9.73	318.44	109.92	1.01						
Primary	92	PF 1		3100.00	1832.25	1835.56	1835.56	1836.71	0.010205
8.61	360.12	157.81	1.00						
Primary	93	PF 1		3100.00	1833.54	1836.95	1836.95	1838.12	0.010063
8.65	358.29	154.61	1.00						
Primary	94	PF 1		3100.00	1834.70	1838.69	1838.69	1839.86	0.010211
8.68	357.30	155.65	1.01						
Primary	95	PF 1		3100.00	1837.09	1841.08	1841.08	1842.27	0.010009
8.72	355.32	150.88	1.00						
Primary	96	PF 1		3100.00	1838.89	1843.53	1843.53	1845.08	0.009210
9.99	310.19	100.76	1.00						
Primary	97	PF 1		3100.00	1840.77	1846.80	1846.80	1848.79	0.008607
11.32	273.94	68.37	1.00						
Primary	98	PF 1		3100.00	1842.76	1848.73	1848.73	1850.60	0.008849
10.97	282.53	76.37	1.01						
Primary	99	PF 1		3100.00	1846.11	1851.96	1851.96	1853.74	0.009079
10.72	289.27	81.80	1.00						
Primary	100	PF 1		3100.00	1847.96	1852.71	1852.71	1854.57	0.008729
10.95	283.02	76.00	1.00						

Profile Output Table - Gibson Arroyo Split Flow

Reach	River Sta	Profile	Q US	Q Leaving	Total	Q DS	Weir Max Depth	Weir Avg Depth	W.S. US.	W.S. DS
			(cfs)		(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
Primary	31.5	PF 1	1019		0	1019			1717.2	1715.1
Primary	32.5	PF 1	1019		0	1019			1718.6	1717.2
Primary	33.5	PF 1	1019		0	1019				

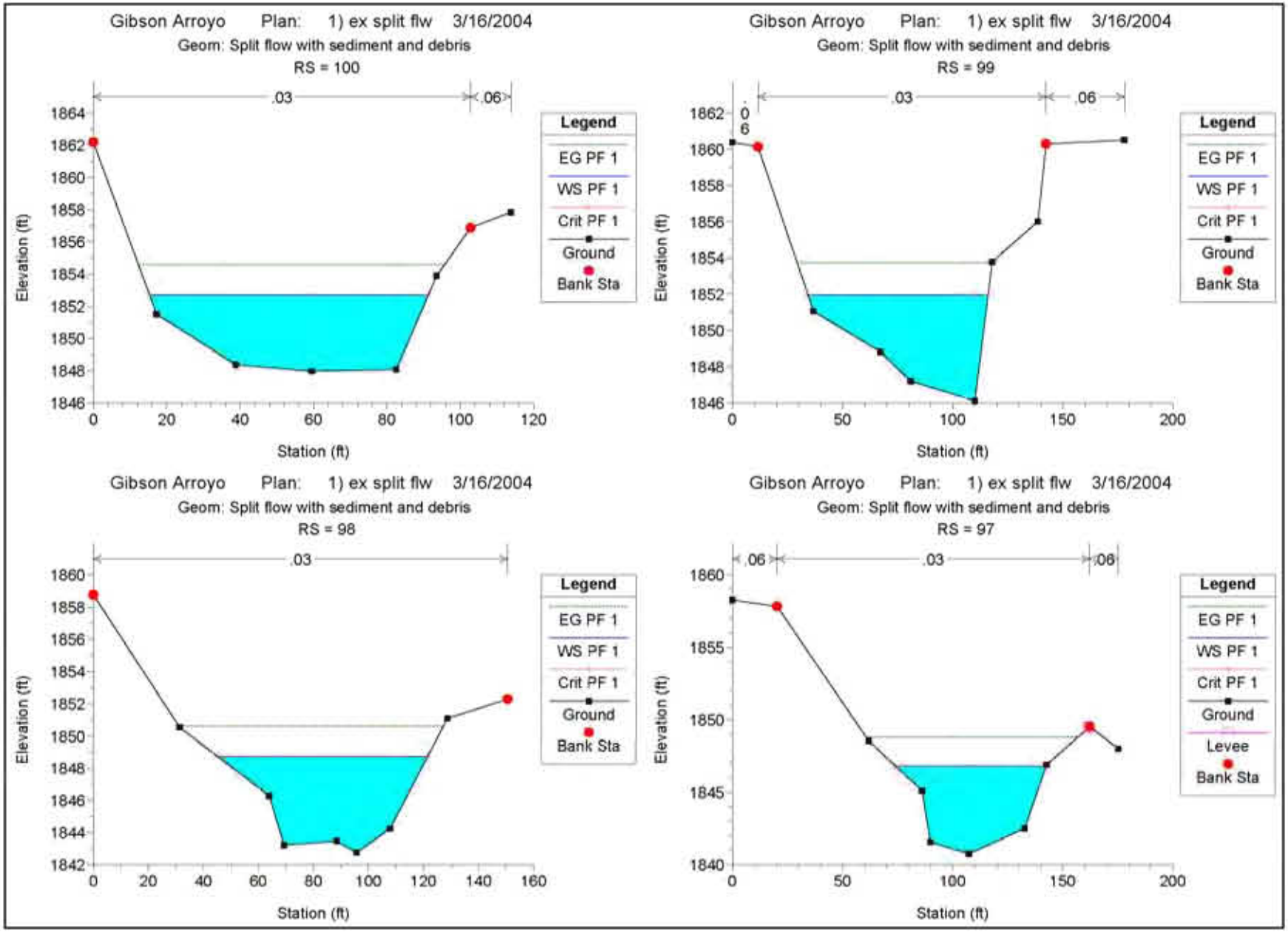
	1719.7	1718.6							
Primary	34.5	PF 1	1019	0	1019				
	1722.0	1719.7							
Primary	35.5	PF 1	1019	0	1019				
	1723.5	1722.0							
Primary	36.5	PF 1	1019	0	1019				
	1725.5	1723.5							
Primary	37.5	PF 1	1019	0	1019				
	1727.2	1725.5							
Primary	38.5	PF 1	1019	0	1019				
	1732.1	1727.2							
Primary	39.5	PF 1	1019	0	1019				
	1733.3	1732.1							
Primary	40.5	PF 1	1019	0	1019				
	1734.3	1733.3							
Primary	41.5	PF 1	1019	0	1019				
	1736.0	1734.3							
Primary	42.5	PF 1	1019	0	1019				
	1736.5	1736.0							
Primary	43.5	PF 1	1019	0	1019				
	1738.5	1736.5							
Primary	45.5	PF 1	1171	152	1019				1.1
0.6	1743.1	1742.1							
Primary	46.5	PF 1	1270	99	1171				1.1
0.6	1743.9	1743.1							
Primary	47.5	PF 1	1288	18	1270				0.3
0.2	1746.0	1743.9							
Primary	48.5	PF 1	1503	215	1288				1.0
0.7	1747.4	1746.0							
Primary	49.5	PF 1	1701	198	1503				1.0
0.8	1748.3	1747.4							
Primary	50.5	PF 1	1780	79	1701				0.5
0.3	1749.6	1748.3							
Primary	51.5	PF 1	1780	0	1780				
	1750.5	1749.6							
Primary	53.4	PF 1	1479	251	1206				1.4
1.0	1753.0	1751.7							
Primary	53.5	PF 1	1479	22	1206				0.9
0.4	1753.0	1751.7							
Primary	54.4	PF 1	1682	50	1479				0.6
0.3	1754.3	1753.0							
Primary	54.5	PF 1	1682	152	1479				0.9
0.7	1754.3	1753.0							
Primary	55.4	PF 1	1786	0	1682				0.1
0.0	1756.0	1754.3							
Primary	55.5	PF 1	1786	103	1682				0.5
0.5	1756.0	1754.3							
Primary	56.5	PF 1	1967	180	1786				1.1
0.7	1758.0	1756.0							
Primary	57.5	PF 1	2377	409	1967				1.1
1.0	1761.3	1758.0							
Primary	58.4	PF 1	2569	192	2377				1.8
0.9	1762.9	1761.3							
Primary	59.4	PF 1	2650	80	2569				1.8
0.9	1765.2	1762.9							
Primary	67.4	PF 1	2488	0	2452				
	1786.9	1782.5							
Primary	67.5	PF 1	2488	36	2452				0.7
0.4	1786.9	1782.5							
Primary	68.4	PF 1	2743	233	2488				1.7
0.8	1790.6	1786.9							
Primary	68.5	PF 1	2743	21	2488				0.7
0.4	1790.6	1786.9							
Primary	69.4	PF 1	2959	216	2743				1.7
0.8	1792.5	1790.6							
Primary	79.4	PF 1	3064	692	2233				2.8
1.9	1813.7	1814.1							
Primary	79.5	PF 1	3064	141	2233				1.9
1.0	1813.7	1814.1							
Primary	80.4	PF 1	3100	36	3064				1.1
0.5	1813.9	1813.7							
Primary	80.5	PF 1	3100	0	3064				
	1813.9	1813.7							

Profile Output Table - Plot Floodplain

Reach	River Sta	Profile	W.S. Elev (ft)	Top Width (ft)	Sta W.S. Lft (ft)	Sta W.S. Rgt (ft)
Primary	31	PF 1	1715.1	62	59	121
Primary	31.5	PF 1				
Primary	32	PF 1	1717.2	40	85	125

Primary	32.5	PF 1				
Primary	33	PF 1	1718.6	35	68	103
Primary	33.5	PF 1				
Primary	34	PF 1	1719.7	39	68	106
Primary	34.5	PF 1				
Primary	35	PF 1	1722.0	43	67	110
Primary	35.5	PF 1				
Primary	36	PF 1	1723.5	88	37	124
Primary	36.5	PF 1				
Primary	37	PF 1	1725.5	57	39	96
Primary	37.5	PF 1				
Primary	38	PF 1	1727.2	52	34	85
Primary	38.5	PF 1				
Primary	39	PF 1	1732.1	39	174	213
Primary	39.5	PF 1				
Primary	40	PF 1	1733.3	45	63	108
Primary	40.5	PF 1				
Primary	41	PF 1	1734.3	49	32	81
Primary	41.5	PF 1				
Primary	42	PF 1	1736.0	40	137	177
Primary	42.5	PF 1				
Primary	43	PF 1	1736.5	49	178	242
Primary	43.5	PF 1				
Primary	44	PF 1	1738.5	135	148	308
Primary	44.5	PF 1				
Primary	45	PF 1	1742.1	263	0	283
Primary	45.5	PF 1				
Primary	46	PF 1	1743.1	267	159	428
Primary	46.5	PF 1				
Primary	47	PF 1	1743.9	247	127	374
Primary	47.5	PF 1				
Primary	48	PF 1	1746.0	258	0	258
Primary	48.5	PF 1				
Primary	49	PF 1	1747.4	299	43	342
Primary	49.5	PF 1				
Primary	50	PF 1	1748.3	279	0	279
Primary	50.5	PF 1				
Primary	51	PF 1	1749.6	280	26	305
Primary	51.5	PF 1				
Primary	52	PF 1	1750.5	297	82	379
Primary	53	PF 1	1751.7	50	0	50
Primary	53.4	PF 1				
Primary	53.5	PF 1				
Primary	54	PF 1	1753.0	113	0	113
Primary	54.4	PF 1				
Primary	54.5	PF 1				
Primary	55	PF 1	1754.3	114	0	114
Primary	55.4	PF 1				
Primary	55.5	PF 1				
Primary	56	PF 1	1756.0	104	3	107
Primary	56.5	PF 1				
Primary	57	PF 1	1758.0	165	0	165
Primary	57.5	PF 1				
Primary	58	PF 1	1761.3	126	1	126
Primary	58.4	PF 1				
Primary	59	PF 1	1762.9	158	0	158
Primary	59.4	PF 1				
Primary	60	PF 1	1765.2	70	12	81
Primary	61	PF 1	1767.4	90	55	145
Primary	62	PF 1	1769.4	108	40	148
Primary	63	PF 1	1771.5	74	33	107
Primary	64	PF 1	1773.1	54	47	101
Primary	65	PF 1	1775.6	58	49	108
Primary	66	PF 1	1778.5	62	18	80
Primary	67	PF 1	1782.5	175	49	224
Primary	67.4	PF 1				
Primary	67.5	PF 1				
Primary	68	PF 1	1786.9	60	10	70
Primary	68.4	PF 1				
Primary	68.5	PF 1				
Primary	69	PF 1	1790.6	60	0	60
Primary	69.4	PF 1				
Primary	70	PF 1	1792.5	110	3	113
Primary	71	PF 1	1794.0	70	29	99
Primary	72	PF 1	1795.9	56	20	75
Primary	73	PF 1	1797.2	58	36	94
Primary	74	PF 1	1799.2	64	48	112
Primary	75	PF 1	1800.8	78	59	137
Primary	76	PF 1	1804.8	57	64	122
Primary	77	PF 1	1806.8	109	54	163
Primary	78	PF 1	1807.3	40	18	58
Primary	78.5	PF 1				
Primary	79	PF 1	1814.1	110	0	110
Primary	79.4	PF 1				

Primary	79.5	PF 1				
Primary	80	PF 1	1813.7	84	0	84
Primary	80.4	PF 1				
Primary	80.5	PF 1				
Primary	81	PF 1	1813.9	58	4	62
Primary	82	PF 1	1816.0	68	39	106
Primary	83	PF 1	1818.3	108	74	183
Primary	84	PF 1	1819.5	110	25	135
Primary	85	PF 1	1823.1	122	178	300
Primary	86	PF 1	1824.7	96	24	121
Primary	87	PF 1	1826.6	103	29	132
Primary	88	PF 1	1828.3	76	80	156
Primary	89	PF 1	1829.9	106	34	140
Primary	90	PF 1	1831.7	139	41	180
Primary	91	PF 1	1833.7	110	40	150
Primary	92	PF 1	1835.6	158	28	186
Primary	93	PF 1	1837.0	155	39	194
Primary	94	PF 1	1838.7	156	53	208
Primary	95	PF 1	1841.1	151	45	196
Primary	96	PF 1	1843.5	101	39	140
Primary	97	PF 1	1846.8	68	74	142
Primary	98	PF 1	1848.7	76	45	121
Primary	99	PF 1	1852.0	82	34	116
Primary	100	PF 1	1852.7	76	15	91



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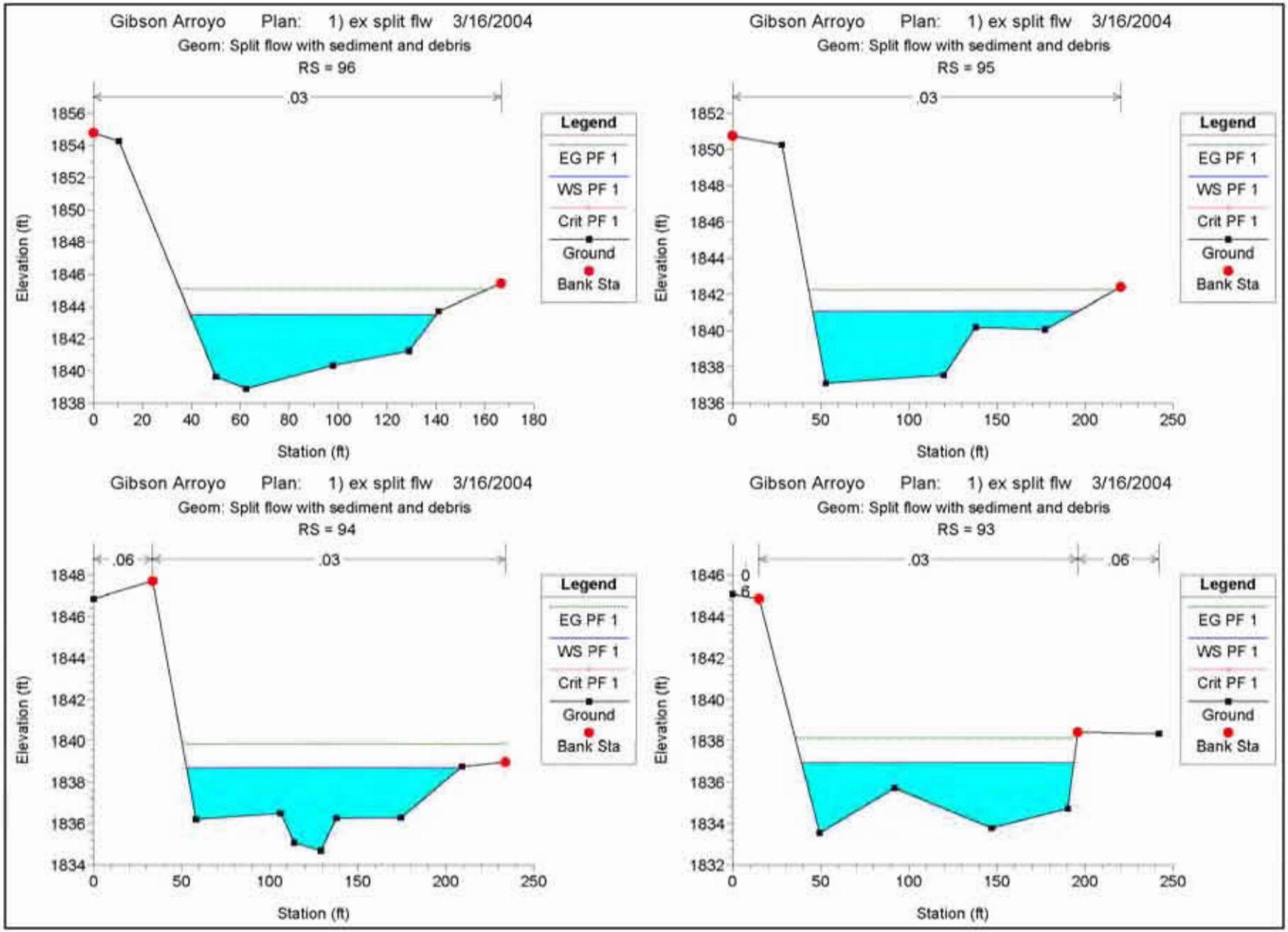

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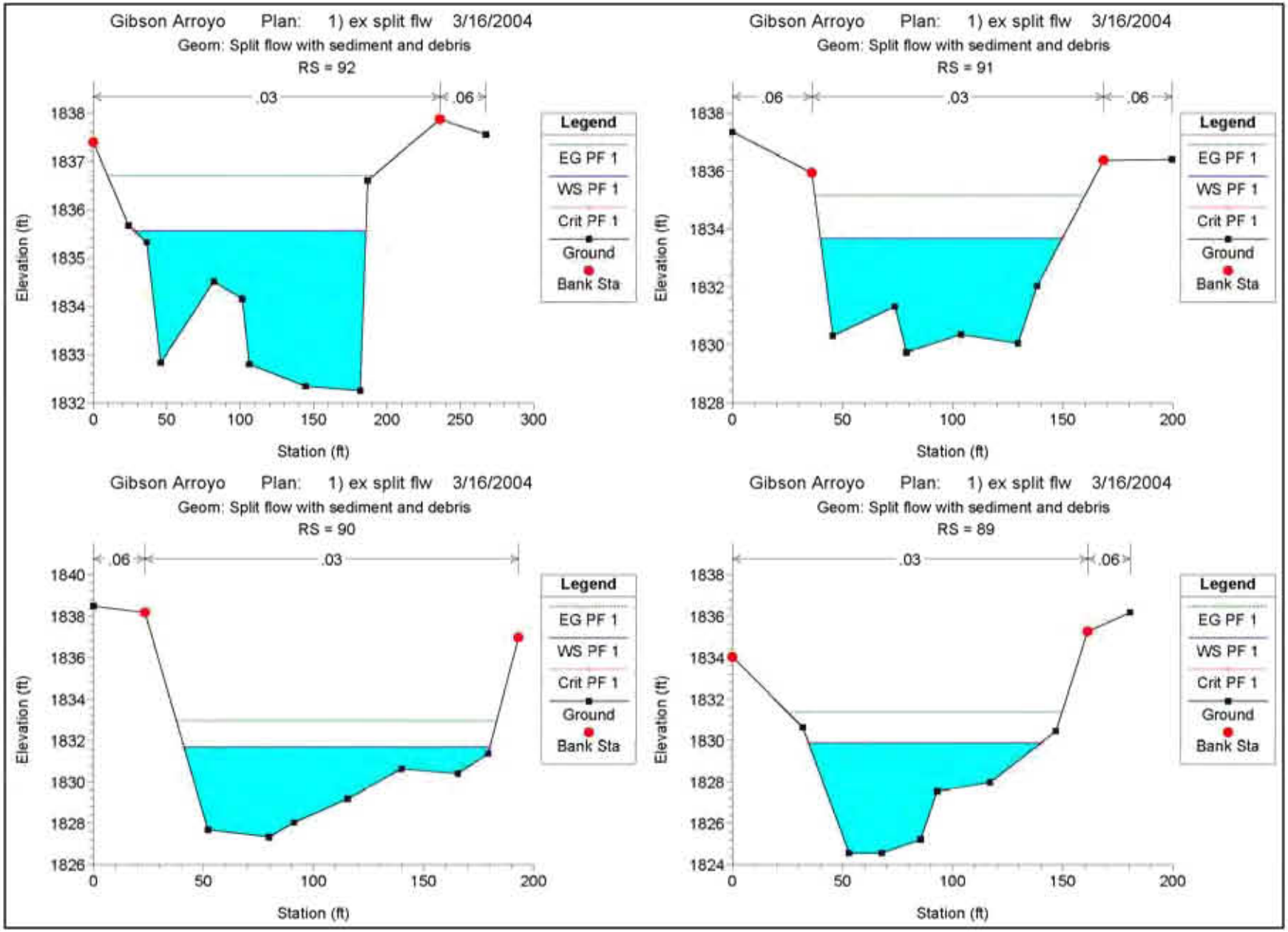

