

**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

**FCD 2000C030**

**TECHNICAL SECTION – VOLUME 2**

**HYDRAULIC ANALYSIS  
FINAL REPORT**

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



Prepared by:  
Stanley Consultants, Inc.  
2929 East Camelback Road, Suite 130  
Phoenix, Arizona 85016



A Stanley Group Company  
Engineering, Environmental and Construction Services - Worldwide

SCI Project #15586

November 2002

# SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN

FCD 2000C030

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Property of  
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Please Return to  
2801 W. Durango  
Phoenix, AZ 85009

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HYDRAULIC ANALYSIS**



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Scottsdale Road Corridor  
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- Appendix E, Exhibits, Figures and CD-ROM

CD-ROM:

HEC-RAS Models

- Existing Condition Flow – EXISTCONDREV01.F01
- Existing Condition Geometry – EXISTCONDREV01.G01
- Existing Condition Output – EXISTCONDREV01.O01
- Existing Condition Plan – EXISTCONDREV01.P01
- Existing Condition Project – EXISTCONDREV01.PRJ
  
- "With Recommended Alternative" Flow – PREFALTREV01.F01
- "With Recommended Alternative" Geometry – PREFALTREV01.G01
- "With Recommended Alternative" Output – PREFALTREV01.O01
- "With Recommended Alternative" Plan – PREFALTREV01.P01
- "With Recommended Alternative" Project – PREFALTREV01.PRJ

StormCAD Models

- 15% Cholla to Confl2<sup>nd</sup> Pipe, Preferred Alt, Rev01
- 15%, Airport Outfall Box
- 15%, Culvert Extension Shea to Sahuaro, 100yr
- 15%, Culvert Extension Shea to Sahuaro, 10yr
- 15%, Existing 60in, Preferred Alt, Rev01
- 15%, Sdale Road, Preferred Alt, Rev02
- 15%, Sunnyside to Cholla, Preferred Alt, Rev03
- Sdale Rd Rec Alt SD, FCD Criteria

Other Technical Section Volumes:

- Volume 1, Hydrology

## 1.0 INTRODUCTION

Hydraulic analysis was performed for the Scottsdale Road Corridor Drainage Master Plan at many locations to serve various aspects of the study objectives. The analysis covers hydraulic features such as open channels, culverts, storm drain systems and spillways. These features involve an extensive array of physical characteristics including configuration, size, lengths, slope, discharge and flow regime.

The objectives of the hydraulic analysis at each location in the study area essentially fall into two related categories:

- Support for the hydrologic models, and
- The evaluation of drainage and flooding problems.

A great deal of the hydraulic analysis for the Scottsdale Road Corridor Drainage Master Plan is contained in the Volume 1 "Hydrology Analysis" prepared by Stanley Consultants under separate cover. The hydraulic analysis contained in Volume 1 hydrology was generally done in support of the HEC-1 models contained in that document. This included hydraulics involving channel routing reaches, diversion steps and level pool routing. Please refer to Volume 1 Hydrology for the related documentation.

Typically, the level of hydraulics that is performed in support of hydrologic analysis is somewhat simple and will sometimes overlook the more complex hydraulic phenomenon. Hydraulics for routing reaches, for example, will typically involve a normal depth approach using an eight-point cross section. This is perfectly acceptable in a hydrologic sense and at many locations this approach will yield results that are adequate for simple hydraulic evaluation. Thus, hydraulics for many of the smaller conveyance features such as streets and some of the straight uniform channel reaches can be evaluated from the hydrologic models. However, normal depth channel routing hydraulics will generally tend to disregard the influence of culverts and other conveyance anomalies. For this reason, the hydraulic analysis contained in the hydrologic models should be used with caution when evaluating the potential for drainage and flooding problems.

The focus of the Volume 2 Hydraulic Analysis is different than that of the hydrologic analysis. Volume 2 is more of a pure hydraulic document that includes HEC-RAS backwater model, normal depth channel hydraulics and culvert hydraulics. The normal depth hydraulic analysis contained in Volume 2 is typically based on more detailed cross section data than what was used in the hydrology models. Volume 2 is aimed at assessing the hydraulic performance of the larger, more complex drainage features found in the Scottsdale Road Corridor Drainage Master Plan study area to determine their potential for drainage and flooding problems.

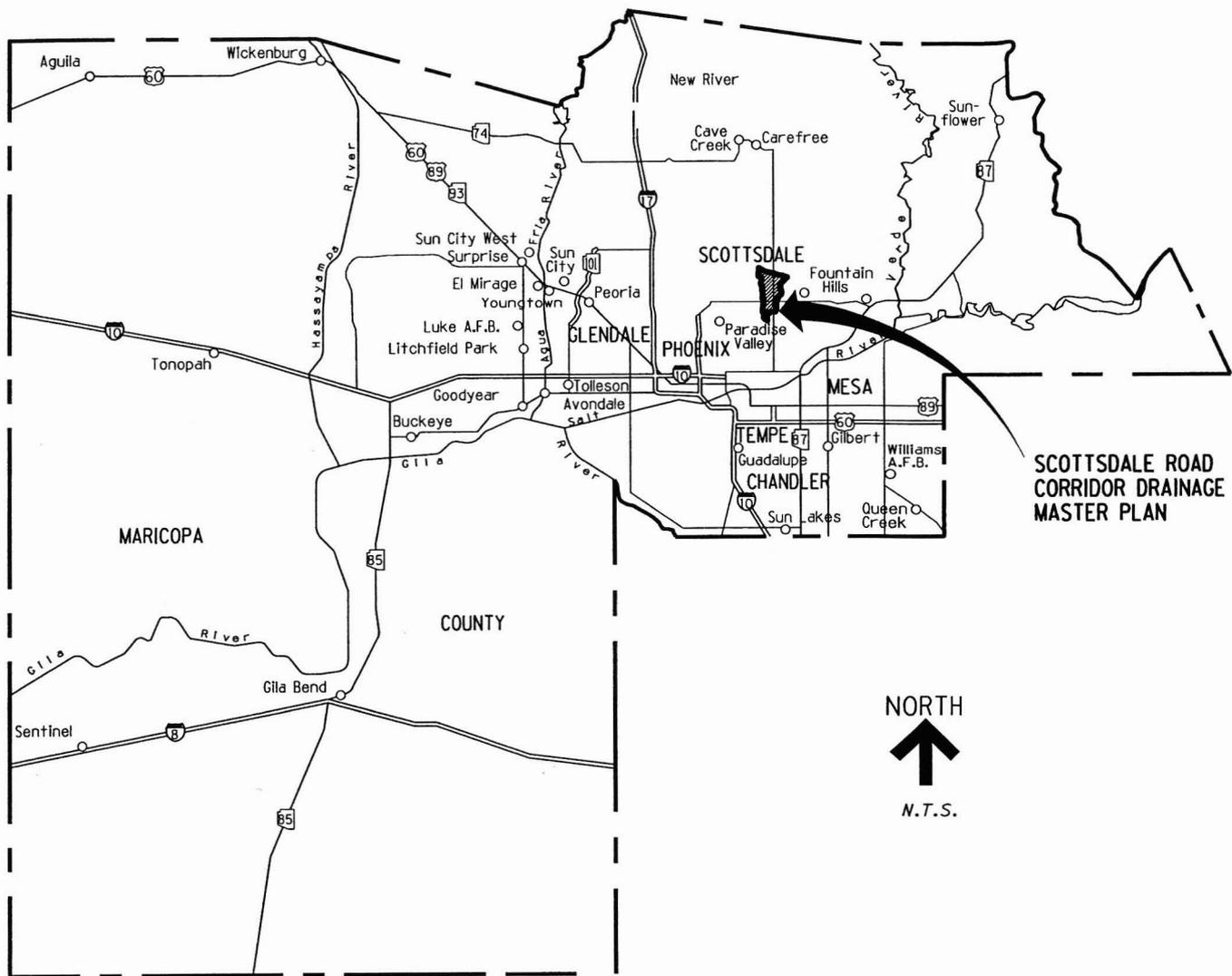
Discharges used in the Volume 2 hydraulic analysis were taken from Volume 1 hydrology. The hydraulic analysis documented here is intended to serve as a baseline existing condition evaluation. Existing condition hydraulics will be used as the basis for identifying drainage and flooding problems within the study area and to confirm the known historic drainage and flooding problem locations. The hydraulic analysis will also serve as the basis for the evaluation of drainage alternatives that will be developed later in the study.

The overall objectives of the Scottsdale Road Corridor Drainage Master Plan are to evaluate and alleviate drainage problems and flooding conditions in the study area. Originally, the focus area of the study was along the Scottsdale Road corridor from Mountain View Road on the south to Thunderbird Road on the north, including the 71<sup>st</sup> Street Channel. The focus area has since been expanded to cover the Berneil Ditch, one of the major stormwater corridors in the Town of Paradise Valley.

A complete description of the study background and objectives is contained in the existing conditions analysis of the final report prepared by Stanley Consultants (under separate cover). Both the existing conditions analysis and the Volume 1 Hydrology Analysis contain extensive descriptions of the study area's physical character as well as numerous references to and descriptions of relevant past drainage and hydrology studies. It is recommended that the above documents be read for a complete understanding of the Volume 2 Hydraulics Analysis report.

Study location and study area/vicinity maps (Figures 1 and 2) depicting the Scottsdale Road Corridor Drainage Master Plan study area are included on Pages 3 and 4 of this report. Figures 3 and 4 summarize the estimated existing condition 10- and 100-year (respectively) HEC-1 peak discharges from the Volume 1 hydrology report. Figures 5 and 6 summarize the "with recommended alternative" condition peak discharges.

In addition to these figures, there are two exhibits in Appendix E that are useful in understanding the overall physical nature of drainage and its conveyance in the Scottsdale Road Corridor Drainage Master Plan study area. Exhibit 1 is a composite of the USGS topography for the study area and Exhibit 2 shows the existing major drainage facilities found in the study area. Exhibit 2 was assembled for this study based on as-built drawings, quarter section maps, GIS data, past drainage studies and extensive field reconnaissance. These exhibits are the same as those found in the Volume 1 hydrology report.



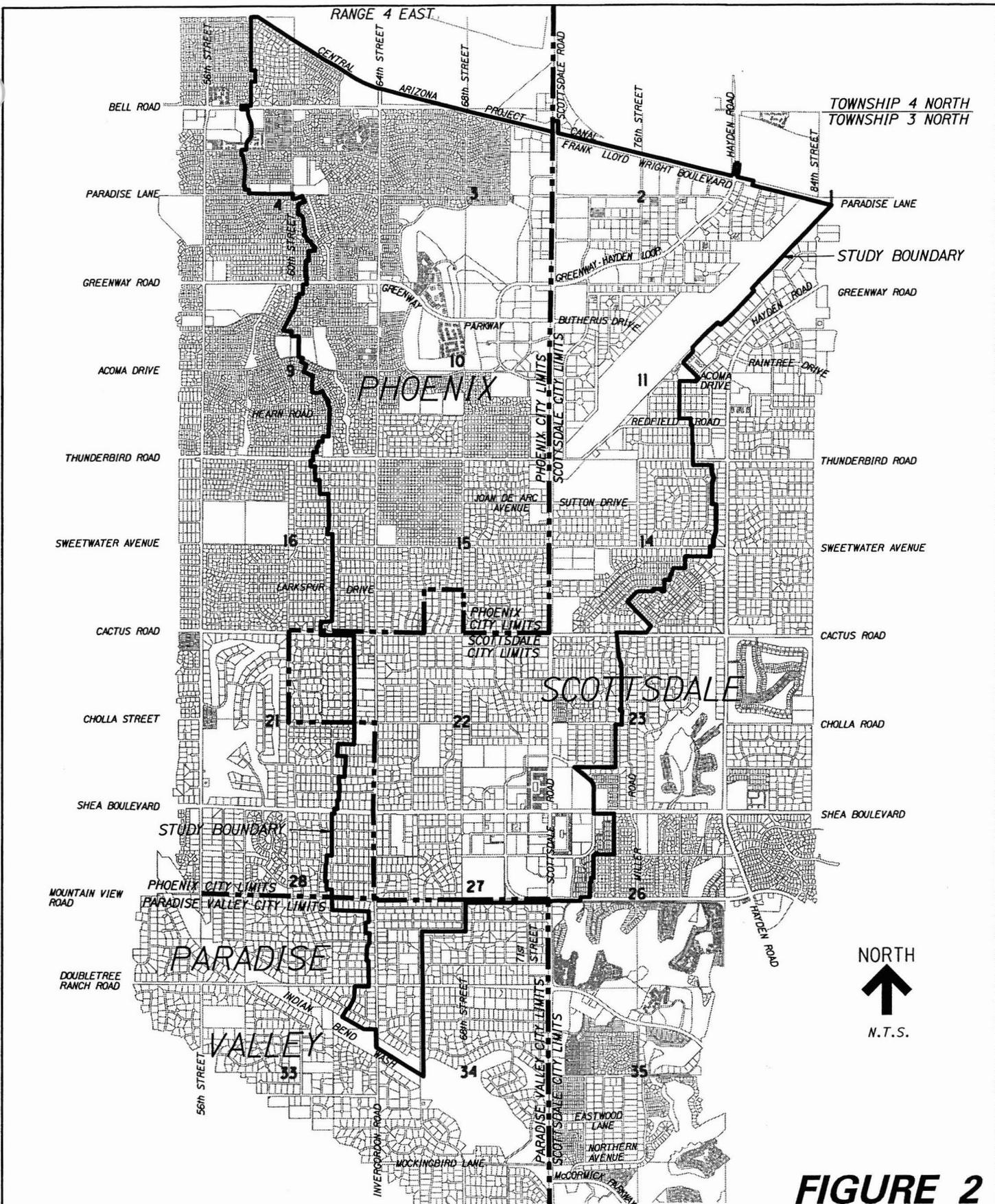
SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN



STUDY LOCATION MAP

**FIGURE 1**

 <b>Stanley Consultants</b> INC.	<b>SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN (FCD2000C030)</b>
	<small>A Stanley Group Company Engineering, Environmental and Construction Services - Worldwide</small>



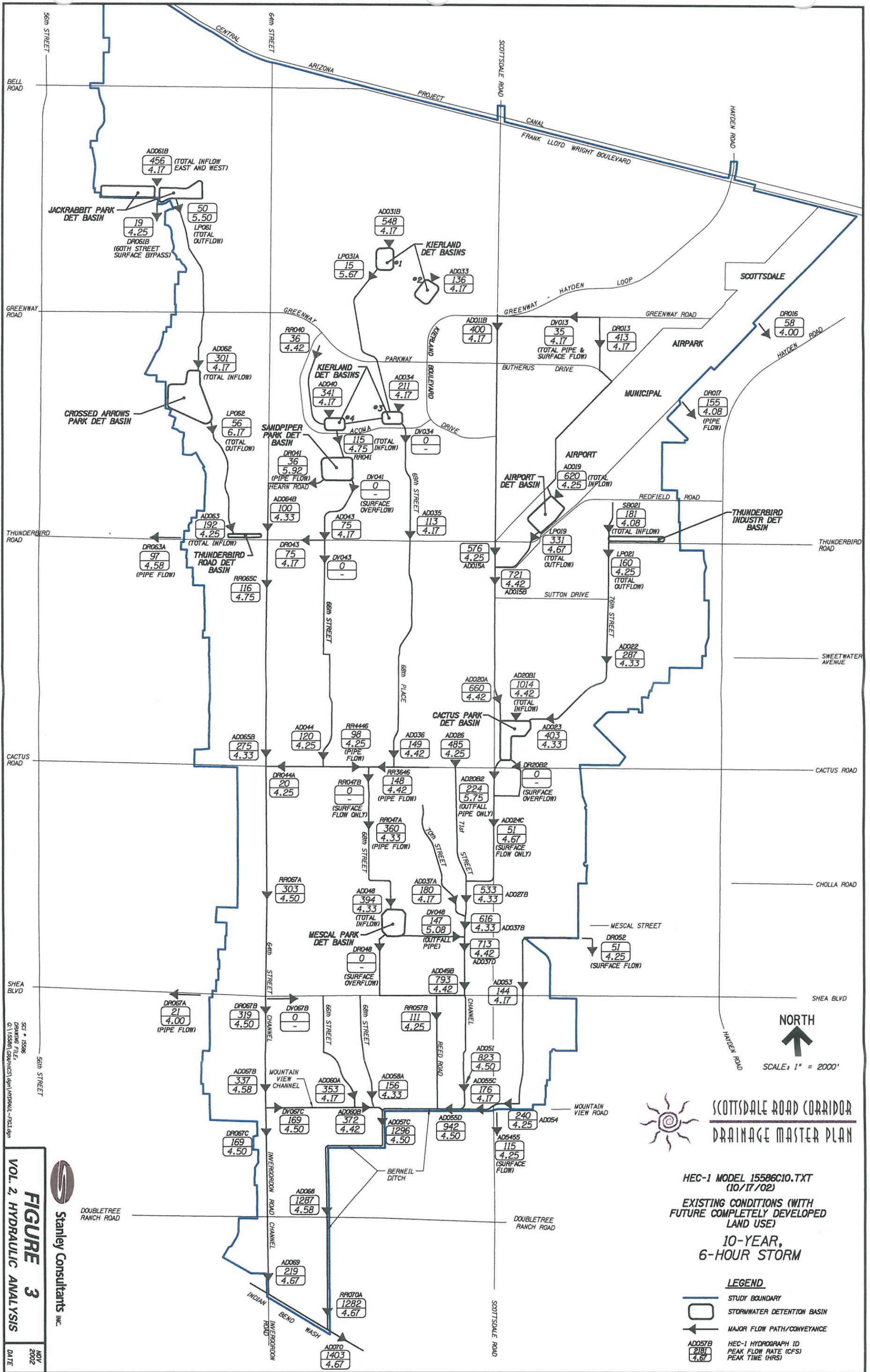
STUDY LIMITS  
AND VICINITY MAP

**FIGURE 2**

  
**Stanley Consultants** INC.

SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN  
 (FCD2000C030)

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**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-1 MODEL 15586C10.TXT  
(10/17/02)  
EXISTING CONDITIONS (WITH  
FUTURE COMPLETELY DEVELOPED  
LAND USE)  
10-YEAR,  
6-HOUR STORM

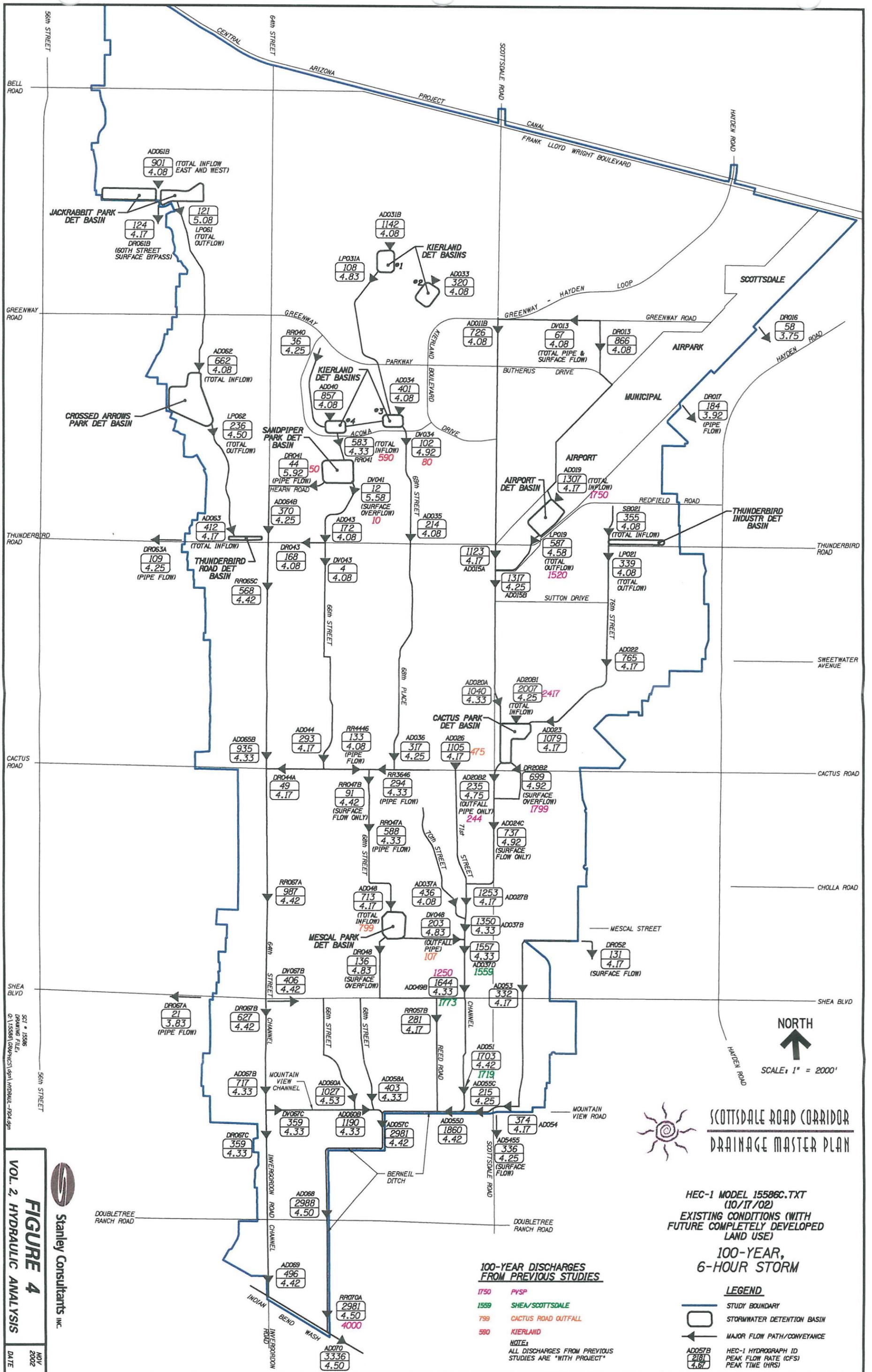
- LEGEND**
- STUDY BOUNDARY
  - STORMWATER DETENTION BASIN
  - MAJOR FLOW PATH/CONVEYANCE
  - HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)

SOI # 15586  
DRAWING FILE #  
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**FIGURE 3**  
VOL. 2, HYDRAULIC ANALYSIS

Stanley Consultants INC.

NOV 2002  
DATE



**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-1 MODEL 15586C.TXT  
(10/17/02)  
EXISTING CONDITIONS (WITH  
FUTURE COMPLETELY DEVELOPED  
LAND USE)

**100-YEAR,  
6-HOUR STORM**

**100-YEAR DISCHARGES  
FROM PREVIOUS STUDIES**

- 1750 PVSP
  - 1559 SHEAR/SCOTTSDALE
  - 799 CACTUS ROAD OUTFALL
  - 580 KIERLAND
- NOTE:  
ALL DISCHARGES FROM PREVIOUS  
STUDIES ARE "WITH PROJECT"

**LEGEND**

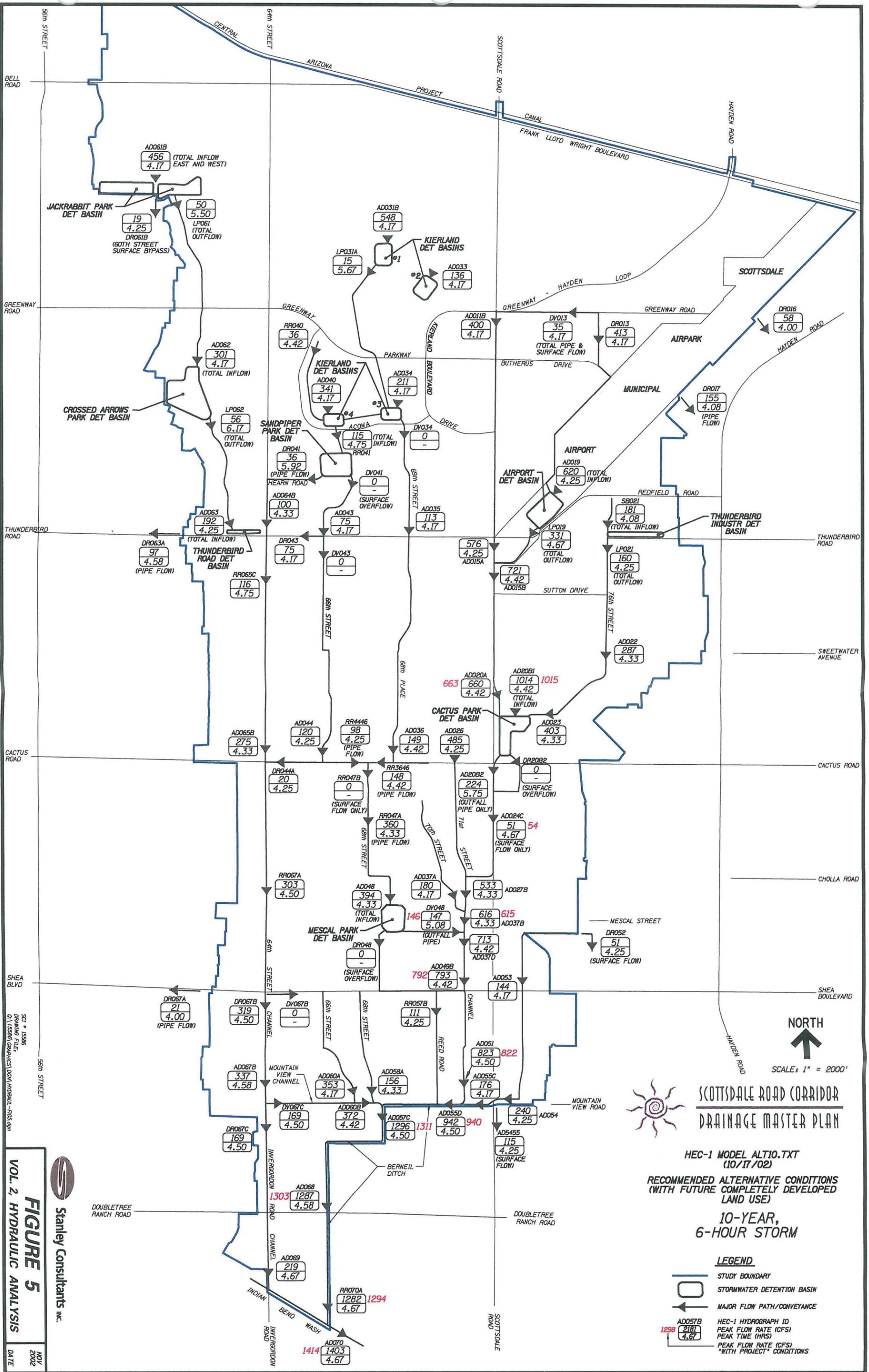
- STUDY BOUNDARY
- STORMWATER DETENTION BASIN
- MAJOR FLOW PATH/CONVEYANCE
- HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)

**Stanley Consultants Inc.**

**FIGURE 4**

**VOL. 2, HYDRAULIC ANALYSIS**

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**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-1 MODEL ALT10.TXT  
(10/17/02)  
RECOMMENDED ALTERNATIVE CONDITIONS  
(WITH FUTURE COMPLETELY DEVELOPED  
LAND USE)  
**10-YEAR,  
6-HOUR STORM**

- LEGEND**
- STUDY BOUNDARY
  - STORMWATER DETENTION BASIN
  - MAJOR FLOW PATH/CONVEYANCE
  - HEC-1 HYDROGRAPH ID
  - PEAK FLOW RATE (CFS)
  - PEAK TIME (HRS)
  - PEAK FLOW RATE (CFS)  
\*WITH PROJECT\* CONDITIONS