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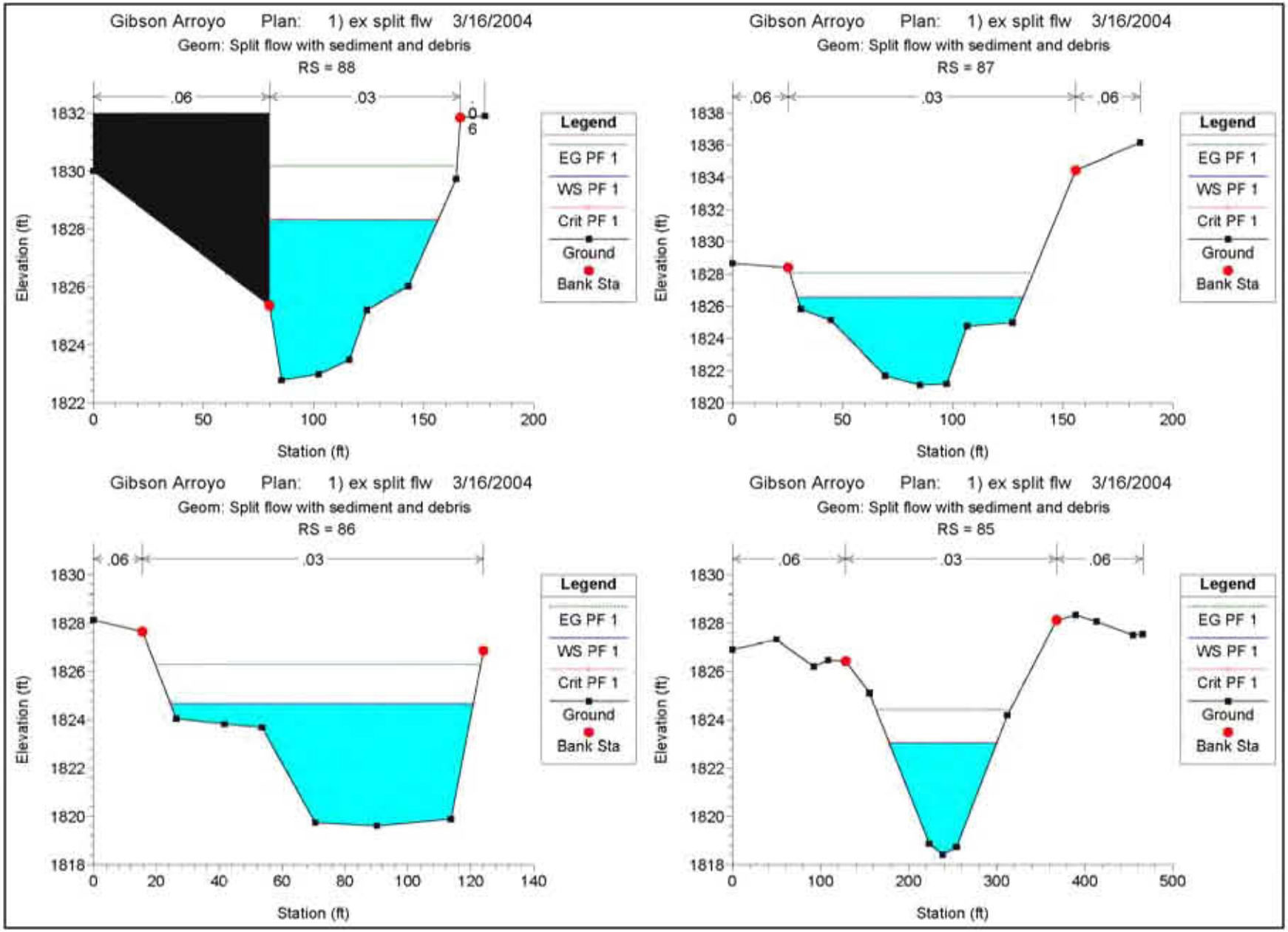

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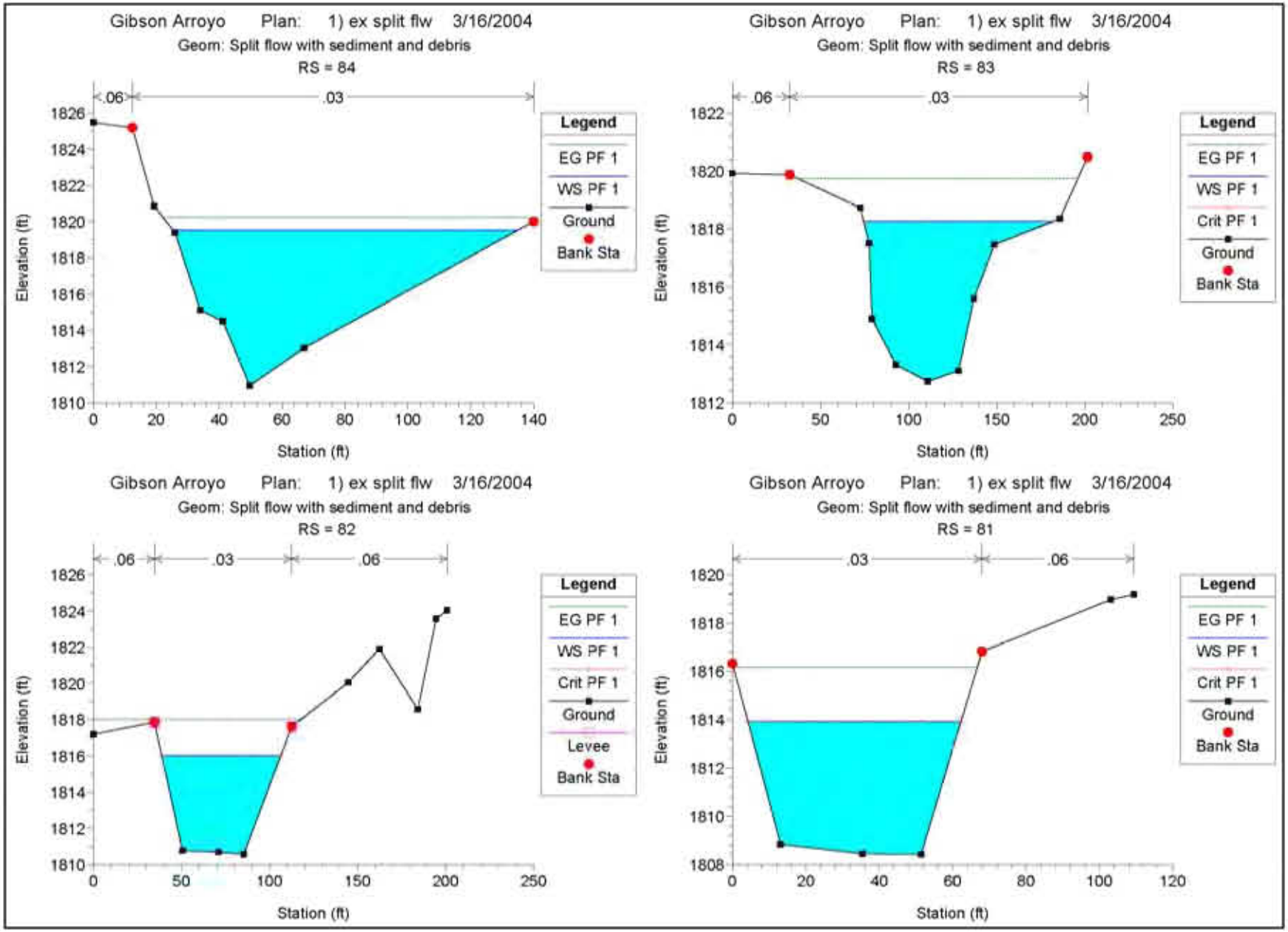

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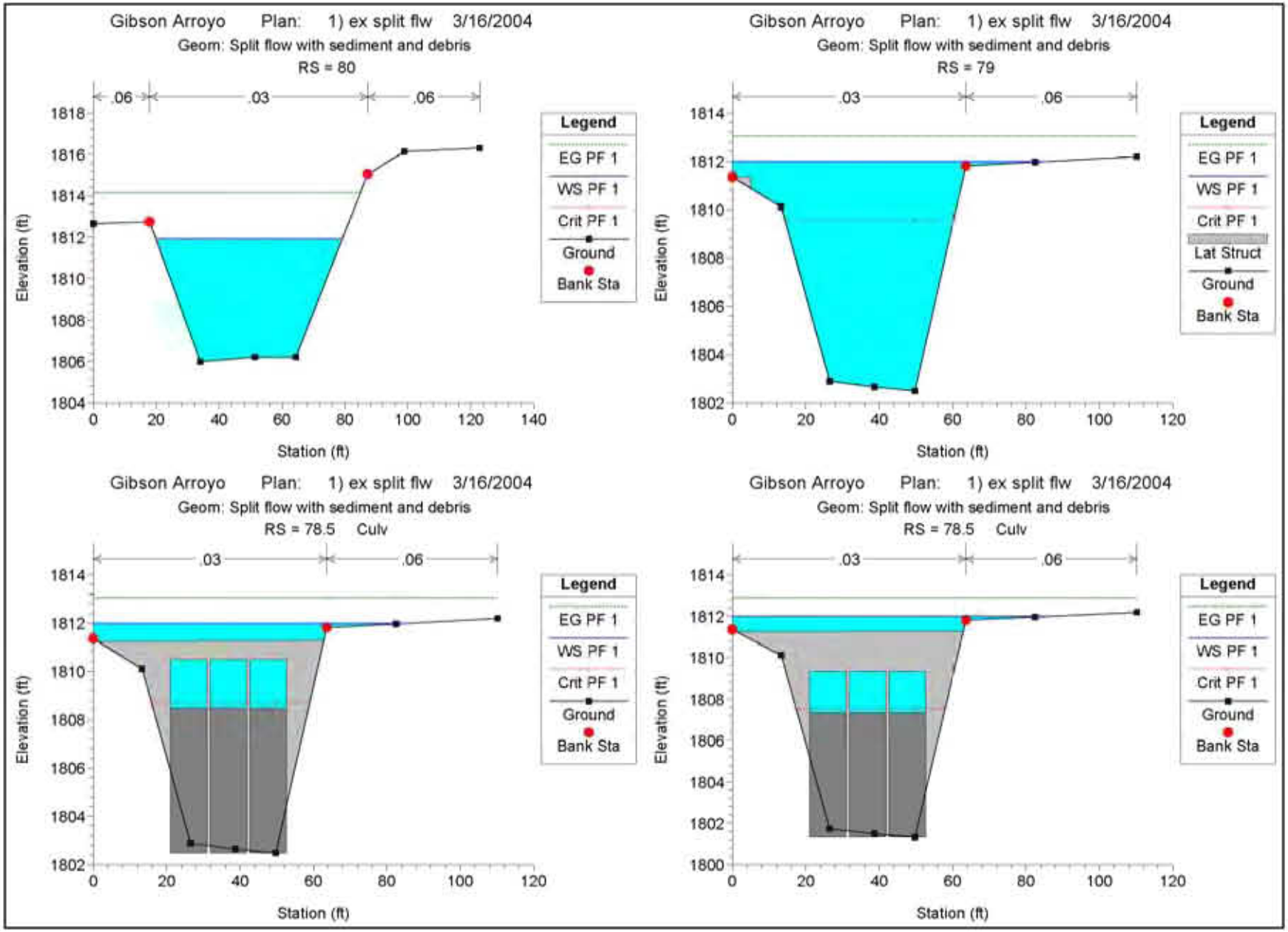

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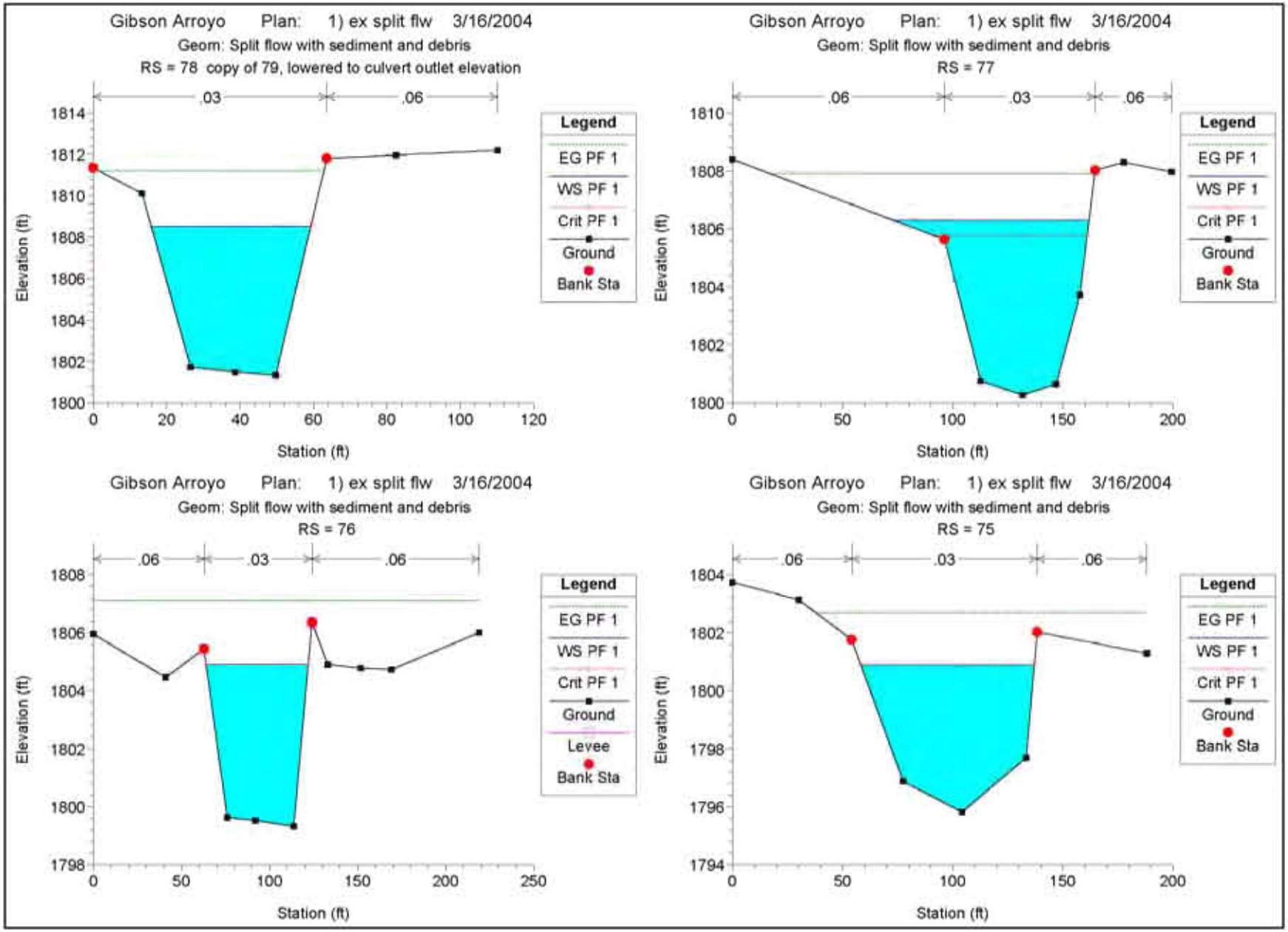

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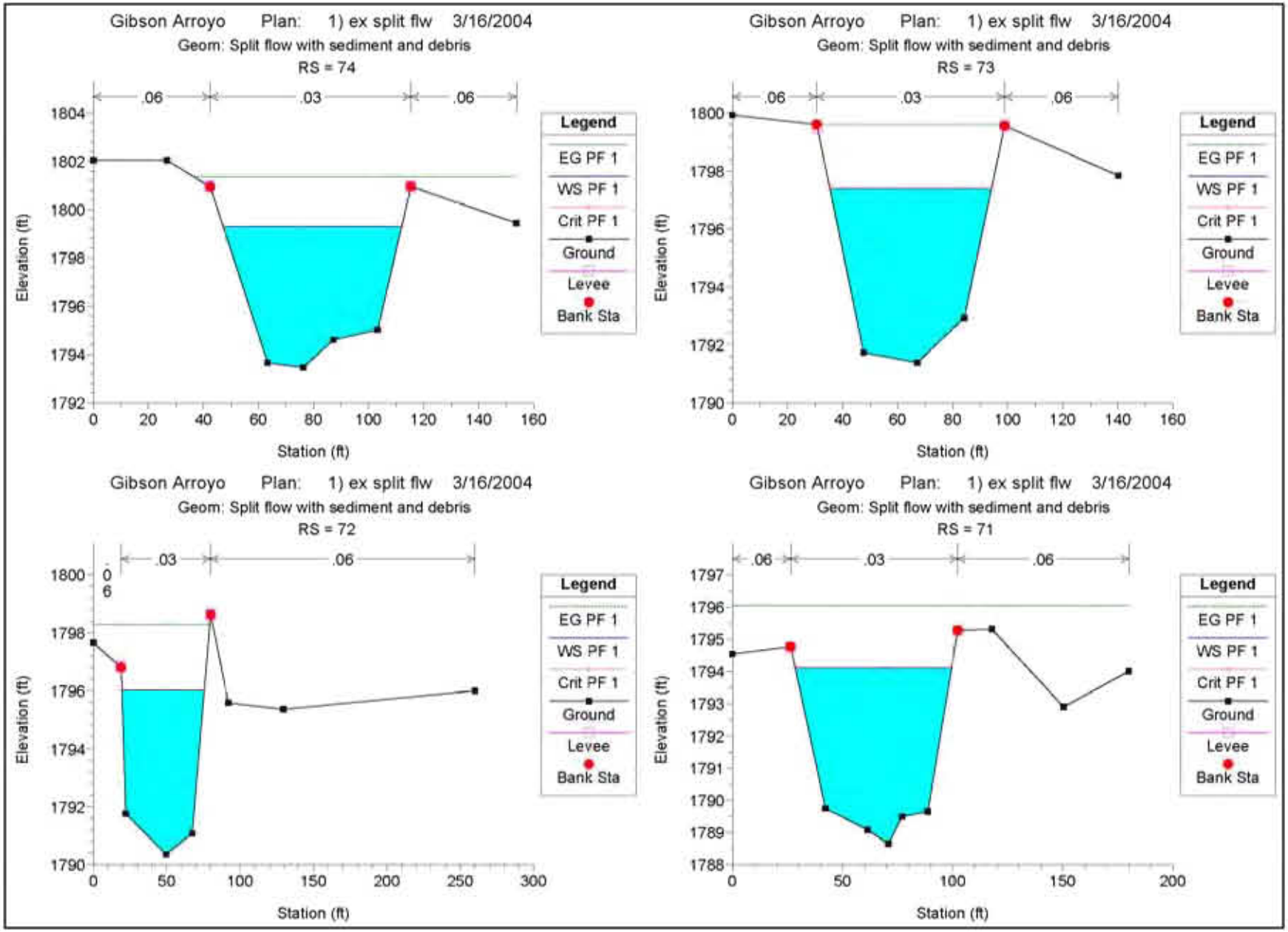