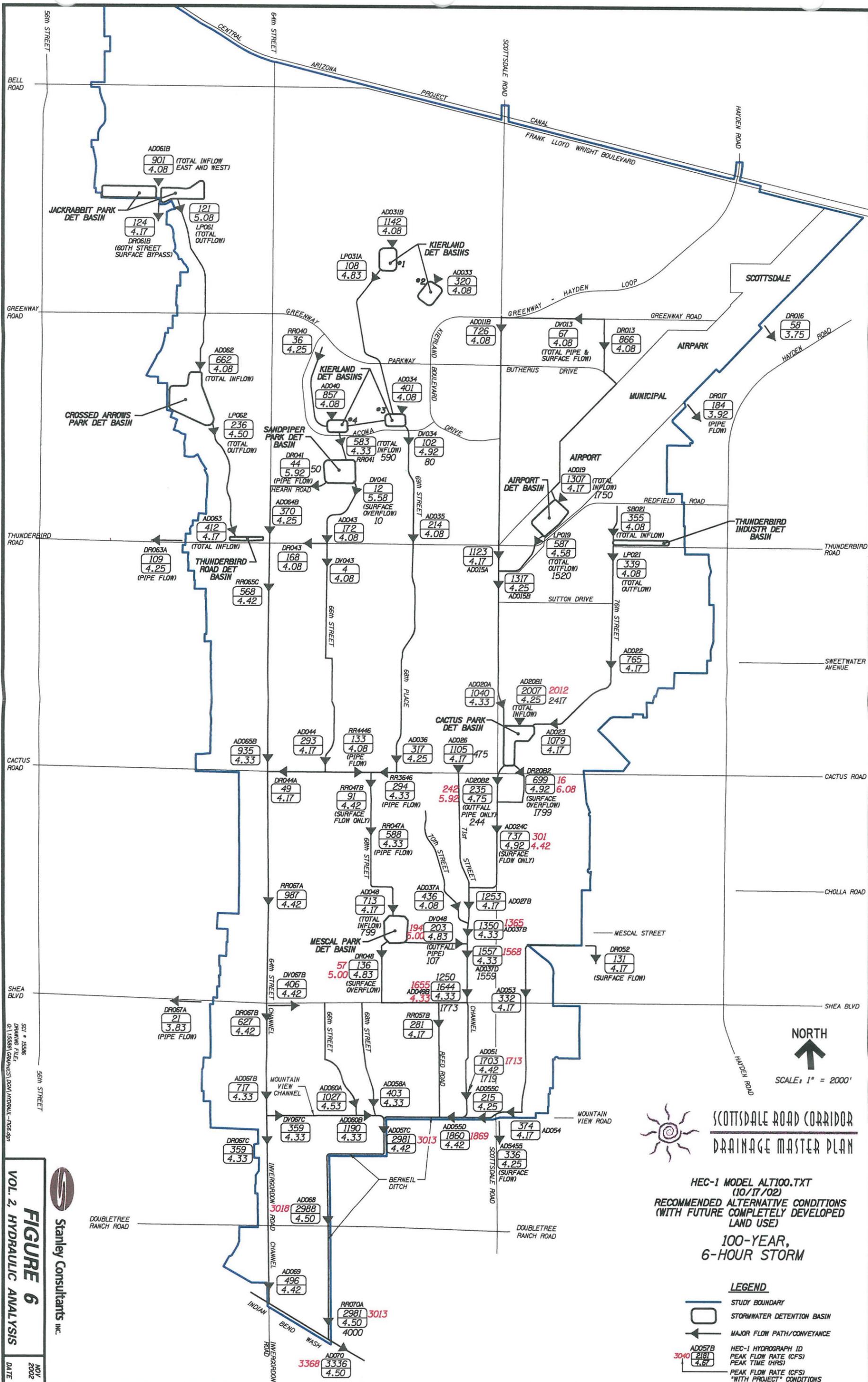
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**FIGURE 5**

**VOL. 2, HYDRAULIC ANALYSIS**

NOV 2002

DATE



SCALE: 1" = 2000'



**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-1 MODEL ALT100.TXT  
(10/17/02)  
RECOMMENDED ALTERNATIVE CONDITIONS  
(WITH FUTURE COMPLETELY DEVELOPED  
LAND USE)

**100-YEAR,  
6-HOUR STORM**

**LEGEND**

- STUDY BOUNDARY
- STORMWATER DETENTION BASIN
- MAJOR FLOW PATH/CONVEYANCE
- HEC-1 HYDROGRAPH ID  
PEAK FLOW RATE (CFS)  
PEAK TIME (HRS)
- PEAK FLOW RATE (CFS)  
\*WITH PROJECT\* CONDITIONS

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**FIGURE 6**

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## **2.0 HEC-RAS HYDRAULIC MODELING**

### **2.1 General Approach and Methods**

Representative flow characteristics for the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel were modeled using the U.S. Army Corps of Engineers' HEC-RAS computer program Version 2.2. Inputs to the HEC-RAS program include channel cross-section geometry, downstream reach length, Manning's roughness coefficient "n" and ineffective flow areas. The model for this system uses the Berneil Ditch as the main channel with branches for the Mountain View Channel and the 71<sup>st</sup> Street Channel.

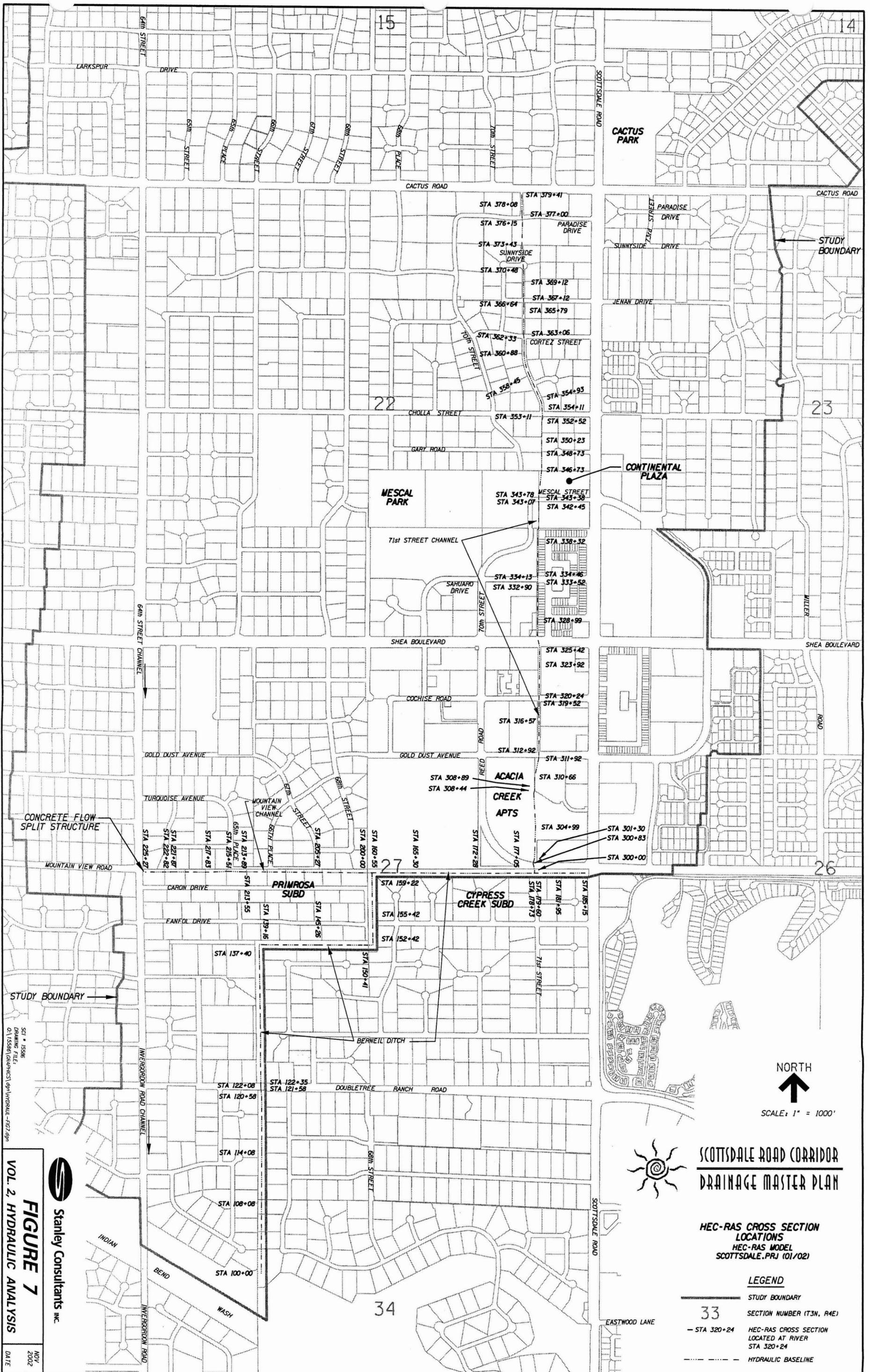
Two water surface profiles are included in the HEC-RAS model, profile number 1 (WS PF 1) for the 10-year discharge and profile number 2 (WS PF 2) for the 100-year discharge. Flow rates for these two profiles were taken from the existing condition HEC-1 models contained in the Volume 1 Hydrology Analysis. The HEC-RAS model utilizes junction loss options to account for the confluence of the Mountain View Channel and 71<sup>st</sup> Street Channel branches. Hydraulic cross sections for the HEC-RAS model are based primarily on field survey data gathered by Stanley Consultants. This data was supplemented by as-built plans and field reconnaissance.

There was no overall topographic survey available along the channel reaches that would be suitable to accurately delineate limits of overflow. The backwater analysis was not intended to establish any floodplain limit for flood insurance or floodplain management purposes. The objectives of the HEC-RAS backwater analysis were to establish a baseline existing hydraulic condition, to assess the location, extent and character of any hydraulically deficient reaches and to serve as the basis for alternatives analysis.

The hydraulic analyses found in previous studies for the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel are typically simple, normal depth hydraulics. No backwater analysis has been found from any previous study for any of these features.

Figure 7 on the following page is a schematic showing the locations of HEC-RAS cross-sections along the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel. Figure 7 is also found at a full size scale of 1" = 500' in Appendix E. Figure 7 serves as the basis for both existing condition and alternative analysis HEC-RAS models. HEC-RAS electronic files on diskette are also found in Appendix E.

Appendix A contains supporting data related to the existing condition HEC-RAS hydraulic analysis of the Berneil Ditch, Mountain View and 71<sup>st</sup> Street Channels. Appendix B includes existing condition HEC-RAS output files and cross-section plots. Appendix D includes the HEC-RAS model corresponding to the recommended alternative.



SCALE: 1" = 1000'

**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

HEC-RAS CROSS SECTION  
LOCATIONS  
HEC-RAS MODEL  
SCOTTSDALE.PRJ (01/02)

**LEGEND**

- STUDY BOUNDARY
- SECTION NUMBER (T3N, R4E)
- HEC-RAS CROSS SECTION  
LOCATED AT RIVER  
STA 320+24
- HYDRAULIC BASELINE

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**Stanley Consultants Inc.**  
**FIGURE 7**  
**VOL. 2, HYDRAULIC ANALYSIS**  
 DATE: NOV 2002

## **2.2 Berneil Ditch Characteristics**

The Berneil Ditch has evolved over many years to its present state. Historic accounts indicate that it is likely to be more than 50 years old and may have originated as a combined earth channel and levee intended to protect the old Folkman Ranch from flooding. Its original construction was probably a local, perhaps private effort. No documentation of its original design, hydrology or hydraulics has been found. Its apparent age would be from an era when the offsite contributing area extended all the way north to the McDowell Mountains and when the Indian Bend Wash was largely uncontrolled.

The Berneil Ditch is situated at the downstream end of the Scottsdale Road Corridor Drainage Master Plan study area and is approximately 8,500 feet in length. The upstream limit of the ditch is at the southwest corner of the intersection of Scottsdale and Mountain View Roads where an existing double barrel - 8' x 3' concrete box culvert (CBC) discharges flow from the contributing drainage area east of Scottsdale Road.

From Scottsdale Road, the Berneil Ditch flows west along Mountain View Road (and the Mountain View Road alignment) to about the 68<sup>th</sup> Street alignment. From this location, which is near the southwest corner of Chaparral High School, the Berneil Ditch turns and goes straight south for a distance of approximately 850 feet. The ditch then turns and goes straight west for a distance of approximately 1,260 feet. There, it turns south again and follows roughly the 66<sup>th</sup> Street alignment all the way to the Indian Bend Wash, which is the downstream limit of study.

The Berneil Ditch has a trapezoidal cross section for its entire length. From Scottsdale Road to its confluence with the Mountain View Channel, the Berneil Ditch has a primarily earth section with short segments of concrete lining at some of the tributary inflow points. The earth reach has virtually no landscape or visual aesthetic amenities. A perennial growth of weeds and native vegetation is present along its bottom in this reach. At the confluence with the Mountain View Channel, the Berneil Ditch transitions into a wider concrete-lined cross section and maintains this configuration all the way to the Indian Bend Wash.

Sub-reaches of the Berneil Ditch are generally straight and uniform but there are three relatively tight right angle bends in the study reach. A six barrel – 10' x 5' CBC conveys flow under Double Tree Ranch Road. Double Tree Ranch Road has a high point in its profile where it passes over the Berneil Ditch. The bottom of the Berneil Ditch drops approximately 4 feet in elevation just below the Double Tree Ranch Road culvert.

Generally, the flow line profile of the Berneil Ditch is well below the adjacent ground elevation. However, the south banks along both of the east-west reaches are elevated slightly, ranging from a few tenths to about 1.5 feet above adjacent grade. The east side of the 66<sup>th</sup> Street alignment of the Berneil Ditch south of Double Tree Ranch Road is also elevated above adjacent grade forming a levee averaging about 2 to 3 feet in height.

The earth portion of the Berneil Ditch along the Mountain View Road alignment ranges in depth from about 5 feet to about 7 feet and has a bottom width of about 20 feet and side slopes of about 4H to 1V. The concrete lined reaches of the Berneil Ditch average about 8 feet in depth with a bottom width of approximately 30 to 35 feet and side slopes of

about 3H to 1V. The longitudinal slope of the channel bottom ranges from about 0.1 to 0.3 percent with the greater slopes occurring in the north-south alignments and the flatter slopes occurring in the east-west reaches.

The predominant fall and direction of flow for this region of the Scottsdale Road Corridor Drainage Master Plan study area is from north to south. The two east-west sub-reaches of the Berneil Ditch essentially cut across the predominant slope.

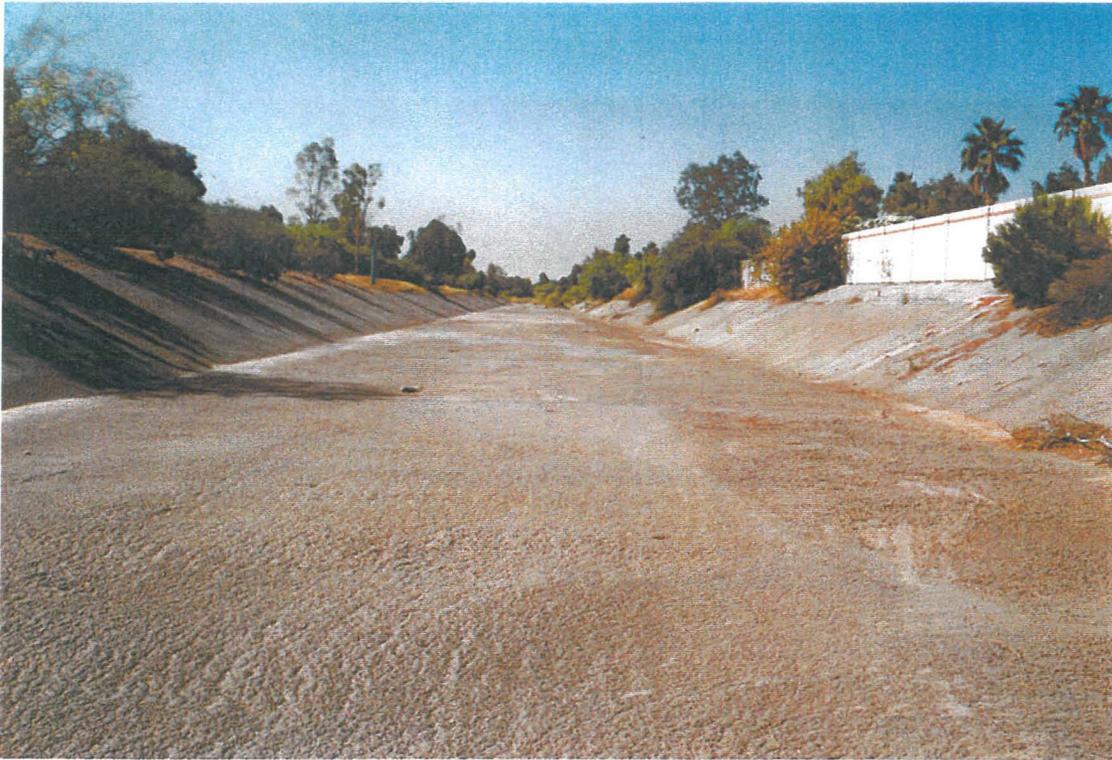
There is a gravel surfaced maintenance access road along the entire length of the Berneil Ditch on its south and east sides. Vehicular access to the maintenance road is limited but the road does serve as a local and fairly well established multi-use pedestrian/equestrian trail. Residential lots back up onto the Berneil Ditch along its entire length except on the north side of the sub-reach along Mountain View Road. Many of the residential lots have masonry block fences adjacent to the ditch. The Berneil Ditch is located entirely within the Town of Paradise Valley on a tract of land owned and maintained by the Town.

Drainage flows into the Berneil Ditch at many locations. The largest inflow points occur in the upper reach of the ditch and are located at the culvert under Scottsdale Road, the 71<sup>st</sup> Street Channel, the Reed Road (70<sup>th</sup> Street) storm drain and the Mountain View Channel. Local drainage flows into the ditch at other locations between Mountain View Road and Double Tree Ranch Road. From Double Tree Ranch Road to the Indian Bend Wash, there is essentially no inflow to the ditch.

It is unknown what the original design discharge was for either the Berneil Ditch or the culvert at Double Tree Ranch Road. The Paradise Valley, Scottsdale, Phoenix (PVSP) Study from the late 1970's estimated a 100-year "with project" discharge for the Berneil Ditch of about 4,000 cfs. However, the suggested design discharge for the Berneil Ditch from the PVSP Study was only 2,000 cfs based on the limited combined capacity of its two primary upstream tributary channels, the 71<sup>st</sup> Street Channel and the Mountain View Channel. The significance of the PVSP Study to the Scottsdale Road Corridor Drainage Master Plan is discussed in more detail in Volume 1 hydrology.

The existing condition 100-year HEC-1 discharges for the Berneil Ditch from Volume 1 hydrology range from 215 cfs at the Scottsdale Road box culvert (HEC-1 I.D. AD055C), the upstream limit, to 2981 cfs at the Indian Bend Wash (HEC-1 I.D. RR070A), the downstream limit.

Photo plates on the following pages depict representative reaches of the Berneil Ditch.



**PHOTO PLATE 1**

Berneil Ditch looking downstream (south) just below Doubletree Ranch Road.



**PHOTO PLATE 2**

Berneil Ditch looking at the upstream face of the box culvert at Doubletree Ranch Road.



**PHOTO PLATE 3**

Berneil Ditch looking upstream (east) near the middle bend. Block wall along top of south bank was recently constructed by Town of Paradise Valley to contain flow.



**PHOTO PLATE 4**

Berneil Ditch looking upstream (east) along the Mountain View Road alignment. 71<sup>st</sup> Street Channel enters from left near middle of photo.

### **2.3 Mountain View Channel Characteristics**

There has been no reference found in past studies to a specific name for the channel that runs along the Mountain View Road alignment from Invergordon Road to the Berneil Ditch. It was generally referred to as part of the Berneil Ditch system in the PVSP Study from the late 1970's. For the purposes of the Scottsdale Road Corridor Drainage Master Plan, it will be referred to as the "Mountain View Channel".

Also, for this study, the channel along Invergordon Road/64<sup>th</sup> Street will be referred to as the "Invergordon Road Channel" south of the Mountain View Road alignment in the Town of Paradise Valley. North of the Mountain View Road alignment in the City of Scottsdale, it is referred to as the "64<sup>th</sup> Street Channel". It is unknown exactly when the Mountain View and Invergordon Road/64<sup>th</sup> Street Channels were constructed but from historic accounts and recollections, they are probably at least 30 years old. Their origins go back to when the offsite contributing area was not only much larger (prior to construction of the Central Arizona Project Canal) but was also largely undeveloped.

The length of the Mountain View Channel is approximately 2,500 feet. The entire length of channel has a concrete lined trapezoidal section. The upstream limit of the channel is at the Invergordon Road/64<sup>th</sup> Street Channel. The Mountain View Channel runs from west to east along the Mountain View Road alignment. It outfalls to the Berneil Ditch at about the 68<sup>th</sup> Street alignment near the southwest corner of Chaparral High School. The Mountain View Channel has a relatively tight right angle bend to the south where it joins the Berneil Ditch.

The depth of the Mountain View Channel ranges from about 4 to about 7 feet. The cross section has a bottom width that ranges from about 6 to about 10 feet and side slopes of about 2H to 1V. The Mountain View Channel has a relatively uniform longitudinal slope of approximately 0.4 percent. Like the east-west reaches of the Berneil Ditch, the Mountain View Channel cuts roughly perpendicular across the predominant local slope and direction of flow. Generally, the Mountain View Channel is straight and uniform. However, there are 5 locations along the channel where sewer manhole shafts project up from the channel bottom and out from the channel side, presenting a moderate local obstruction to flow.

The Mountain View Channel essentially lies entirely within the Town of Paradise Valley on private property. The channel is located in a combined drainage channel, roadway and utility easement that totals 30 feet in width. The channel crosses the rear yards of the residential lots in the Primrosa Subdivision on the north side of Caron Drive. It is presumed that any maintenance of the Mountain View Channel is provided either by the Town of Paradise Valley or by a residential property owners association.

Residential land use adjoins both sides of the Mountain View Channel. The residential lots that the channel crosses all have masonry block fences along the channel's south bank that provide a physical separation between the channel and the rear yards. These block fences would form a substantial barrier if any overflow occurs along the Mountain View Channel.

An overflow weir is constructed on the south bank of the Mountain View Channel approximately 500 feet upstream from its confluence with the Berneil Ditch. The overflow weir is located opposite the point where 67<sup>th</sup> Street discharges stormwater into

the Mountain View Channel from the north. The overflow weir is approximately 25 feet long with a bottom elevation that is approximately 5.5 feet above the flow line of the Mountain View Channel.

There was no documentation found that explains the concept and intent of the overflow weir. The location of the weir may be on the historic flow path that served as the outfall for the drainage coming down 67<sup>th</sup> Street prior to construction of the Mountain View Channel and the Primrosa Subdivision south of it. If flow were to escape the Mountain View Channel at the weir, it would enter a shallow landscaped channel on the adjacent residential lot, flow south a short distance to Caron Drive then east in Caron Drive to the Berneil Ditch. There does not appear to be any drainage easement across the residential lot where the weir on the south bank is located.

One of the most unique and significant hydraulic features in this system is a concrete flow split structure located at the upstream end of the Mountain View Channel. This structure projects out into and a short distance upstream (north) on the Invergordon Road/64<sup>th</sup> Street Channel. It appears that the intent of the structure is to split the stormwater flowing south in the 64<sup>th</sup> Street Channel 50/50. Half of the flow would continue south in the Invergordon Road Channel and the other half would be diverted east to the Mountain View Channel and the Berneil Ditch. The flow split structure was apparently in place prior to the PVSP Study, which refers to it as the "Berneil bifurcation works". The hydrology in the PVSP study assumed a 50/50 split at this location.

The concrete flow split structure appears to have been intended to maintain the perceived flow pattern that existed at the time it was constructed. However, its hydraulic and hydrologic concept and design have not been very extensively documented in previous studies. The PVSP study simply acknowledges the structure and concludes that the "project/no project" conditions are identical.

There is no detailed hydraulic analysis performed for the concrete flow split structure in the Scottsdale Road Corridor Drainage Master Plan study. From both a hydrologic and a hydraulic standpoint it is basically assumed, as in past studies, that it would achieve a 50/50 flow split. In addition, this 50/50 proportion has been assumed to be constant over the entire range of flows that would approach the structure from the north.

In reality, this may not exactly be the case. Based on site reconnaissance, survey data and hydraulic judgment, the actual proportion may vary from event to event and also with the level of flow. The proportion of flow that is split would be influenced by debris that may catch on the leading edge of the concrete splitter wall. It is also likely to be influenced by local hydraulic losses and backwater effects that would occur on each side of the splitter wall downstream from its leading edge.

On the east side of the splitter wall, the sharp bend and backwater effect from the Mountain View Channel would probably combine to reduce the capacity on that side. This could potentially result in a greater proportion of flow continuing to the south. In addition, during extreme events, it is possible that the splitter wall could be overtopped which would also send a larger proportion of flow to the south.

Based on the above observations, it is considered unlikely that the discharge directed to the Mountain View Channel would be greater than 50 percent of the total flow coming down the 64<sup>th</sup> Street Channel approaching the flow split structure. Conversely, it is

considered more likely that greater than 50 percent of the flow approaching the concrete flow split structure would continue south along the Invergordon Road Channel.

Storm runoff enters the Mountain View Channel from the north at essentially six locations: the Invergordon Road/64<sup>th</sup> Street Channel, a local drainage channel just east of 64<sup>th</sup> Street that drains 64<sup>th</sup> Place, at 65<sup>th</sup> and 66<sup>th</sup> Places and at 67<sup>th</sup> and 68<sup>th</sup> Streets. It is unknown what the original design discharge was for the Mountain View Channel. The PVSP Study mentions a discharge of 600 cfs but it is unclear whether this is an estimated hydraulic capacity or an estimated inflow based on PVSP hydrology.

The existing condition 100-year HEC-1 discharges for the Mountain View Channel from Volume 1 hydrology range from 359 cfs just east of the concrete flow split structure on the Invergordon Road Channel (HEC-1 I.D. DV067C) to 1,379 cfs at its confluence with the Berneil Ditch (HEC-1 I.D. AD058B).

Photo plates on the following pages depict the Mountain View Channel and the concrete flow split structure at the Invergordon Road Channel.



**PHOTO PLATE 5**

Mountain View Channel looking upstream (northwest) at the confluence with the Berneil Ditch (in foreground).



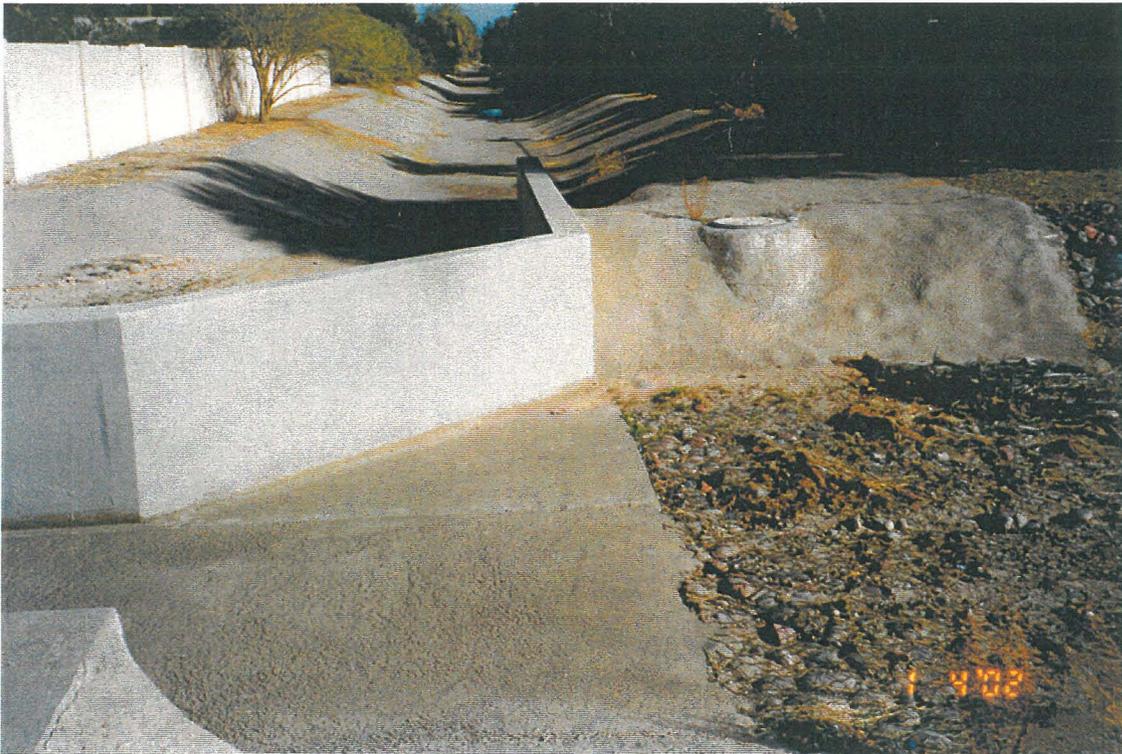
**PHOTO PLATE 6**

Looking south across Mountain View Channel at weir structure near 67<sup>th</sup> Street alignment.