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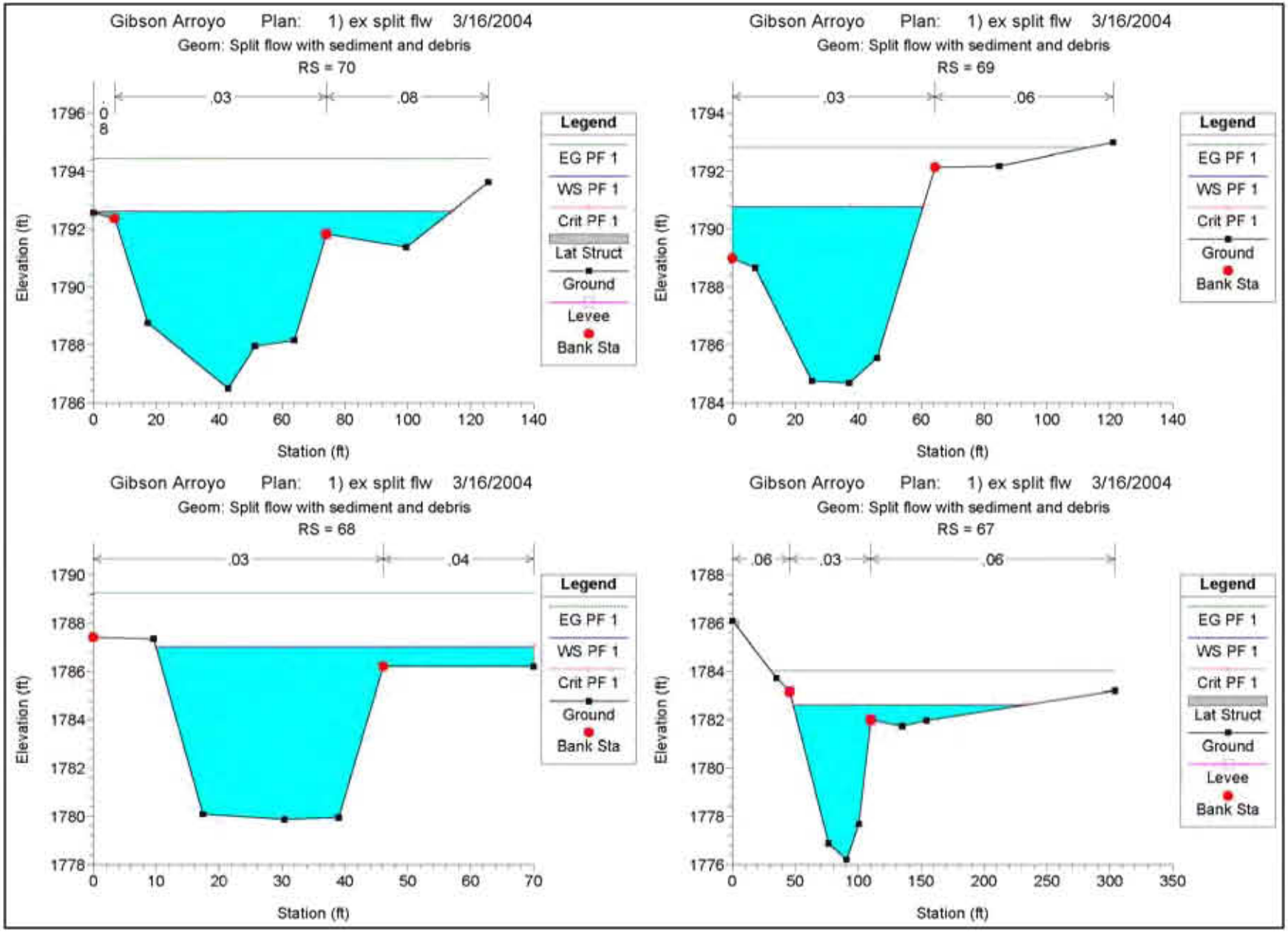

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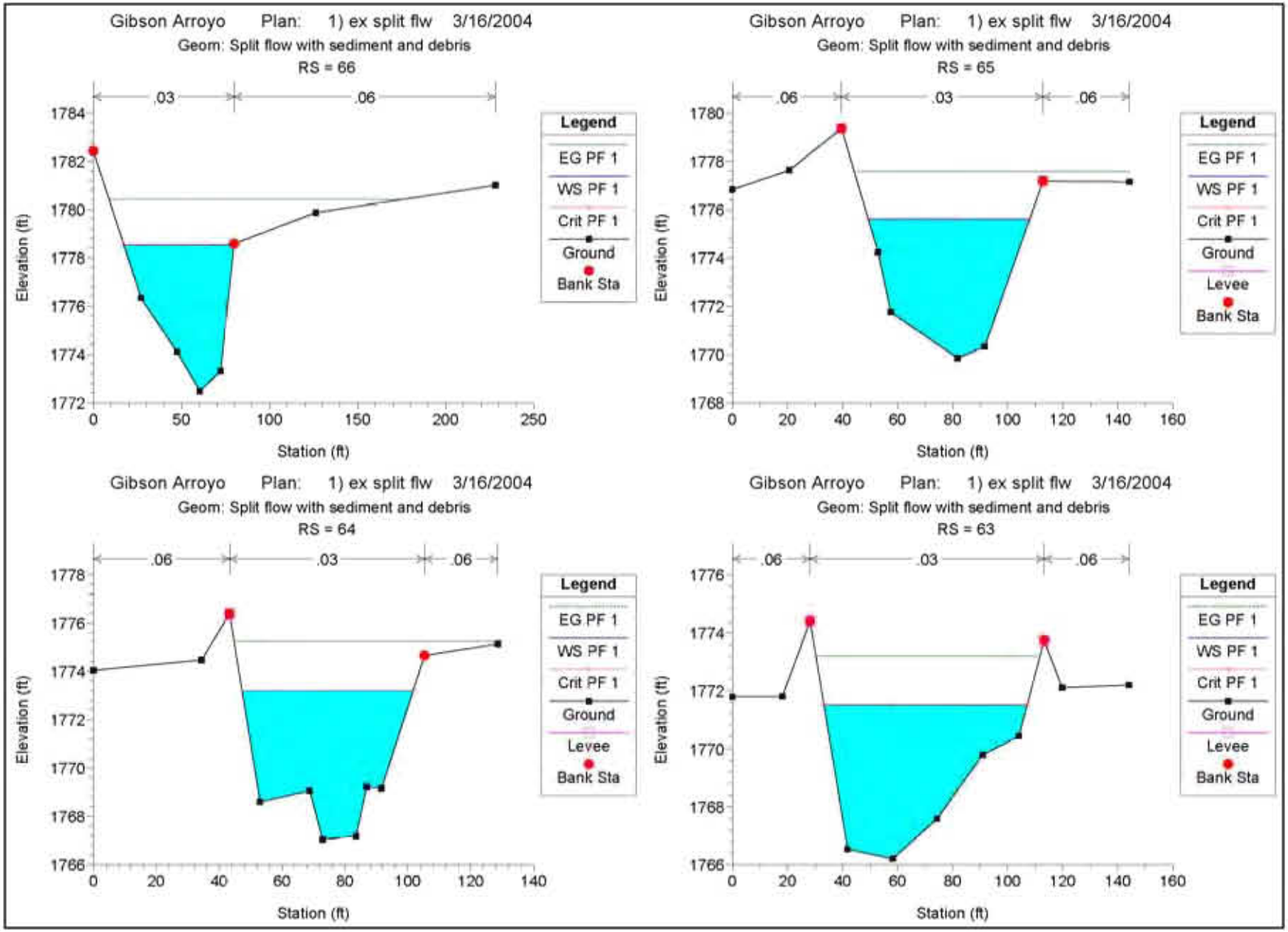

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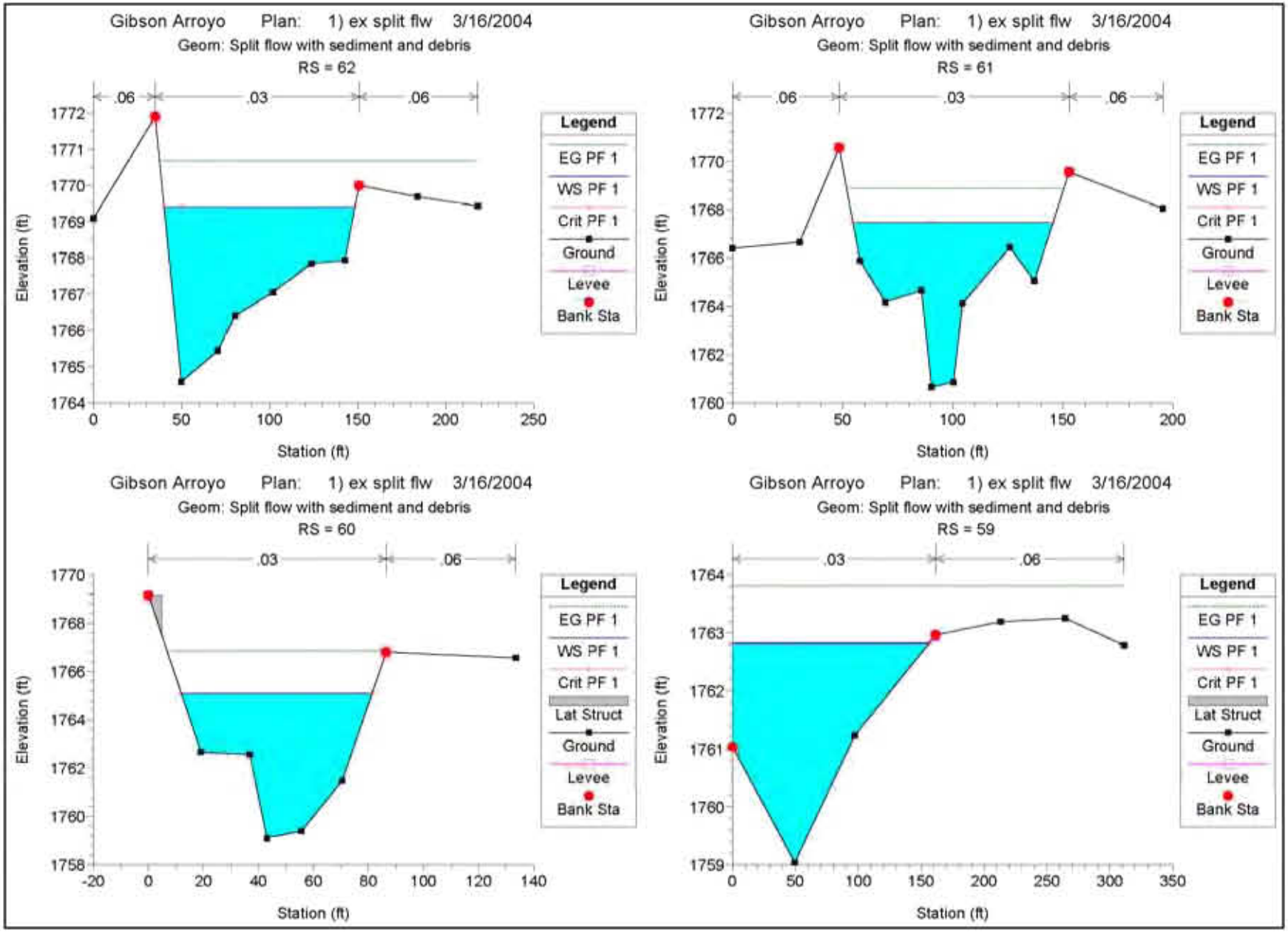

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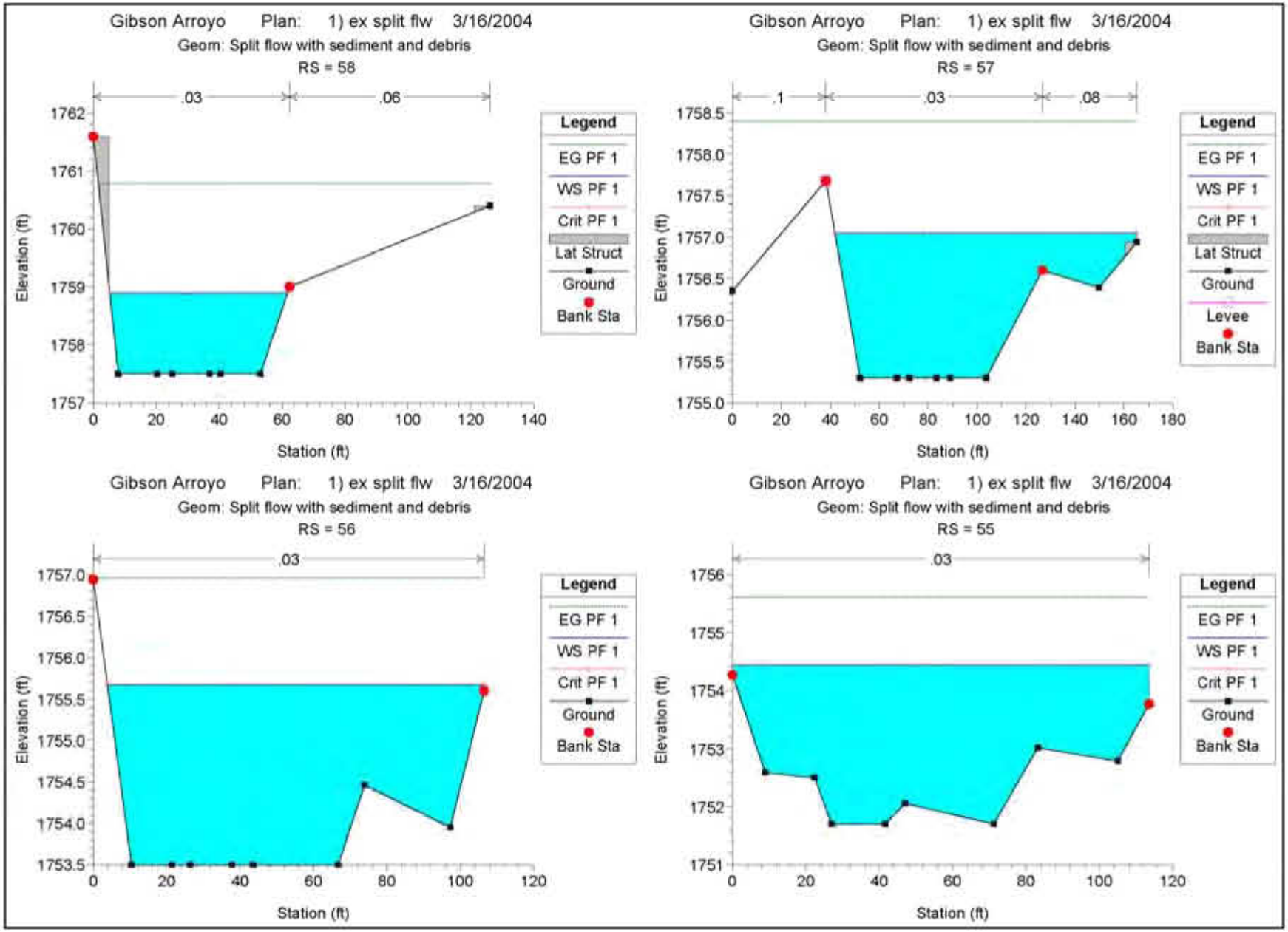

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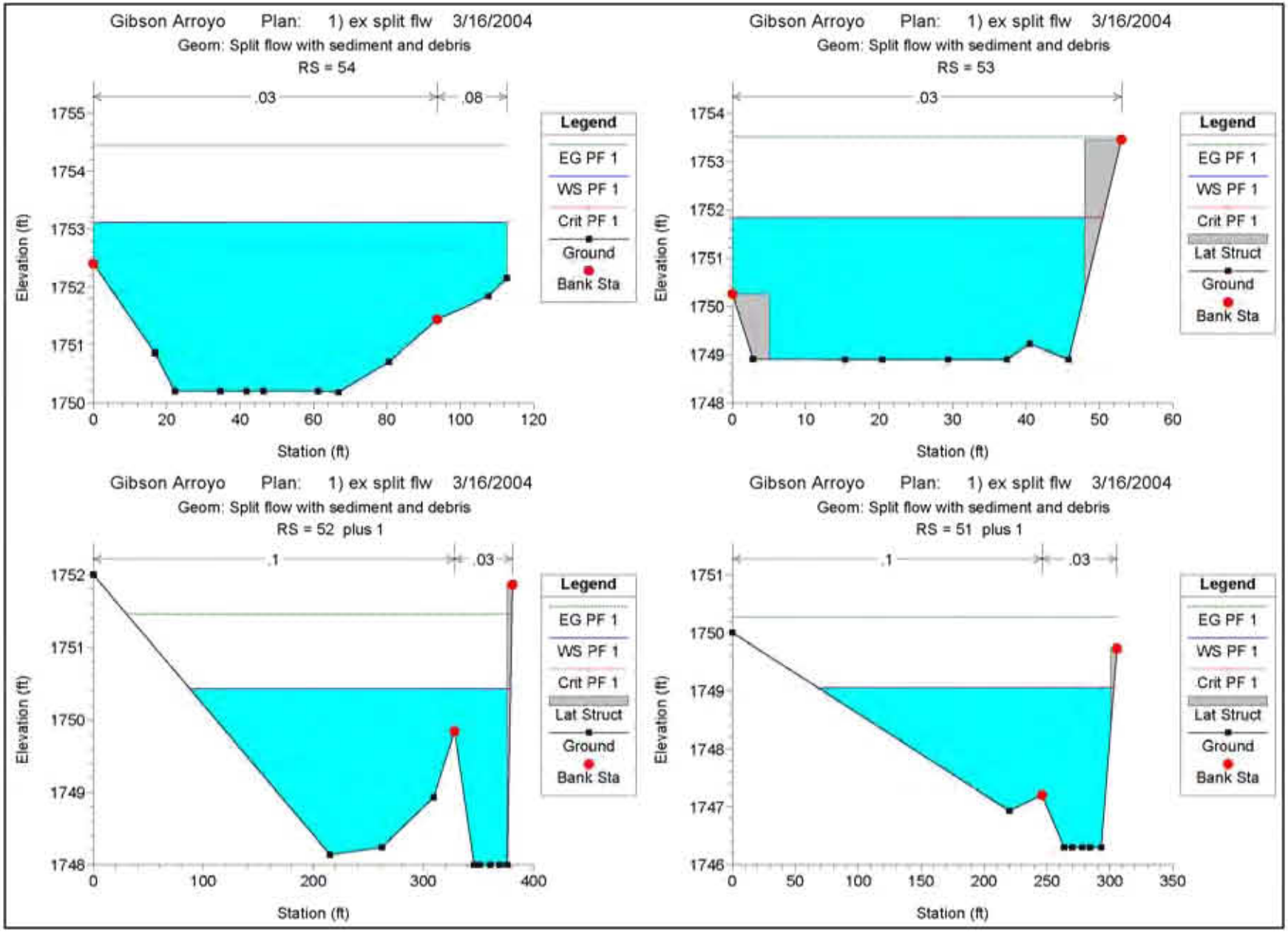