**PHOTO PLATE 7**

Mountain View Channel looking upstream (west) from about its mid point.



**PHOTO PLATE 8**

Upstream end of Mountain View Channel looking downstream (east) across flow split structure at Invergordon Road Channel.

## **2.4 71<sup>st</sup> Street Channel Characteristics**

The downstream limit of the 71<sup>st</sup> Street Channel is the Berneil Ditch just below Mountain View Road, approximately 600 feet west of Scottsdale Road. The channel essentially follows the 71<sup>st</sup> Street alignment for its entire length. For purposes of the Scottsdale Road Corridor Drainage Master Plan study, the upstream limit of the 71<sup>st</sup> Street Channel is Cactus Road. The total length is approximately 8,000 feet.

The 71<sup>st</sup> Street Channel conveyance ranges widely in cross-section geometry, longitudinal slope and surface treatment. Sub-reach configurations include numerous concrete lined rectangular, trapezoidal and triangular shaped sections. There are also trapezoidal earth sections, ranging from modestly to nicely landscaped and an inverted crown street section. The level of condition and maintenance also varies widely.

From the Berneil Ditch north to Gold Dust Avenue, the 71<sup>st</sup> Street Channel is a fairly wide, nicely landscaped channel where it passes thru the Acacia Creek Apartment complex. Between Gold Dust Avenue and Shea Boulevard, it is a deep, steep-sided concrete lined channel designed for maximum conveyance in a very narrow corridor .

From Shea Boulevard to Sahuaro Drive the concrete lined open channel that existed at the beginning of the study has recently been replaced by a 12' x 9' concrete box culvert extension. The existing condition HEC-RAS model in Appendix B reflects the old concrete lined channel in this reach. The "with recommended alternative" condition HEC-RAS model in Appendix D reflects the concrete box culvert extension.

From Sahuaro Drive to a point about 300 feet north of Mescal Street, the 71<sup>st</sup> Street Channel is a moderately landscaped, mostly earth channel with loose rip-rap lining portions of it. And from north of Mescal Street to Cholla Road, the channel is a shallow paved alley with the outfall pipe from the Cactus Park detention basin running underneath it.

Cholla Street is simply a dip crossing with no culvert. From Cholla Street north to Cortez Street, the 71<sup>st</sup> Street Channel actually consists of 71<sup>st</sup> Street itself, which has an inverted crown. From Cortez Street to Sunnyside Drive, the channel is no more than a paved alley, very shallow and narrow in section. And from Sunnyside Drive north to Cactus Road, the channel is concrete lined with steep sides. This upper-most reach is one of the outfalls constructed for the Cactus Road storm drain improvements. The channel takes a relatively tight bend around an existing single-family residence just south of Paradise Drive.

Generally, sub-reaches of the 71<sup>st</sup> Street Channel tend to be fairly straight and uniform in a horizontal sense with occasional offset transitions in alignment to conform to property lines and avoid certain improvements that existed prior to the channel. The existing channel probably follows an historic, wide shallow flow path that gradually became more and more defined and confined as the adjacent land developed.

When viewed from an overall perspective, there appears to be very little continuity in the character, design and hydraulic performance of the 71<sup>st</sup> Street Channel. The form of each channel sub-reach seems to reflect the character of the adjacent land use, which ranges from commercial and office to single and multi-family residential. Each of the channel sub-reaches seems to vary significantly from its adjacent sub-reach as if the

channel were really just a loose collection of very differing conveyances placed end-to-end.

The channel flows from north to south, which is the predominant direction of slope and drainage in the Scottsdale Road corridor area. Sub-reaches generally have a fairly uniform longitudinal slope. The overall slope from Cactus Road to the Berneil Ditch is about 0.6 percent. Side slopes range from near vertical to flatter than 4H to 1V. The depth of the channel ranges from about one foot to over 8 feet. Bottom widths are as little as one foot and top widths range upward to over 50 feet.

For the most part, the 71<sup>st</sup> Street Channel is entirely below the adjacent grade except for a portion of the upper-most reach, which has hardened banks that are built up above ground. The overbank area adjacent to most of the 71<sup>st</sup> Street Channel is relatively flat. Along the channel just above Shea Boulevard, the west overbank falls slightly away from the channel and Shea Boulevard actually has a longitudinal slope that falls from east to west where it crosses over the channel. These conditions present the potential for a very wide shallow overbank floodplain adjacent to the channel or even breakout to a parallel flow path if the 71<sup>st</sup> Street Channel or any of its culvert capacities are exceeded.

There are a total of eight culvert crossings on the 71<sup>st</sup> Street Channel. Table 1 that follows provides the location and configuration of these culverts.

Table 1, 71<sup>st</sup> Street Channel Culverts

Location	Configuration	Length (ft)	Skew Angle (degrees)	Downstream Skew Direction
Mountain View Road	3 – 8'x6'	82	10	Right
Acacia Creek Apartments	4 – 12'x4'	50	0	-
Gold Dust Avenue	3 – 8'x5'	93	30	Right
Cochise Road	2 – 8'x6'	70	0	-
Shea Boulevard	1 – 10'(12')x9'	341	30	Left
Sahuaro Drive	3 – 10'x5'	60	0	-
Mescal Street	2 – 10'x6'	30	0	-
Paradise Drive	2 – 10'x3'	83	0	-

The culvert originally constructed under Shea Boulevard has been extended three times on its upstream end. The original culvert was a skewed 10' x 9' concrete box and the extensions are all 12' x 9' boxes that are more or less oriented in a north-south direction. The first culvert extension was done in the early 1980's as part of the PVSP project,

jointly sponsored by Flood Control District and the City of Scottsdale. The second extension of the Shea Boulevard culvert was done in mid 1990's as a private venture to provide room for more parking spaces for an adjacent restaurant.

And as mentioned previously in this section, this culvert was extended again, just recently. The latest extension was done to provide additional parking for the new Claim Jumper restaurant in the Scottsdale Promenade 7000 retail center. The latest extension makes the total length of the culvert nearly 800 feet.

Construction of the 71<sup>st</sup> Street Channel and its cross culverts has taken place in many phases over about the last 30 years. Some of the improvements are private and some public. Most of the channel is situated on private property. All but one of the culverts is situated in public right-of-way. Drainage easements only cover part of the channel. For the most part, maintenance, repairs and minor improvements have been performed by the City of Scottsdale.

Storm runoff enters the 71<sup>st</sup> Street Channel at many, many locations from the north, east and west. The primary inflow points involve both surface inflow and storm drains. Primary inflow occurs from the following:

- The Cactus Road storm drain;
- 70<sup>th</sup> Street surface flow just south of Gary Road;
- The Cactus Park detention basin outfall pipe just north of Mescal Street;
- The Scottsdale Road storm drain at Mescal Street;
- The Mescal Park detention basin outfall pipe just below Mescal Street; and,
- Storm drains in Shea Boulevard from both the east and west.

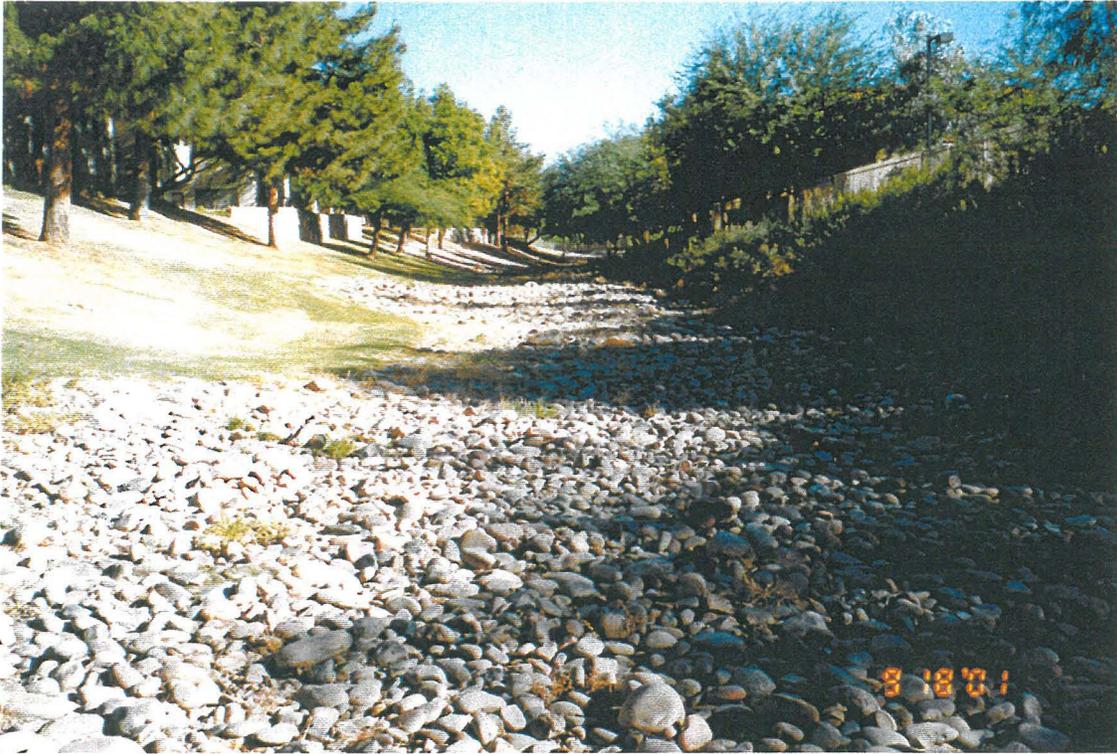
In addition, there are dozens of smaller more local inflow points consisting of small diameter storm drains serving adjacent private development and surface inflow from public streets and private driveways.

The original design discharge for the 71<sup>st</sup> Street Channel is unknown. Much of the original channel and some of the original culverts pre-date the PVSP Study. The PVSP Study concludes that a "with project" design discharge of 1,100 cfs should be used for the design of (then) future 71<sup>st</sup> Street Channel and culvert improvements. However, the estimated "with project" flow rate downstream from Mescal Street based on PVSP hydrology is 1,200 to 1,300 cfs.

The upper-most reach of the 71<sup>st</sup> Street Channel was designed on the basis of a 10-year discharge of 200 cfs as part of the Cactus Road storm drain outfall project constructed in the early 1990's. The design discharge for the lower-most reach recommended in the Shea Scottsdale Master Plan in the mid 1980's is around 1,700 to 1,800 cfs.

The 100-year HEC-1 discharges for the 71<sup>st</sup> Street Channel from Volume 1 hydrology range from 1,105 cfs at Cactus Road (HEC-1 I.D. AD026) to 1,614 cfs below the Mescal Park detention basin outfall pipe (HEC-1 I.D. AD037D) to 1,751 cfs at the confluence with the Berneil Ditch (HEC-1 I.D. AD051).

Photo plates on the following pages depict various sub-reaches and culverts found along the 71<sup>st</sup> Street Channel.



**PHOTO PLATE 9**

71<sup>st</sup> Street Channel looking upstream (north) from a point just north of the Mountain View Road culvert within the Acacia Creek Apartment complex.



**PHOTO PLATE 10**

71<sup>st</sup> Street Channel looking upstream (north) from Cochise Road. Outlet of Shea Boulevard culvert is at far end of reach.



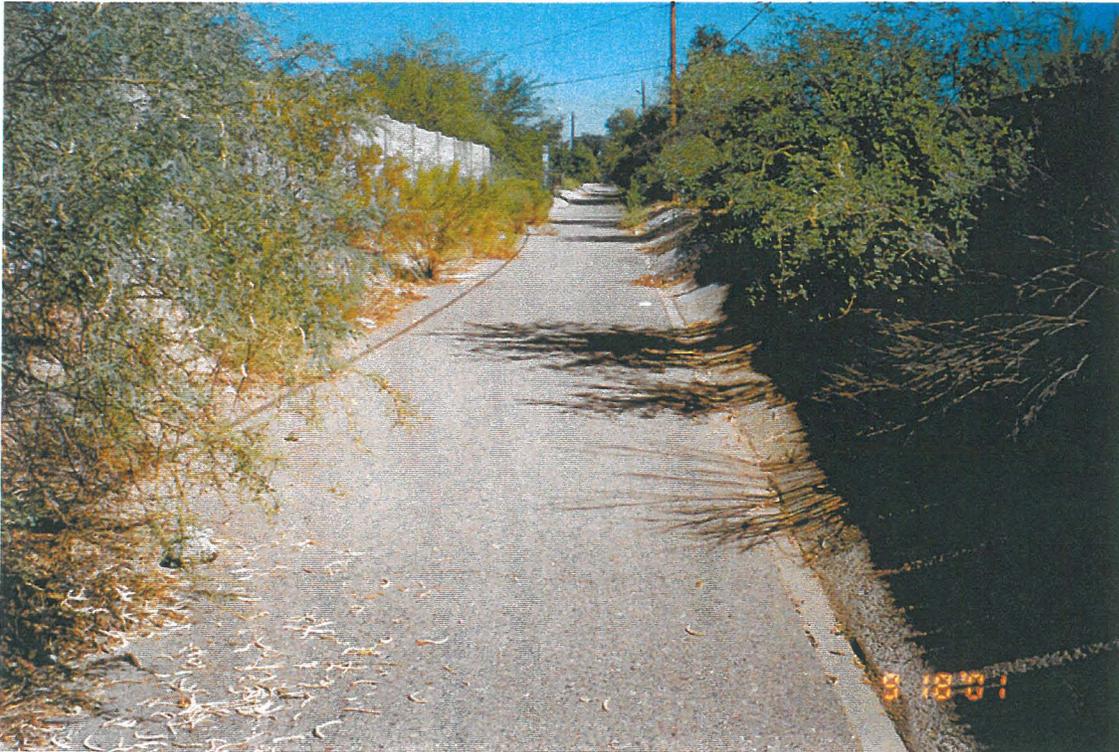
**PHOTO PLATE 11**

71<sup>st</sup> Street Channel looking downstream (south) at inlet of extended Shea Boulevard box culvert. Opening is 12' x 9'.



**PHOTO PLATE 12**

71<sup>st</sup> Street Channel looking downstream (south) from Mescal Street.



**PHOTO PLATE 13**

71<sup>st</sup> Street Channel looking upstream (north) from a point about 600 feet south of Cholla Road. 60" outfall pipe from Cactus Park detention basin is under channel.



**PHOTO PLATE 14**

71<sup>st</sup> Street looking upstream from just north of Cholla Road. Inverted crown street section serves as sole means of conveyance in this reach.



**PHOTO PLATE 15**

71<sup>st</sup> Street Channel looking upstream (north) from Cortez Street.



**PHOTO PLATE 16**

71<sup>st</sup> Street Channel looking upstream from Sunnyside Drive.

## **2.5 Downstream Starting Conditions**

A subcritical flow regime and normal depth slope of 0.0027 ft/ft were used for starting downstream conditions in the Berneil Ditch at the Indian Bend Wash. A water surface elevation based on the November 1997 Indian Bend Wash Floodplain Delineation Study was known, but not used as a downstream condition because it is unlikely that peak discharges would be coincidental in time at the confluence of these two watercourses.

In addition, according to the Indian Bend Wash Study, the calculated 100-year water surface elevation for the Indian Bend Wash immediately downstream of the Berneil Ditch outfall is 1,315.3 feet with floodway encroachments. The HEC-RAS computed Berneil Ditch 100-year, 6-hr normal depth water surface elevation at the Indian Bend Wash outfall is equal to 1,316.3 feet. Therefore, using the normal depth starting conditions provides more conservative upstream flow depths than would the Indian Bend Wash water surface elevation as the starting condition.

Excerpts from the Indian Bend Wash Floodplain Delineation Study pertaining to the starting conditions in the Berneil Ditch are presented in Appendix A. Modeling guidelines regarding starting water surface conditions is provided by FEMA Guidelines and Specifications for Study Contractors, January 1995 and is also presented in Appendix A.

## **2.6 Cross Section Geometry Data**

Flow depths were computed at perpendicular HEC-RAS hydraulic sections along each reach. Sections were obtained from SCI survey data, as-built plans and field reconnaissance. Sections were taken to reflect variations in channel geometry, discharge rate and the numerous culverts found along the study reaches. Hydraulic Sections are defined by data points oriented from left to right and looking downstream. Transverse stationing increases left to right. Transverse station 1,000 represents the channel centerline.

Longitudinal "river mile" stationing increases upstream and reflects the distance in feet upstream from the downstream limit of each respective reach. The Berneil Ditch downstream limit river station is 100+00. The Mountain View Channel downstream limit river station is 200+00 and begins at the Berneil Ditch. The 71<sup>st</sup> Street Channel downstream limit river station is 300+00, also beginning at the Berneil Ditch. Vertical control for cross-sections and longitudinal profiles is based on SCI survey data, which utilizes the North American Vertical Datum of 1988 (NAVD 88).

## **2.7 Manning's Roughness and Expansion/Contraction Coefficients**

Manning's n-values for each reach were estimated from field reconnaissance and hydraulic engineering judgment. Also, n-value references were made to Roberson and Crowe's "Engineering Fluid Mechanics" and the USGS "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County Arizona".

Manning's roughness coefficients for channels ranged from 0.016 for streets to 0.035 for landscaped earth channels. Manning's roughness coefficients for overbanks ranged from 0.016 for ally-ways and parking lots to 0.100 for overbank areas having substantial

obstruction to flow. A final field reconnaissance of the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel by Stanley Consultants to verify roughness coefficients at each section took place October 3, 2001.

Expansion and contraction coefficients were applied where flow constrictions or expansions were present or where flows approach and leave structures. Expansion coefficients ranged from 0.3 for uniform conditions to 0.5 for sections upstream and downstream of culverts. Contraction coefficients ranged from 0.1 for uniform conditions to 0.3 for sections upstream and downstream of culverts.

## **2.8 Ineffective Flow Areas**

Ineffective flow areas are modeled at various sections where overbank conditions would provide minimal conveyance. Objects within the overbank area that would impede conveyance include masonry block fencing, trash dumpsters, parked cars, thick vegetation and extended loading/unloading docks within ally-ways. Ineffective flow areas are typically reflected in channel geometry by truncating the beginning or end of a hydraulic section.

## **2.9 Culverts**

Eight culvert crossings are modeled in the 71<sup>st</sup> Street Channel. One culvert crossing is modeled in the Berneil Ditch. HEC-RAS input data includes culvert type, length, upstream and downstream invert elevations, deck width, entrance and exit loss coefficients and weir coefficient. Data for culverts were obtained from SCI surveys, field reconnaissance and/or as-built drawings. Typically, there was no adjustment in culvert geometry to account for potential debris clogging at any culvert. Culvert crossings range widely in size, length and number of barrels. No two culverts were alike. A roughness coefficient of 0.013 was used for all culverts. A culvert hydraulics report is provided in the HEC-RAS printout in Appendix B.

The HEC-RAS model for the recommended system-wide alternative was modified from the existing condition model to reflect not only the recommended alternative improvements but also the extended box culvert at Shea Boulevard mentioned previously. Due to its length, angle points and change in geometry, the extended culvert was modeled using a StormCADD hydraulic grade line analysis with the results being inserted into HEC-RAS. The supporting data for this analysis is included in Appendix D.

## **2.10 Calibration**

The Flood Control District of Maricopa County installed a combination rain and stream gauge along the east bank of the Berneil Ditch (Sensor ID #4685 and 4688, respectively) approximately 1,000 feet downstream from the Double Tree Ranch Road culvert crossing. The gauge was installed July 30, 1998. The stream gauge uses a pressure transducer to estimate the flow depth within the channel. The discharge associated with a given flood depth is then calculated using a depth versus discharge rating curve.

As long as the flow in the Berneil Ditch is not concurrent with any significant flow in the Indian Bend Wash, the normal depth rating curve for the gage should provide reliable and predictable estimates of discharge. This gage can potentially be used to calibrate the HEC-1 hydrology model. Eventually, with enough years of record, it could provide a

statistical database for use in hydrologic calibration. However, it cannot be used for any hydraulic calibration regardless of the record length.

### **2.11 Application of HEC-1 Discharges**

HEC-RAS discharges and flow change locations were intended to reflect variations in discharge rates obtained from the 10- and 100-year, 6-hour existing conditions HEC-1 models. Typically, the peak discharge from the downstream concentration point was used as the discharge for the entire length of the respective upstream sub-reach. This provided a more conservative flow depth because the downstream discharge is always equal to or greater than the upstream discharge.

Two exceptions to this approach are the Berneil Ditch discharge upstream from its confluence with the 71<sup>st</sup> Street Channel and the Mountain View Channel discharge upstream from the 67<sup>th</sup> Street alignment. The upstream discharge is used for these two exceptions since there is no concentration point to reflect local inflow for these upper reaches.

### **2.12 Special Modeling Problems**

Hydraulic modeling of the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel was challenging for a number of reasons. The primary challenges involved the following:

- Junction losses at the Mountain View Channel and 71<sup>st</sup> Street Channel confluences with the Berneil Ditch;
- The culvert crossing located at Shea Boulevard; and,
- The water surface superelevation likely to occur at the right angle bends in the Berneil Ditch.

The fact that there was no comprehensive topography along these reaches also made it difficult to interpret the HEC-RAS results in terms of estimating the extent and depth of overbank flooding.

#### **2.12A Junction Losses**

The two confluences with the Berneil Ditch were modeled as junctions in HEC-RAS. At each junction, the momentum equation was applied due to the likelihood that the tributary angles would cause significant energy losses. The momentum equation option allows for the angle of the tributaries entering or exiting the junction to be modeled. In addition, the momentum equation option is capable of calculating friction losses at each junction.

The tributary angles that were chosen for the model reflect the angle of the flow path at each confluence. The larger the angle, the sharper the channel bends and the larger the energy loss. The Mountain View Channel confluence with the Berneil Ditch has a particular problem in that both the Mountain View Channel and Berneil Ditch have sharp bends toward the south immediately upstream of the confluence. Hydraulic losses are occurring due to the flow combination and the bends. It is difficult to precisely model the dynamic hydraulic process that is taking place at such a complex junction.

The 71<sup>st</sup> Street Channel is oriented approximately 90 degrees to the Berneil Ditch. However, the sharp bend at the confluence is reduced somewhat by the skew of the Mountain View Road Culvert and the orientation of the wing walls at the culvert outlet. Based on field reconnaissance and judgment, the junction angle used in the HEC-RAS model at both the Mountain View Channel and 71<sup>st</sup> Street Channel confluences with the Berneil Ditch was chosen to be 45 degrees.

### **2.12B Shea Boulevard Culvert**

The culvert crossing at Shea Boulevard presents another challenge for HEC-RAS. The original culvert installed to convey flow from the 71<sup>st</sup> Street Channel under Shea Boulevard was a single barrel - 10' x 9' concrete box. With the first two of the three culvert extensions mentioned previously, approximately 200 linear feet of single barrel - 12' x 9' concrete box was added to make a total length of approximately 340 feet. This is the condition that existed at the beginning of the study. Then, the third extension, which was just recently completed, added about another 450 feet for a total of almost 800 feet.

In addition to the change in culvert cross-section geometry and added length, the extended culvert has two bends near its mid point. There are also four storm drain pipes ranging in size from 18" to 30" that enter the culvert near the north side of Shea Boulevard and one 48" culvert that discharges through the wing wall at the downstream end of the culvert. All of these features would potentially result in additional hydraulic losses at the culvert.

Since HEC-RAS cannot model a change in barrel geometry, the smaller 10' x 9' CBC was modeled in HEC-RAS for the entire 340-foot length of the culvert that existed at the beginning of the study. In addition, HEC-RAS is not capable of modeling culverts at a skewed angle relative to the flow direction, a culvert with a bend and the additional losses associated with side inflow. The associated hydraulic losses due to the bends and the side inflow are not accounted for in the existing condition HEC-RAS model. Therefore, the HEC-RAS model probably reflects greater efficiency than would actually exist, making the resulting existing condition flow depths a little less conservative than they really are. As mentioned in Section 2.9, the analysis of this culvert was modified for the recommended alternative model using a hydraulic grade line approach.

### **2.12C Superelevation**

HEC-RAS is designed to perform one-dimensional hydraulic calculations. This one-dimensional limitation does not account for superelevation differences that are transverse to the direction of flow at bends. In addition to the bend located at the confluence with the Mountain View Channel, the Berneil Ditch has two other bends. It is probable that the water surface elevation on the outside of each bend will be higher than on the inside. Based on the Drainage Design Manual for Maricopa County, Volume II, Hydraulics, Equation 6.9, the estimated increase in water surface elevation at a typical bend in the Berneil Ditch is approximately 3 feet. The superelevation calculation is included in Appendix A.

## 2.13 HEC-RAS Results - Berneil Ditch

According to the existing condition HEC-RAS results, the Berneil Ditch sub-reach along Mountain View Road between Scottsdale Road and the confluence with the 71<sup>st</sup> Street Channel will experience overtopping of both the north and south banks during the 100-year flood event and overtopping of the south bank during the 10-year flood event.

The HEC-RAS results also indicate that the Berneil Ditch sub-reach from the confluence with the 71<sup>st</sup> Street Channel to the confluence with the Mountain View Channel will experience overtopping of both north and south banks for the 100-year event. The 10-year peak discharge is conveyed through this sub-reach without overtopping either the north or the south bank.