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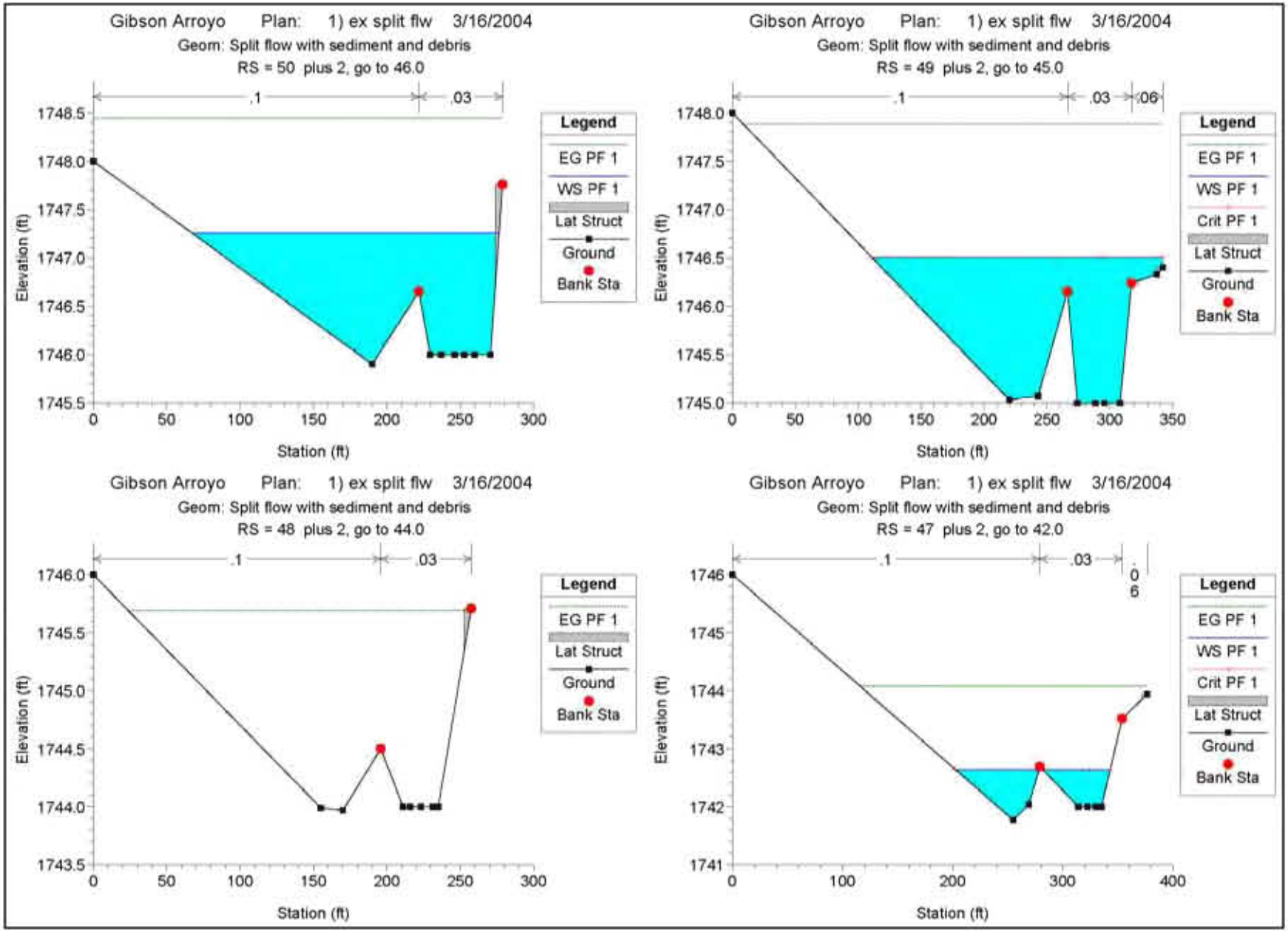

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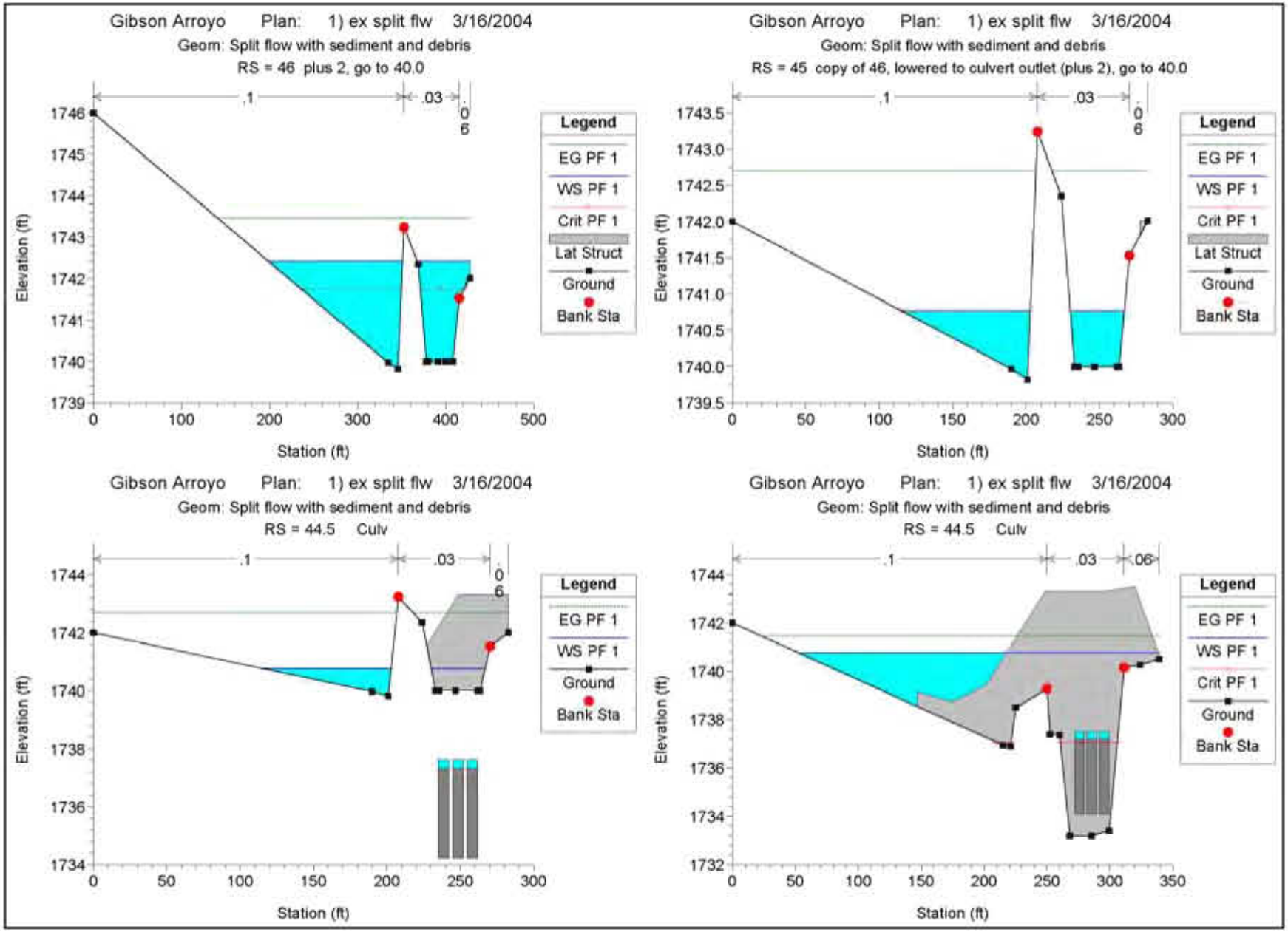

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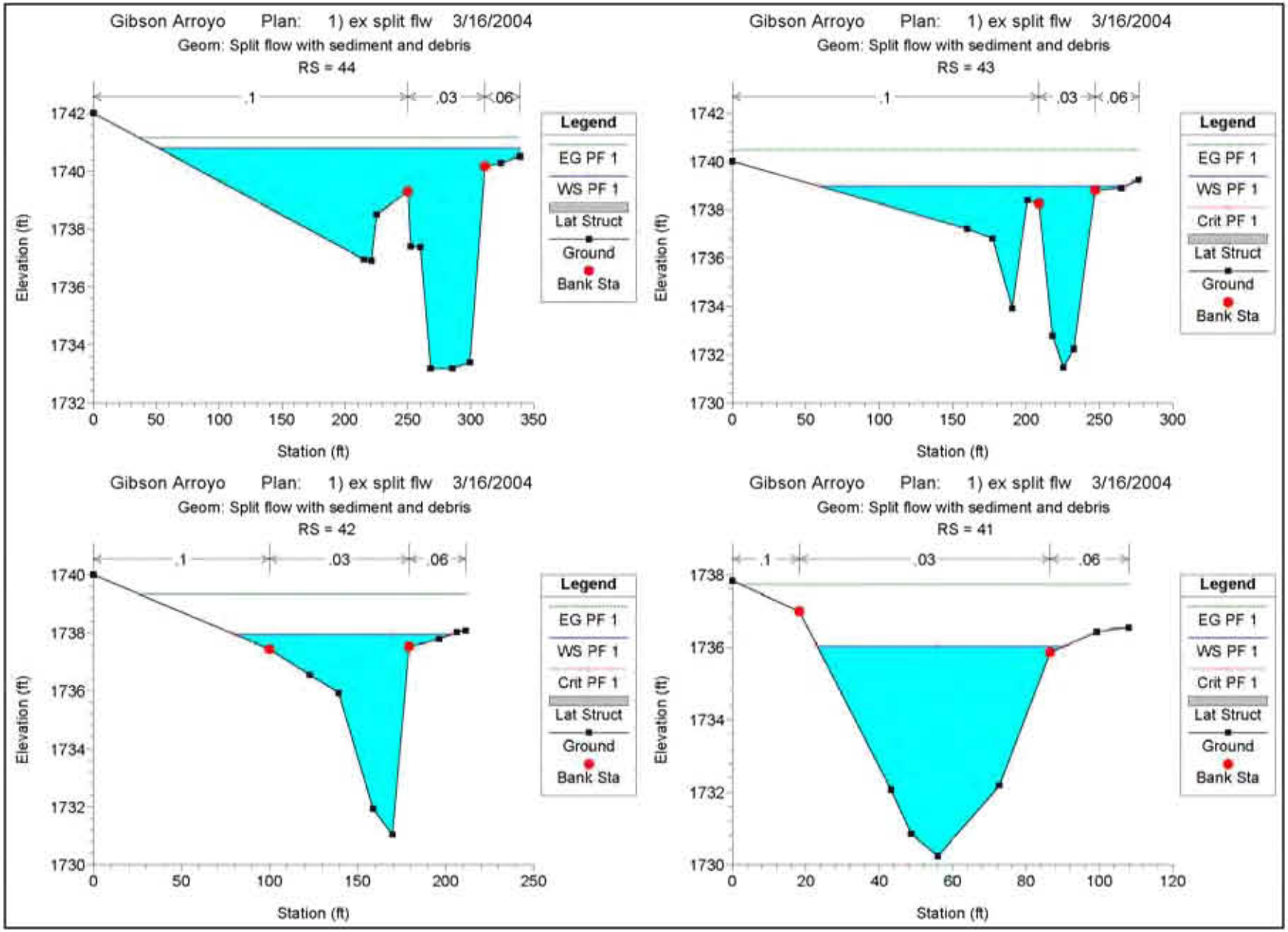

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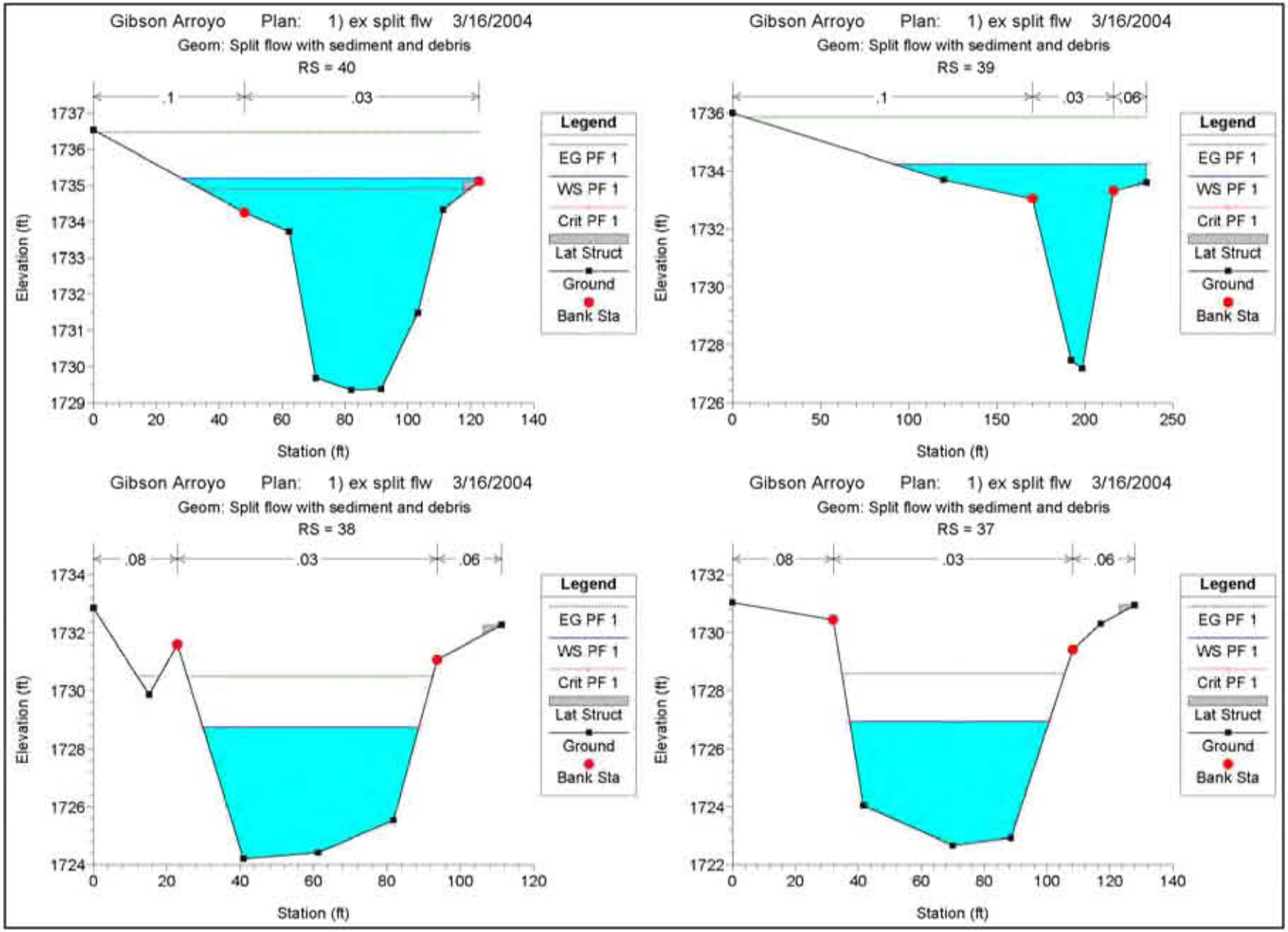

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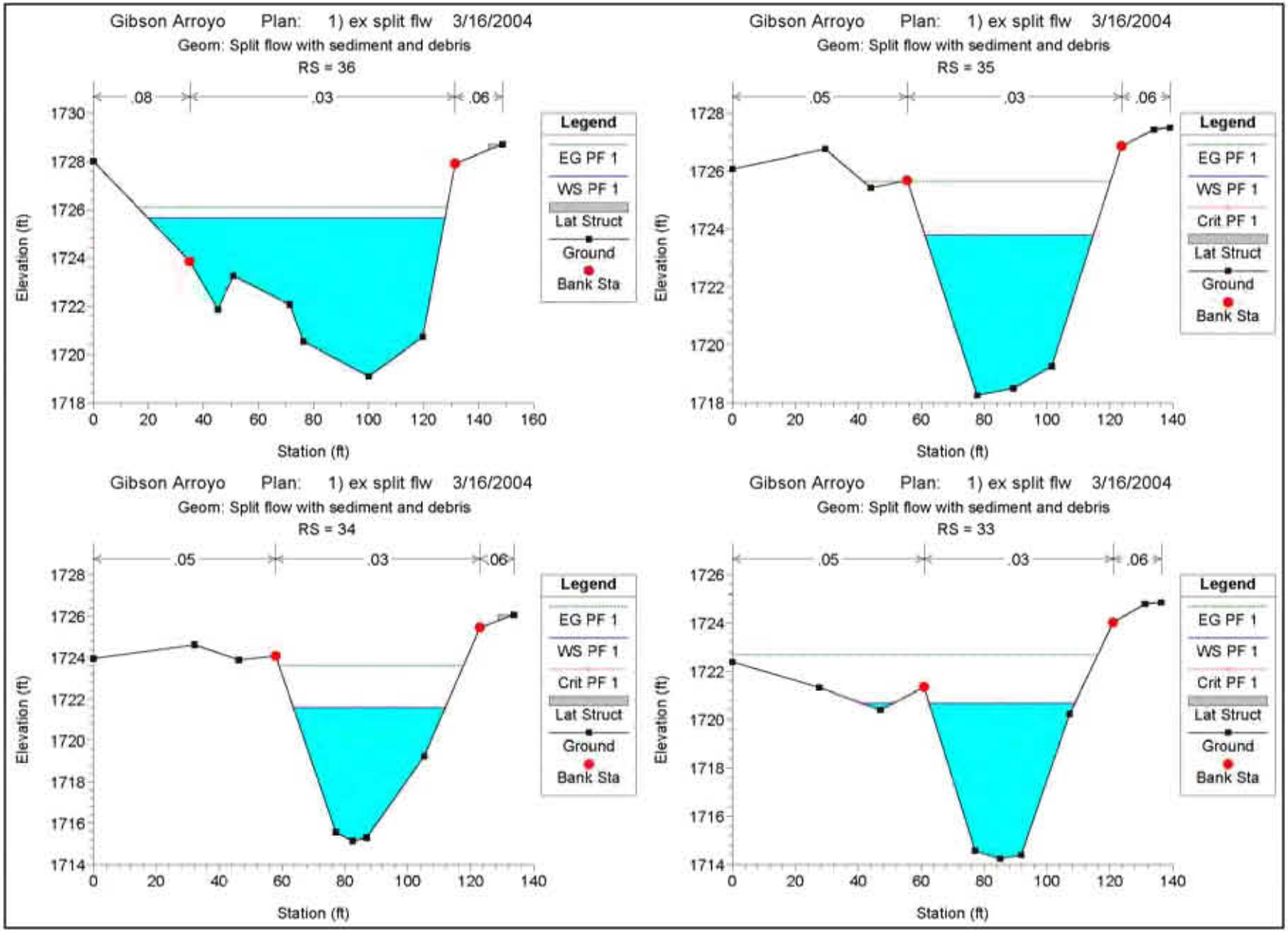

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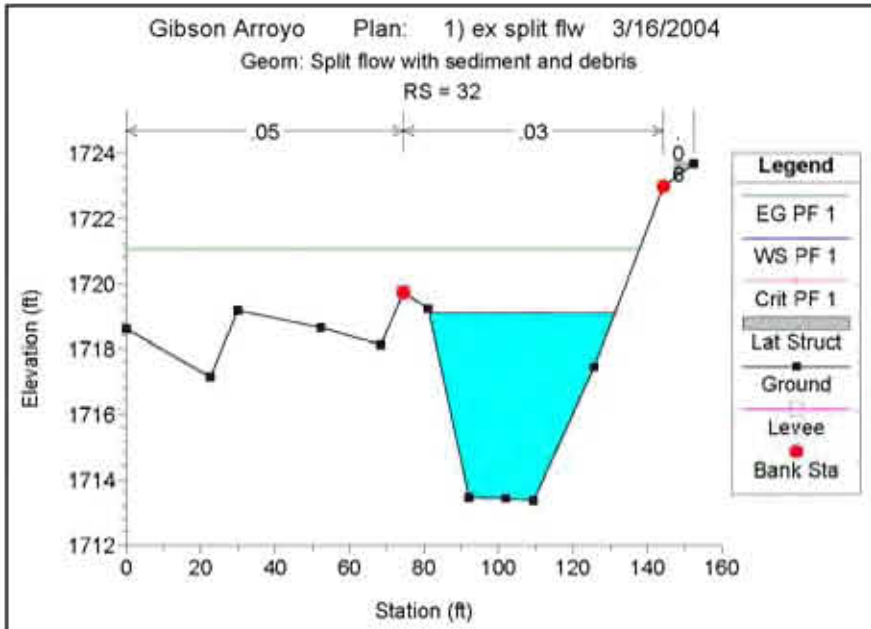
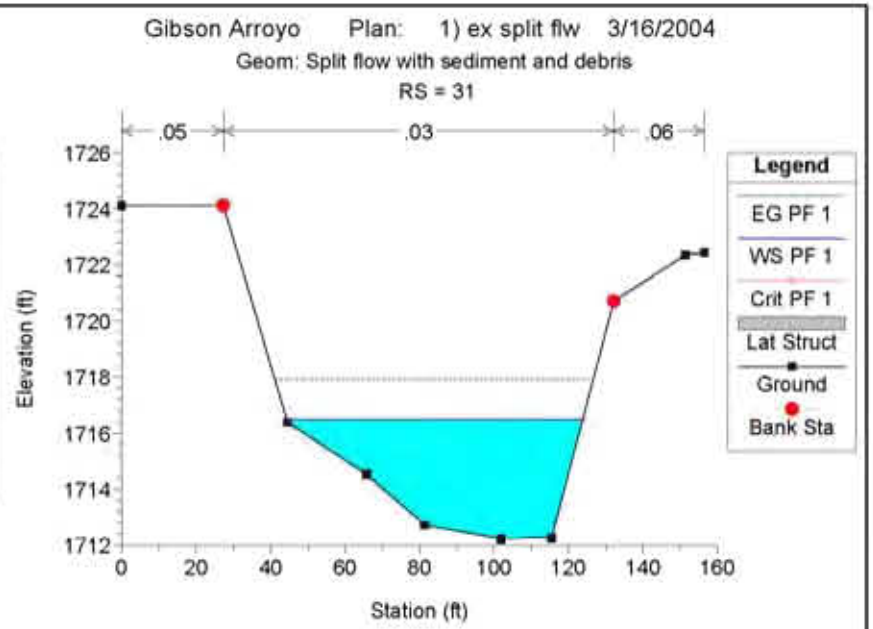

Gibson Arroyo Plan: 1) ex split flw 3/16/2004
Geom: Split flow with sediment and debris
RS = 32
.05
.03
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Levee
Bank Sta


Gibson Arroyo Plan: 1) ex split flw 3/16/2004
Geom: Split flow with sediment and debris
RS = 31
.05
.03
.06
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Lat Struct
Ground
Bank Sta

SEDIMENT ROUTING BY HYDROGRAPH TIME STEPS—
SLOPE-AREA METHOD

For: July 29, 2003, Flood on Gibson Arroyo (at Sartillion Avenue)								
Wtd. Manning's "n" Value:			0.0274	For a Rise Time, in mins., of:				36
Energy Slope, in ft./ft.:			0.0077	For a Peak Discharge, in cfs, of:				3150
For Sediment-Transport Coefficient & Y/V Exponents of:						1.486e-05	-0.30	4.32
Step	Time (mins.)	ΔTime (mins.)	Q_s (cfs)	Y (feet)	V (ft./sec.)	W (feet)	Q_s (cfs)	ΔVOL_s (cubic feet)
1	3.6	3.6	79	0.82	3.84	35.13	0.19	34
2	7.2	3.6	274	1.50	5.88	39.47	1.09	229
3	10.8	3.6	504	1.84	6.87	44.57	2.28	602
4	14.4	3.6	765	2.07	7.56	50.38	3.76	1,079
5	18.0	3.6	1,090	2.27	8.13	57.58	5.72	1,693
6	21.6	3.6	1,421	2.41	8.57	64.92	7.95	2,441
7	25.2	3.6	1,814	2.55	8.97	73.66	10.80	3,349
8	28.8	3.6	2,325	2.68	9.37	84.99	14.82	4,575
9	32.4	3.6	2,794	2.78	9.67	95.41	18.86	6,015
10	36.0	3.6	3,150	2.85	9.87	103.31	22.14	7,322
11	39.6	3.6	2,911	2.81	9.74	98.00	19.92	7,511
12	43.2	3.6	2,643	2.75	9.58	92.05	17.53	6,688
13	46.8	3.6	2,381	2.70	9.41	86.25	15.29	5,861
14	50.4	3.6	2,136	2.64	9.23	80.79	13.26	5,099
15	54.0	3.6	1,903	2.57	9.05	75.62	11.49	4,420
16	57.6	3.6	1,717	2.52	8.88	71.49	10.07	3,850
17	61.2	3.6	1,518	2.45	8.68	67.09	8.64	3,341
18	64.8	3.6	1,336	2.38	8.47	63.03	7.36	2,857
19	68.4	3.6	1,172	2.31	8.25	59.40	6.25	2,431
20	72.0	3.6	1,017	2.23	8.02	55.97	5.27	2,057
21	79.2	7.2	759	2.07	7.54	50.24	3.70	3,204
22	86.4	7.2	564	1.90	7.06	45.90	2.61	2,254
23	93.6	7.2	428	1.75	6.61	42.89	1.88	1,604
24	100.8	7.2	321	1.59	6.14	40.51	1.33	1,147
25	108.0	7.2	246	1.44	5.70	38.84	0.95	814
26	122.4	14.4	154	1.19	4.94	36.81	0.52	1,050
27	136.8	14.4	95	0.92	4.13	35.48	0.25	550
28	151.2	14.4	63	0.69	3.47	34.78	0.12	264
29	165.6	14.4	38	0.41	2.64	34.22	0.04	114
30	180.0	14.4	25	0.19	1.97	33.94	0.02	43
31	252.0	72.0	0	0.00	0.00	33.38	0.00	71
TOTALS:	N/A	252.0	N/A	N/A	N/A	N/A	N/A	82,569

Note: Visually Estimate of Sediment Gradation Is D_{50} = 2.0 mm and G = 5.0.

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: October 1, 2003

RE: Bed-Material Sediment Transport Estimate for July 29, 2003, Flow Event on Gibson Arroyo in Ajo, Arizona, (Estimate at Sartillion Avenue, Located in Section 15 of Township 12 South, Range 6 West, G&SRB&M, Pima County, Arizona)

Bed-material sediment transport can be estimated for the July 29, 2003, flood event on the Gibson Arroyo. To make such an estimate, peak discharge and flood-hydrograph dimension must first be determined. In this regard, a separate hydrologic analysis was performed by Tetra Tech (September, 2003) which estimated the July 29, 2003, flood peak at Sartillion Avenue to be approximately 3100 cfs.

Once the peak discharge has been determined, a flood hydrograph can be developed by also knowing the rise time of the hydrograph, following which the Pima County Synthetic Flood hydrograph Procedure can be applied. For the Gibson Arroyo at Sartillion Avenue, Tetra Tech estimates a rise time of 42 minutes for the July 29, 2003, flood. The resulting flood hydrograph becomes:

Tabular Flood Hydrograph	
Time (minutes)	Discharge (cubic ft/s)
0.0	0
3.6	79
7.2	274
10.8	504
14.4	765
18.0	1,090
21.6	1,421
25.2	1,814
28.8	2,325
32.4	2,794
36.0	3,150
39.6	2,911
43.2	2,643
46.8	2,381
50.4	2,136
54.0	1,903
57.6	1,717
61.2	1,518
64.8	1,336
68.4	1,172
72.0	1,017
79.2	759
86.4	564
93.6	428
100.8	321
108.0	246
122.4	154
136.8	95
151.2	63
165.6	38
180.0	25
252.0	0

Next, bed-material sediment transport was calculated for each time step of the preceding flood hydrograph using the Zeller-Fullerton Sediment-Transport Equation. The hydraulics for each time step were taken as the average of the hydraulic parameters for two naturally occurring cross-sections located along the Gibson Arroyo—one located approximately 73 feet upstream of Sartillion Avenue and the other located approximately 173 feet upstream of Sartillion Avenue. The hydraulic parameters used for the differing time steps were based upon regression-equation estimates of the average depths, velocities, and widths versus discharge for the two referenced cross-sections. The sediment-transport results follow:

**SEDIMENT ROUTING BY HYDROGRAPH TIME STEPS—
SLOPE-AREA METHOD**

For: July 29, 2003, Flood on Gibson Arroyo (at Sartillion Avenue)								
Wtd. Manning's "n" Value:			0.0274	For a Rise Time, in mins., of:				36
Channel Slope, in ft./ft.:			0.0077	For a Peak Discharge, in cfs, of:				3150
For Sediment-Transport Coefficient & Y/V Exponents of:						1.486e-05	-0.30	4.32
Step	Time (mins.)	ΔTime (mins.)	Q_s (cfs)	Y (feet)	V (ft./sec.)	W (feet)	Q_s (cfs)	ΔVOL_s (cubic feet)
1	3.6	3.6	79	0.82	3.84	35.13	0.19	34
2	7.2	3.6	274	1.50	5.88	39.47	1.09	229
3	10.8	3.6	504	1.84	6.87	44.57	2.28	602
4	14.4	3.6	765	2.07	7.56	50.38	3.76	1,079
5	18.0	3.6	1,090	2.27	8.13	57.58	5.72	1,693
6	21.6	3.6	1,421	2.41	8.57	64.92	7.95	2,441
7	25.2	3.6	1,814	2.55	8.97	73.66	10.80	3,349
8	28.8	3.6	2,325	2.68	9.37	84.99	14.82	4,575
9	32.4	3.6	2,794	2.78	9.67	95.41	18.86	6,015
10	36.0	3.6	3,150	2.85	9.87	103.31	22.14	7,322
11	39.6	3.6	2,911	2.81	9.74	98.00	19.92	7,511
12	43.2	3.6	2,643	2.75	9.58	92.05	17.53	6,688
13	46.8	3.6	2,381	2.70	9.41	86.25	15.29	5,861
14	50.4	3.6	2,136	2.64	9.23	80.79	13.26	5,099
15	54.0	3.6	1,903	2.57	9.05	75.62	11.49	4,420
16	57.6	3.6	1,717	2.52	8.88	71.49	10.07	3,850
17	61.2	3.6	1,518	2.45	8.68	67.09	8.64	3,341
18	64.8	3.6	1,336	2.38	8.47	63.03	7.36	2,857
19	68.4	3.6	1,172	2.31	8.25	59.40	6.25	2,431
20	72.0	3.6	1,017	2.23	8.02	55.97	5.27	2,057
21	79.2	7.2	759	2.07	7.54	50.24	3.70	3,204
22	86.4	7.2	564	1.90	7.06	45.90	2.61	2,254
23	93.6	7.2	428	1.75	6.61	42.89	1.88	1,604
24	100.8	7.2	321	1.59	6.14	40.51	1.33	1,147
25	108.0	7.2	246	1.44	5.70	38.84	0.95	814
26	122.4	14.4	154	1.19	4.94	36.81	0.52	1,050
27	136.8	14.4	95	0.92	4.13	35.48	0.25	550
28	151.2	14.4	63	0.69	3.47	34.78	0.12	264
29	165.6	14.4	38	0.41	2.64	34.22	0.04	114
30	180.0	14.4	25	0.19	1.97	33.94	0.02	43
31	252.0	72.0	0	0.00	0.00	33.38	0.00	71
TOTALS:	N/A	252.0	N/A	N/A	N/A	N/A	N/A	82,569

Note: Visually Assumed Sediment Gradation IS D_{50} =2.0 mm and G = 5.0.

The computed sediment transport of 82,569 cubic feet represents "bulked" sediment conditions (i.e., assuming an active-layer sediments density of 100 pounds/cubic foot).

Computed bed-material sediment transport that occurred in upstream channel reaches during the July 29, 2003, flood on the Gibson Arroyo, can be computed using the following approximating equation, which is specific to the hydrologic and hydraulic conditions at that existed during the referenced flood:

$$V_S = 1.467x10^{-4} T_R S^{0.885} Q_p^{1.264}. \qquad \text{(Equation No. 1)}$$

Where,

V_s	=	Bulked volume of bed-material yield, in acre-feet
T_R	=	Hydrograph rise time, in minutes
S	=	Upstream Watercourse Slope of channel, in ft/ft
Q	=	Peak Discharge, in cfs = 3150 cfs (computed using Slope-Area Method)

Given an assumed rise time of 36 minutes for the computed flood peak that occurred on July 29, 2003 (see hydrograph on previous page), and an upstream watercourse slope of 0.0212 ft/ft (based upon the relevant USGS quadrangle maps for Ajo, Arizona), applying Equation No. 1 to the 1.7-square-mile contributing watershed area of the Gibson Arroyo upstream of Sartillion Avenue yields:

V_s	≈	4.61 acre-feet
V_s	≈	200,812 cubic feet

As noted above, according to USGS quadrangle maps, which are based upon mapping conducted in 1961, the bed slope of the Gibson Arroyo around Sartillion Avenue should be approximately 0.0212 ft/ft. However, the measured bed slope (by Pima County survey personnel) along the segment of the Gibson Arroyo located immediately upstream of Sartillion Avenue currently has an approximate value of 0.0133 ft/ft. In Tetra Tech's professional opinion, this nearly 40% reduction in bed slope reflects an ongoing process of sedimentation that has occurred along the study reach of the Gibson Arroyo during the past 40+ years (i.e., since mapping was performed for the referenced USGS quadrangle maps).

The USGS quadrangle maps also indicate that at a point located Approximately 1/2 of a mile downstream of Sartillion Avenue, at the North Cedar Street crossing, the slope of the Gibson Arroyo streambed flattens to approximately 50% of the slope at and near Sartillion Avenue, which is more or less consistent with the reduction between the measured versus mapped bed slope for the arroyo immediately upstream of Sartillion Avenue. (Actually, at and downstream of the North Cedar Creek Crossing, the bed slope is now likely to also be less than indicated on the USGS quadrangle maps due to the abrupt change in alignment of the channel through this segment of the Gibson Arroyo.) Slope reductions of this magnitude create corresponding reductions in the sediment-transport rates along the Gibson Arroyo that are approximately equivalent to 1/3 to 1/2 of the upstream sediment-transport rate (i.e., in the upstream watershed reaches). This means that, during the July 29, 2003, flood it is estimated that as much as, and potentially even more than, 67% (i.e., 134,544 cubic feet) of the sediment transported from upstream watershed reaches "dropped out" of the Gibson Arroyo channel along the streambed within a segment of the channel extending from immediately upstream of Sartillion Avenue to the West Second Avenue Bridge Crossing, located downstream of the North Cedar Street crossing (total reach distance = approximately 4500 feet). The primary flow conveyance portion of the Gibson Arroyo channel along the study reach varies from 20 to 40 feet in width (average ≈ 30 feet) near Sartillion Avenue, and at and near the North Cedar Street crossing "averages" about 40 feet in width; but narrows down to only about 10 feet in width about 1100 feet downstream, after making an abrupt turn northward at a point located immediately west of the existing railroad tracks. This narrow section of the channel continues for approximately 500 feet, until flow "passes through" a bridge structure located underneath West Second Avenue. Overall, then, a width of approximately 30 feet would represent a reasonable "average" width for the primary flow conveyance portion of the Gibson Arroyo channel along the segment of the study reach, beginning immediately upstream of Sartillion Avenue and extending to immediately upstream of West Second Avenue.

Given the preceding, and if making the simplifying assumption that all 134,544 cubic feet of predicted sediment excess were to have "dropped out" uniformly along the study reach of the Gibson Arroyo during the July 29, 2003, flood event, the net effect would have been to raise the primary flow conveyance portion of the channel streambed by an "average" of approximately 12 inches (i.e., 1.0 foot). On the other hand, if sediment excess were proportioned along the reach, then an "average" of approximately 12 inches (1.0 foot) of sediment would drop out in the first 2900 feet, an "average" of approximately 9 inches

(0.75 feet) of sediment would drop out in the next 1100 feet of the reach, and an "average" of approximately 3.0 feet of sediment would drop out in the last 500 feet of the reach. Of course, sediment does not drop out uniformly along a reach. Typically, sedimentation will occur where channel changes/expansions, backwater effects, breakout flows, and conditions of flow retardance are maximums. For example, the abrupt northward bend of the channel at the point located just west of the existing railroad tracks would significantly exacerbate sedimentation immediately upstream of this point, resulting in a lessening in sedimentation downstream. It is very likely that this feature, in combination with the flow breakout that occurred along this reach of the Gibson Arroyo, would cause the "average" amount of sediment deposition in the upstream reach (i.e., the segment of the channel from the abrupt northward bend westward to the North Cedar Street crossing) to range anywhere from 2 feet to 4 feet in depth during the July 29, 2003, flood.

Along the segment of the study reach from the abrupt northward bend near the railroad to upstream of Sartillion Avenue, measured data suggest that, at least in segments, the streambed of the Gibson Arroyo has flattened by almost 40 percent since existing USGS quadrangles maps were first prepared using 1961 data (i.e., more than 40 years ago). The July 29, 2003, flood contributed to this trend of streambed flattening by depositing significant amounts of sediment—predicted to be anywhere from 2 feet to 4 feet in depth along stretches of the Gibson Arroyo channel located immediately upstream of the abrupt northward bend in the Gibson Arroyo channel. This trend of streambed flattening due to sediment deposition will continue without (1) a significant reduction in upstream sediment supply, or (2) modification to the current channel alignment of the Gibson Arroyo through the study reach—particularly near the railroad tracks were an abrupt northward bend occurs. In the absence of either of these mitigation measures, routine channel maintenance will help control the ordinary depositional problems that are being experienced along the study reach of the Gibson Arroyo, but will not eliminate the threat of significant deposition during the occurrence of a major flow event, such as the flood which occurred on July 29, 2003. Such a depositional episode would lead to a more or less instantaneous and marked reduction in channel conveyance; which, in turn, would likely lead to flooding similar in magnitude to what occurred along the Gibson Arroyo on July 29, 2003.

Information for Properties in Ajo upon which some form of Drainage Infrastructure Exists.		
Name	**Address**	**Parcel Code**
Lucy, Kendall R. and Kathleen M.	441 W. Palo Verde Ave	40125950
Lucy, Kendall R. and Kathleen M.	431 W. Palo Verde Ave	40125960
Lucy, Kendall R. and Kathleen M.	421 W. Palo Verde Ave	40125970
Pima County	525 N. Sahuaro	401131480
Disie S Desert Realty	524 N. Sahuaro	401131480
Disie S Desert Realty	430 N. 2nd Ave	401131490
International Sonoran Desert Alliance		401140290
Bustamante, Alejandro and Isabel	1341 W. Hoover Street	401140300
Bustamante, Alejandro and Isabel	1333 W. Hoover Street	401140310
Garcia, Alejandro and Mary	1325 W. Hoover Street	401140320
Ramirez, Maria	1301 W. Hoover Street	401140350
Ramirez, Maria	1219 W. Hoover Street	401140360
Ramizez, Mario	1213 W. Hoover Street	401140370
Escalante, Lydia	1207 W. Hoover Street	401140380
Wilkens, Richard and Catherine	1208 W. Martin Street	401140410
Ramirez, Mario	1214 W. Martin	401140420
Valdez, Lorenzo and Anna	1222 W. Martin	401140430
Colarich, Paul and Helen	1302 W. Martin	401140440
Schroeder, Roger and Patricia	1310 W. Martin	401140450
Clyde and Joan Bassett	1318 W. Martin	401140460
Yokum, C.L. and Carol	1342 W. Martin Street	401140490
Deweese, Joseph	524 N. Kilbright Ave	401140570
Shoppers Market and Enterprises	731 N. Cameron Ave	401150390
Life Enrichment Poultry Intervention	756 N. Sartillion Ave	401150440
Pima County Flood Control District		401151150
Pima County		401151510
Pima County Flood Control District		401151540
Pima County Flood Control District		401151580
Pima County	730 N. D'Armitt Ave	401151590

Information for Properties in Ajo upon which some form of Drainage Infrastructure Exists.		
International Sonoran Desert Alliance		401152100
International Sonoran Desert Alliance		401152110
International Sonoran Desert Alliance	725 N. 2nd Ave	401152130
Martinez, Felipe and Margarita		401180390
Wilson, Greg and Terry		401220010
Morrow, Jo Dean and Sally		401220030
Steel, John and Dorothy	240 W. Rocalla	401231360
Wilbur, Robert and Yvonne	300 W. Rocalla	401231420
Bell, Lance and Karen	341 W. Rocalla	401231560
Bell, Lance and Karen	331 W. Rocalla	401231570
Estate of Shirley Stewart	321 W. Rocalla	401231580
DePriest, Phyllis	311 W. Rocalla	401231590
Tredway, Moody and Dan	301 W. Rocalla	401231600
School District No. 15	441 W. Esperanza	401232370
Ansotegui, Leland and Barbara	440 W. Esperanza Blvd	401232460
Leap, Charles and Andrea	410 W. Morondo Ave	401232530
Marttila, Larry	420 W. Moronodo Ave	401232540
Holt Ajo Sales	430 W. Morondo Ave	401232550
Holt, Michael and Patricia	440 W. Morondo Ave	401232560
Holt, Michael and Patricia	421 W. Rocalla Ave	401232590
Bustamante, Maria	411 W. Rocalla Ave	401232600
Gibson, Willie and Patricia	401 W Rocalla	401232610
Ross, Anna M.	500 W. Esperanza Blvd	401240210
Jones, Edward and Dora	501 W. Morondo Ave	401240300
Rossi, Lisa and Mario	501 W. Esperanza	401240350
Vega, Jose	741 W. Rocalla Ave	401240840
Hardwick, Jack and Dorothy	731 W. Rocalla Ave	401240850
Julander, Sharron and Artemisa	721 W. Rocalla Ave	401240860
Mans, Lester and Linda	830 W. Morondo Ave	401241210
Mans, Lester and Linda	840 W. Morondo Ave	401241220
Lopez, Heriberto and Eloisa	801 W. Rocalla Ave	401241270