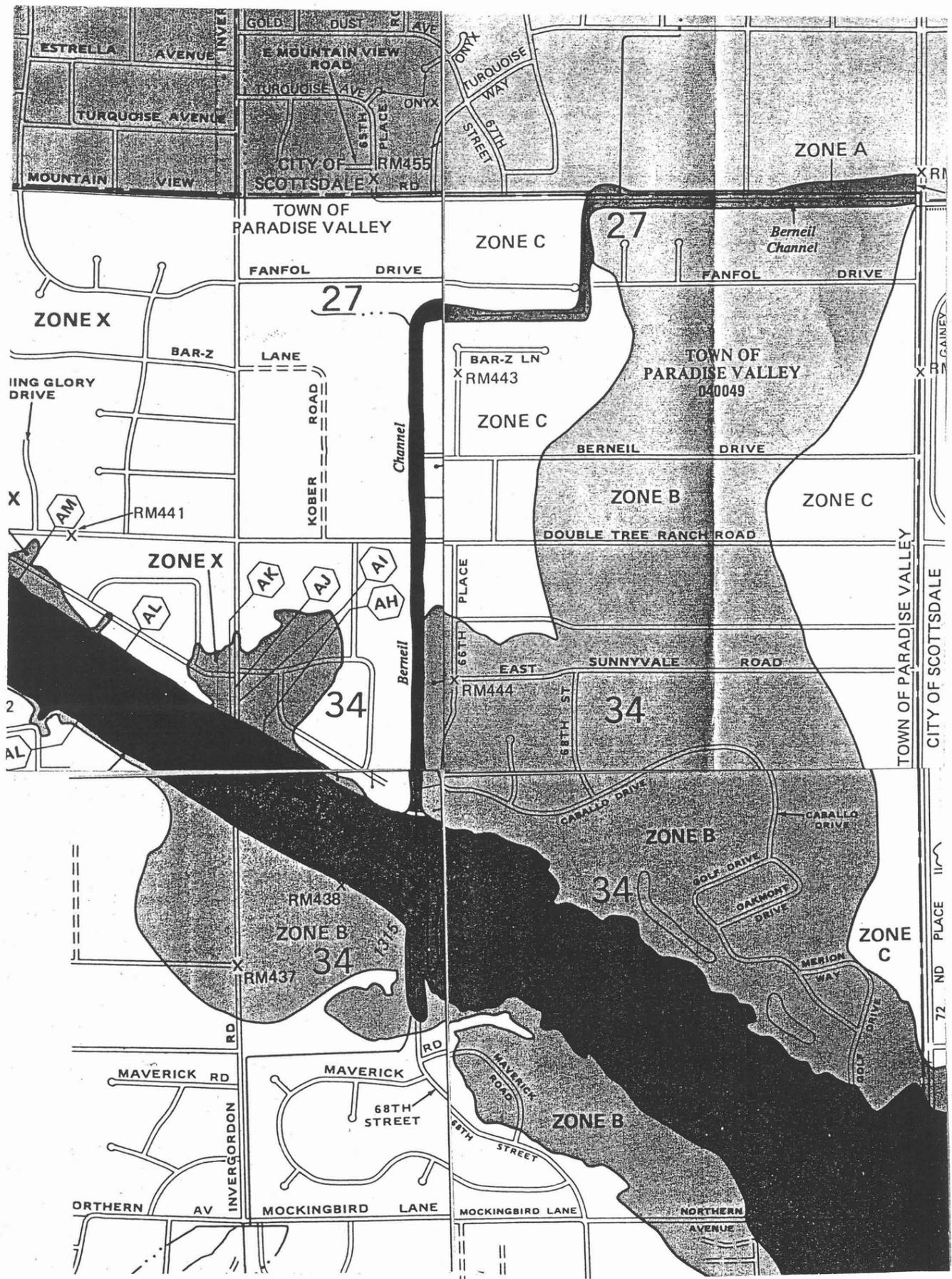
Overtopping of these two sub-reaches of the Berneil Ditch seems to correlate, at least in location, with what was anticipated from previous studies and with historic flooding in the area. The PVSP Study, for example, makes numerous references to the potential for overflow along the Berneil Ditch, even with the recommended PVSP features in place.

In addition, the Flood Insurance Rate Map (FIRM) panel for this area indicates a shallow flood zone south of Mountain View Road that extends all the way down to the Indian Bend Wash. The current FIRM panel indicates a shaded Zone "X" for the area south of Mountain View Road corresponding to the anticipated overflow. The older FIRM panel (April, 1988) that was superseded by the current one (July, 2001) shows this as a Zone "B". This appears to have originated based on an approximate flood zone delineation from a flood insurance study performed by consultant PRC Toups. Figure 8 on the following page is a partial copy of the older FIRM panel depicting both the shallow flood zone and the approximate Zone "A" for the Berneil Ditch from the PRC Toups study.

And last, ground level drainage openings were constructed in the residential fences of the Cypress Creek subdivision along the south bank of the Berneil Ditch. This indicates that overflow was anticipated, probably based on data from the PRC Toups study and the associated shallow flood zone on the FIRM panel. A copy of the Cypress Creek drainage report could not be located to confirm this. Many of the drainage openings in the Cypress Creek fences have been filled in and blocked by homeowners using various means.

According to Bill Mead, Public Works Director for the Town of Paradise Valley, the Berneil Ditch overflowed its south bank along Mountain View Road in the mid 1990's. Shallow flooding from this event damaged residential structures in the Cypress Creek subdivision immediately south of the upper Berneil Ditch including both newly constructed homes and homes that were under construction. Flows that break out of the Berneil Ditch along this reach drain through the residential area to the south in a shallow unconfined manner. This flow reaches the Indian Bend Wash along numerous flow paths and would not re-join the Berneil Ditch.

The discharge rate and return frequency associated with the overflow event of the mid 1990's are unknown either in terms of the flow rate that the Berneil Ditch was able to convey or the amount of flow that broke out over the south bank. The overflow event of the 1990's seems to support the HEC-RAS conclusions. However, since no flow rates were known, it is not possible to establish any calibration of the HEC-RAS model or provide any significant technical conclusions.

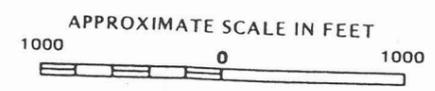


KEY TO MAP

- 500-Year Flood Boundary ————
  - 100-Year Flood Boundary ————
  - Zone Designations
  - 100-Year Flood Boundary ————
  - 500-Year Flood Boundary ————
  - Base Flood Elevation Line With Elevation In Feet\*\* 513
  - Base Flood Elevation in Feet Where Uniform Within Zone\*\* (EL 987)
  - Elevation Reference Mark RM7x
  - Zone D Boundary ————
  - River Mile •M1.5
- \*\*Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**  
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,  
ARIZONA AND  
INCORPORATED AREAS

PANEL 1680 OF 4350,  
PANEL 1685 OF 4350,  
PANEL 1690 OF 4350, AND  
PANEL 1695 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	1690	D
PARADISE VALLEY, TOWN OF	040049	1690	D
PHOENIX, CITY OF	040051	1690	D
SCOTTSDALE, CITY OF	045012	1690	D

MAP NUMBER  
04013C1690 D

EFFECTIVE DATE:  
APRIL 15, 1988



Federal Emergency Management Agency

COMPOSITE FIRM PANEL  
FOR BERNEIL DITCH

Stanley Consultants INC.

**FIGURE 8**  
VOL. 2, HYDRAULIC ANALYSIS

The lowest average flow velocities for the unlined section of Berneil Ditch occur in the reach from Scottsdale Road to the confluence with the 71<sup>st</sup> Street Channel. They are on the order of 0.47 feet per second associated with a 100-year discharge. The maximum flow velocity for the unlined section of Berneil Ditch from the confluence with the 71<sup>st</sup> Street Channel to the confluence with the Mountain View Channel is on the order of 0.82 feet per second associated with the 10-year discharge. According to the FCDMC Hydraulics Manual, Volume II, the design velocity for any channel lining should not fall below 2 feet per second in order to minimize sediment deposition problems. In addition, the FCDMC manual suggests that drainage channels (earthen, no vegetation) with a graded, silt-to-cobbles lining have permissible velocities no greater than 5.5 feet per second to prevent erosion.

Based on the above suggested velocities, it is unlikely that severe scour will occur in the section of Berneil Ditch from Scottsdale Road to the confluence with the Mountain View Channel. However, sediment deposition may occur in the section of Berneil Ditch from Scottsdale Road to the 71<sup>st</sup> Street Channel confluence. The vegetative growth in the upper reach (earth section) of Berneil Ditch would also prevent scour and decrease velocities, which could increase the potential for sediment deposition.

As seen from the HEC-RAS results, the entire sub-reach of the Berneil Ditch from its confluence with the Mountain View Channel to the culvert at Double Tree Ranch Road has sufficient capacity to convey the 10-year peak discharge without overtopping. The culvert at Double Tree Ranch Road has at least a 10-year capacity. However, this reach cannot convey the 100-year peak discharge and overtopping of both banks will occur. This is apparently due to the backwater effect of the culvert at Double Tree Ranch Road during the 100-year event. If flow breaks out of the Berneil Ditch upstream from Double Tree Ranch Road, very little of it would return back to the channel south of Double Tree. The flow that does not make it back into the Berneil Ditch would make its way to the Indian Bend Wash through the adjacent residential area.

According to Bill Mead with the Town of Paradise Valley, the south bank of the Berneil Ditch has overtopped around the outside of bend number 2, located near river station 150+41. Again, it is not known what rate of flow or return frequency is associated with this event or how much flow broke over the south bank. It is also not known exactly when the event occurred. The overflow event is consistent, at least in location, with the results from the HEC-RAS model when combined with the results of the superelevation analysis mentioned earlier. Shortly after the overflow occurred at this location, the Town of Paradise Valley constructed about 200 feet of masonry block wall about 18" high along the south bank just downstream from the bend to act as a flood wall.

As indicated by the HEC-RAS results, the Berneil Ditch sub-reach extending from Double Tree Ranch Road to the Indian Bend Wash has sufficient capacity to convey both the 10- and 100-year peak discharges without overtopping of either east or west channel bank.

Again, as stated in the Volume 1 Hydrology Analysis, none of the potential breakouts that might occur along the Berneil Ditch have been reflected in a hydrologic sense as diversion steps in the HEC-1 model. Hydraulically, discharge in the Berneil Ditch downstream from any of the potential breakouts is not reduced to account for the loss of flow from the channel.

## **2.14 HEC-RAS Results - Mountain View Channel**

According to the HEC-RAS model, the Mountain View Channel has sufficient capacity to convey the 10-year peak discharge without overtopping of either the north or south channel bank. Overtopping of the north channel bank, and portions of the south bank, occurs during the 100-year peak discharge throughout the entire length of channel.

The 10- and 100-year water surface elevations were reviewed at River Station 205+27, corresponding roughly to the location of the weir on the south bank mentioned previously. These water surface elevations are 1335.55 and 1338.80 feet, respectively. The elevation of the weir is approximately 1,337 feet and it is located approximately 65 feet downstream from River Station 205+27. It appears that the 10-year water surface is perhaps a foot or more below the weir elevation. However, it is possible that part of the 100-year flow could weir south to Caron Drive, which would then convey the flow to the Berneil Ditch.

There is no historic record of overtopping at the weir on the Mountain View Channel. And again, as stated in the Volume 1 Hydrology Analysis, the potential breakout that might occur at this location is not reflected in a hydrologic sense as a diversion step in the HEC-1 model. Hydraulically, the discharge in the Mountain View Channel downstream from the weir is not reduced to account for weir flow.

## **2.15 HEC-RAS Results - 71<sup>st</sup> Street Channel**

According to the existing condition HEC-RAS model for the 71<sup>st</sup> Street Channel, the channel does not have sufficient capacity anywhere along the study reach to convey the 100-year peak discharge without overtopping its banks. Overtopping of the channel banks also occurs for the 10-year peak discharge in several sub-reaches. These sub-reaches include Cactus Road to Mescal Street, the reach from Cochise Road to Gold Dust Avenue, and a section of channel upstream of the Mountain View Road culvert crossing within the Acacia Creek Apartments.

None of the culvert crossings along the 71<sup>st</sup> Street Channel are able to convey the 100-year peak discharge. This would result in overtopping of the roadways and significant overbank flooding. The 10-year peak discharge is apparently conveyed by all culvert crossings except for the Paradise Drive and Cochise Road crossings.

As mentioned previously, HEC-RAS is not capable of calculating losses due to the culvert skew relative to the direction of flow. This implies that the actual water surface elevation could be greater than the calculated water surface elevations at culverts with a skew (see Table 1 in Section 2.4 for culverts with skew). Based on a typical culvert with a skew, the increase in water surface elevation would be approximately 0.1 feet for both the 10- and 100-year flood events. The calculation for estimating an increase in water surface elevation due to a skewed culvert is provided in Appendix A.

There are many, many HEC-RAS cross sections that indicate neither the 10- or 100-year flows are contained within the end points of the hydraulic section. Flows that are not contained within the channel proper or within close proximity to the channel may break away and find nearby parallel flow paths. During the 100-year event, it is possible that 70<sup>th</sup> Street from Sunnyside Drive to Cortez Street may carry a portion of the west

overbank flow from the 71<sup>st</sup> Street Channel. It is also possible that flow overtopping the culverts at Sahuaro Drive and Shea Boulevard may flow west to 70<sup>th</sup> Street then south.

There are no specific historic accounts of flooding or overtopping of channel banks along the 71<sup>st</sup> Street Channel except as indicated by some of the attendees to the first public involvement meeting for the Scottsdale Road Corridor Drainage Master Plan in May of 2001. According to local residents, the upper part of the study reach north of about Cholla Road historically flooded on numerous occasions prior to construction of the Central Arizona Project canal and its associated retention basins.

### **3.0 NORMAL DEPTH AND CULVERT HYDRAULICS**

Many of the smaller drainage corridors in the Scottsdale Road Corridor Drainage Master Plan study area that are tributary to the Berneil Ditch, Mountain View Channel and 71<sup>st</sup> Street Channel were analyzed using simple normal depth and culvert hydraulics. These drainage corridors were typically broken up into sub-reaches, many of them corresponding to routing reaches in the HEC-1 hydrology model. The following sub-reaches were analyzed:

- 64<sup>th</sup> Street Channel from Gary Road to Shea Boulevard;
- 64<sup>th</sup> Street Channel from Shea Boulevard to the Mountain View Channel;
- Invergordon Road Channel from the Mountain View Channel to the Indian Bend Wash;
- Scottsdale Road from Greenway-Hayden Loop to Thunderbird Road;
- Scottsdale Road from Thunderbird Road to the Confluence with the Scottsdale Airport Detention Basin Outfall Channel;
- Scottsdale Airport Detention Basin Outfall Channel;
- Scottsdale Road from the Scottsdale Airport Detention Basin Outfall Channel to Sutton Drive;
- Scottsdale Road from Sutton Drive to Sweetwater Avenue;
- Scottsdale Road from Sweetwater Avenue to Cactus Road;
- Scottsdale Road from Cactus Road to Mescal Street;
- Continental Plaza Channel;
- 73<sup>rd</sup> Street from Cactus Road to Sunnyside Drive;
- Sunnyside Drive from 73<sup>rd</sup> Street to Scottsdale Road;
- 76<sup>th</sup> Street from Thunderbird Road to Sweetwater Avenue;
- Greenway Road from 78<sup>th</sup> Street to 76<sup>th</sup> Street; and
- Greenway Road from 76<sup>th</sup> Street to Greenway-Hayden Loop.

The hydraulic analysis presented here is not as detailed or comprehensive as the HEC-RAS modeling but is a step above the analysis that is found in the HEC-1 hydrology. The results of the combined normal depth and culvert hydraulics for each sub-reach are discussed in Section 3.3. Typically, culverts are associated with each respective upstream sub-reach in the way Section 3.3 is presented. And typically, photo plates depicting the various channels and culverts follow each of the sub-sections in Section 3.3.

#### **3.1 Normal Depth Analysis – General Approach and Method**

Representative normal flow depths for various drainage corridors were estimated using Haestad Methods' Flow Master version 6.1. Drainage corridors consist of both open channels and roadway sections that behave hydraulically as open channels. In addition to the surface flow conveyed by the street section, many of the roadway corridors also have storm drain pipes beneath or next to them.

The 10- and 100-year, 6-hour peak discharges estimated from the existing condition HEC-1 models were used in the following hydraulic analysis. For roadways with storm drains, the discharge used in the analysis is typically the total discharge minus the just-flowing-full capacity of the storm drain.

Input data to Flow Master includes typical channel cross-section geometry, Manning's roughness coefficient "n" and channel slope. Manning's n-values were estimated as discussed previously in the HEC-RAS hydraulic modeling section. Channel slopes were estimated from SCI survey data, field reconnaissance and/or as-built drawings.

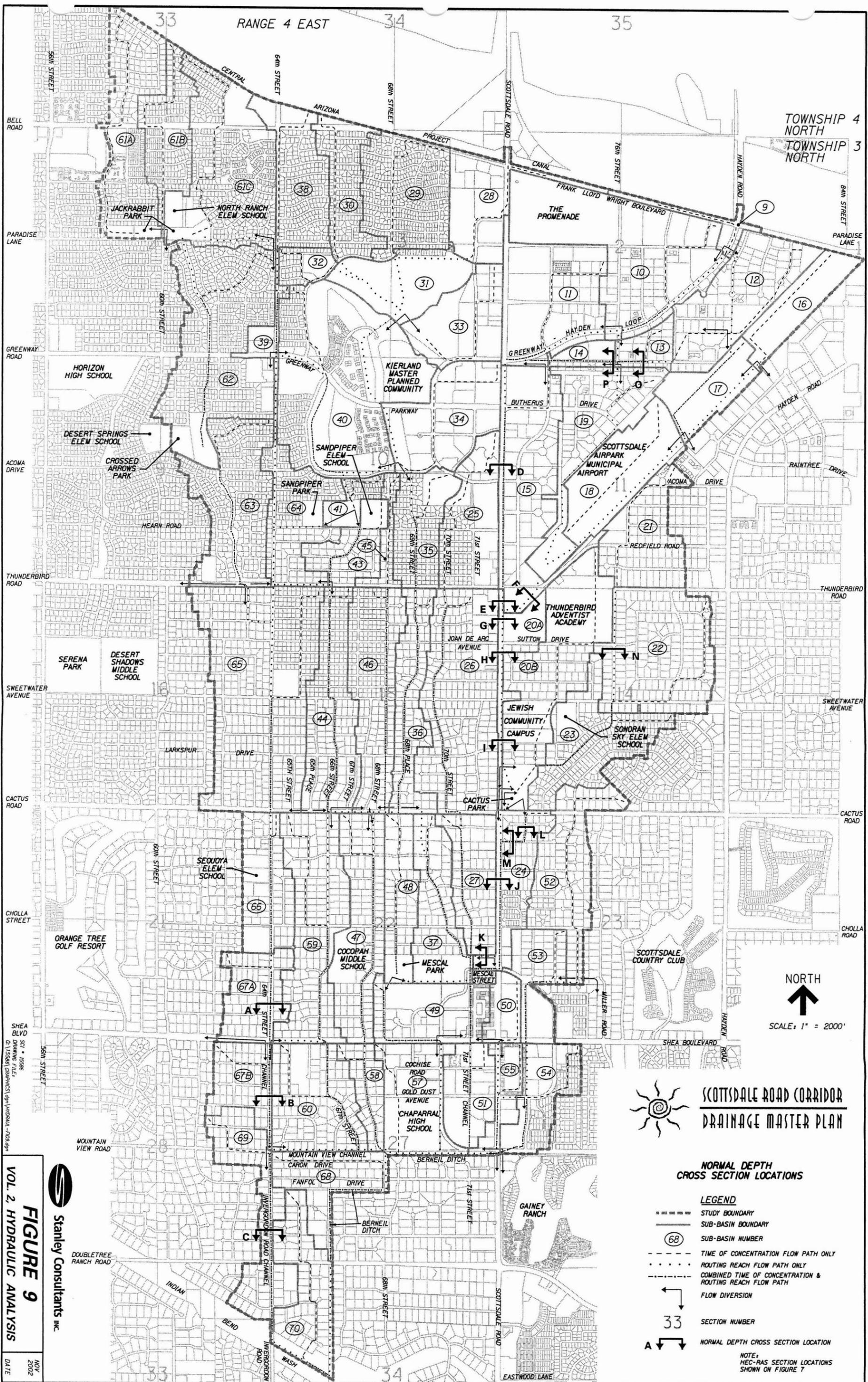
Normal depth output data and cross-section plots are provided in Appendix C. All normal depth sections are oriented from left to right looking downstream. The locations of normal depth cross sections are indicated on Figure 9 on the following page.

### **3.2 Culvert Analysis – General Approach and Method**

Hydraulic analysis was performed for culverts that were found in the normal depth reaches listed in the previous section. Culvert hydraulic analyses were completed using the FHWA HY-8, version 6.0 culvert analysis program. For tailwater conditions downstream from culverts, channel cross-section, slope and Manning's "n" values were taken from the typical sections modeled in the normal depth calculations.

Culvert dimensions, lengths and slopes were typically based either on survey data, as-built plans or field reconnaissance or a combination of all three. All culverts analyzed were concrete and a Manning's "n" of 0.013 was used in every case. HY-8 output printouts are provided in Appendix C. Typically, the flow rate used in culvert hydraulic analysis was the HEC-1 peak flow calculated at the downstream limit of each reach. This flow rate corresponded to the discharge used in the normal depth hydraulics.

Typically, there was no reduction in cross section geometry or other adjustment to account for the potential debris loading at the inlet of any of the culverts. This assumption is similar to the culvert analysis performed as part of the HEC-RAS model. Photo plates depicting the culverts that were analyzed are found on the following pages.



TOWNSHIP 4 NORTH  
TOWNSHIP 3 NORTH

NORTH  
SCALE: 1" = 2000'

**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN**

**NORMAL DEPTH  
CROSS SECTION LOCATIONS**

- LEGEND**
- STUDY BOUNDARY
  - SUB-BASIN BOUNDARY
  - (68) SUB-BASIN NUMBER
  - TIME OF CONCENTRATION FLOW PATH ONLY
  - ... ROUTING REACH FLOW PATH ONLY
  - .-.- COMBINED TIME OF CONCENTRATION & ROUTING REACH FLOW PATH
  - ↘ FLOW DIVERSION
  - 33 SECTION NUMBER
  - A ↘ NORMAL DEPTH CROSS SECTION LOCATION

NOTE:  
HEC-RAS SECTION LOCATIONS  
SHOWN ON FIGURE 7

SHEA BLVD  
S21 • 15586  
0:15586A (addendum) (open) (vertical) - 7/03.dgn

**Stanley Consultants Inc.**  
**FIGURE 9**  
**VOL. 2, HYDRAULIC ANALYSIS**  
DATE NOV 2002

### **3.3A Results - Normal Depth Section A and Shea Boulevard Culvert, 64<sup>th</sup> Street Channel from Gary Road to Shea Boulevard**

This reach corresponds to routing reach RR067A in the HEC-1 model. The HEC-1 discharges used for the hydraulic analysis are 303 cfs and 987 cfs for the 10- and 100-year flows, respectively.

It is unknown what the original design capacity was for the 64<sup>th</sup> Street Channel or the culvert at Shea Boulevard. The PVSP Study appears to recommend improvements to the channel based on a design discharge of 900 cfs. The PVSP Study also concluded that based on field measurements, the capacity of the existing culvert at Shea Boulevard was only 600 cfs. As a result, it was concluded in the PVSP Study that there would be a flooding problem at that location.

The 64<sup>th</sup> Street Channel from Gary Road to Shea Boulevard has a trapezoidal section with gabion-lined sides. Unconsolidated sediment consisting primarily of coarse sand and gravel and small cobbles line the channel bottom. The channel left and right banks are approximately 4 feet and 5 feet high, respectively. Channel side slopes are 1H:1V and the bottom width is approximately 10 feet. The frontage road located on the east side of the channel is approximately 25 feet wide and turns east at the Shea Boulevard.

Based on normal depth hydraulics, the bank-full capacity of the channel is approximately 520 cfs. The channel is capable of conveying a 10-year discharge with about 1-foot of freeboard. However, overtopping of both banks will occur for the 100-year event resulting in shallow overbank flow in the street sections adjacent to both sides of the channel.

The profile of Shea Boulevard drops in elevation from west to east as it crosses over the 64<sup>th</sup> Street Channel culvert. This may result in a portion of any flow that overtops either the left channel bank upstream from Shea Boulevard or the Shea Boulevard culvert being directed east along Shea and along the frontage road on its north side to the low point in the Shea profile at 66<sup>th</sup> Street. This potential diversion is reflected in diversion DV/DR067B.

The culvert crossing under Shea Boulevard consists of a double barrel - 10' x 4' CBC. This culvert is capable of conveying the 10-year peak discharge without overtopping of Shea Boulevard. However, overtopping of Shea Boulevard occurs for the 100-year peak discharge. The depth of water above the overtopping crest elevation is approximately 12 inches during the 100-year event. This conclusion is somewhat consistent with the conclusion mentioned above from the PVSP Study.



**PHOTO PLATE 17**

64<sup>th</sup> Street Channel looking upstream (north) just south of Gary Road.



**PHOTO PLATE 18**

64<sup>th</sup> Street Channel looking downstream (south) at Shea Boulevard culvert.

### **3.3B Results - Normal Depth Section B and Bridges/Culverts, 64<sup>th</sup> Street Channel from Shea Boulevard to the Mountain View Channel**

This reach corresponds to routing reach RR067B in the HEC-1 model. The HEC-1 discharges used for the hydraulic analysis are 337 cfs and 717 cfs for the 10- and 100-year flows, respectively. It is unknown what the original design capacity was for this sub-reach of channel or for any of its culverts or bridges.

The 64<sup>th</sup> Street Channel from Shea Boulevard to Mountain View Road has a trapezoidal section. The channel has gabion-lined sides. Unconsolidated sediments consisting primarily of coarse sand and gravel and small cobbles line the channel bottom. The channel is approximately 7.5 feet deep with 2.5H:1V side slopes and a bottom width of about 10 feet.

Based on normal depth hydraulics, the bank-full capacity of the channel is 2,400 cfs. The channel has capacity to convey the 100-year peak discharge with approximately 3.5 feet of freeboard.

There are two bridges and two culvert crossings along this reach. Both culverts are double barrel - 10' x 5' CBCs. Compared to the bridges, the culverts represent the more restrictive hydraulics. A single representative double barrel - 10' x 5' CBC was analyzed. The culvert crossing is capable of conveying both the 10- and 100-year peak discharges without overtopping. Overtopping of the culvert crossing occurs when the channel is conveying approximately 920 cfs. It appears that any overtopping flow would remain along the 64<sup>th</sup> Street Channel corridor and continue to the south.

Compared to the culvert capacity, the channel at the bridge crossings can convey approximately 1,740 cfs with the water surface elevation at the low chord of the bridge.



**PHOTO PLATE 19**

64<sup>th</sup> Street Channel looking upstream (north) at culvert under Gold Dust Avenue. Bridges at residential driveways are visible upstream.



**PHOTO PLATE 20**

64<sup>th</sup> Street Channel looking downstream (south) at concrete flow split structure which is the upper limit of the Mountain View Channel.

### **3.3C Results - Normal Depth Section C and Culverts, Invergordon Road Channel from the Mountain View Channel to the Indian Bend Wash**

This reach corresponds to routing reach RR069 in the HEC-1 model. The Invergordon Road Channel is the southern extension of the 64<sup>th</sup> Street Channel. It starts at the Mountain View Channel concrete flow split structure and outfalls to the Indian Bend Wash. As discussed in Section 2.3, it has been tentatively concluded that the concrete flow split structure was originally designed to produce a 50/50 split. That is, 50% of the flow would be diverted west into the Mountain View Channel and the remaining 50% would go south down the Invergordon Road Channel.

However, for reasons discussed in Section 2.3, a slightly more conservative assumption has been included in the hydraulic evaluation of the Invergordon Road Channel. Two discharges have been considered corresponding to the 10- and 100-year peak flows. A 10-year discharge of 219 cfs representing 50% of the flow approaching the flow split structure and a slightly larger discharge of 257 cfs representing 60%. In addition, a 100-year discharge of 496 cfs and 573 cfs representing the 50% and 60% flow splits, respectively, has been evaluated.

It is unknown what the original design capacity was for this sub-reach of channel or for any of its culverts. It appears that the recommended design capacity for this sub-reach from the PVSP Study was 900 cfs, just like the sub-reach to the north of it. This would appear to disregard the ability of the concrete flow split structure to direct a portion of the flow to the Mountain View Channel.

The Invergordon Road Channel typically has a trapezoidal section with gabion-lined sides. The channel bottom consists of coarse sand, gravel and small cobbles. The channel is approximately 5.5 feet deep with 1.5H:1V side slopes and a channel bottom of width of about 10 feet.

Based on normal depth calculations, the channel bank-full capacity is 984 cfs. The channel has enough capacity to convey both the 100-year 50% and 60% peak discharges with approximately 1.5 feet of freeboard.

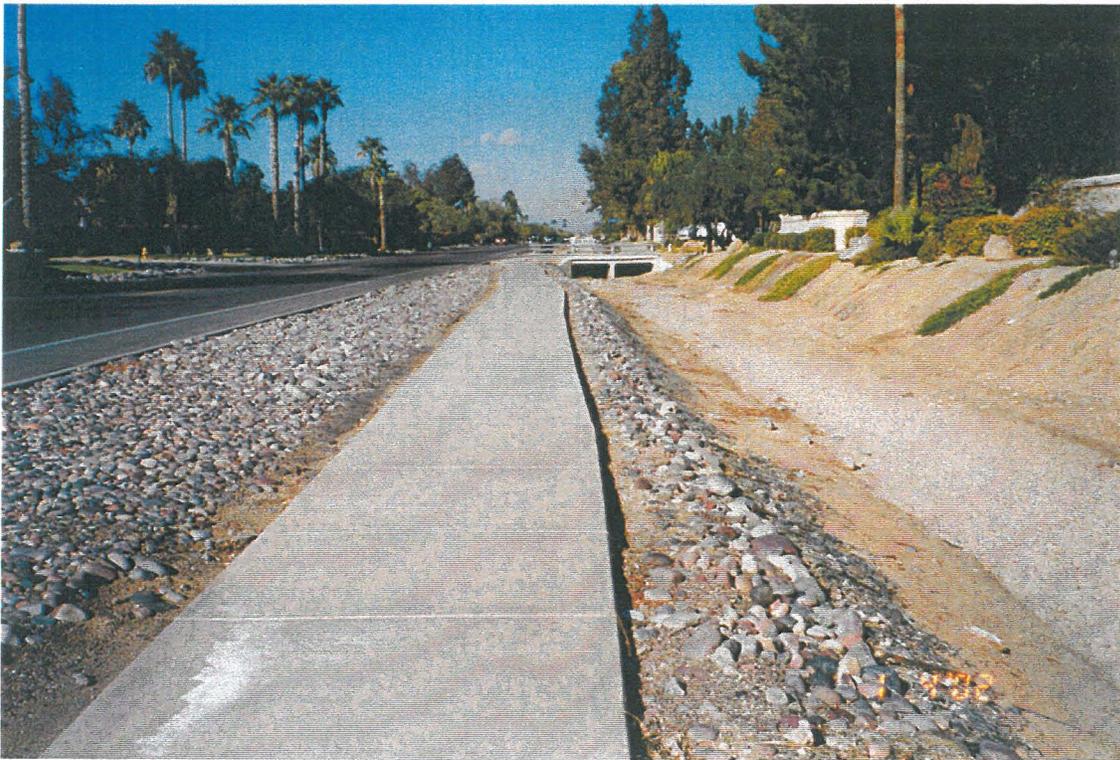
There are a total of nine culvert crossings along the Invergordon Road Channel. Two of the culverts are double barrel - 8' x 4' CBCs. The other seven culverts are double barrel - 6' x 4' CBCs. A typical double barrel - 6' x 4' CBC was chosen to represent the worst hydraulic case for this reach. The typical 6' x 4' culvert crossing is capable of conveying the 10-year peak discharge for both the 50% and 60% flow split scenarios.

However, the typical 6' x 4' culvert does not have sufficient capacity to convey either the 100-year 50% or 60% flow split peak discharge without overtopping. The depth of water above the overtopping crest elevation is approximately 6 and 8 inches for the 50% and 60% flow split peak discharges, respectively. If overtopping of this degree occurs, it appears that the excess flow would remain along the Invergordon Road Channel corridor and continue south to the Indian Bend Wash.



**PHOTO PLATE 21**

Invergordon Road Channel looking downstream (south). Culvert is a double 6' x 4' box at Doubletree Ranch Road.



**PHOTO PLATE 22**

Invergordon Road Channel looking upstream (north) near the Indian Bend Wash. Culvert is double 8' x 4' box at Horseshoe Road.

### **3.3D Results – Normal Depth Section D, Scottsdale Road from Greenway-Hayden Loop to Thunderbird Road**

This reach corresponds to routing reach RR015A and the upper part of routing reach RR015B in the HEC-1 model. Scottsdale Road has a normal crown section from Greenway-Hayden Loop to Thunderbird Road. The typical section is approximately 90 feet wide from face to face of curb with a 16-foot raised median and vertical curb.

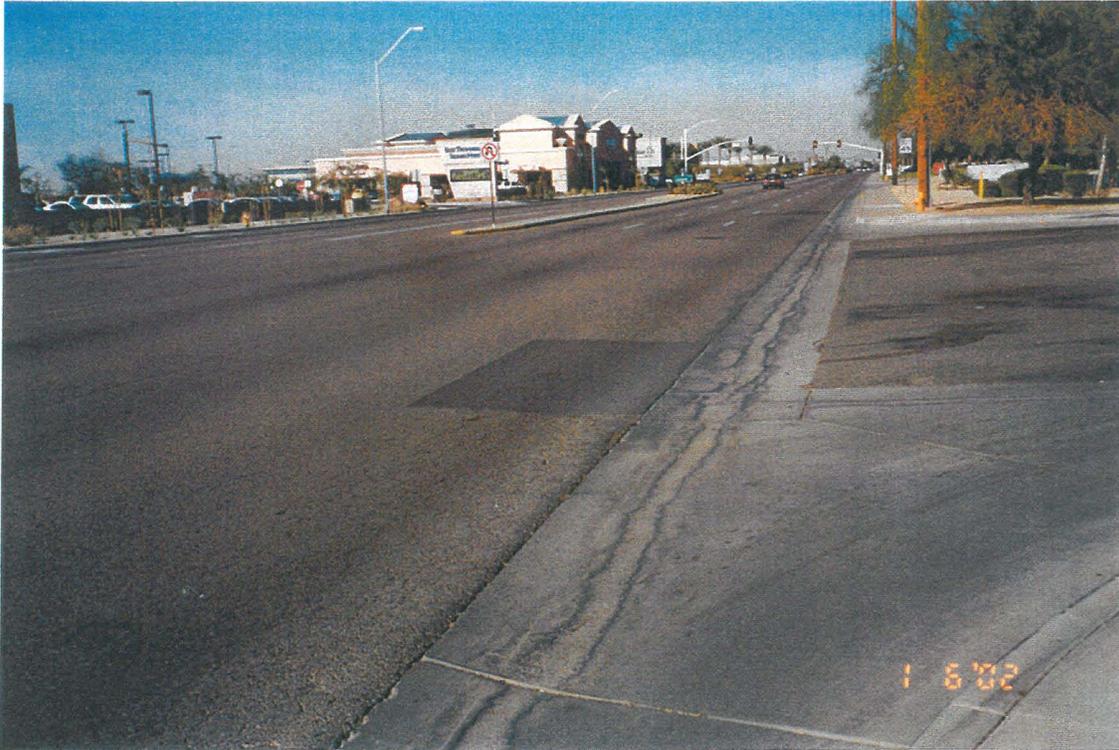
A 66-inch diameter storm drain trunk line runs along the west side of this section of Scottsdale Road. This storm drain transitions to a 72-inch diameter trunk line about 1,200 feet north of Thunderbird Road. The storm drain trunk line was constructed in the late 1980's in place of an open channel that used to run along the west side of the road. It is not known what the design capacity of the storm drain trunk line was. It is assumed that the trunk line was sized, at least in part, based on the capacity of the open channel that it replaced.

The trunk line ties into a three-barrel 6' x 4' concrete box culvert that passes diagonally under the intersection of Scottsdale and Thunderbird Roads, discharging into the channel discussed in the next section. The three-barrel 6' x 4' CBC was constructed by the City of Scottsdale in the mid-1980's as part of the PVSP drainage improvements.

The flow rate used in this analysis is the total discharge from the HEC-1 model minus the just-flowing-full capacity of the 66-inch diameter storm drain trunk line. The resulting discharges used for the hydraulic analysis are 111 cfs and 405 cfs for the 10- and 100-year flows, respectively.

According to the normal depth analysis, the street section has a top-of-curb capacity of only about 48 cfs. The typical section, when coupled with the capacity of the existing storm drain trunk line, may have roughly a 10-year capacity if the storm drain were assumed to be operating under a slight pressure head.

The combined capacity of the storm drain and street section is not sufficient to convey the 100-year peak discharge and overflow above top-of-curb would occur. The depth of water above top of curb during a 100-year event is on the order of a few tenths of a foot. Given the slight overall regional topographic gradient to the west, overflow would most likely occur in that direction toward the retail and commercial properties on the west side of Scottsdale Road.



**PHOTO PLATE 23**

Scottsdale Road looking north near Evans Road between Thunderbird and Acoma.



**PHOTO PLATE 24**

Looking northwest at intersection of Scottsdale Road and Thunderbird Road. Triple 6' x 4' box is the outfall for the Scottsdale Road storm drain north of Thunderbird.

### **3.3E Results – Normal Depth Section E, Scottsdale Road Channel from Thunderbird Road to Confluence with Scottsdale Airport Detention Basin Outfall Channel**

This reach corresponds to the lower part of routing reach RR015B in the HEC-1 model. Scottsdale Road has a normal crown section from Thunderbird Road south. The typical street section is approximately 90 feet wide from face to face of curb with a 16-foot raised median and 6-inch vertical curb. This reach is adjacent to the (mostly) vacant parcel of land at the southeast corner of Scottsdale and Thunderbird Roads.

There is an existing channel that runs along the east side of Scottsdale Road from Thunderbird Road south. This channel is situated on a parcel of land currently owned by the City of Scottsdale and planned for the future Fighter Pilot Museum. The channel is lined with patterned, colored concrete on its sides and bottom for a distance of about 200 feet downstream of Thunderbird Road.

Downstream from the lined section, the channel is generally earth cut with essentially no landscaping. The bottom and sides of the channel in the earth cut section typically have a moderate cover of perennial native grass and weeds. A short section of the earth cut reach is lined with grouted concrete at the confluence of the airport detention basin outfall channel (see next section).

The total length of channel from Thunderbird Road to the Scottsdale Airport detention basin outfall channel is approximately 550 feet. There are no culverts associated with this channel reach. And, there are no catch basins on the adjacent section of Scottsdale Road that would direct roadway drainage into the channel.

The channel receives drainage primarily from the storm drain trunk line mentioned above in Section 3.3D. It also receives inflow from an existing 42-inch diameter storm drain at Thunderbird Road draining into it from the east as well as local surface runoff from the north and east.

This channel was improved by the City of Scottsdale in the mid 1980's apparently stemming from earlier recommendations in the PVSP Study. The design discharge for this channel appears to have been 650 cfs from the PVSP Study. The 10- and 100-year discharges used for the normal depth analysis here are 576 cfs and 1,123 cfs respectively.

Based on the normal depth analysis, the concrete lined sub-reach of this channel just downstream from Thunderbird Road is capable of conveying a discharge of approximately 1,600 cfs at the top of bank elevation. The earth sub-reach just below the concrete lined section can convey roughly 2,800 cfs to the top of bank. This means that this reach can potentially convey both the 10- and 100-year peak discharges.

However, based on the results in Section 3.3D, there is a significant amount of surface flow conveyed in Scottsdale Road that may not entirely enter the channel south of Thunderbird Road. This is due primarily to potential overflow of the Scottsdale Road street section north of Thunderbird and the lack of catch basin inlets south of Thunderbird. Also, the flow velocity for the 100-year event is over 8 feet per second in the earth sub-reach. This may be considered slightly erosive for the unlined section of the channel.



**PHOTO PLATE 25**

Scottsdale Road Channel looking upstream (north) from a point about 200 feet south of Thunderbird Road.



**PHOTO PLATE 26**

Scottsdale Road Channel looking upstream (north) from a point about 600 feet south of Thunderbird Road just downstream from the confluence with the airport detention basin outfall channel.

### **3.3F Results – Normal Depth Section F, Scottsdale Airport Detention Basin Outfall Channel**

This channel serves as the outfall for the Scottsdale Airport detention basin (HEC-1 ID RR015C). It originates at the southeast corner of the airport basin just north of Thunderbird Road where the basin's primary outlet is located. The outlet consists of a double 12' x 3' concrete box culvert. There is a short reach of channel about 150 feet long from the basin outlet to Thunderbird Road where there is another double 12' x 3' culvert that passes diagonally under the road. The channel then traverses along the southeast edge of the vacant property owned by the City of Scottsdale where the proposed Fighter Pilot Museum will be located. The detention basin outfall channel joins the Scottsdale Road Channel (see previous section) about 550 feet south of Thunderbird Road.

The total length of the outfall channel from the detention basin to the Scottsdale Road Channel is approximately 1,300 feet, including the outlet structure at the detention basin and the culvert mentioned above. The channel has a concrete lined trapezoidal cross section for its entire length and a relatively uniform longitudinal slope of about 0.005 ft/ft. The typical cross section has a minimum depth of about 4 feet, a bottom width of approximately 9 feet and side slopes of about 1.5H to 1V. A portion of the south (left) bank of the outfall channel adjacent to the Seventh Day Adventist Church parcel is built up above the adjacent grade of the church parking lot.

The original airport detention basin outlet proposed in the PVSP study was apparently a single 60-inch diameter bleedoff pipe designed for an average flow of 150 cfs and a maximum flow of 250cfs. However, the PVSP study indicates that the airport basin, as originally conceived, would only contain about one half of the 100-year storm and that the 100-year discharge at the outlet would be 1,520 cfs. The PVSP Study concluded that this discharge downstream from the airport basin would exceed the proposed design capacity of the Scottsdale Road Channel (850 cfs) for a duration of about one half hour. The PVSP Study also concludes that the anticipated overflow of the channel along Scottsdale Road downstream from the airport basin would generally follow along Scottsdale Road and would enter the (then future) Cactus Park detention basin.

The downstream end of the outfall channel near the confluence with the Scottsdale Road Channel was constructed in the mid 1980's as part of the PVSP improvements. This work was later modified in the early 1990's when the Scottsdale Airport detention basin and outfall channel were constructed. This is the channel that exists today. It is not known what the design discharge was for the existing outfall channel. The 10- and 100-year existing condition discharges from the HEC-1 model are 332 and 586 cfs respectively. Based on the normal depth analysis, the channel is capable of conveying about 820 cfs flowing bank full.



**PHOTO PLATE 27**

Scottsdale Airport detention basin outfall channel looking downstream (southwest) just below Thunderbird Road.



**PHOTO PLATE 28**

Scottsdale Airport detention basin outfall channel looking upstream (east) from confluence with Scottsdale Road Channel.

### **3.3G Results – Normal Depth Section G and Sutton Drive Culvert, Scottsdale Road Channel from Confluence with Scottsdale Airport Detention Basin Outfall Channel to Sutton Drive**

This reach corresponds to routing reach RR020A in the HEC-1 model. The HEC-1 discharges used for the hydraulic analysis are 722 cfs and 1,317 cfs for the 10- and 100-year flows, respectively.

This channel may have been initially improved as part of the PVSP Study. The design discharge for this channel appears to have been 800 cfs from the PVSP Study. This discharge was the numerical addition of 650 cfs from the channel to the north and an estimated average discharge of 150 cfs from the Scottsdale Airport detention basin outfall channel. At the time of the PVSP Study, the airport detention basin had not yet been constructed.

Scottsdale Road has essentially the same street section adjacent to reach 3.3G as it does adjacent to reach 3.3E to the north. A landscaped channel with a somewhat rounded trapezoidal cross section having a top width of over 100 feet and a depth of about 5 feet runs adjacent to the east side of Scottsdale Road from the Scottsdale Airport detention basin outfall channel to Sutton Drive. This channel runs across the frontage of the Seventh Day Adventist Church property.

There are two driveways from Scottsdale Road that cross the channel into the church parking lot. These driveways are paved surface crossings with no culverts. The channel is partly situated within a 70-foot wide drainage easement across the church property immediately adjacent to the Scottsdale Road right-of-way.

The channel crosses under Sutton Drive in a four-barrel - 8' x 3' concrete box culvert. This culvert was apparently sized hydraulically to pass a flow of 800 cfs based on the PVSP Study. The culvert was constructed in the mid-1980's by the City of Scottsdale as part of the PVSP drainage improvements.

According to the culvert hydraulic analysis, the Sutton Drive culvert crossing has the capacity to convey the 10-year peak discharge with approximately 0.3 feet of freeboard. However, the 100-year peak discharge overtops the roadway. According to the culvert hydraulics, the depth of water above the overtopping crest elevation at the Sutton Drive culvert is approximately 1.7 feet for the 100-year event.

According to the normal depth analysis, the channel section has the capacity to convey both the 10- and 100-year peak discharges without consideration to the conveyance capacity in the adjacent street section.

The flow velocity in this channel approaches 8 feet per second. This may be considered erosive, especially in light of the length of time that flow would be present in the channel due to the draw down of the airport detention basin. There are only two catch basins in Scottsdale Road adjacent to this reach, both located just north of Sutton Drive.



**PHOTO PLATE 29**

Scottsdale Road Channel looking downstream (south) at the upper driveway dip crossing into the Seventh Day Adventist Church property.



**PHOTO PLATE 30**

Scottsdale Road Channel looking upstream (north) at the 4-barrel 8' x 3' box culvert under Sutton Drive.

### **3.3H Results – Normal Depth Section H, Scottsdale Road Channel from Sutton Drive to Sweetwater Avenue**

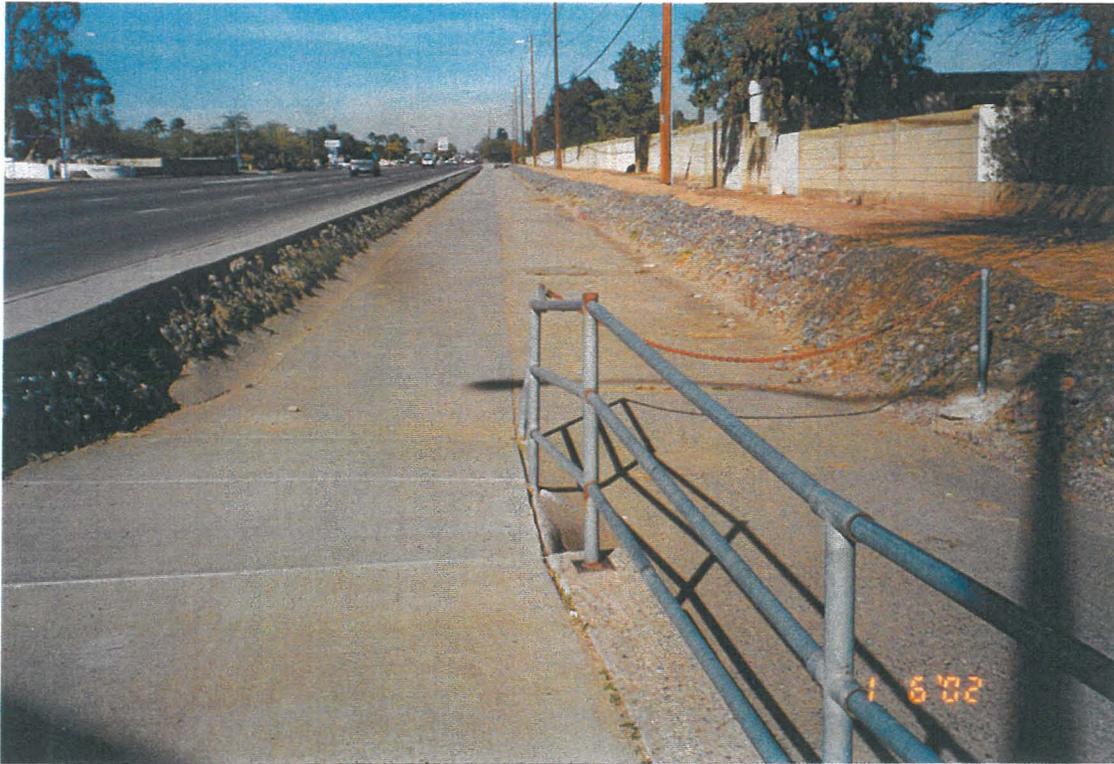
This reach corresponds to routing reach RR020B in the HEC-1 model. The HEC-1 discharges used for the hydraulic analysis are 717 cfs and 1,307 cfs for the 10- and 100-year flows, respectively.

A trapezoidal channel runs adjacent to the east side of Scottsdale Road along this reach. The channel has gabion-lined sides having a slope of approximately 1H:1V, a depth of about 3.5 feet and a concrete-lined channel bottom with a width of about 17 feet. The bottom of the channel incorporates a concrete sidewalk on its west side for the entire length of the reach. This sidewalk is elevated slightly above the east side of the channel bottom.

This channel was under construction in 1978 when the PVSP Study was just being completed. The PVSP Study concluded that a design discharge of 800 cfs would not be entirely contained in the channel. Scottsdale Road adjacent to the channel has a normal crown section the same as the previous two reaches to the north. There are no catch basins in Scottsdale Road adjacent to the channel that would direct roadway drainage into it. The channel is probably too shallow to serve as an outfall for a roadway storm drain system.

Overflow of the combined channel and road section above the top-of-curb elevation would occur for both the 10- and 100-year peak discharges according to the normal depth analysis. The depth of water above top-of-curb is approximately 0.4 and 0.9 feet for the 10- and 100-year events, respectively. The trapezoidal channel has the capacity to convey just over 430 cfs before overtopping occurs and flow enters Scottsdale Road. The section of Scottsdale Road from Sutton Drive to Sweetwater Avenue can only convey about 30 cfs with the water surface elevation at top-of-curb. Flows of the magnitude that exceed top of curb elevation would probably overflow to the west side of Scottsdale Road since that side is lower in elevation than the along the east side of the channel.

At Sweetwater Avenue, the channel drops into the inlet of a 90-inch diameter storm drain. This storm drain is discussed in more detail in Section 3.3I, which follows. The storm drain in Reach 3.3I has greater capacity than the bank-full capacity of the channel in Reach 3.3H. Therefore, it would not pose a restriction to the channel capacity above Sweetwater Avenue. But again, the amount of flow that would be in the immediate vicinity of the storm drain inlet may be limited by the capacity of the upstream channel reach.



**PHOTO PLATE 31**

Scottsdale Road Channel looking upstream (north) from just above Sweetwater Avenue.



**PHOTO PLATE 32**

Scottsdale Road Channel looking downstream (south) at the inlet to the 90" storm drain just above Sweetwater Avenue.

### **3.3I Results – Normal Depth Section I, Scottsdale Road and Storm Drain Trunkline from Sweetwater Avenue to Outfall at Cactus Park Detention Basin**

This reach corresponds to routing reach RR020C in the HEC-1 model. The primary conveyance in this reach is a 90-inch diameter storm drain trunkline that runs under the east curb of Scottsdale Road from Sweetwater Avenue to the northwest corner of Cactus Park where it outfalls into the Cactus Park detention basin. This storm drain was constructed by the City of Scottsdale in the Mid-1980's as part of the PVSP drainage features. The PVSP Study, however, appears to have anticipated an open gabion-lined channel in this reach, similar to that found north of Sweetwater, with culverts under Sweetwater and Larkspur. Again, as in the reach to the north, the design discharge from the PVSP Study appears to have been 800 cfs.

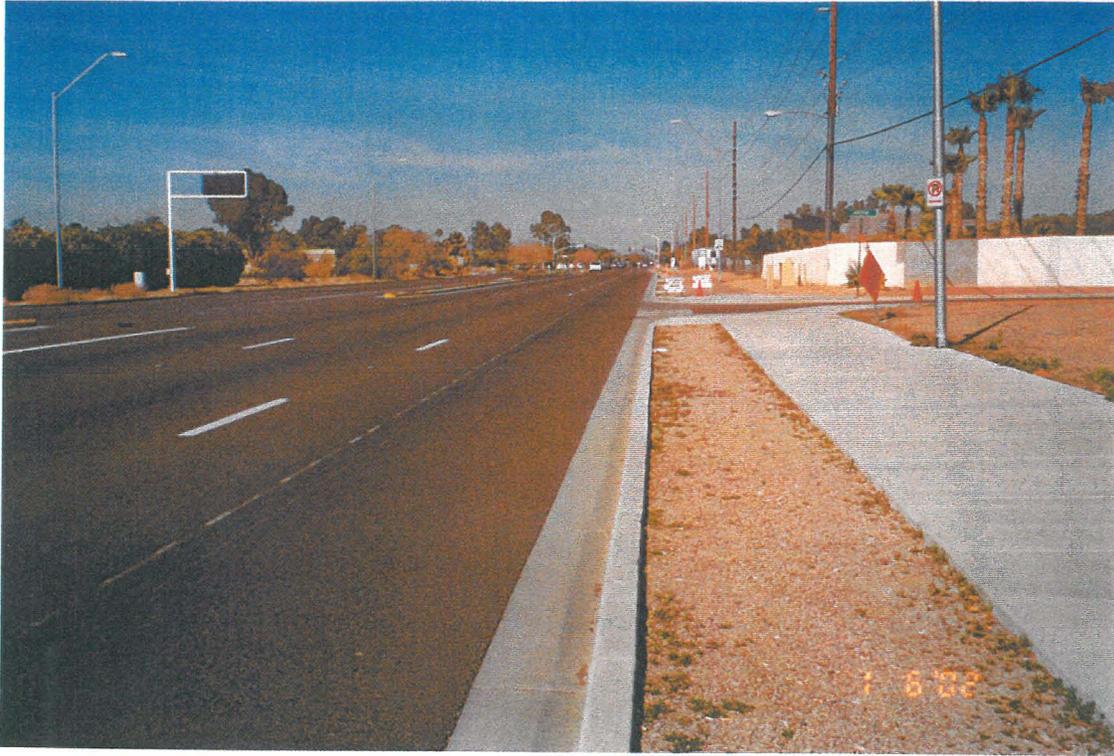
In the HEC-1 model for the Scottsdale Road Corridor Drainage Master Plan study, flow from this reach is split south of Sweetwater Avenue based on the capacity of the existing 90-inch diameter storm drain. Flow not conveyed by the pipe is conveyed south down Scottsdale Road as surface flow. The flow split corresponding to the storm drain is diversion step DV20A1 in the HEC-1 model.

According to normal depth analysis, the full-flow capacity of a 90-inch diameter storm drain pipe with a 0.0056 ft/ft slope and a Manning's roughness coefficient of 0.013 is approximately 575 cfs. In comparison, the inlet capacity of the 90-inch diameter storm drain assuming inlet control is approximately 700 cfs. The inlet control analysis is based on the headwater elevation at top-of-headwall.

The pipe-flowing-full discharge of 575 cfs was used as the basis for the flow split in the HEC-1 model. This 575 cfs is also subtracted from the total 10- and 100-year HEC-1 discharges of 714 and 1,306 cfs (respectively) to evaluate the surface capacity of Scottsdale Road. The 10- and 100-year discharges for evaluation of surface flow hydraulics are therefore 139 cfs and 731 cfs, respectively.

The Scottsdale Road street section in this reach is only capable of conveying a surface flow of 35 cfs based on a normal depth hydraulic section. This section of Scottsdale Road has catch basins and lateral pipes that collect the roadway drainage and convey it to the 90-inch storm drain. Flow in excess of the combined capacity of the storm drain and street will overflow both the east and west sides of Scottsdale Road, generally following the roadway corridor to the south in a shallow, unconfined manner.

If the existing 90-inch storm drain could accept a slight surcharge and if enough flow could be directed to its inlet just above Sweetwater Avenue and to its catch basin inlets south of Sweetwater, it could potentially convey approximately a 10-year flow.



**PHOTO PLATE 33**

Scottsdale Road looking north from about Larkspur Drive. 90-inch storm drain trunkline is below east curb.



**PHOTO PLATE 34**

Looking northwest from within the Cactus Park detention basin at the outfall of the 90-inch storm drain.

### **3.3J Results – Normal Depth Section J, Scottsdale Road and Storm Drain Trunkline from Cactus Road to Mescal Street**

This reach corresponds to routing reach RR024D in the HEC-1 model and represents the surface flow component of flow in Scottsdale Road. Scottsdale Road has a normal crown section south of Cactus Road. The typical section is approximately 90 feet wide from curb to curb, has a 6-inch vertical curb height and a raised median with a width of 16 feet.

A storm drain system for the roadway drainage runs under Scottsdale Road from Paradise Drive to a sump in the road profile just north of Mescal Street. The storm drain trunkline ranges in diameter from 24-inches at the north end to 54-inches at the south end. The outfall for the Scottsdale Road storm drain system is the 71<sup>st</sup> Street Channel at Mescal Street. The Scottsdale Road storm drain is not connected to the 60-inch diameter outfall pipe that drains the Cactus Park detention basin. The flow in the Cactus Park detention basin outfall pipe is a separate conveyance from the surface flow in Scottsdale Road in both a hydrologic and hydraulic sense.