Information for Properties in Ajo upon which some form of Drainage Infrastructure Exists.		
Pima County	900 W. Morondo Ave	401241420
Pima County	910 W. Morondo Ave	401241430
Hetherington, Cyril D. and Margaret	500 W. Ocatillo Ave	401251000
Hetherington, Cyril D. and Margaret	510 W. Ocatillo Ave	401251010
Hetherington, Cyril D. and Margaret	520 W. Ocatillo Ave	401251020
Walters, Gerald and Paulette	530 W. Ocatillo Ave	401251030
Ownby, Robbie	540 W. Ocatillo Ave	401251040
Jenkins, Elizabeth	600 W. Ocatillo Ave	401251100
Moxham, Maurina	610 W. Ocatillo Ave	401251110
Shaw, Roland and Sue	620 W. Ocatillo Ave	401251120
Ramirez, Albert and Susana	630 W. Ocatillo Ave	401251130
Weatherby, Harold	640 W. Ocatillo Ave	401251140
Romero, Raul	700 W. Ocatillo Ave	401251200
Gaylin, Clifford and Darlene	710 W. Ocatillo Ave	401251210
Rios, Felipe and Fernando	720 W. Ocatillo Ave	401251220
Lampman, William	730 W. Ocatillo Ave	401251230
Hemenway, Robert and Patricia	740 W. Ocatillo Ave	401251240
Smith, Robert and Judith	800 W. Ocatillo Ave	401251300
Schroek, Paul	810 W. Ocatillo Ave	401251310
Jerez, Frank and Carol	820 W. Ocatillo Ave	401251320
Leon, Jose	830 W. Ocatillo Ave	401251330
Chelewski, Raymond and Eloise	840 W. Ocatillo Ave	401251340
Canon, Kem and Jane	1051 W Solana Ave	401260540
Holt Ajo Sales		401260580
Holt Ajo Sales		401260590
Fisher-Podoll, Patricia		401260600
Walker, Michael and Norma	700 W. Guest House Road	401552540
Morgart, John and Elizabeth	7 W. Guest House Rd	401552820
Phelps Dodge	655 W. Guest House Rd	401552830
Phelps Dodge Corp.		401553460
Ajo-Lukeville Health Service District	410 N. Malcate Street	401554660

Information for Properties in Ajo upon which some form of Drainage Infrastructure Exists.		
School District No. 15		40109004K
Pima County	527 N. Sahuaro	40113146K
Disie S Desert Realty		40113146U
Disie S Desert Realty	500 N. 2nd Ave	40113146V
Nogales, Ruben and Mary	410 N. 2nd Ave	40113146W
Pima County		40113153C
Garcia, Alejandro and Mary	1309 W. Hoover Street	40114034A
Clyde and Joan Bassett	1326 W. Martin Street	40114047A
Yokum, C.L. and Carol	1334 W. Martin Street	40114048A
West, Ronald and Shirley	512 N. Kilbright Ave	40114055A
Gabovda, Anna	501 N. Kilbright Ave	40114074A
Poverty Point Properties		40118038D
Wood, Alverta		40118041E
Morrow, Jo Dean and Sally		40122006A
Yanez, James	441 W. Morondo Ave	40123247B
Mesquita, Frank		40124119A
Sartori, Vivian	820 W. Morondo Ave	40124120A
Pima County		40126052A
Holt Ajo Sales	303 N. Cameron Ave	40126061A
BJB Casa Properties		40126062A
Boyd, Cathy Leigh	931 W. Morondo Ave	40126067B
Glodowski, Robert and Barbara		40126067D
Evans, Dora	355 S. Sahuaro Street	40155292A
55 Sahuaro Assoc. Inc.	55 S. Sahuaro Street	40155472H
Zarecor, Carmel and Michael		40155472K
Phelps Dodge Corp.		40155473A
Phelps Dodge		40155473A
Pima County	211 E. 2nd Street	40155476A

Culvert ID No. 1

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.5
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	65.0
Invert Elevation at Downstream end of Culvert (ft)	1,838.0
Invert Elevation at Upstream end of Culvert (ft)	1,839.4
Culvert Slope (ft/ft)	0.0215
Starting Flow Rate (cfs)	35.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	52.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
35.0	0.0	3.62	3.57	2.3	2.01	2.3	7.4
36.0	0.0	3.74	3.67	2.5	2.04	2.5	7.33
37.0	0.0	3.85	2.97	2.5	2.06	2.5	7.54
38.0	0.0	3.97	3.17	2.5	2.08	2.5	7.74
39.0	0.0	4.09	3.34	2.5	2.11	2.5	7.95
40.0	0.0	4.21	3.5	2.5	2.13	2.5	8.15
41.0	0.0	4.34	3.67	2.5	2.15	2.5	8.35
42.0	0.0	4.47	3.82	2.5	2.17	2.5	8.56
43.0	0.0	4.61	3.97	2.5	2.19	2.5	8.76
44.0	0.0	4.74	4.13	2.5	2.21	2.5	8.96
45.0	0.0	4.88	4.29	2.5	2.23	2.5	9.17
46.0	0.0	5.03	4.45	2.5	2.24	2.5	9.37
47.0	0.0	5.17	4.61	2.5	2.26	2.5	9.57
48.0	0.0	5.32	4.78	2.5	2.27	2.5	9.78
49.0	0.0	5.47	4.94	2.5	2.29	2.5	9.98
50.0	0.0	5.63	5.11	2.5	2.3	2.5	10.19
51.0	0.0	5.79	5.29	2.5	2.31	2.5	10.39
52.0	0.0	5.95	5.46	2.5	2.32	2.5	10.59

Culvert ID No. 2

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 10, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	5.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	80.0
Invert Elevation at Downstream end of Culvert (ft)	1,832.0
Invert Elevation at Upstream end of Culvert (ft)	1,835.3
Culvert Slope (ft/ft)	0.0413
Starting Flow Rate (cfs)	200.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	210.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
200.0	0.0	7.28	0.0	3.08	4.04	3.08	15.78
201.0	0.0	7.32	0.0	3.09	4.05	3.09	15.79
202.0	0.0	7.36	0.0	3.1	4.06	3.1	15.81
203.0	0.0	7.4	0.0	3.11	4.06	3.11	15.83
204.0	0.0	7.44	0.0	3.12	4.07	3.12	15.85
205.0	0.0	7.48	0.0	3.13	4.08	3.13	15.86
206.0	0.0	7.52	0.0	3.14	4.09	3.14	15.88
207.0	0.0	7.56	0.0	3.15	4.1	3.15	15.89
208.0	0.0	7.6	0.0	3.16	4.11	3.16	15.91
209.0	0.0	7.64	0.0	3.17	4.12	3.17	15.92
210.0	0.0	7.68	0.0	3.18	4.13	3.18	15.94

Culvert ID No. 3

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	75.0
Invert Elevation at Downstream end of Culvert (ft)	1,832.0
Invert Elevation at Upstream end of Culvert (ft)	1,835.8
Culvert Slope (ft/ft)	0.0507
Starting Flow Rate (cfs)	300.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	317.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
300.0	0.0	8.25	0.0	3.28	4.73	3.28	18.95
301.0	0.0	8.28	0.0	3.29	4.74	3.29	18.96
302.0	0.0	8.31	0.0	3.3	4.75	3.3	18.97
303.0	0.0	8.34	0.0	3.3	4.76	3.3	18.99
304.0	0.0	8.37	0.0	3.31	4.76	3.31	19.0
305.0	0.0	8.4	0.0	3.32	4.77	3.32	19.02
306.0	0.0	8.43	0.0	3.32	4.78	3.32	19.03
307.0	0.0	8.46	0.0	3.33	4.78	3.33	19.04
308.0	0.0	8.49	0.0	3.34	4.79	3.34	19.06
309.0	0.0	8.51	0.0	3.34	4.8	3.34	19.08
310.0	0.0	8.54	0.0	3.35	4.81	3.35	19.09
311.0	0.0	8.57	0.0	3.36	4.81	3.36	19.11
312.0	0.0	8.6	0.0	3.36	4.82	3.36	19.12
313.0	0.0	8.63	0.0	3.37	4.83	3.37	19.13
314.0	0.0	8.66	0.0	3.38	4.83	3.38	19.15
315.0	0.0	8.69	0.0	3.38	4.84	3.38	19.16
316.0	0.0	8.72	0.0	3.39	4.85	3.39	19.17
317.0	0.0	8.75	0.0	3.4	4.86	3.4	19.19

Culvert ID No. 4

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	6.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	60.0
Invert Elevation at Downstream end of Culvert (ft)	1,806.0
Invert Elevation at Upstream end of Culvert (ft)	1,808.0
Culvert Slope (ft/ft)	0.0333
Starting Flow Rate (cfs)	275.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	292.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
275.0	0.0	7.65	0.0	3.55	4.54	3.55	15.8
276.0	0.0	7.67	0.0	3.56	4.55	3.56	15.82
277.0	0.0	7.68	0.0	3.56	4.56	3.56	15.83
278.0	0.0	7.7	0.0	3.57	4.56	3.57	15.84
279.0	0.0	7.73	0.0	3.58	4.57	3.58	15.86
280.0	0.0	7.76	0.0	3.59	4.58	3.59	15.87
281.0	0.0	7.78	0.0	3.6	4.59	3.6	15.88
282.0	0.0	7.81	0.0	3.6	4.6	3.6	15.9
283.0	0.0	7.84	0.0	3.61	4.6	3.61	15.91
284.0	0.0	7.86	0.0	3.62	4.61	3.62	15.91
285.0	0.0	7.89	0.0	3.63	4.62	3.63	15.93
286.0	0.0	7.92	0.0	3.64	4.63	3.64	15.94
287.0	0.0	7.94	0.0	3.65	4.64	3.65	15.95
288.0	0.0	7.97	0.0	3.66	4.64	3.66	15.97
289.0	0.0	8.0	0.0	3.66	4.65	3.66	15.98
290.0	0.0	8.03	0.0	3.67	4.66	3.67	15.99
291.0	0.0	8.05	0.0	3.68	4.67	3.68	16.0
292.0	0.0	8.08	0.0	3.69	4.67	3.69	16.02

Culvert ID No. 5

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	4.0
Culvert Rise (ft)	2.5
FHWA Chart Number	8
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.4
Culvert Length (ft)	280.0
Invert Elevation at Downstream end of Culvert (ft)	1,780.0
Invert Elevation at Upstream end of Culvert (ft)	1,785.4
Culvert Slope (ft/ft)	0.0193
Starting Flow Rate (cfs)	75.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	85.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
75.0	0.0	4.17	0.0	2.13	2.22	2.13	8.78
76.0	0.0	4.22	0.0	2.16	2.24	2.16	8.81
77.0	0.0	4.28	0.0	2.18	2.26	2.18	8.84
78.0	0.0	4.34	0.0	2.2	2.28	2.2	8.87
79.0	0.0	4.4	0.0	2.22	2.3	2.22	8.89
80.0	0.0	4.46	0.0	2.24	2.32	2.24	8.92
81.0	0.0	4.53	0.0	2.26	2.34	2.26	8.95
82.0	0.0	4.59	0.0	2.28	2.36	2.28	8.97
83.0	0.0	4.65	0.0	2.31	2.37	2.31	9.0
84.0	0.0	4.72	0.0	2.33	2.39	2.33	9.02
85.0	0.0	4.78	0.0	2.35	2.41	2.35	9.05

Culvert ID No. 6

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	12.0
Culvert Rise (ft)	8.0
FHWA Chart Number	13
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.4
Culvert Length (ft)	60.0
Invert Elevation at Downstream end of Culvert (ft)	1,774.0
Invert Elevation at Upstream end of Culvert (ft)	1,776.0
Culvert Slope (ft/ft)	0.0333
Starting Flow Rate (cfs)	1,150.0
Incremental Flow Rate (cfs)	5.0
Ending Flow Rate (cfs)	1,200.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
1,150.0	0.0	10.88	0.0	2.93	6.58	2.93	32.76
1,155.0	0.0	10.92	0.0	2.93	6.6	2.93	32.8
1,160.0	0.0	10.96	0.0	2.94	6.62	2.94	32.85
1,165.0	0.0	10.99	0.0	2.95	6.64	2.95	32.89
1,170.0	0.0	11.03	0.0	2.96	6.66	2.96	32.93
1,175.0	0.0	11.07	0.0	2.97	6.68	2.97	32.98
1,180.0	0.0	11.11	0.0	2.98	6.7	2.98	33.02
1,185.0	0.0	11.15	0.0	2.99	6.72	2.99	33.06
1,190.0	0.0	11.19	0.0	3.0	6.74	3.0	33.11
1,195.0	0.0	11.23	0.0	3.0	6.75	3.0	33.15
1,200.0	0.0	11.27	0.0	3.01	6.77	3.01	33.19

Culvert ID No. 7

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	24.0
Culvert Rise (ft)	4.0
FHWA Chart Number	10
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.03
Entrance Loss Coefficient of Culvert Opening	0.4
Culvert Length (ft)	30.0
Invert Elevation at Downstream end of Culvert (ft)	1,764.0
Invert Elevation at Upstream end of Culvert (ft)	1,766.0
Culvert Slope (ft/ft)	0.0667
Starting Flow Rate (cfs)	850.0
Incremental Flow Rate (cfs)	5.0
Ending Flow Rate (cfs)	900.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
850.0	0.0	5.97	0.0	1.96	3.39	1.96	18.1
855.0	0.0	6.0	0.0	1.96	3.4	1.96	18.13
860.0	0.0	6.04	0.0	1.97	3.42	1.97	18.17
865.0	0.0	6.07	0.0	1.98	3.43	1.98	18.21
870.0	0.0	6.11	0.0	1.99	3.44	1.99	18.25
875.0	0.0	6.14	0.0	1.99	3.46	1.99	18.29
880.0	0.0	6.18	0.0	2.0	3.47	2.0	18.32
885.0	0.0	6.21	0.0	2.01	3.48	2.01	18.36
890.0	0.0	6.25	0.0	2.02	3.5	2.02	18.4
895.0	0.0	6.29	0.0	2.02	3.51	2.02	18.43
900.0	0.0	6.32	0.0	2.03	3.52	2.03	18.47

Culvert ID No. 8

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	4.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	130.0
Invert Elevation at Downstream end of Culvert (ft)	1,760.5
Invert Elevation at Upstream end of Culvert (ft)	1,764.0
Culvert Slope (ft/ft)	0.0269
Starting Flow Rate (cfs)	100.0
Incremental Flow Rate (cfs)	2.0
Ending Flow Rate (cfs)	122.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
100.0	0.0	5.12	0.0	2.66	3.03	2.66	11.25
102.0	0.0	5.2	0.0	2.7	3.06	2.7	11.29
104.0	0.0	5.3	0.0	2.74	3.09	2.74	11.32
106.0	0.0	5.4	0.0	2.78	3.12	2.78	11.36
108.0	0.0	5.51	0.0	2.82	3.14	2.82	11.4
110.0	0.0	5.61	0.0	2.86	3.17	2.86	11.43
112.0	0.0	5.72	0.0	2.9	3.2	2.9	11.46
114.0	0.0	5.83	0.0	2.95	3.22	2.95	11.49
116.0	0.0	5.94	0.0	2.99	3.25	2.99	11.51
118.0	0.0	6.05	0.0	3.03	3.27	3.03	11.54
120.0	0.0	6.16	0.0	3.08	3.3	3.08	11.55
122.0	0.0	6.28	0.0	3.13	3.32	3.13	11.56

Culvert ID No. 9

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	7.5
Culvert Rise (ft)	3.33
FHWA Chart Number	10
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.4
Culvert Length (ft)	160.0
Invert Elevation at Downstream end of Culvert (ft)	1,752.0
Invert Elevation at Upstream end of Culvert (ft)	1,755.0
Culvert Slope (ft/ft)	0.0188
Starting Flow Rate (cfs)	205.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	215.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
205.0	0.0	5.13	0.0	1.61	2.85	1.61	16.96
206.0	0.0	5.15	0.0	1.62	2.86	1.62	16.99
207.0	0.0	5.18	0.0	1.62	2.87	1.62	17.01
208.0	0.0	5.2	0.0	1.63	2.88	1.63	17.04
209.0	0.0	5.23	0.0	1.63	2.89	1.63	17.06
210.0	0.0	5.25	0.0	1.64	2.9	1.64	17.09
211.0	0.0	5.28	0.0	1.64	2.91	1.64	17.11
212.0	0.0	5.3	0.0	1.65	2.92	1.65	17.14
213.0	0.0	5.33	0.0	1.65	2.93	1.65	17.17
214.0	0.0	5.35	0.0	1.66	2.94	1.66	17.19
215.0	0.0	5.38	0.0	1.67	2.94	1.67	17.21

Culvert ID No. 10

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	70.0
Invert Elevation at Downstream end of Culvert (ft)	1,723.7
Invert Elevation at Upstream end of Culvert (ft)	1,725.5
Culvert Slope (ft/ft)	0.0257
Starting Flow Rate (cfs)	50.0
Incremental Flow Rate (cfs)	0.5
Ending Flow Rate (cfs)	55.5
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
50.0	0.0	3.93	0.0	2.15	2.3	2.15	9.22
50.5	0.0	3.97	0.0	2.17	2.31	2.17	9.23
51.0	0.0	4.0	0.0	2.19	2.32	2.19	9.25
51.5	0.0	4.04	0.0	2.2	2.33	2.2	9.26
52.0	0.0	4.08	0.0	2.22	2.34	2.22	9.27
52.5	0.0	4.12	0.0	2.24	2.36	2.24	9.28
53.0	0.0	4.16	0.0	2.26	2.37	2.26	9.29
53.5	0.0	4.2	0.0	2.27	2.38	2.27	9.3
54.0	0.0	4.24	0.0	2.29	2.39	2.29	9.31
54.5	0.0	4.28	0.0	2.31	2.4	2.31	9.32
55.0	0.0	4.33	0.0	2.33	2.41	2.33	9.33
55.5	0.0	4.37	0.0	2.35	2.42	2.35	9.33

Culvert ID No. 11

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	1
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	1,814.0
Invert Elevation at Upstream end of Culvert (ft)	1,814.3
Culvert Slope (ft/ft)	0.006
Starting Flow Rate (cfs)	35.0
Incremental Flow Rate (cfs)	0.5
Ending Flow Rate (cfs)	43.5
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
35.0	0.0	6.27	3.84	2.0	1.92	2.0	11.14
35.5	0.0	6.42	3.9	2.0	1.92	2.0	11.3
36.0	0.0	6.56	3.96	2.0	1.93	2.0	11.46
36.5	0.0	6.71	4.03	2.0	1.93	2.0	11.62
37.0	0.0	6.85	4.1	2.0	1.94	2.0	11.78
37.5	0.0	7.0	4.16	2.0	1.94	2.0	11.94
38.0	0.0	7.16	4.23	2.0	1.94	2.0	12.1
38.5	0.0	7.31	4.3	2.0	1.94	2.0	12.25
39.0	0.0	7.47	4.37	2.0	1.95	2.0	12.41
39.5	0.0	7.63	4.43	2.0	1.95	2.0	12.57
40.0	0.0	7.79	4.51	2.0	1.95	2.0	12.73
40.5	0.0	7.95	4.58	2.0	1.95	2.0	12.89
41.0	0.0	8.11	4.65	2.0	1.96	2.0	13.05
41.5	0.0	8.28	4.73	2.0	1.96	2.0	13.21
42.0	0.0	8.45	4.8	2.0	1.96	2.0	13.37
42.5	0.0	8.62	4.88	2.0	1.96	2.0	13.53
43.0	0.0	8.79	4.95	2.0	1.96	2.0	13.69
43.5	0.0	8.96	5.03	2.0	1.97	2.0	13.85