The discharge used in the hydraulic analysis for normal depth Section J is the total routed discharge from HEC-1 minus the just-flowing-full capacity of the roadway storm drain system (120 cfs). Since the storm drain varies in size, a 48-inch diameter pipe was chosen as being hydraulically representative of the overall trunkline. The calculated surface flow only 10- and 100-year peak discharges are 51 and 737 cfs, respectively. The apparently large difference between the 10- and 100-year discharges is because the Cactus Park detention basin has surface overflow for the 100-year event but not for the 10-year event.

According to the normal depth analysis, the Scottsdale Road Street section does not have capacity to convey either the 10- or the 100-year peak discharge without exceeding the top-of-curb. A depth of water of approximately 0.1 and 1.0 feet above top-of-curb will occur during the 10- and 100-year events, respectively. The street section alone only has capacity to convey about 35 cfs with the water surface elevation at top-of-curb. Flow in excess of the combined capacity of the storm drain and street will overflow both the east and west sides of Scottsdale Road, generally following the roadway corridor to the south in a shallow, unconfined manner.

### **3.3K Results – Normal Depth Section K, Continental Plaza Channel from Scottsdale Road to 71<sup>st</sup> Street Channel**

This channel originates at Scottsdale Road approximately 300 feet north of Mescal Street and drains west across the north edge of the Continental Plaza property to the 71<sup>st</sup> Street Channel (HEC-1 ID RR024E). The Continental Plaza property is referred to as the “nursery yard” in the PVSP Study because at the time of that study, the property was a plant nursery. There is no specific mention of a channel at this location in the PVSP Study although it existed in essentially the same location at that time across the north edge of the nursery yard. This channel was apparently not part of the PVSP recommended plan. The original purpose of the channel was to convey offsite surface flow from a sump or dip in the Scottsdale Road profile to the 71<sup>st</sup> Street Channel.

The channel presently consists of a cobble lined trapezoidal section with a parking lot on the south side and a 6-foot high masonry block fence on the north side. Its total length is approximately 600 feet. The parking lot along the south side of the channel slopes away from the channel to the south. On the other side of the masonry fence north of the channel there are residential lots on Gary Road that back up to the channel. There is a clear opening in the fence along Scottsdale Road where the channel begins but at the downstream end, the channel passes through a shallow opening under the masonry block fence along the west side of the Continental Plaza property.

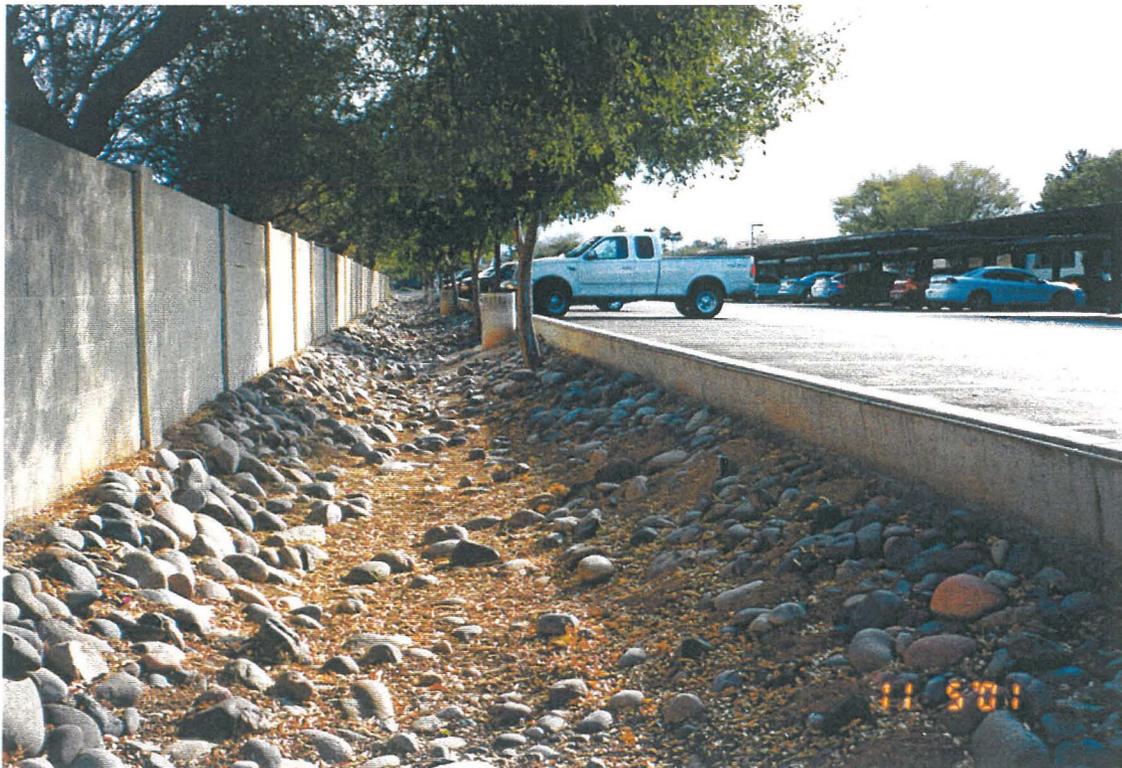
When Scottsdale Road was improved to its present state in the late 1990's a storm drain was constructed below the roadway. This storm drain collects roadway drainage but also intercepts local drainage from the area east of Scottsdale Road below Cactus Road. There are catch basins at the sump in the Scottsdale Road profile located about 100 feet north of the inlet to the Continental Plaza Channel. These catch basins, combined with the rest of the storm drain system, would redirect flows up to a certain magnitude away from the Continental Plaza Channel. The storm drain in Scottsdale Road continues south past the sump and the channel and turns west on Mescal Street where it discharges to the 71<sup>st</sup> Street Channel. For runoff events up to the capacity of the Scottsdale Road storm drain system, the Continental Plaza Channel will essentially not experience any flow.

This channel, however, still serves as the overflow conveyance for events in excess of the Scottsdale Road storm drain capacity. The 10- and 100-year discharges for existing conditions based on the Volume 1 Hydrology HEC-1 model are 52 cfs and 729 cfs respectively. As presented in the previous section, there is an apparently large difference in magnitude between the 10- and 100-year discharges. This is due to the Cactus Park detention basin that controls the 10-year event but overflows during the 100-year event.

Normal depth Section K indicates that the Continental Plaza Channel has 10-year capacity, but with very little freeboard. The 100-year event would significantly exceed the capacity of the channel. The normal depth analysis does not recognize that there would be significant backwater impact from the small opening under the block fence at the downstream end of the channel or that the overflow from the sump in Scottsdale Road may have difficulty reaching the upstream inlet of the channel due to its offset from the sump. Overflow could significantly impact both the Continental Plaza buildings to the south that have finished floors well below grade and the residences to the north.



**PHOTO PLATE 35**  
Scottsdale Road looking north from about Jenan Drive.



**PHOTO PLATE 36**  
Continental Plaza Channel north of Mescal Street from Scottsdale Road sump to 71<sup>st</sup> Street channel looking upstream (east). Scottsdale Road is at far end of channel.

### **3.3L Results – Normal Depth Section L, 73<sup>rd</sup> Street from Cactus Road to Sunnyside Drive**

This reach corresponds to routing reach RR024B in the HEC-1 model. 73<sup>rd</sup> Street has a normal crown section and an approximate curb-to-curb width of 31 feet. 73<sup>rd</sup> Street has 4-inch roll curbs from Cactus Road to Paradise Drive and 6-inch vertical curbs from Paradise Drive to Sunnyside Drive. The 4-inch roll curbs were modeled in the hydraulic analysis. Masonry fences along the property lines adjacent to this routing reach on both the east and west sides of 73<sup>rd</sup> Street would tend to confine the flow on both sides.

The local drainage that collects along this reach is relatively minor. However, this reach is the primary conveyance for any surface overflow from the Cactus Park detention basin. According to the HEC-1 model, Cactus Park does not overflow during the 10-year event, but overtopping does occur during the 100-year event.

If overflow of the Cactus Park detention basin occurs, the location of the overflow would be the south side of the basin along Cactus Road just east of Scottsdale Road near 73<sup>rd</sup> Street. Overflow would pass from the detention basin to Cactus Road to 73<sup>rd</sup> Street. When this flow reaches Sunnyside Drive, a portion of it would be directed west to Scottsdale Road. The 100-year HEC-1 discharge used for the 73<sup>rd</sup> Street hydraulic analysis is 698 cfs.

The PVSP study appears to conclude that there would be an “uncontrolled” 100-year overflow of about 1,800 cfs from the Cactus Park detention basin but this seems to have only been anticipated in a hydrologic sense. There does not appear to have been any recommendation or provision made in the PVSP study for local conveyance of the overflow. Although stormwater in the Cactus Park detention basin has reached a depth of about 10 feet since its construction in the mid 1980's, it has apparently never overflowed.

According to the normal depth analysis, the 73<sup>rd</sup> Street section does not have sufficient capacity to convey the 100-year peak discharge without exceeding the top-of-curb elevation. The water surface elevation for this discharge exceeds the top-of-curb elevation by 1.9 feet. The street conveyance capacity for this reach at the top-of-curb elevation is less than 10 cfs.

### **3.3M Results – Normal Depth Section M, Sunnyside Drive from 73<sup>rd</sup> Street to Scottsdale Road**

This reach corresponds to routing reach RR024C in the HEC-1 model. Sunnyside Drive has a normal crown section with 6-inch vertical curbs and a curb-to-curb width of 31 feet. Sunnyside Drive drains west from 73<sup>rd</sup> Street to Scottsdale Road and would receive the overflow from the Cactus Park detention basin (see previous section).

The 100-year HEC-1 discharge used for the Sunnyside Drive hydraulic analysis is 692 cfs. The same discharge was used in previous Section 3.3L. According to the normal depth analysis, the Sunnyside Drive street section only has enough capacity to convey approximately 25 cfs at the top-of-curb elevation. The water surface elevation for a discharge of 692 cfs exceeds the top-of-curb elevation by 1.9 feet.

Realistically, however, flow would probably not reach that depth. More likely, it would overflow the curb on both sides of the street at a shallow depth of probably less than one foot. Since the predominant direction of topographic relief in this area is to the southwest, most of the potential overflow would occur over the south curb.

Based on field reconnaissance and the review of local topography, it is tentatively concluded that overflows from the Cactus Park detention basin in the magnitude described above would generally spread out in a shallow unconfined manner through the residential area south of Sunnyside Drive. This flow would gradually work its way toward the southwest rejoining the Scottsdale Road corridor north of Mescal Street.

At the west end of Sunnyside Drive near Scottsdale Road, there is a catch basin and an opening under the block fence to accommodate local drainage. Overflow from the Cactus Park detention basin would exceed the capacity of this system and result in shallow ponding at the end of Sunnyside Drive.



**PHOTO PLATE 37**

73<sup>rd</sup> Street looking south from south of Cactus Road. Cross street in background is Sunnyside Drive.



**PHOTO PLATE 38**

Sunnyside Drive looking west between 73<sup>rd</sup> Street and Scottsdale Road.

### **3.3N Results – Normal Depth Section N, 76<sup>th</sup> Street from Thunderbird Road to Sweetwater Avenue**

This reach corresponds to reach RR022 in the HEC-1 model. Although 76<sup>th</sup> Street is represented in the HEC-1 model as a single routing reach from a hydrologic standpoint, hydraulic characteristics vary somewhat along its length. The typical street section for 76<sup>th</sup> Street from Thunderbird Road to Sutton Drive is a two-lane strip of pavement with a relatively level cross section and no curb and gutter.

To the east of 76<sup>th</sup> Street are the front yards of residential lots and to the west is a relatively level unpaved strip of land about twice the width of the pavement. There is essentially no ditch or flow path along the west side of the road. The primary conveyance in this section is a very shallow roadside ditch along the east side of the pavement that traverses the adjoining residential front yards and driveways. There is not more than about 6 inches of total vertical relief across this section and no confining physical features on either side of it.

76<sup>th</sup> Street from Sutton Drive to Sweetwater Avenue is a much wider pavement section than north of Sutton Drive. It has a transverse slope from west to east, a vertical curb along its west side and no curb along its east side. Along the east edge of pavement there is a shallow swale that traverses the front yards of adjacent residential lots. In the southern most section of 76<sup>th</sup> Street near Sweetwater Avenue, there is a concrete lined drainage channel on the west side of the road. This channel has a triangular section and is approximately 2 feet in maximum depth with a top width of about 10 to 15 feet.

An 18-inch diameter storm drain runs under 76<sup>th</sup> Street for almost the entire length of this reach. This storm drain serves as the outfall drain for the Thunderbird Industrial detention basin just north of Thunderbird Road and also collects local stormwater from the residential subdivision east of 76<sup>th</sup> Street and north of Sutton Drive. This storm drain outfalls to the triangular channel described in the paragraph above and has only a minor capacity when compared to either the 10- or 100-year discharges.

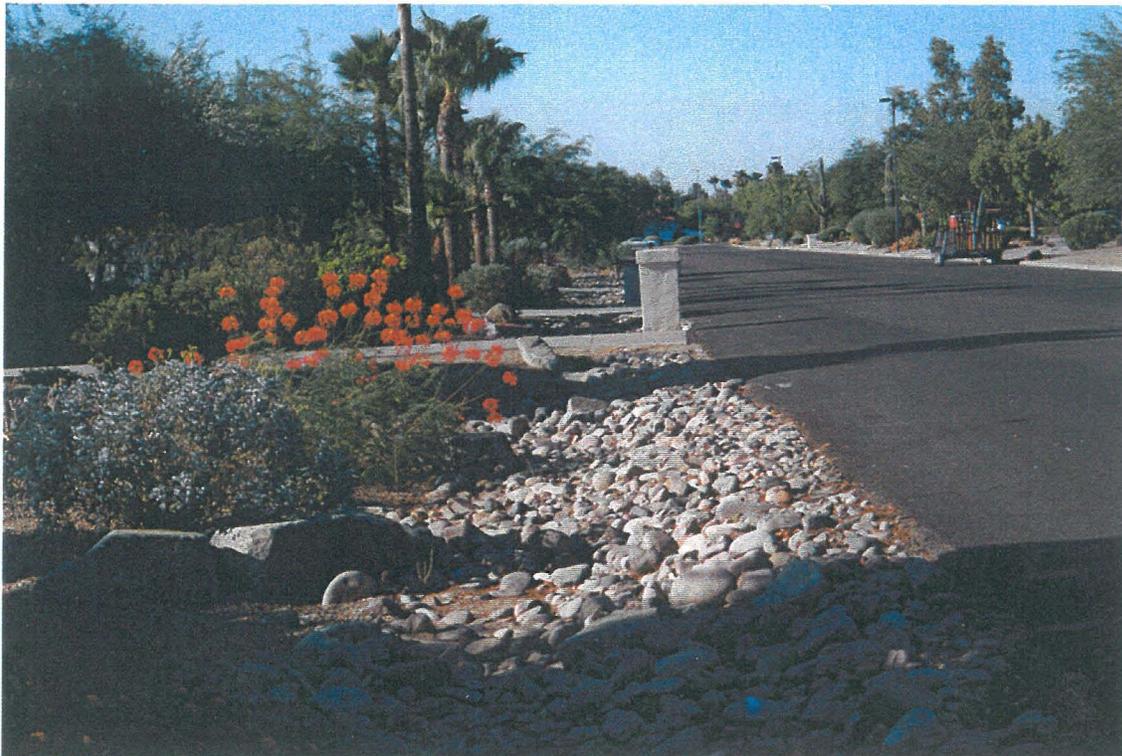
The discharge used in the hydraulic analysis is the total routed discharge from HEC-1 minus the just-flowing-full capacity of the 18-inch diameter storm drain. The resulting 10- and 100-year peak discharges are 122 cfs and 303 cfs, respectively.

The hydraulic section chosen to represent this reach is located just south of Sutton Drive. From the average depth of flow indicated, it is apparent that flow would not be contained in the street section north of Sutton Drive and shallow flooding would occur on both sides of the pavement. South of Sutton Drive, overflow of the swale along the east side of the road occurs for both the 10- and 100-year peak discharges. This would result in shallow flooding mainly along the east side of the road. Residential lots on the west side of 76<sup>th</sup> Street south of Sutton Drive appear to be above the 100-year water surface.

At the south end of 76<sup>th</sup> Street there is a single barrel 8' x 3' concrete box culvert that conveys flow under Sweetwater Avenue. This culvert outfalls into a trapezoidal ditch that drains through the residential area south of Sweetwater and eventually outfalls into the Cactus Park detention basin. The capacity of the culvert is approximately 145 cfs with a headwater depth to the top of the roadway indicating overtopping of the roadway during the 100-year event.



**PHOTO PLATE 39**  
76<sup>th</sup> Street looking north from just south of Sutton Drive.



**PHOTO PLATE 40**  
76<sup>th</sup> Street looking south from just south of Sutton Drive.

### **3.30 Results – Normal Depth Section O, Greenway Road from Scottsdale Airport to 76<sup>th</sup> Street**

This reach corresponds to reach RR013A in the HEC-1 model. Greenway Road has a typical section with a transverse slope from north to south, allowing less than half of the street section to be utilized for stormwater conveyance. The section is approximately 40 feet wide from curb-to-curb, with 6-inch vertical curbs on both sides. A 33-inch diameter storm drain runs under Greenway Road from 78<sup>th</sup> Street to the Greenway-Hayden Loop.

The discharge used in the hydraulic analysis is the total routed discharge from HEC-1 minus the just-flowing-full capacity of the storm drain system. The calculated 10- and 100-year peak discharges are 272 cfs and 559 cfs, respectively. The capacity of this street section only with the water surface at the top-of-curb elevation is less than 10 cfs. The combined capacity of the street section and the 33-inch diameter storm drain is less than 30 cfs. The diversion step in the HEC-1 model at this location is based on the combined capacity of the street and storm drain directed westerly with all flow in excess of this capacity overflowing the south curb.

According to normal depth modeling, the road is significantly overtopped by both the 10- and 100-year peak discharges. This overtopping is consistent with the reported historic flooding of Greenway Road and the commercial/industrial area to the south. It is also consistent in location with an historical flow path evident from USGS topographic maps (see Exhibit 1 in Appendix E). According to Tom Eldridge of Gilbertson Engineering, flooding of Greenway Road and overtopping of the south curb has occurred in the past.

Overflow of the south curb would more than likely be shallow in nature and may take place over a length of several hundred feet. The overflow would pass through the industrial/commercial parcels south of Greenway Road in a shallow unconfined manner, cross the taxiway just south of Greenway Road and collect along the local streets to the south. Most of the overflow would probably find its way to Airport Drive and ultimately be directed to the airport detention basin. This is consistent with historic accounts.

### **3.3P Results – Normal Depth Section P, Greenway Road from 76<sup>th</sup> Street to 73<sup>rd</sup> Street**

This reach corresponds to reach RR014 in the HEC-1 model. As with the previous routing reach (RR013A), this sub-reach of Greenway Road has a typical north to south transverse slope section, allowing for only the south part of the street section to be utilized for conveyance. The section is approximately 40 feet wide from curb-to-curb with 6-inch vertical curb on both the north and south sides. A 33-inch diameter storm drain runs under Greenway Road from 78<sup>th</sup> Street to the Greenway-Hayden Loop.

The difference between normal depth Sections O and P is in the left (south) overbank. The overbank in Section O drops away to the south whereas the overbank in Section P slopes upward to the south. The street in Section P is generally below the adjacent grade to the south (and north). The discharge used in the hydraulic analysis is the total routed discharge from HEC-1 minus the just-flowing-full capacity of the 33-inch diameter storm drain. The calculated 10- and 100-year peak discharges are 42 cfs and 104 cfs, respectively. The capacity of this street section with the water surface at the top-of-curb elevation is less than 10 cfs.

Although the water surface elevation is higher than the left top-of-curb elevation for both the 10- and 100-year peak discharges, the left overbank should prevent flow from escaping to the south into the Scottsdale Airpark.



**PHOTO PLATE 41**  
Greenway Road looking west near 77<sup>th</sup> Street.



**PHOTO PLATE 42**  
Greenway Road looking west near 76<sup>th</sup> Street.

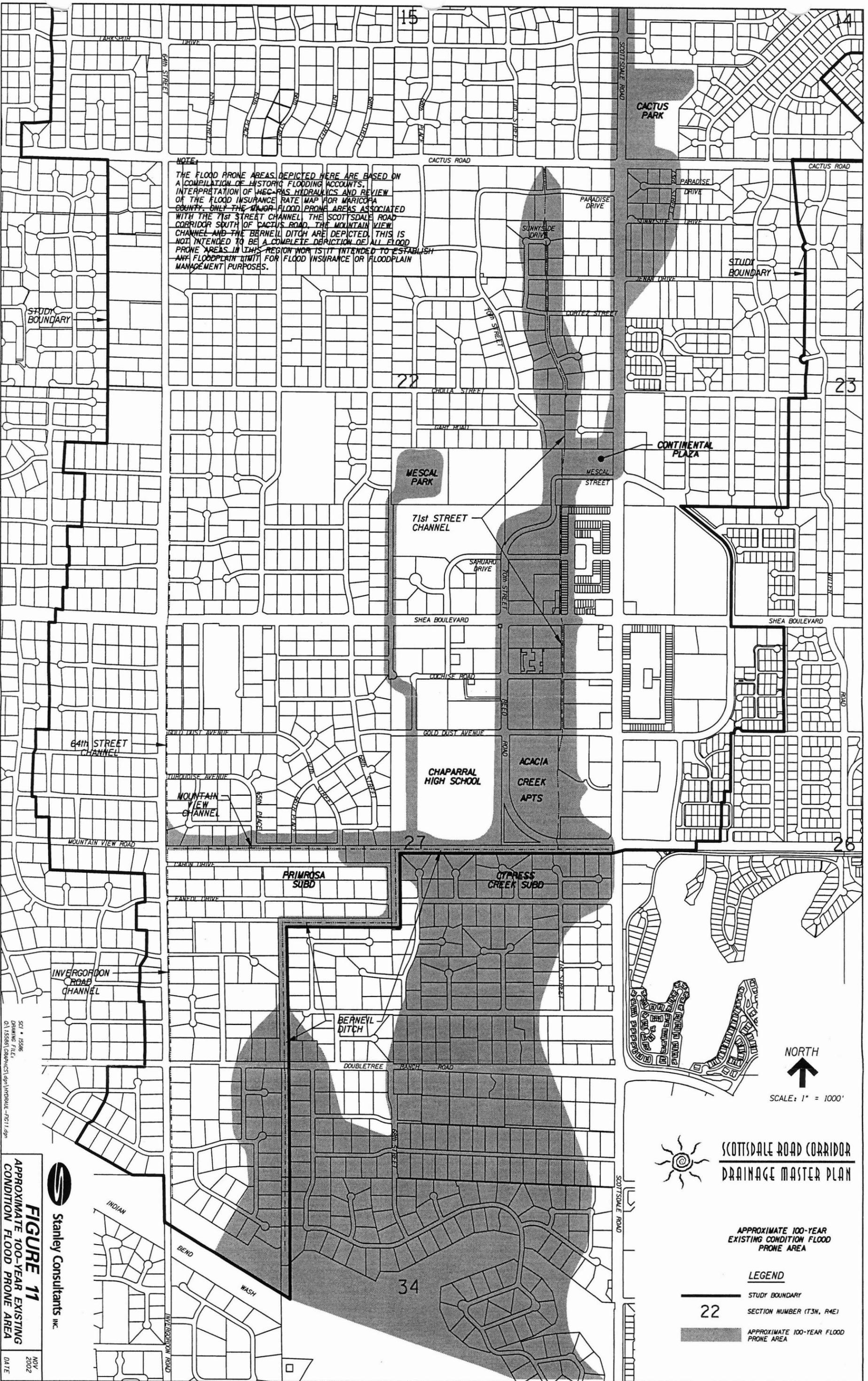
#### **4.0 EXISTING CONDITION CONCLUSIONS**

Based on the combined results of both the HEC-RAS and normal depth hydraulic analysis contained herein, the approximate existing condition flood prone areas are indicated in Figures 10 and 11 on the following pages.



**NOTE:**

THE FLOOD PRONE AREAS DEPICTED HERE ARE BASED ON A COMPILATION OF HISTORIC FLOODING ACCOUNTS, INTERPRETATION OF HEC-RAS HYDRAULICS AND REVIEW OF THE FLOOD INSURANCE RATE MAP FOR MARICOPA COUNTY. ONLY THE MAJOR FLOOD PRONE AREAS ASSOCIATED WITH THE 71st STREET CHANNEL, THE SCOTTSDALE ROAD CORRIDOR SOUTH OF CACTUS ROAD, THE MOUNTAIN VIEW CHANNEL AND THE BERNEIL DITCH ARE DEPICTED. THIS IS NOT INTENDED TO BE A COMPLETE DEPICTION OF ALL FLOOD PRONE AREAS IN THIS REGION NOR IS IT INTENDED TO ESTABLISH ANY FLOODPLAIN LIMIT FOR FLOOD INSURANCE OR FLOODPLAIN MANAGEMENT PURPOSES.



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 DATE: 11/01/02

**FIGURE 11**  
 APPROXIMATE 100-YEAR EXISTING  
 FLOOD PRONE AREA  
 DATE: NOV 2002

**Stanley Consultants INC.**



**SCOTTSDALE ROAD CORRIDOR  
 DRAINAGE MASTER PLAN**

APPROXIMATE 100-YEAR EXISTING FLOOD PRONE AREA

**LEGEND**

-  STUDY BOUNDARY
-  SECTION NUMBER (T3N, R4E)
-  APPROXIMATE 100-YEAR FLOOD PRONE AREA

## **5.0 HEC-RAS AND OTHER HYDRAULIC ANALYSES FOR THE “WITH RECOMMENDED ALTERNATIVE” CONDITION**

The recommended alternative hydraulic analyses includes the following:

- A 10-year StormCAD model for the Scottsdale Road storm drain from Thunderbird Road to Cactus Park,
- A 100-year StormCAD model for the future storm drain that will replace the existing Scottsdale Airport detention basin outfall channel,
- A 10-year HEC-RAS model for the 71<sup>st</sup> Street Channel and Berneil Ditch,
- A 100-year HEC-RAS model for the 71<sup>st</sup> Street Channel and Berneil Ditch,
- A 10-year StormCAD model for the upper 71<sup>st</sup> Street Channel from Sunnyside Drive to Cholla Street,
- A 10-year Storm CAD model for the proposed 72” diameter pipe from Cholla Street to approximately 300’ north of Mescal Street, and
- A 10-year Storm CAD model for a section of the existing 60” diameter Cactus Park detention basin outlet pipe from Cholla Street to approximately 300’ north of Mescal Street.

Appendix D contains hydraulic model output for the “with recommended alternative” condition and supporting hydraulic calculations. Refer to the Scottsdale Road Corridor Drainage Master Plan Conceptual Plans for plan, profile and section drawings of the recommended alternative.

### **5.1 Scottsdale Road Storm Drain from Thunderbird Road to Sweetwater Avenue**

StormCAD was used to model the recommended Scottsdale Road storm drain improvements from Thunderbird Road to Sweetwater Avenue. The proposed channel improvements require replacing the existing channel from Thunderbird Road to Sweetwater Avenue with a storm drain trunk line. At Sweetwater Avenue, the proposed trunk line is to tie into the existing 90” diameter storm drain, which outfalls into the Cactus Park detention basin. Along Scottsdale Road, proposed inlets would collect local runoff.

From Thunderbird Road to the confluence with the existing Scottsdale Airport detention basin outfall channel, the proposed trunk line is an 8’ x 5’ reinforced concrete box (RCB). From the airport basin outfall channel confluence to immediately south of Sutton Drive the proposed trunk line is a 12’ x 5’ RCB. The remaining portion of the proposed trunk line to Sweetwater Avenue is a 90” diameter reinforced concrete pipe. In order to avoid utilities, and to provide adequate burial depth, construction of a continuous 90” diameter storm drain pipe from Sweetwater Avenue north to Thunderbird Road is not recommended and the transition from a box to a pipe is necessary. A proposed drainage swale to collect and convey local runoff is to be constructed over the trunk line.

The downstream starting water surface elevation used for StormCAD modeling computations was assumed to be the outlet soffit of the existing 90” diameter pipe at the Cactus Park detention basin. The soffit elevation is 1385.7 feet, which approximates the 10-year peak stage of 1386.1 feet in the Cactus Park detention basin. Although the 10-year peak stage is slightly higher than the soffit elevation, it is unlikely that the time to peak for the storm drain system would coincide with the basin’s 10-year peak stage.

## **5.2 Scottsdale Airport Detention Basin Outfall Channel**

The Scottsdale Airport detention basin outfall channel is to be replaced by a closed system when construction of the International Fighter Pilot Museum (IFPM) begins. Currently, this channel outfalls into the Scottsdale Road Channel. Storm drain improvements replacing both the Scottsdale Road Channel and the airport basin outfall channel would require the two systems to be joined near their current confluence. A 100-year StormCAD model was used to approximate the storm drain size that may be necessary to replace the existing Scottsdale Airport outfall channel.

A starting water surface elevation equal to the top-of-curb elevation for Scottsdale Road near the confluence of the two existing channels was utilized for the future airport basin storm drain. This is because the proposed storm drain system that is to replace the Scottsdale Road Channel is sized for a 10-year event and the storm drain system to replace the Scottsdale Airport outfall channel would need to convey a 100-year event. According to the 100-year StormCAD computations, a 12' x 5' box structure would be adequate for conveying the peak discharge.

## **5.3 71<sup>st</sup> Street Channel and Berneil Ditch HEC-RAS Models**

Both a 10- and 100-year "with recommended alternative" condition HEC-RAS model were developed to assess the hydraulics for the proposed improvements to the 71<sup>st</sup> Street Channel and Berneil Ditch. The "existing" condition and "with recommended alternative" condition HEC-RAS models are essentially the same, except for the following changes to reflect the proposed improvements:

- Discharges used in the HEC-RAS model were taken from the 10- and 100-year "with recommended alternative" condition HEC-1 model,
- The discharges were reduced where the proposed improvements allowed for flows to be conveyed in storm drain systems below existing channels, and not as surface flow,
- Changes in cross-section geometry and "n" values were made to reflect proposed improvements for the 71<sup>st</sup> Street Channel reach starting at Sahuaro Drive and extending north for approximately 600',
- Known 10- and 100-year water surface elevations were used at 71<sup>st</sup> Street Channel river stations 333+52, 332+90 and 328+99 to reflect the recent completion of the (now existing) 12' x 9' box culvert to Sahuaro Drive, and
- Changes in cross-section geometry and "n" values were made to reflect proposed improvements for the Berneil Ditch reach from Scottsdale Road to the Mountain View Channel confluence.

## **5.4 Upper 71<sup>st</sup> Street Channel from Sunnyside Drive to Approximately 300' North of Mescal Street**

StormCAD was utilized to model the upper 71<sup>st</sup> Street Channel proposed storm drain system from Sunnyside Drive to approximately 300' north of Mescal Street. The following three StormCAD models were necessary to model the system:

- A StormCAD model for the proposed 84" diameter pipe from Sunnyside Drive to Cholla Street,
- A StormCAD model for the existing Cactus Park detention basin 60" diameter outlet pipe from Cholla Street to approximately 300' north of Mescal Street , and
- A StormCAD model for the proposed 72" diameter pipe from Cholla Street to approximately 300' north of Mescal Street.

The proposed inlet for the system is a 16' wide x 20' long grate inlet on grade located just north of Sunnyside Drive. The inlet was designed to intercept 100% of the 10-year flow (calculations provided in Appendix D). From Sunnyside Drive to Cholla Street, the proposed storm drain is an 84" diameter, reinforced concrete pipe. Great inlets in sump just north of Jenan Drive and Cortez Street and a catch basin just north of Cholla Street, are to be constructed in order to collect local runoff.

From Cholla Street to approximately 300' north of Mescal Street a new 72" diameter, reinforced concrete pipe is proposed as part of the recommended alternative. The proposed pipe would be constructed adjacent to the existing 60" diameter pipe that serves as the Cactus Park detention basin outlet pipe. Both the 72" and 60" diameter pipes outfall at the same location, but the invert elevations at the upstream and downstream ends of the proposed pipe would be 1-foot lower than the existing 60" storm drain. A proposed junction structure, located south of Cholla Street, would convey flow from the proposed 84" diameter pipe and Cactus Park detention basin 60" diameter outflow pipe into the proposed 72" diameter pipe and existing 60" diameter pipe.

Starting water surface elevations equal to the soffit elevations of the existing 60" and proposed 72" diameter pipes were used to compute the water surface profiles for each pipe. Because these two storm drains will convey flow in parallel, the discharge conveyed by each pipe was estimated by trial and error. The amount of flow in the 60" diameter pipe necessary to bring the hydraulic grade line to the upstream rim elevation was used for modeling the existing pipe. The remaining 10-year flow was modeled in the proposed 72" diameter pipe. The upstream rim elevation was then used as the starting hydraulic grade line elevation for modeling the proposed 84" diameter pipe.



## APPENDIX A

### SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN SUPPORTING HYDRAULIC DOCUMENTS AND CALCULATIONS

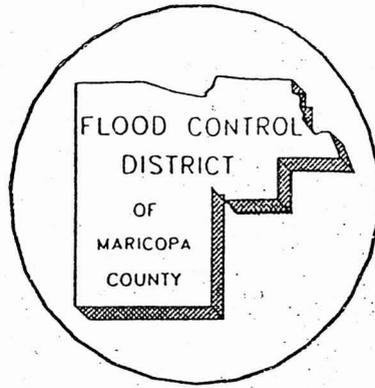
EXERPTS FROM IBW FLOODPLAIN DELINEATION STUDY

EXERPTS FROM FEMA 37, JANUARY 1995

SUPERELEVATION CALCULATION FOR TYPICAL BEND  
IN THE BERNEIL DITCH

WATER SURFACE ELEVATION INCREASE  
DUE TO ANGLE OF CULVERT SKEW

EXERPTS FROM IBW FLOODPLAIN DELINEATION STUDY



INDIAN BEND WASH  
FLOODPLAIN DELINEATION STUDY

Salt River to 40th Street  
FCD 93-05

HYDRAULICS REPORT  
VOLUME 1 OF 2

NOVEMBER 1997

**sla** Simons, Li & Associates, Inc.

INDIAN BEND WASH  
FROM  
SALT RIVER CONFLUENCE TO 40TH STREET

DOCUMENTATION IN SUPPORT OF A  
REQUEST FOR LETTER OF MAP REVISION

Prepared for:

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

Prepared by:

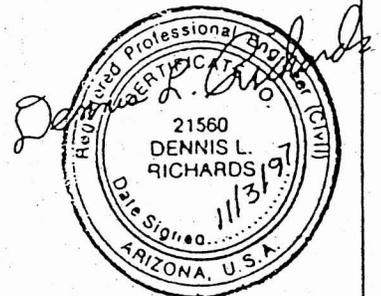
Simons, Li & Associates, Inc.  
4600 South Mill Avenue, Suite 200  
Tempe, AZ 85282  
(602) 491-1393

November 1997



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## LIST OF EXHIBITS

<u>Exhibit No.</u>
1 Flood Profiles
2 Proposed Floodplain Map
3 Proposed Floodway Map



### 3.0 ENGINEERING METHODS

#### 3.1 Hydrologic Analysis

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

Table 2 Summary of Discharges

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

#### 3.2 Hydraulic Analysis

##### 3.2.1 Work Map Delineation

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

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

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

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

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

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

### 3.2.2 Roughness Coefficient

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

### 3.2.3 Effective and Ineffective Flow Area

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

### 3.2.4 Simulation of Flow Through Structures

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

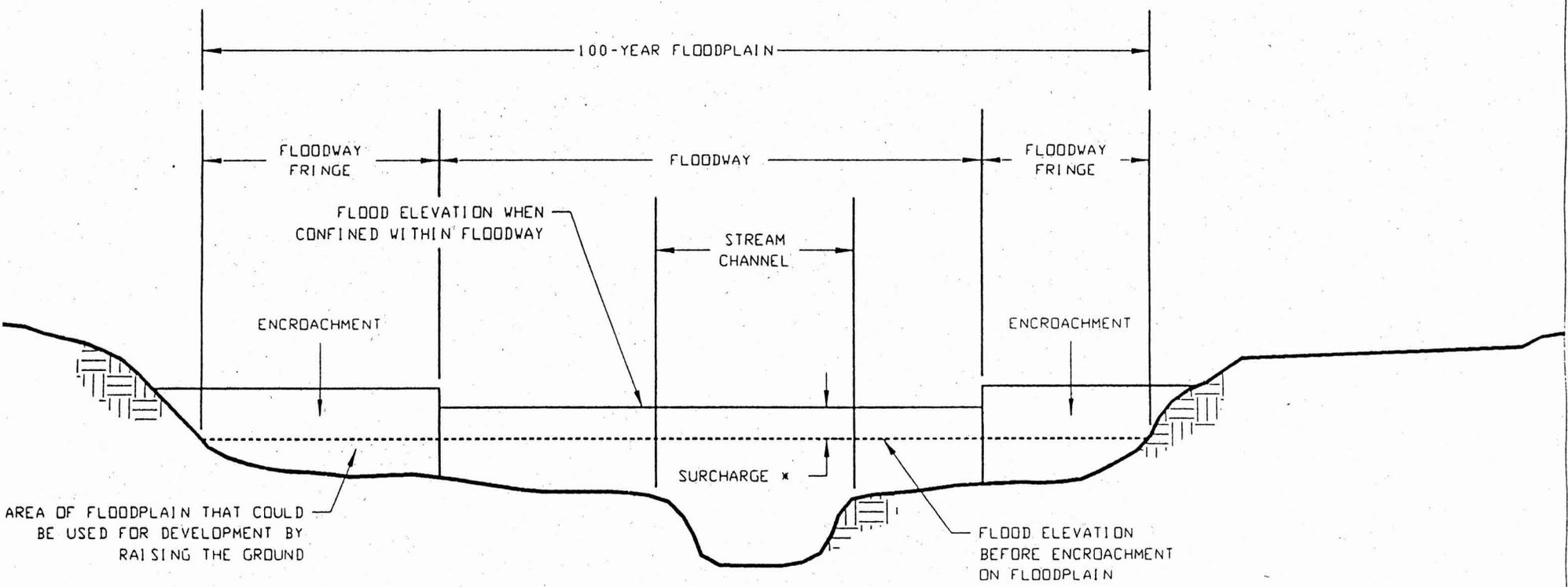
The HEC-2 computer program provides a special culvert routine for computing losses through culverts. The special culvert routine is similar to the special bridge routine except that the Federal Highway Administration's (FHWA) standard equations for culvert hydraulics are used to compute losses through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

### 3.2.5 HEC-2 Computer Model Set Up

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

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

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

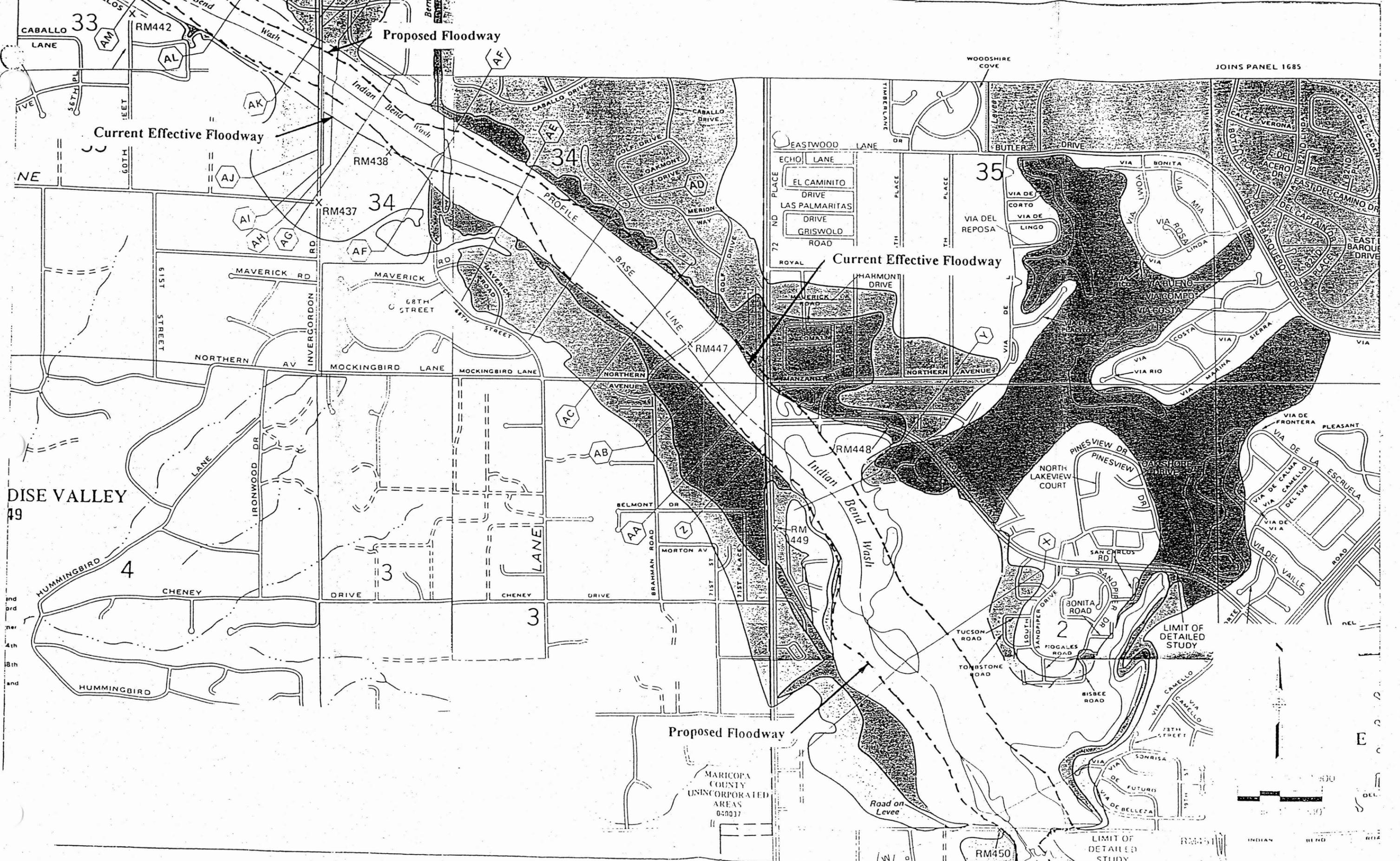


LINE A-B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT  
 LINE C-D IS THE FLOOD ELEVATION AFTER ENCROACHMENT

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

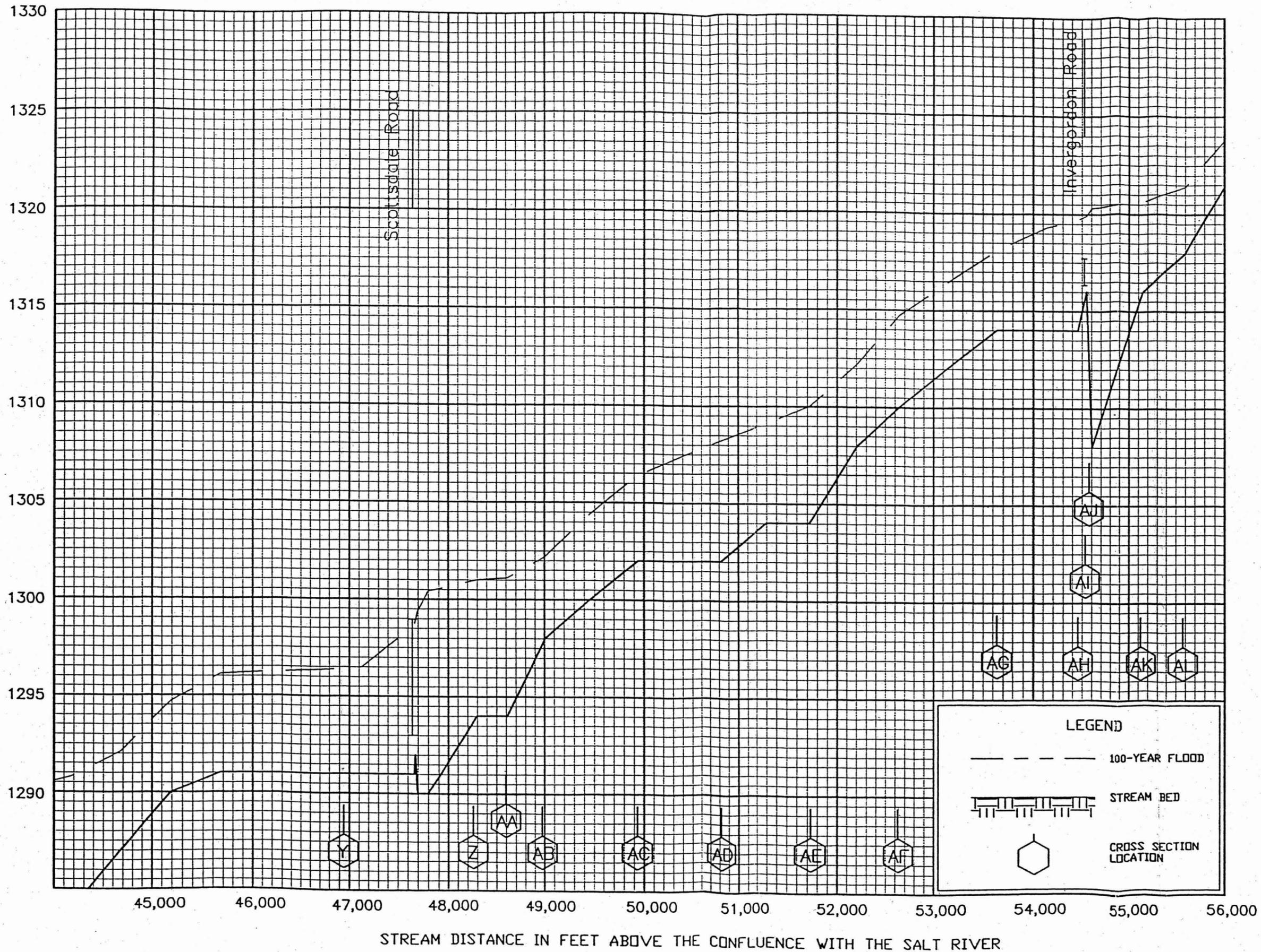
**sla** SIMONS, LI & ASSOCIATES, INC.  
 Indian Bend Wash Floodplain Delineation Study

FLOODWAY SCHEMATIC  
 Figure 2



JOINS PANEL 1685

ELEVATION IN FEET (1988 NGVD)



FLOOD PROFILES

INDIAN BEND WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ

(FLOOD CONTROL DISTRICT)

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

<sup>1</sup> Feet above confluence with Salt River

<sup>2</sup> 1988 Datum

TABLE 3

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SIMONS, LI & ASSOCIATES, INC.

FLOODWAY DATA

INDIAN BEND WASH

EXERPTS FROM FEMA 37, JANUARY 1995



flooding source. However, floodway revisions are justifiable and necessary if restudy data indicate an increase in surcharge above the maximum limit, or if, as a result of improved data, the width or configuration of the floodway necessitates a change from that shown on the effective map. When revisions are made to the floodway that will change the effective map, the SC shall notify the Regional PO immediately so that the Regional PO can coordinate with the community as soon as possible in the restudy process.

D. General Modeling Methodologies and Guidance

INTRODUCTION

In the preparation of an FIS, the SC may encounter unique hydraulic situations that require specialized modeling techniques to accurately determine the flood hazard potential. This section provides guidance in handling these situations:

1. Two-Dimensional Water-Surface Computer Models

Two-dimensional (2-D) computer models may be used to determine the water-surface elevations in two directions in the horizontal plane, where one-dimensional computer models may have difficulty analyzing these situations.

2-D computer models may be used for shallow flooding areas, split flow situations, and at complex bridge sites. Although it is not recommended because of the complexities involved and the costs that would be incurred, 2-D models can be used in areas subject to alluvial fan flooding.

These models will only be requested where 1-D models, current accepted techniques, and engineering judgment will not provide satisfactory information for floodplain management and flood insurance purposes. All 2-D models must meet the criteria as specified in 44 CFR 65.6 (a)(6).

Floodways must be developed through an interactive trial-and-error procedure and must be based on equal conveyance reduction.

2. One-Dimensional Unsteady Flow Models

One-dimensional unsteady flow models may be used for floodplains with substantial overbank storage areas, streams where there may be a reversal of flow, and complex pipes, channels, ponds, and reservoir systems.

Any one-dimensional unsteady flow model used must be accepted by FEMA and meet the criteria specified in 44 CFR 65.6(a)(6). The use of any one-dimensional unsteady flow model must first be coordinated with, and approved by, the Regional PO.

Floodways must be developed through an interactive trial-and-error procedure and must be based on equal conveyance reduction.

3. Starting Water-Surface Elevations

In general, the starting water-surface elevations chosen for profile computations should be based on normal depth (or slope-area), unless known water-surface elevations are available from other sources. When using normal depth on the main stream, the model should be started several cross sections downstream of the corporate limits. For starting conditions on tributaries, normal depth should be used unless a coincident peak situation is assumed, or the tributary flow depths are higher than the corresponding main stream events. The assumption of coincident peaks may be appropriate if a) the ratio of the drainage areas lies between 0.6 and 1.4, b) the times of peak flows are similar for the two combining watersheds, and c) the likelihood of both watersheds being covered by the storm being modeled are high. If gage records are available for the basins, guidance for coincidence of peak flows should be taken from them.

4. Modeling Techniques for Streams with Supercritical Flow Regimes

Step-backwater analyses are normally performed from downstream to upstream as subcritical profile runs. Critical depth messages will appear in the backwater runs at several consecutive cross sections, if supercritical flow occurs. For natural streams, critical depth should be used at all times, including the plotting of water-surface profiles. For channel modification projects, a supercritical run should be performed for the project area. For modified channels, the composite roughness coefficient should account for the sediment that accumulates on the channel bottom and for the lined surface of the sides of the channel. The analysis must extend both upstream and downstream of the project area to have a smooth transition between subcritical and supercritical profiles. The water-surface elevations from the subcritical run downstream of the project should be drawn horizontally until they cross the supercritical profiles to eliminate drawdowns. Velocities at the bends should be checked to determine potential erosion. Any deviations from the aforementioned procedures should be approved by the Regional PO.

5. Split-Flow Analyses

Split-flow analyses should be considered when flows overflow the banks of the main stream and take a different flow path. The analyses should address the reduction of flow in the downstream reach with respect to the multiple-flood profile and floodway. Because overbank discharges may flow into another stream, possible increase in discharges on the other stream should be considered. Overflow segment on the main stream should remain open by analyzing a separate floodway for the overflow path, or by a note on the FIRM (or FBFM) stating that the overflow area should remain unencroached until a detailed hydraulic analysis is performed to establish a

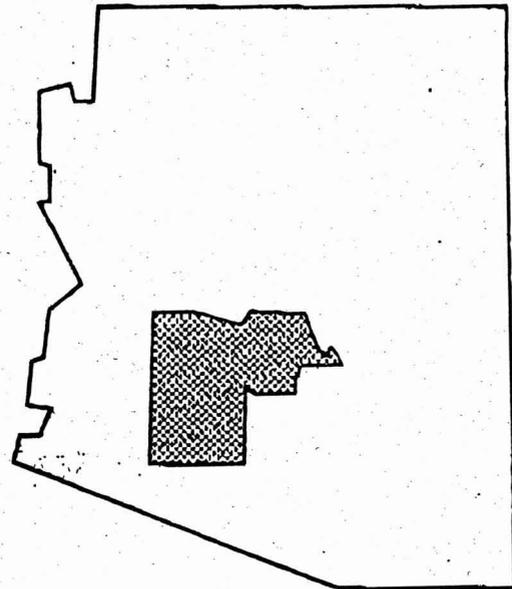
# FLOOD INSURANCE STUDY



## MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS VOLUME 1 OF 16

04013CV001

COMMUNITY NAME	COMMUNITY NUMBER
AVONDALE, CITY OF	040038
BUCKEYE, TOWN OF	040039
CAREFREE, TOWN OF	040128
CAVE CREEK, TOWN OF	040129
CHANDLER, CITY OF	040040
EL MIRAGE, CITY OF	040041
FOUNTAIN HILLS, TOWN OF	048138
GILA BEND, TOWN OF	040043
GILBERT, TOWN OF	040044
GLENDALE, CITY OF	040045
GOODYEAR, CITY OF	040046
GUADALUPE, TOWN OF	040111
LITCHFIELD PARK, CITY OF	040125
MARICOPA COUNTY UNINCORPORATED AREAS	040037
MESA, CITY OF	040048
PARADISE VALLEY, TOWN OF	040049
PEORIA, CITY OF	040050
PHOENIX, CITY OF	040051
QUEEN CREEK, TOWN OF	040132
SCOTTSDALE, CITY OF	045012
SURPRISE, CITY OF	045063
TEMPE, CITY OF	040064
TOLLESON, CITY OF	040065
WICKENBURG, TOWN OF	040056
YOUNGTOWN, TOWN OF	040057



REVISED: JULY 19, 2001



### Federal Emergency Management Agency

Apr Creek (Apache Junction Alluvial Fan)  
 S. Highway 80 and 108th Street

2.64      433      831      1,021      --1

Dreamy Draw Wash East  
 At Mouth

0.38      300      750      1,000      1,700

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10-Year	50-Year	100-Year	500-Year
<b>Granite Reef Wash</b>					
Pima Road	6.2	74	278	644	1,431
McDowell Road	7.2	580	950	1,240	2,660
Van Buren Street	7.5	720	1,158	1,417	3,150
<b>Indian Bend Wash</b>					
Scottsdale Road	44.26	3,400	11,000	16,000	35,000
Indian Bend Road	59.6	3,500	12,000	17,000	39,000
Indian School Road	100.0	4,000	14,000	20,000	43,000
Downstream limit of McKellips Lake, Just upstream of McKellips Road Bridge	107.0	4,000	14,000	20,000	42,000
At 32nd Street	2.77	1,000	1,400	2,400	5,500
At 36th Street	9.17	2,000	3,500	6,000	15,500
At Cactus Road	15.07	1,500	5,600	9,000	21,000
<b>Myrtle Avenue Wash</b>					
At Mouth	0.87	600	1,000	1,300	2,800
<b>Tenth Street Wash</b>					
At Cheryl Drive	0.81	385	--1	1,440	3,650
At Hatcher Road	1.59	910	--1	3,400	8,600
At Alice Avenue	2.25	1,170	--1	4,390	11,110
At Griswold Road	2.69	1,265	--1	4,740	12,000
<b>Wash B</b>					
At a point 1,100 feet downstream of 124th Street	1.95	290	1,160	1,925	4,580
At a point 4,500 feet downstream of 124th Street	2.25	340	1,390	2,300	5,500
At a point 4,500 feet downstream of 124th Street	2.25	205	835	1,380	3,300
At a point 5,500 feet downstream of 124th Street	2.50	190	820	1,300	3,200

<sup>1</sup>Not Computed

57

ASSUMPTION OF COINCIDENT PEAKS APPROPRIATE IF:

- a) RATIO OF THE DRAINAGE AREAS LIES BETWEEN 0.6 AND 1.4

INDIAN BEND WASH DRAINAGE AREA AT  
SCOTTSPACE ROAD = 44.26 SQ. MI.

BERNEIL DITCH DRAINAGE AREA AT  
INDIAN BEND WASH OUTFALL = 10 SQ. MI.

$$\frac{10 \text{ SQ. MI.}}{44.26 \text{ SQ. MI.}} = 0.2 \rightarrow \text{PEAKS NOT COINCIDENT}$$

- b) TIMES OF PEAK FLOWS ARE SIMILAR FOR THE TWO  
COMBINING WATERSHEDS, AND

- c) LIKELIHOOD OF BOTH WATERSHEDS BEING COVERED BY THE  
STORM BEING MODELED ARE HIGH.