Culvert ID No. 12

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	4.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	55.0
Invert Elevation at Downstream end of Culvert (ft)	1,796.0
Invert Elevation at Upstream end of Culvert (ft)	1,797.5
Culvert Slope (ft/ft)	0.0273
Starting Flow Rate (cfs)	80.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	135.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
80.0	0.0	4.18	0.0	2.29	2.71	2.29	10.78
81.0	0.0	4.22	0.0	2.3	2.73	2.3	10.81
82.0	0.0	4.26	0.0	2.32	2.74	2.32	10.84
83.0	0.0	4.3	0.0	2.34	2.76	2.34	10.87
84.0	0.0	4.34	0.0	2.36	2.78	2.36	10.89
85.0	0.0	4.37	0.0	2.38	2.79	2.38	10.93
86.0	0.0	4.41	0.0	2.39	2.81	2.39	10.96
87.0	0.0	4.45	0.0	2.41	2.83	2.41	10.99
88.0	0.0	4.49	0.0	2.43	2.84	2.43	11.01
89.0	0.0	4.57	0.0	2.45	2.86	2.45	11.04
90.0	0.0	4.64	0.0	2.47	2.88	2.47	11.07
91.0	0.0	4.71	0.0	2.49	2.89	2.49	11.09
92.0	0.0	4.78	0.0	2.5	2.91	2.5	11.12
93.0	0.0	4.84	0.0	2.52	2.92	2.52	11.14
94.0	0.0	4.89	0.0	2.54	2.94	2.54	11.17
95.0	0.0	4.94	0.0	2.56	2.95	2.56	11.19
96.0	0.0	4.99	0.0	2.58	2.97	2.58	11.21
97.0	0.0	5.03	0.0	2.6	2.99	2.6	11.23
98.0	0.0	5.06	0.0	2.62	3.0	2.62	11.26
99.0	0.0	5.09	0.0	2.63	3.02	2.63	11.28
100.0	0.0	5.12	0.0	2.65	3.03	2.65	11.3
101.0	0.0	5.15	0.0	2.67	3.04	2.67	11.32

102.0	0.0	5.2	0.0	2.69	3.06	2.69	11.35
103.0	0.0	5.25	0.0	2.71	3.07	2.71	11.36
104.0	0.0	5.3	0.0	2.73	3.09	2.73	11.38
105.0	0.0	5.35	0.0	2.75	3.1	2.75	11.4
106.0	0.0	5.4	0.0	2.77	3.12	2.77	11.42
107.0	0.0	5.45	0.0	2.79	3.13	2.79	11.44
108.0	0.0	5.5	0.0	2.81	3.14	2.81	11.46
109.0	0.0	5.56	0.0	2.83	3.16	2.83	11.48
110.0	0.0	5.61	0.0	2.85	3.17	2.85	11.49
111.0	0.0	5.66	0.0	2.87	3.18	2.87	11.5
112.0	0.0	5.72	0.0	2.89	3.2	2.89	11.52
113.0	0.0	5.77	0.0	2.91	3.21	2.91	11.54
114.0	0.0	5.82	0.0	2.93	3.22	2.93	11.55
115.0	0.0	5.88	0.0	2.95	3.24	2.95	11.57
116.0	0.0	5.93	0.0	2.97	3.25	2.97	11.58
117.0	0.0	5.99	0.0	3.0	3.26	3.0	11.59
118.0	0.0	6.05	0.0	3.02	3.27	3.02	11.6
119.0	0.0	6.1	0.0	3.04	3.29	3.04	11.61
120.0	0.0	6.16	0.0	3.06	3.3	3.06	11.62
121.0	0.0	6.22	0.0	3.09	3.31	3.09	11.62
122.0	0.0	6.28	0.0	3.11	3.32	3.11	11.64
123.0	0.0	6.34	0.0	3.14	3.33	3.14	11.64
124.0	0.0	6.4	0.0	3.16	3.35	3.16	11.65
125.0	0.0	6.46	0.0	3.18	3.36	3.18	11.65
126.0	0.0	6.52	0.0	3.21	3.37	3.21	11.65
127.0	0.0	6.58	0.0	3.24	3.38	3.24	11.65
128.0	0.0	6.64	0.0	3.27	3.39	3.27	11.65
129.0	0.0	6.7	0.0	3.29	3.4	3.29	11.65
130.0	0.0	6.76	0.0	3.32	3.41	3.32	11.65
131.0	0.0	6.82	0.0	3.35	3.42	3.35	11.64
132.0	0.0	6.89	0.0	3.39	3.43	3.39	11.63
133.0	0.0	6.95	0.0	3.42	3.44	3.42	11.62
134.0	0.0	7.01	6.6	3.46	3.45	3.46	11.61
135.0	0.0	7.08	6.62	3.5	3.46	3.5	11.58

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Culvert ID No. 13

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	2.5
Culvert Rise (ft)	2.5
FHWA Chart Number	10
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.025
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	230.0
Invert Elevation at Downstream end of Culvert (ft)	1,798.0
Invert Elevation at Upstream end of Culvert (ft)	1,800.0
Culvert Slope (ft/ft)	0.0087
Starting Flow Rate (cfs)	70.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	80.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
70.0	0.0	6.67	0.0	2.5	2.5	2.5	11.2
71.0	0.0	6.8	0.0	2.5	2.5	2.5	11.36
72.0	0.0	6.94	0.0	2.5	2.5	2.5	11.52
73.0	0.0	7.08	0.0	2.5	2.5	2.5	11.68
74.0	0.0	7.22	0.0	2.5	2.5	2.5	11.84
75.0	0.0	7.36	0.0	2.5	2.5	2.5	12.0
76.0	0.0	7.51	0.0	2.5	2.5	2.5	12.16
77.0	0.0	7.66	0.0	2.5	2.5	2.5	12.32
78.0	0.0	7.8	0.0	2.5	2.5	2.5	12.48
79.0	0.0	7.96	0.0	2.5	2.5	2.5	12.64
80.0	0.0	8.11	0.0	2.5	2.5	2.5	12.8

Culvert ID No. 14

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.7
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	3
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.8
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	1,790.0
Invert Elevation at Upstream end of Culvert (ft)	1,792.0
Culvert Slope (ft/ft)	0.04
Starting Flow Rate (cfs)	20.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	37.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
20.0	0.0	2.31	0.0	1.13	1.48	1.13	8.8
21.0	0.0	2.39	0.0	1.16	1.52	1.16	8.91
22.0	0.0	2.47	0.0	1.19	1.56	1.19	9.02
23.0	0.0	2.56	0.0	1.22	1.6	1.22	9.12
24.0	0.0	2.64	0.0	1.25	1.63	1.25	9.22
25.0	0.0	2.72	0.0	1.28	1.67	1.28	9.32
26.0	0.0	2.8	0.0	1.31	1.7	1.31	9.41
27.0	0.0	2.88	0.0	1.34	1.73	1.34	9.5
28.0	0.0	2.96	0.0	1.37	1.77	1.37	9.59
29.0	0.0	3.04	0.0	1.4	1.8	1.4	9.67
30.0	0.0	3.12	0.0	1.43	1.83	1.43	9.75
31.0	0.0	3.2	0.0	1.46	1.86	1.46	9.83
32.0	0.0	3.28	0.0	1.49	1.89	1.49	9.91
33.0	0.0	3.37	0.0	1.52	1.92	1.52	9.97
34.0	0.0	3.5	0.0	1.54	1.95	1.54	10.05
35.0	0.0	3.61	0.0	1.57	1.98	1.57	10.11
36.0	0.0	3.7	0.0	1.6	2.01	1.6	10.18
37.0	0.0	3.76	0.0	1.63	2.03	1.63	10.24

Culvert ID No. 15

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 11, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	8.0
Culvert Rise (ft)	4.0
FHWA Chart Number	8
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.013
Entrance Loss Coefficient of Culvert Opening	0.4
Culvert Length (ft)	60.0
Invert Elevation at Downstream end of Culvert (ft)	1,789.5
Invert Elevation at Upstream end of Culvert (ft)	1,790.0
Culvert Slope (ft/ft)	0.0083
Starting Flow Rate (cfs)	175.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	185.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
175.0	0.0	3.96	0.0	1.81	2.46	1.81	12.09
176.0	0.0	3.97	0.0	1.82	2.47	1.82	12.11
177.0	0.0	3.99	0.0	1.82	2.48	1.82	12.13
178.0	0.0	4.0	0.0	1.83	2.49	1.83	12.15
179.0	0.0	4.02	0.0	1.84	2.5	1.84	12.17
180.0	0.0	4.03	0.0	1.85	2.51	1.85	12.19
181.0	0.0	4.05	0.0	1.85	2.52	1.85	12.21
182.0	0.0	4.07	0.0	1.86	2.52	1.86	12.24
183.0	0.0	4.08	0.0	1.87	2.53	1.87	12.26
184.0	0.0	4.1	0.0	1.87	2.54	1.87	12.28
185.0	0.0	4.11	0.0	1.88	2.55	1.88	12.3

Culvert ID No. 16

BOX CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Span (ft)	3.5
Culvert Rise (ft)	3.0
FHWA Chart Number	10
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	35.0
Invert Elevation at Downstream end of Culvert (ft)	1,791.5
Invert Elevation at Upstream end of Culvert (ft)	1,792.0
Culvert Slope (ft/ft)	0.0143
Starting Flow Rate (cfs)	100.0
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	110.0
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
100.0	0.0	5.75	4.3	3.0	2.94	3.0	9.52
101.0	0.0	5.82	4.34	3.0	2.96	3.0	9.62
102.0	0.0	5.89	4.38	3.0	2.98	3.0	9.71
103.0	0.0	5.96	4.42	3.0	3.0	3.0	9.81
104.0	0.0	6.03	0.0	3.0	3.0	3.0	9.9
105.0	0.0	6.1	0.0	3.0	3.0	3.0	10.0
106.0	0.0	6.17	0.0	3.0	3.0	3.0	10.1
107.0	0.0	6.24	0.0	3.0	3.0	3.0	10.19
108.0	0.0	6.32	0.0	3.0	3.0	3.0	10.29
109.0	0.0	6.39	0.0	3.0	3.0	3.0	10.38
110.0	0.0	6.46	0.0	3.0	3.0	3.0	10.48

Culvert ID No. 17

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

February 12, 2004

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	140.0
Invert Elevation at Downstream end of Culvert (ft)	1,798.0
Invert Elevation at Upstream end of Culvert (ft)	1,798.8
Culvert Slope (ft/ft)	0.0057
Starting Flow Rate (cfs)	90.0
Incremental Flow Rate (cfs)	0.5
Ending Flow Rate (cfs)	98.5
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	0.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
90.0	0.0	8.21	12.09	3.0	2.85	2.85	12.98
90.5	0.0	8.27	12.2	3.0	2.85	2.85	13.05
91.0	0.0	8.34	12.32	3.0	2.85	2.85	13.11
91.5	0.0	8.41	12.43	3.0	2.86	2.86	13.18
92.0	0.0	8.48	12.54	3.0	2.86	2.86	13.24
92.5	0.0	8.55	12.66	3.0	2.86	2.86	13.31
93.0	0.0	8.62	12.78	3.0	2.86	2.86	13.37
93.5	0.0	8.69	12.89	3.0	2.87	2.87	13.44
94.0	0.0	8.76	13.0	3.0	2.87	2.87	13.51
94.5	0.0	8.84	13.13	3.0	2.87	2.87	13.57
95.0	0.0	8.91	13.24	3.0	2.87	2.87	13.64
95.5	0.0	8.98	13.36	3.0	2.88	2.88	13.7
96.0	0.0	9.05	13.48	3.0	2.88	2.88	13.77
96.5	0.0	9.13	13.6	3.0	2.88	2.88	13.84
97.0	0.0	9.2	13.72	3.0	2.88	2.88	13.9
97.5	0.0	9.27	13.84	3.0	2.89	2.89	13.97
98.0	0.0	9.35	13.96	3.0	2.89	2.89	14.04
98.5	0.0	9.42	14.08	3.0	2.89	2.89	14.1

APPENDIX 4

Miscellaneous Technical Memorandums

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: October 2, 2003

RE: Stormwater Detention Potential on the Gibson Arroyo, Community of Ajo, Pima County, Arizona

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Computed Regulatory Flood Volumes

In order to provide a conservative estimate of flood runoff volume when assessing stormwater detention potential along the Gibson Arroyo in Ajo, Arizona, hydrologic parameters were taken from the Pima County Flood Peak Procedure, applying rainfall estimates derived using NOAA Atlas VIII data and procedures.

Consequently, the estimated regulatory (100-year) flood volume for the Gibson Arroyo at Sartillion Avenue (contributing watershed area = 1.7 square miles) was computed to be approximately 200 acre-feet. For a 10-year event, the flood volume for the Gibson Arroyo at Sartillion Avenue was extrapolated to be about 90 acre-feet. Accordingly, accounting for the potential for a piggyback storm to occur, the required storage volume would be 290 acre-feet, without consideration for freeboard, for an "online" stormwater facility along the Gibson Arroyo above Sartillion Avenue.

From a stormwater detention standpoint, a reasonable goal would be to throttle down the 100-year peak discharge so that the outflow from the detention facility would be equivalent to a 5-year peak discharge (extrapolated estimate = 700 cfs). Assuming that 3100 cfs is a reasonable estimate for the 100-year peak discharge, this would mean that, for "online" detention, a storage volume of approximately 154 acre-feet would be required for a stormwater detention facility along the Gibson Arroyo above Sartillion Avenue, and this is before consideration of a piggyback storm event and sedimentation accumulation in the stormwater detention facility. When these factors are included, the required storage volume is estimated to be about 230 acre-feet for an "online" stormwater detention facility along the Gibson Arroyo above Sartillion Avenue.

Stormwater Detention Facility Sizing

For "offline" detention, and given the same hydrologic conditions as assumed in the preceding paragraph, a storage volume of approximately 120 acre-feet would be required for a stormwater detention facility along the Gibson Arroyo above Sartillion Avenue, and this is before consideration of a piggyback storm event and sedimentation accumulation in the stormwater detention facility. When these factors are included, the required storage volume is estimated to be approximately 195 acre-feet for an "offline" stormwater detention facility along the Gibson Arroyo above Sartillion Avenue.

Such storage volumes exceed the Arizona Dam Safety threshold criteria for above-ground surface-water impoundment facilities (i.e., they become jurisdictional dams), which means that if a stormwater detention facility were to be constructed along the Gibson Arroyo, either it would have to be designed to exist below natural grade or it would have to be designed as a small dam—subject to dam criteria that would likely include consideration of 1/2 the Probable Maximum Flood (PMF) event, at a minimum, and the PMF at worst. In any case, the technical, environmental, regulatory, and social obstacles would be significant; and thus would be extremely difficult to overcome without substantial effort and monetary cost.

Preliminary Construction Costs—Online Stormwater Detention

Including land costs, excavation, inlet/outlet appurtenances, landscaping, and contingency factors of 1.3 and 1.2 for ancillary construction costs and engineering and project management, respectively, a very preliminary cost of **$5,327,923** has been estimated to construct an approximately 54-acre, 25-foot-deep geometrically square online stormwater detention facility with side-slopes of 4H:1V and a bottom slope of 0.5 percent containing 230 acre-feet of stormwater runoff emanating from the Gibson Arroyo. Such a cost makes stormwater detention along Gibson Arroyo essentially infeasible. Given this fact, property acquisition and diversion of the Gibson Arroyo northward offer a better economic and technical solution.

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: October 17, 2003

RE: Stormwater Detention Potential on 4 Southern Tributaries to Gibson Arroyo within the Community of Ajo, AZ

Setting

During the July 29, 2003, storm and flood, there were two sources of flooding in Ajo, Arizona. The primary source of flooding was the Gibson Arroyo. A secondary source was the result of stormwater runoff emanating from southern tributaries to the Gibson Arroyo. Field reconnaissance and aerial photography reveals that there are four (4) locations where this southern-tributaries stormwater runoff could be detained, for subsequent release downstream in a much more controlled manner. The locations of the potential Stormwater Detention Facilities (SDF) are as follows:

1. SDF "A". The land where this potential SDF is located lies immediately south of State Highway 85, approximately 275 feet west of Saguaro Road. SDF No. 1 is a vacant parcel of land. It has a potential surface area approximately that is approximately 1.0 acre in size. The contributing watershed area for SDF "A" is 31.6 acres.

2. SDF "B". The land where this potential SDF is located lies more or less at the northwest corner of the intersection of Saguaro Road and West Morondo Avenue. SDF No. 2 also is a vacant parcel of land. It has a potential surface area that is approximately 1.8 acres in size. The contributing watershed area for SDF "B" is 54.7 acres.

3. SDF "C". The land where this potential SDF is located lies at the southeast corner of the intersection of Saguaro Road and West Esperanza Avenue. SDF No. 3 is a vacant parcel of land. It has a potential surface area that is approximately 0.75 acres in size. The contributing watershed area for SDF "C" is 17.6 acres.

4. SDF No. "D". The land where this potential SDF is located lies immediately west of Orilla Avenue, approximately 200 feet south of West Esperanza Avenue. SDF No. 4 is the site of an old, abandoned athletic field. It has a potential surface area that is approximately 2.65 acres in size. The contributing watershed area for SDF "D" is 125.4 acres.

Computed Regulatory Peaks and Flood Volumes

In order to provide a conservative estimate of flood runoff volume when assessing stormwater detention potential for the four (4) southern tributaries on the Gibson Arroyo in Ajo, Arizona, contributing watershed areas were computed at each of the four potential (4) SDF locations, and hydrologic parameters were taken from the Pima County Flood Peak Procedure, applying rainfall estimates derived using NOAA Atlas VIII data and procedures. Consequently, the estimated regulatory (100-year) flood volumes for the four (4) southern tributaries were computed to be as follows.

Stormwater Detention Facility ID	Regulatory [100-year] Peak* (cfs)	Regulatory [100-Year] Flood Volume* (acre-feet)
SDF "A"	215	6.29 acre-feet
SDF "B"	319	9.97 acre-feet
SDF "C"	115	3.24 acre-feet
SDF "D"	631	22.98 acre-feet

*Note: Where applicable, the preceding flood peaks and flood volumes are based upon future watershed conditions.

For a 10-year event, the flood volumes for Tributaries A, B, C, and D were extrapolated to be about 2.83 acre-feet, 4.49 acre-feet, 1.46 acre-feet, and 10.34 acre-feet, respectively.

Stormwater Detention Facility Sizing

From a stormwater detention standpoint, a reasonable goal would be to throttle down the 100-year peak discharges emanating from these four (4) southern tributaries so that the outflow from the detention facilities would be equivalent to a 5-year peak discharge (extrapolated estimates = 49 cfs, 72 cfs, 26 cfs, and 142 cfs for Tributaries A, B, C, and D, respectively). Assuming that the values presented in the preceding table are reasonable estimates for the 100-year peak discharge, this would mean that, for "online" detention, storage volumes of approximately 4.86 acre-feet, 7.72 acre-feet, 2.51 acre-feet, and 17.81 acre-feet would be required for stormwater detention facilities on Tributaries A, B, C, and D, respectively, and this is before consideration of a piggyback storm event and sedimentation accumulation in the stormwater detention facility. When these factors are included, the required storage volumes are estimated to be about 7.29 acre-feet, 11.58 acre-feet, 3.77 acre-feet, and 26.72 acre-feet, for "online" stormwater detention facilities located on Tributaries A, B, C, and D, respectively.

Due to the highly urban nature of the land uses located adjacent to and nearby the four (4) identified SDF sites for Tributaries A, B, C, and D, the potential to effectuate meaningful flood peak reduction via "offline" detention is less feasible than it is along the much larger Gibson Arroyo watershed. Nevertheless, assuming that "offline" detention were employed, and given the same hydrologic conditions as assumed in the preceding paragraph, storage volumes of approximately 6.20 acre-feet, 9.84 acre-feet, 3.20 acre-feet, and 22.71 acre-feet would be required for Tributaries A, B, C, and D, respectively. These latter storage volumes include consideration for a piggyback storm event and sedimentation accumulation in the stormwater detention facilities.

Given the estimated surface areas available for SDFs on Tributaries A, B, C, and D, it appears that, based upon very preliminary/approximate estimates, if each of the four (4) SDF facilities were designed to function as "online" facilities, with 4:1V side-slopes and bottom slopes of 0.5 percent, SDF "A" would have to be about 14 feet deep, SDF "B" would have to be about 10 feet deep, SDF "C" would have to be about 8 feet deep, and SDF "D" would have to be about 13 feet deep. These depths, while significant, are not so extreme as to preclude stormwater detention at each of the four (4) identified locations—especially if some of the required depth were accommodated via the construction of aboveground levees. A key issue, however, will be identifying a suitable outfall location for detained discharge emanating from each of the four (4) identified SDFs.

Preliminary Construction Costs—Stormwater Detention

Provided below is a very preliminary estimate of the cost to construct a stormwater detention facility—including land costs, excavation, inlet/outlet appurtenances, landscaping, and contingency factors of 1.3 and 1.2 for ancillary construction costs and engineering and project management, respectively—for each of the four (4) SDFs referenced above:

SDF "A":	$155,688
SDF "B":	$241,591
SDF "C":	$ 94,703
SDF "D":	$474,691
Total Cost:	**$966,673**

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: November 3, 2003

RE: Channel Diversion Potential along the Gibson Arroyo, Community of Ajo, Pima County, Arizona

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Background

In a previous Technical Memorandum, dated October 2, 2003, Tetra Tech documented results of an evaluation of stormwater detention along the Gibson Arroyo as the primary means of protecting the urban area of Ajo from future flooding and flood damage of the magnitude that occurred on July 29, 2003. The results of that evaluation indicate that about 230 acre-feet of storage would be required for an "online" stormwater detention facility along the Gibson Arroyo at a location above Sartillion Avenue. In addition, a preliminary cost of **$5,327,923** has been estimated to construct such a facility, including land costs, excavation, inlet/outlet appurtenances, landscaping, engineering, and project management. Practicably speaking, such a cost makes stormwater detention along Gibson Arroyo infeasible. Furthermore, Tetra Tech concluded that, to construct such a facility, technical, environmental, regulatory, and social obstacles would be significant, and thus would be extremely difficult to overcome without added effort and monetary cost.

Channel Diversion Potential

Given the preceding, in the hopes of offering a better solution to flood mitigation, especially from an economic standpoint, Tetra Tech evaluated the potential to acquire private properties and divert the Gibson Arroyo northward around the urban area of Ajo. The diversion would consist of a constructed, earthen channel. A preliminary alignment for the diversion channel is depicted on Page 2, and a detail of the potential diversion point is depicted on Page 3, of this Technical Memorandum.

The preliminary alignment for the proposed diversion of the Gibson Arroyo, as depicted on the following pages, would have an approximate length of 7200 feet. The channel constructed along the diversion alignment would be earthen, would be 8 feet deep, would have a bottom-width of 40 feet and a top-width of 88 feet, and would have side-slopes of 3H:1V. The longitudinal slope along the bed of the diversion alignment would average approximately 2 percent. If 20-foot-wide access and maintenance roads were provided along each channel bank, the total width of right-of-way required along the diversion channel would be 128 feet. However, to be safe, and account for the potential of some lateral movement of the channel banks, a right-of-way width of 150 feet was chosen for preliminary cost-estimating purposes.

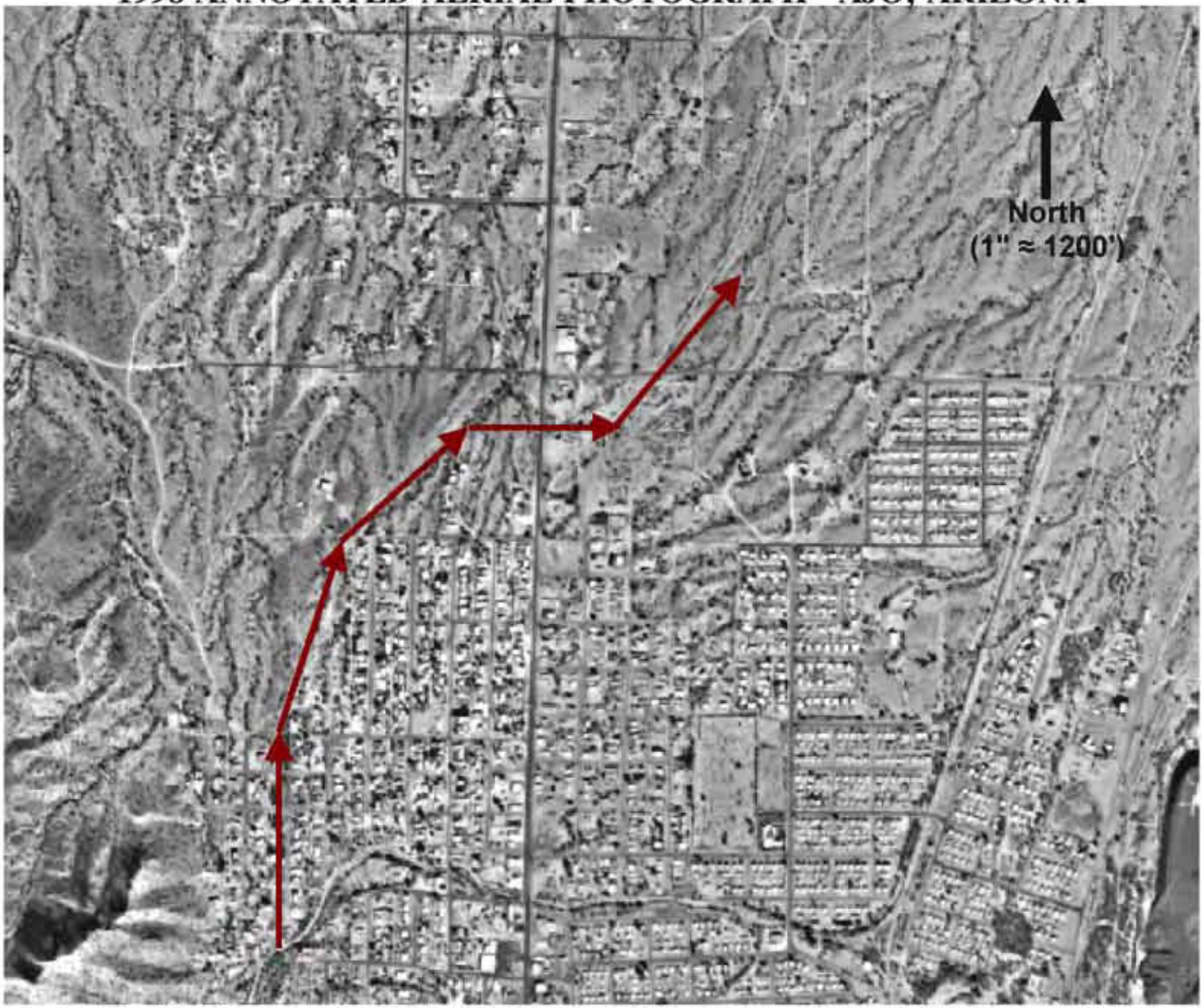
Preliminary Construction Costs

Using the preliminary configuration described in the preceding paragraph, and as graphically depicted on the following pages, it is roughly estimated that (1) about $827,521 worth of property would have to be acquired, which cost estimate includes acquisition of about 23 properties, 4 with structures, and right-of-way for a diversion channel along and to the west of Lyons Ave.; (2) about $129,600 would be required for a structure to provide 100-year, all-weather access across the diversion channel (tentatively at Childs Street); and (3) approximately $762,665 would be required to construct the diversion channel, which cost estimate includes a contingency for attendant stabilization measures, if and where warranted. Therefore, after including contingency factors of 1.30 and 1.20 for ancillary construction costs and engineering and project management, respectively, the total cost for the diversion-channel option is roughly estimated to be **$2,682,866.** It is noted that this dollar amount is nearly 50 percent less than what would be the cost if stormwater detention measures were used for mitigation of flood-damage potential along the Gibson Arroyo in the urban area of Ajo.

Environmental Considerations

A critical issue related to diversion of the Gibson Arroyo is the associated environmental implications. In particular, diversion of existing flow along another channel alignment may cause some concern related to the 404 Permitting process, especially impacts to riparian habitat along the existing Gibson Arroyo.

1998 ANNOTATED AERIAL PHOTOGRAPH—AJO, ARIZONA



Note: The Arrows Indicate Potential Diversion of Gibson Arroyo Around Urban Area of Ajo

Detail of 1998 Annotated Aerial Photograph—Ajo, Arizona

Possible Flow Diversion Point at Lyons Ave. along the Gibson Arroyo

TECHNICAL MEMORANDUM

TO: Project File (PAZ-PDOT.020, W.O. No. 1)

FROM: Michael E. Zeller, P.E., P.H.

DATE: November 6, 2003

RE: Guidelines for Preparing Preliminary Cost Estimates for Flood Mitigation Measures in Ajo, Arizona

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The following guidelines were used in order to prepare preliminary cost estimates for flood mitigation measures in Ajo, Arizona:

Unit Costs

Land costs. $25,000 per acre for vacant land not subject to easements, restrictions, or natural hazards, and $10,000 per acre for floodprone lands (assuming some portion developable). Value of improved lands is based upon full cash value, per Pima County Assessor's Office, times an adjustment factor of 1.50 to account for market value.

Excavation Costs. Normally $3.00 per cubic yard for diversion channel excavation and excavation of stormwater detention facilities (based upon flood-storage-volume requirements)—this assumes minimal to no haul costs. For short hauls, use $5.00 per cubic yard. For long hauls, use $7.00 per cubic yard.

(Assume that all hauls in Ajo will be short hauls.)

Culvert Costs. $40 per square foot of surface area for an RCBC structure.

Inflow/outflow Structures (Tributaries to Gibson Arroyo). $3000 $\sqrt{Q_{out}}$.

Outflow structure (Gibson Arroyo Stormwater Detention Facility). $40 per square foot of surface area for an RCBC structure.

Landscaping (Stormwater Detention Facilities). $10,000 per acre.

Contingency Factor. At this very preliminary stage, a factor of 1.3 was applied to base costs to account for ancillary costs associated with the diversion channel for Gibson Arroyo and for stormwater detention facilities. A factor of 1.2 was also applied to base costs to account for the added costs associated with Engineering and Management services.

Specific Cost Calculations (to the Nearest Whole Dollar)

Four (4) tributary stormwater detention facilities

SDF "A" = 1.3 x 1.2 x [$10,000 x 1.0 acres (surface area)+$10,000 x 1.0 acres (landscaping)+ $5.00 x 11,760 cu. yd. (≈ 7.29 acre-feet) + $3000 $\sqrt{49}$].

= $155,688.00.

SDF "B" = 1.3 x 1.2 x [$10,000 x 1.8 acres (surface area)+$10,000 x 1.8 acres (landscaping)+ $5.00 x 18,682 cu. yd. (≈ 11.58 acre-feet) + $3000 $\sqrt{72}$].

= $241,591.00.

SDF "C" = 1.3 x 1.2 x [$10,000 x 0.75 acres (surface area)+$10,000 x 0.75 acres (landscaping)+ $5.00 x 6,082 cu. yd. (≈ 3.77 acre-feet) + $3000 $\sqrt{26}$].

= $94,703.00.

SDF "D" = 1.3 x 1.2 x [$10,000 x 2.65 acres (surface area)+$10,000 x 2.65 acres (landscaping)+ $5.00 x 43,108 cu. yd. (≈ 26.72 acre-feet) + $3000 $\sqrt{142}$].

= $474,691.00.

Gibson Arroyo Stormwater Detention Facility

GA SDF = 1.3 x 1.2 x [$10,000 x 54 acres (surface area)+$10,000 x 54 acres (landscaping)+ $5.00 x 371,067 cu. yd. (≈ 230 acre-feet) +$40 x 12 x 1000 (for 10' by 4' RCBC outfall for @700 cfs].

= $5,327,923.

Gibson Arroyo Diversion Channel

GA DC = 1.3 x 1.2 x [$469,521 (land costs along 1700 feet of Lyons Ave., with improved properties) + $20,000 x 17.90 acres (150' x 5200', the remaining length and width of channel diversion) + $129,600 (90' by 36' RCBC 100-year crossing at Childs Street) + $5.00 x 136,533 cu. yd. (channel excavation) + $80,000 contingencies (channel stabilization]. No landscaping.

= $2,682,866.

Ajo Flood Investigation Follow-up
September 17, 2003

- Ron Metsch at 200 E. Second Ave. had a rain gauge estimate of 2.5" in 1.5 hours. Mr. Metsch can be reached (520) 387-6158.

Photo number 1 is looking north downstream across First Ave. of tributary flow coming from behind the Ajo High School.

- I met with Francisca Sandoval at 701 W. Solano Avenue. Mrs. Sandoval's house (which has a basement) was flooded from flows entering the property from the west. I advised Mrs. Sandoval on making sure she cleans up the mold within the basement and also recommended her to install a flow path to convey water through the property rather than fighting the runoff at property boundaries. Numerous improvements at the fence line along the west side of the property indicated many years of fighting the runoff. The alley system to the south side of the Sandoval's appears to have been a collector of runoff, which helped convey more flow towards the Sandoval property. The alignment of the alley is such that it does not appear to be likely to be able to use that alignment for the capture and conveyance of flow due to elevation and utility conflicts. Judging by the terrain on the bend of the State Highway further to the north and west of the Sandoval property it does not appear as though the majority or any of the flows originated from the Gibson Arroyo. The source of the runoff is not from the two southern tributaries either.

Photograph number 2 is taken looking east down the
Gibson Arroyo at the intersection of Cholla and Sahuaro.

- A significant portion of the right overbank of the Gibson Arroyo flowed across the embankment at this location (Photo 2). Debris in the left overbank indicated the flow was between one to two feet deep. This flow joined with flow further to the south from that portion of the flood that weir flowed over the State Highway. Those overbank flows contributed to runoff down Palo Verde Street.

  Any employee from the Arizona Water Company informed me that there was a significant amount of debris that clogged the State highway box culvert for the Gibson Arroyo. That blockage was the main contributor to the breakout of flow to the south. In addition he said that pre-storm sediment within the culvert was such that you had to duck to walk underneath it. He estimated it had about a 5-foot clearance. The day after the storm the State Highway Department was in and was using a Bobcat to clean out the wash. Photograph number 3 is of the three-cell box culvert. The dimensions of the box culvert are approximately 10 x 8. The water company employee informed me that the water level was up to 2 feet on their maintenance shop.

Photograph number 3 is of the three-cell box culvert.
The dimensions of the box culvert are approximately 10 x 8 feet.

- I met with Mr. Smith who is lives at 1410 W. Clymer. His phone number is (520) 387-6856. His main concerns were with recreational vehicles up and down the wash and the breakout flow that occurred around his house.

  I gave Mr. Smith some advice as to how to work with the drainage on his property. I also indicated I would mail out a photograph of his property, the copy of the off-road vehicle ordinance, and a floodplain use permit application.

- Two photographs were taken of the flow path that broke out across the old Ben Franklin parking lot from the Gibson Arroyo. The photographs were looking towards the northwest.

- A good majority of the left overbank flow downstream of the State Highway crossing for the Gibson Arroyo appears to be uncaptured by a drainage ditch located along the north side of Ocotillo Avenue. The next two photographs indicate the high water marks going to the pedestrian crossing going to each lot. Flow depths down this street on various lots outside of the drainage ditch indicates that flows through properties average between 6” and 1’ in depth around the intersection of Ocotillo and Perro De Nieve.

- The drainage ditch along the north side of Ocotillo turns to the north just west of Tierra Street and crosses along the north side of the Presbyterian Church after it crosses Palo Verde Boulevard. The next photo shows the upstream side of the dip crossing at Palo Verde. The debris line on the fence indicates that the fence collapsed within the main channel however the depth of flow within the major vegetation to the right of the fence line indicates flow depths were approximately 2 feet. This flow along with the Gibson Arroyo confluence flow appears to have inundated most of the Presbyterian Church property.

- The northern parking area for the Ajo Ambulance Company, the concrete slab on which they wash they ambulances, was barely inundated and should be considered the limit to the breakout flow to the south. There is some evidence that the railroad tracks were overtopped adjacent to the concrete walkway maintained by Pima County. The next photograph is showing the

walkway and the point where the water may have crossed through the railroad ties. The next photo is taken looking downstream in a County maintained drainage easement that is dedicated by plat. The area just upstream of the pedestrian crossing adjacent to the ambulance company needs to be cleaned.

This area seems to be the confluence between the southern watershed and the Pima County maintained drainage ditch underneath the pedestrian easement. The southern breakout flows of the Gibson Arroyo associate with those flows going around the western leg of the railroad extension, and flows coming from the Ajo Town center.

- One of the issues brought up in a letter to Supervisor Bronson was the condition of the Gibson Arroyo downstream of the 2nd Avenue box culvert. The next photograph shows a picture looking upstream towards the 2nd Avenue bridge from a point about 250 to 300 feet downstream the bridge. There seems to be one area where the channel capacity is reduced. This area along with a sandbar just downstream of the bridge located on the left side of the next photograph could be removed and channel capacity increased.

  However, starting at a point approximately 80 feet north of the next northern alley alignment lies an area with bedrock encroachment into the channel. The channel bottom width in this area is approximately 20 to 25 feet in width with the embankment on the west side being approximately 4 to 4.5 feet high and the railroad trestle to the east. The bedrock will severely limit the ability to increase channel capacity. It should be noted that it appears as though the Gibson Arroyo did cross the railroad tracks to the west north of 2nd Avenue but to a much lesser degree than upstream of 2nd Avenue. The next photograph the location of what appears to be a repaired water line crossing the Gibson Arroyo just downstream of one of the bedrock outcrops.

  From that repaired utility line going down the Gibson Arroyo to a point due east of the municipal swimming pool the channel capacity appears to be very adequate. Due east of the County pool is a split flow location for the Gibson Arroyo. One portion of the flow turns to the east and under a railroad trestle. Debris across this trestle indicates it was overtopped. The major flow path appears to travel parallel and west of the railroad going further to the north. This northern segment of the channel appears to have contained all the flow. No inspection was made of the railroad trestle crossing however erosion damage was noted on the approaches to the crossing.

  It appears as though a shallow drainage swale exists between railroad drive and the railroad crossing conveying flow to the north from approximately 2nd Avenue. Observations in the field indicate this drainage swale (a natural drainage swale) was inadequate to handle all the flows that crossed the railroad tracks north and south of the 2nd Avenue crossing. Virtually all of the fences for those properties fronting Railroad Avenue had debris lines to the north of 2nd Avenue varying in height from .5’ to 1’.

- The next photograph is looking northeast at a property at the northeast corner of Copper and 2nd. This is a transitional area for overbank flows of the Gibson Arroyo. Flows are inhibited from flowing further to the east at the dead end of 2nd Avenue by a utility line, which is elevated. It is my understanding talking to operations personnel that this utility line is a water line owned by Phelps Dodge that serves town. Flows tend to be directed down the Copper Street alignment. Properties on each side of Copper Street have had yard and potentially residential flooding to

varying degrees. One potential solution to the flows in this areas would be to find means in which to transition the runoff to the east underneath or through the utility line.

- Investigated the flooding problems at 411 W. Rocalla. The basement house at this location flooded. Mrs. Bustamante's son, Raul, informed me I could enter the property to assess the flood damages. The first photograph shows the neighbor's house which sits virtually on top of the wash. This house is adjacent to Mr. Leap's property who was earlier investigated with damages to a retaining wall. The bottom floor of the Bustamante's house is virtually at invert level. Flow depths outside the basement indicate water was against the structure to about a 3-foot height. Raul informed me that his mom is having respiratory problems. Mrs. Bustamante's house is upstream of a bridge on Talara Street. The top width of the bridge is approximately 21 feet. The next photograph shows looking upstream from the bridge on Talara Street on the left overbank is the Leap property. Notice the fallen retaining wall in the wash and the shed overhanging the wash.

- Write a letter to Clairmond Benjamin 111 W. 2nd Avenue Ajo, Arizona 85321. Recognize that the house had been flooded, mail out the flooded repair manual, and indicate that we are assessing our different options on what improvements need to be performed.

- I've noticed that flow broke to the north from McKinney Road out of the Gibson Arroyo towards 1st Avenue. It appears as though the flow depths along the eastern shoulder of McKinney Road indicate that waters were approximately 1 foot deep.

- On September 18, 2003 I met with Raymond Lockwood regarding the construction activity by private property owner located at the northwest corner of Sartillian Avenue and Clymer Street. Mr. Lockwood owns a property with an address of 1240 W. Brady. The individual at Clymer and Sartillian has excavated material from the Gibson Arroyo and is building pads into the channel bed. I informed Mr. Lockwood that our office is already on top of this situation and that we had already spoken to building codes and the County Attorney's office. I informed him I would look at having the fill encroachment into the wash removed.