GIVEN THE LARGE DIFFERENCE BETWEEN DRAINAGE  
AREAS, IT IS UNLIKELY TIMES OF PEAK WILL BE  
SIMILAR OR BOTH WATERSHEDS WILL BE COVERED  
BY THE STORM BEING MODELED  $\rightarrow$  PEAKS NOT COINCIDENT.

SUPERELEVATION CALCULATION FOR TYPICAL BEND  
IN THE BERNEIL DITCH



Computed by B SCHACK Date 3-13-02

BEND FOR BERNEIL DITCH

Checked by Date

Approved by Date

Sheet No. of

- ASSUMED BEND #2 IS TYPICAL
- ASSUMED SUBCRITICAL CONDITIONS

$$\Delta y = \frac{V^2 T}{gR} \quad (\text{EQ 6.9, FCDMC HYDRAULICS MANUAL})$$

V = AVERAGE VELOCITY

V<sub>1</sub> = 9.09 FT/S @ STA 152+42 (100 YR, 6HR STORM)

V<sub>2</sub> = 11.34 FT/S @ STA 150+41 (100 YR, 6HR STORM)

$$V = \frac{1}{2}(9.09 + 11.34) = 10.22 \text{ FT/S}$$

T = WIDTH ALONG TOP WSEL

T<sub>1</sub> = 72.86 FT @ STA 152+42

T<sub>2</sub> = 67.22 FT @ STA 150+41

$$T = \frac{1}{2}(72.86 + 67.22) = 70.04 \text{ FT}$$

R<sub>c</sub> = RADIUS OF CHANNEL CENTERLINE CURVATURE

R<sub>c</sub> = 76 FT (SEE ATTACHED)

$$\Delta y = \frac{(10.22 \text{ FT/S})^2 (70.04 \text{ FT})}{(32.2 \text{ FT/S}^2) (76 \text{ FT})}$$

$$\Delta y = 3.0 \text{ FT}$$

WSEL @ STA 150+41 = 1331.49 FT

LEFT BANK EL @ STA 150+41 = 1334.20 FT

$$1334.20 - 1331.49 = 2.71 \text{ FT}$$

2.7 < 3.0 → OVERTOPPING
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HEC-RAS 15506 B  
100YR, 6HR STORM

**Plan: BerneilDitch River: Berneil Ditch Reach: Lower Reach Riv Sta: 15242 Profile: PF 2**

E.G. Elev (ft)	1334.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.28	Wt. n-Val.		0.018	
W.S. Elev (ft)	1332.72	Reach Len. (ft)	201	201	201
Crit W.S. (ft)		Flow Area (sq ft)		330.09	
E.G. Slope (ft/ft)	0.001676	Area (sq ft)		330.09	
Q Total (cfs)	3002	Flow (cfs)		3002	
Top Width (ft)	72.86	Top Width (ft)		72.86	
Vel Total (ft/s)	9.09	Avg. Vel. (ft/s)		9.09	
Max Chl Dpth (ft)	6.22	Hydr. Depth (ft)		4.53	
Conv. Total (cfs)	73333.3	Conv. (cfs)		73333.3	
Length Wtd. (ft)	201	Wetted Per. (ft)		74.77	
Min Ch El (ft)	1326.5	Shear (lb/sq ft)		0.46	
Alpha	1	Stream Power (lb/ft s)		4.2	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.05	38.33	0.07
C & E Loss (ft)	0.07	Cum SA (acres)	0.09	8.83	0.13

100 TR, 6 HR STEAM  
 HECRAS 15586B  
 100 TR, 6 HR STEAM

**Plan: BerneilDitch River: Berneil Ditch Reach: Lower Reach Riv Sta: 15041 Profile: PF 2**

E.G. Elev (ft)	1333.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	2	Wt. n-Val.		0.018	
W.S. Elev (ft)	1331.49	Reach Len. (ft)	515	515	515
Crit W.S. (ft)	1331.49	Flow Area (sq ft)		264.8	
E.G. Slope (ft/ft)	0.00313	Area (sq ft)		264.8	
Q Total (cfs)	3002	Flow (cfs)		3002	
Top Width (ft)	67.22	Top Width (ft)		67.22	
Vel Total (ft/s)	11.34	Avg. Vel. (ft/s)		11.34	
Max Chl Dpth (ft)	5.29	Hydr. Depth (ft)		3.94	
Conv. Total (cfs)	53662	Conv. (cfs)		53662	
Length Wtd. (ft)	515	Wetted Per. (ft)		68.85	
Min Ch El (ft)	1326.2	Shear (lb/sq ft)		0.75	
Alpha	1	Stream Power (lb/ft s)		8.52	
Frctn Loss (ft)	1.06	Cum Volume (acre-ft)	0.05	36.96	0.07
C & E Loss (ft)	0.25	Cum SA (acres)	0.09	8.5	0.13

WATER SURFACE ELEVATION INCREASE  
DUE TO ANGLE OF CULVERT SKEW



Computed by B SCHALK Date 9-5-02

DUE TO CULVERT SKEW ANGLE

Checked by \_\_\_\_\_ Date \_\_\_\_\_

Approved by \_\_\_\_\_ Date \_\_\_\_\_

Sheet No. \_\_\_\_\_ of \_\_\_\_\_

- SKEW ANGLE IS BASED ON CULVERT ALIGNMENT SKEW FROM THE UPSTREAM DIRECTION OF FLOW.
- CULVERT AT GOLD DUST ASSUMED TO BE TYPICAL CULVERT WITH SKEW. APPROX SKEW = 30° TO THE RIGHT.
- BEND LOSS CALCULATED BY EQ 4.12, DRAINAGE DESIGN MANUAL FOR COUNTY, VOL II, HYDRAULICS:

$$h_b = K_b \frac{V_2^2}{2g} \quad (\text{EQ 4.12})$$

$K_b$  FROM FIG 4.7, BEND WITH NO SHAPINGS, ATTACHED  
 $V_2$  = VELOCITY AT CULVERT OUTLET

• 10-YR, 6-HR STORM, STA 311+92'

$$h_b = (0.12) \frac{(6.12 \text{ FT/s})^2}{(2)(32.2 \text{ FT/s}^2)}$$

$$h_b = 0.1 \text{ FT}$$

• 100-YR, 6-HR STORM, STA 311+92'

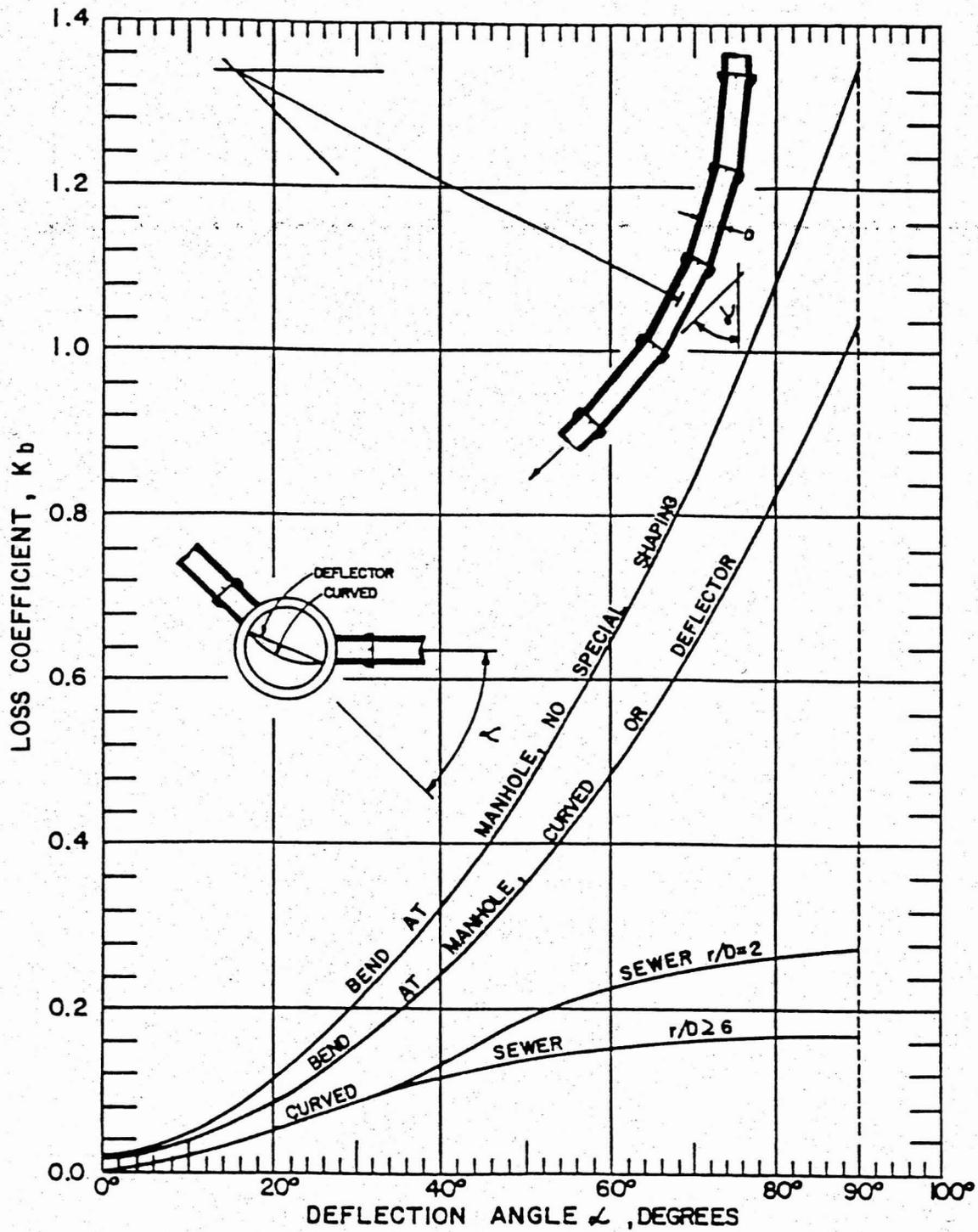
$$h_b = (0.12) \frac{(5.50 \text{ FT/s})^2}{(2)(32.2 \text{ FT/s}^2)}$$

$$h_b = .09 \text{ FT}$$

∴ BECAUSE HEC-RAS IS NOT CAPABLE OF ACCOUNTING FOR LOSSES ASSOCIATED WITH BENDS IN CULVERTS, THE INCREASE IN THE WATER SURFACE ELEVATION IS APPROX  $h_b$ .

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31192 Profile: PF 1					
E.G. Elev (ft)	1340.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.		0.035	
W.S. Elev (ft)	1339.73	Reach Len. (ft)	126	126	126
Crit W.S. (ft)	1337.9	Flow Area (sq ft)		135.2	
E.G. Slope (ft/ft)	0.00255	Area (sq ft)		182.82	
Q Total (cfs)	828	Flow (cfs)		828	
Top Width (ft)	47.72	Top Width (ft)		47.72	
Vel Total (ft/s)	6.12	Avg. Vel. (ft/s)		6.12	
Max Chl Dpth (ft)	4.83	Hydr. Depth (ft)		4.83	
Conv. Total (cfs)	16397.2	Conv. (cfs)		16397.2	
Length Wtd. (ft)	126	Wetted Per. (ft)		28	
Min Ch El (ft)	1334.9	Shear (lb/sq ft)		0.77	
Alpha	1	Stream Power (lb/ft s)		4.71	
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	0.03	6.73	0.02
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	1.82	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31192 Profile: PF 2					
E.G. Elev (ft)	1342.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1342.31	Reach Len. (ft)	126	126	126
Crit W.S. (ft)	1339.84	Flow Area (sq ft)	0.03	318.31	0.01
E.G. Slope (ft/ft)	0.001749	Area (sq ft)	0.03	318.31	0.01
Q Total (cfs)	1751	Flow (cfs)	0.01	1750.99	0
Top Width (ft)	55.1	Top Width (ft)	0.06	55	0.04
Vel Total (ft/s)	5.5	Avg. Vel. (ft/s)	0.17	5.5	0.13
Max Chl Dpth (ft)	7.41	Hydr. Depth (ft)	0.51	5.79	0.21
Conv. Total (cfs)	41866.9	Conv. (cfs)	0.1	41866.7	0
Length Wtd. (ft)	126	Wetted Per. (ft)	1.01	58.37	0.41
Min Ch El (ft)	1334.9	Shear (lb/sq ft)	0	0.6	0
Alpha	1	Stream Power (lb/ft s)	0	3.28	0
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.62	12.82	0.41
C & E Loss (ft)	0.04	Cum SA (acres)	0.26	2.06	0.21



**Figure 4.7**  
**Bend Loss Coefficient**  
 (University of Missouri, 1958)



## **APPENDIX B**

### **SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN EXISTING CONDITIONS HEC-RAS RESULTS**

**EXISTING CONDITIONS HEC-RAS OUTPUT TABLES**

**EXISTING CONDITIONS HEC-RAS CROSS-SECTIONS**

**EXISTING CONDITIONS HEC-RAS  
HYDRAULICS REPORT & CULVERT TABLE**

EXISTING CONDITIONS HEC-RAS OUTPUT TABLES

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37941 Profile: PF 1

E.G. Elev (ft)	1384.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1383.89	Reach Len. (ft)	133.00	133.00	133.00
Crit W.S. (ft)	1383.89	Flow Area (sq ft)	17.80	48.10	17.80
E.G. Slope (ft/ft)	0.002280	Area (sq ft)	17.80	48.10	17.80
Q Total (cfs)	498.00	Flow (cfs)	63.08	371.84	63.08
Top Width (ft)	50.30	Top Width (ft)	20.00	10.30	20.00
Vel Total (ft/s)	5.95	Avg. Vel. (ft/s)	3.54	7.73	3.54
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	0.89	4.67	0.89
Conv. Total (cfs)	10428.9	Conv. (cfs)	1321.0	7786.9	1321.0
Length Wtd. (ft)	133.00	Wetted Per. (ft)	20.89	17.52	20.89
Min Ch El (ft)	1379.10	Shear (lb/sq ft)	0.12	0.39	0.12
Alpha	1.35	Stream Power (lb/ft s)	0.43	3.02	0.43
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	2.69	20.76	2.30
C & E Loss (ft)	0.11	Cum SA (acres)	2.22	5.95	1.99

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37941 Profile: PF 2

E.G. Elev (ft)	1386.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.24	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1385.00	Reach Len. (ft)	133.00	133.00	133.00
Crit W.S. (ft)	1385.00	Flow Area (sq ft)	39.94	59.50	39.94
E.G. Slope (ft/ft)	0.003136	Area (sq ft)	39.94	59.50	39.94
Q Total (cfs)	1171.00	Flow (cfs)	274.74	621.52	274.74
Top Width (ft)	50.30	Top Width (ft)	20.00	10.30	20.00
Vel Total (ft/s)	8.40	Avg. Vel. (ft/s)	6.88	10.45	6.88
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)	2.00	5.78	2.00
Conv. Total (cfs)	20912.1	Conv. (cfs)	4906.4	11099.2	4906.4
Length Wtd. (ft)	133.00	Wetted Per. (ft)	22.00	17.52	22.00
Min Ch El (ft)	1379.10	Shear (lb/sq ft)	0.36	0.66	0.36
Alpha	1.13	Stream Power (lb/ft s)	2.45	6.95	2.44
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	8.19	36.88	8.36
C & E Loss (ft)	0.09	Cum SA (acres)	3.39	6.53	3.88

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37808 Profile: PF 1

E.G. Elev (ft)	1384.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.018	0.050
W.S. Elev (ft)	1383.74	Reach Len. (ft)	108.00	108.00	108.00
Crit W.S. (ft)	1381.88	Flow Area (sq ft)		100.04	0.01
E.G. Slope (ft/ft)	0.000724	Area (sq ft)		100.04	0.01
Q Total (cfs)	498.00	Flow (cfs)		498.00	0.00
Top Width (ft)	26.51	Top Width (ft)		26.23	0.28
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)		4.98	0.06
Max Chl Dpth (ft)	5.04	Hydr. Depth (ft)		3.81	0.02
Conv. Total (cfs)	18509.4	Conv. (cfs)		18509.4	0.0
Length Wtd. (ft)	108.00	Wetted Per. (ft)		29.81	0.28
Min Ch El (ft)	1378.70	Shear (lb/sq ft)		0.15	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.75	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	2.66	20.53	2.27
C & E Loss (ft)	0.02	Cum SA (acres)	2.19	5.90	1.96

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37808 Profile: PF 2

E.G. Elev (ft)	1385.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1384.82	Reach Len. (ft)	108.00	108.00	108.00
Crit W.S. (ft)	1384.22	Flow Area (sq ft)	76.83	128.35	4.15
E.G. Slope (ft/ft)	0.001423	Area (sq ft)	76.83	128.35	4.15
Q Total (cfs)	1171.00	Flow (cfs)	112.25	1055.62	3.13
Top Width (ft)	83.71	Top Width (ft)	50.00	26.30	7.41
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)	1.46	8.22	0.76
Max Chl Dpth (ft)	6.12	Hydr. Depth (ft)	1.54	4.88	0.56
Conv. Total (cfs)	31044.1	Conv. (cfs)	2975.9	27985.2	83.0
Length Wtd. (ft)	108.00	Wetted Per. (ft)	51.63	29.90	7.50
Min Ch El (ft)	1378.70	Shear (lb/sq ft)	0.13	0.38	0.05
Alpha	1.96	Stream Power (lb/ft s)	0.19	3.14	0.04
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	8.01	36.59	8.29
C & E Loss (ft)	0.01	Cum SA (acres)	3.28	6.47	3.83

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37700 Profile: PF 1

E.G. Elev (ft)	1384.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.33	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1383.71	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)	1381.20	Flow Area (sq ft)	5.37	107.27	0.37
E.G. Slope (ft/ft)	0.000600	Area (sq ft)	5.37	107.27	0.37
Q Total (cfs)	498.00	Flow (cfs)	0.88	497.11	0.01
Top Width (ft)	121.20	Top Width (ft)	50.00	21.20	50.00
Vel Total (ft/s)	4.41	Avg. Vel. (ft/s)	0.16	4.63	0.03
Max Chl Dpth (ft)	5.11	Hydr. Depth (ft)	0.11	5.06	0.01
Conv. Total (cfs)	20334.6	Conv. (cfs)	36.0	20298.1	0.4
Length Wtd. (ft)	85.00	Wetted Per. (ft)	50.11	30.91	50.01
Min Ch El (ft)	1378.60	Shear (lb/sq ft)	0.00	0.13	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.60	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.66	20.28	2.27
C & E Loss (ft)		Cum SA (acres)	2.12	5.84	1.90

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37700 Profile: PF 2

E.G. Elev (ft)	1385.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1384.58	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)	1383.19	Flow Area (sq ft)	48.97	125.75	43.97
E.G. Slope (ft/ft)	0.001624	Area (sq ft)	48.97	125.75	43.97
Q Total (cfs)	1171.00	Flow (cfs)	57.09	1066.14	47.77
Top Width (ft)	121.20	Top Width (ft)	50.00	21.20	50.00
Vel Total (ft/s)	5.35	Avg. Vel. (ft/s)	1.17	8.48	1.09
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)	0.98	5.93	0.88
Conv. Total (cfs)	29059.2	Conv. (cfs)	1416.7	26456.9	1185.6
Length Wtd. (ft)	85.00	Wetted Per. (ft)	50.98	30.91	50.88
Min Ch El (ft)	1378.60	Shear (lb/sq ft)	0.10	0.41	0.09
Alpha	2.29	Stream Power (lb/ft s)	0.11	3.50	0.10
Frctn Loss (ft)		Cum Volume (acre-ft)	7.86	36.28	8.23
C & E Loss (ft)		Cum SA (acres)	3.16	6.41	3.76

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37615 Profile: PF 1

E.G. Elev (ft)	1383.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.		0.018	
W.S. Elev (ft)	1382.62	Reach Len. (ft)	272.00	272.00	272.00
Crit W.S. (ft)	1381.11	Flow Area (sq ft)		86.81	
E.G. Slope (ft/ft)	0.001127	Area (sq ft)		86.81	
Q Total (cfs)	498.00	Flow (cfs)		498.00	
Top Width (ft)	21.37	Top Width (ft)		21.37	
Vel Total (ft/s)	5.74	Avg. Vel. (ft/s)		5.74	
Max Chl Dpth (ft)	4.12	Hydr. Depth (ft)		4.06	
Conv. Total (cfs)	14833.3	Conv. (cfs)		14833.3	
Length Wtd. (ft)	272.00	Wetted Per. (ft)		29.15	
Min Ch EI (ft)	1378.50	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		1.20	
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)	2.65	20.09	2.27
C & E Loss (ft)	0.07	Cum SA (acres)	2.07	5.80	1.85

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37615 Profile: PF 2

E.G. Elev (ft)	1385.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.94	Wt. n-Val.	0.100	0.018	0.050
W.S. Elev (ft)	1384.50	Reach Len. (ft)	272.00	272.00	272.00
Crit W.S. (ft)	1383.64	Flow Area (sq ft)	8.01	127.03	80.10
E.G. Slope (ft/ft)	0.001431	Area (sq ft)	8.01	127.03	80.10
Q Total (cfs)	1171.00	Flow (cfs)	5.12	1045.13	120.74
Top Width (ft)	76.40	Top Width (ft)	5.00	21.40	50.00
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	0.64	8.23	1.51
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)	1.60	5.94	1.60
Conv. Total (cfs)	30951.6	Conv. (cfs)	135.4	27624.8	3191.5
Length Wtd. (ft)	272.00	Wetted Per. (ft)	6.60	29.71	51.60
Min Ch EI (ft)	1378.50	Shear (lb/sq ft)	0.11	0.38	0.14
Alpha	2.05	Stream Power (lb/ft s)	0.07	3.14	0.21
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	7.80	36.03	8.11
C & E Loss (ft)	0.05	Cum SA (acres)	3.10	6.37	3.66

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37343 Profile: PF 1

E.G. Elev (ft)	1382.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	Wt. n-Val.		0.018	
W.S. Elev (ft)	1381.28	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1381.28	Flow Area (sq ft)		55.50	
E.G. Slope (ft/ft)	0.004009	Area (sq ft)		55.50	
Q Total (cfs)	498.00	Flow (cfs)		498.00	
Top Width (ft)	22.48	Top Width (ft)		22.48	
Vel Total (ft/s)	8.97	Avg. Vel. (ft/s)		8.97	
Max Chl Dpth (ft)	3.08	Hydr. Depth (ft)		2.47	
Conv. Total (cfs)	7865.3	Conv. (cfs)		7865.3	
Length Wtd. (ft)	295.00	Wetted Per. (ft)		24.68	
Min Ch EI (ft)	1378.20	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		5.05	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	2.65	19.64	2.27
C & E Loss (ft)	0.19	Cum SA (acres)	2.07	5.66	1.85

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37343 Profile: PF 2

E.G. Elev (ft)	1384.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.	0.100	0.018	0.050
W.S. Elev (ft)	1383.50	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1383.50	Flow Area (sq ft)	5.48	109.57	55.15
E.G. Slope (ft/ft)	0.002350	Area (sq ft)	5.48	109.57	55.15
Q Total (cfs)	1171.00	Flow (cfs)	3.68	1084.05	83.27
Top Width (ft)	80.40	Top Width (ft)	5.00	25.10	50.30
Vel Total (ft/s)	6.88	Avg. Vel. (ft/s)	0.67	9.89	1.51
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)	1.10	4.37	1.10
Conv. Total (cfs)	24154.2	Conv. (cfs)	75.9	22360.6	1717.7
Length Wtd. (ft)	295.00	Wetted Per. (ft)	6.10	28.19	51.41
Min Ch EI (ft)	1378.20	Shear (lb/sq ft)	0.13	0.57	0.16
Alpha	1.92	Stream Power (lb/ft s)	0.09	5.64	0.24
Frctn Loss (ft)	0.63	Cum Volume (acre-ft)	7.76	35.29	7.69
C & E Loss (ft)	0.13	Cum SA (acres)	3.07	6.23	3.35

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37048 Profile: PF 1

E.G. Elev (ft)	1381.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.63	Wt. n-Val.	0.100	0.018	0.100
W.S. Elev (ft)	1380.52	Reach Len. (ft)	136.00	136.00	136.00
Crit W.S. (ft)		Flow Area (sq ft)	55.85	62.47	50.64
E.G. Slope (ft/ft)	0.001817	Area (sq ft)	55.85	62.47	50.64
Q Total (cfs)	498.00	Flow (cfs)	37.49	428.55	31.96
Top Width (ft)	120.00	Top Width (ft)	50.10	20.00	49.90
Vel Total (ft/s)	2.95	Avg. Vel. (ft/s)	0.67	6.86	0.63
Max Chl Dpth (ft)	3.21	Hydr. Depth (ft)	1.11	3.12	1.01
Conv. Total (cfs)	11682.5	Conv. (cfs)	879.4	10053.3	749.8
Length Wtd. (ft)	136.00	Wetted Per. (ft)	51.21	22.95	50.91
Min Ch EI (ft)	1377.30	Shear (lb/sq ft)	0.12	0.31	0.11
Alpha	4.67	Stream Power (lb/ft s)	0.08	2.12	0.07
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	2.46	19.24	2.10
C & E Loss (ft)	0.07	Cum SA (acres)	1.91	5.51	1.68

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 37048 Profile: PF 2

E.G. Elev (ft)	1383.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.98	Wt. n-Val.	0.100	0.018	0.100
W.S. Elev (ft)	1382.06	Reach Len. (ft)	136.00	136.00	136.00
Crit W.S. (ft)		Flow Area (sq ft)	133.06	93.29	127.54
E.G. Slope (ft/ft)	0.001923	Area (sq ft)	133.06	93.29	127.54
Q Total (cfs)	1171.00	Flow (cfs)	160.64	860.11	150.26
Top Width (ft)	120.00	Top Width (ft)	50.10	20.00	49.90
Vel Total (ft/s)	3.31	Avg. Vel. (ft/s)	1.21	9.22	1.18
Max Chl Dpth (ft)	4.76	Hydr. Depth (ft)	2.66	4.66	2.56
Conv. Total (cfs)	26705.5	Conv. (cfs)	3663.5	19615.3	3426.7
Length Wtd. (ft)	136.00	Wetted Per. (ft)	52.76	22.95	52.46
Min Ch EI (ft)	1377.30	Shear (lb/sq ft)	0.30	0.49	0.29
Alpha	5.74	Stream Power (lb/ft s)	0.37	4.50	0.34
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	7.29	34.60	7.07
C & E Loss (ft)	0.04	Cum SA (acres)	2.89	6.07	3.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36912 Profile: PF 1

E.G. Elev (ft)	1380.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.		0.020	
W.S. Elev (ft)	1379.38	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1379.38	Flow Area (sq ft)		54.39	
E.G. Slope (ft/ft)	0.005150	Area (sq ft)		54.39	
Q Total (cfs)	498.00	Flow (cfs)		498.00	
Top Width (ft)	20.24	Top Width (ft)		20.24	
Vel Total (ft/s)	9.16	Avg. Vel. (ft/s)		9.16	
Max Chl Dpth (ft)	3.08	Hydr. Depth (ft)		2.69	
Conv. Total (cfs)	6939.2	Conv. (cfs)		6939.2	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		24.17	
Min Ch EI (ft)	1376.30	Shear (lb/sq ft)		0.72	
Alpha	1.00	Stream Power (lb/ft s)		6.63	
Frctn Loss (ft)	0.76	Cum Volume (acre-ft)	2.37	19.06	2.02
C & E Loss (ft)	0.25	Cum SA (acres)	1.83	5.45	1.60

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36912 Profile: PF 2

E.G. Elev (ft)	1382.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.35	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1381.31	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1381.31	Flow Area (sq ft)	95.39	93.48	80.40
E.G. Slope (ft/ft)	0.003204	Area (sq ft)	95.39	93.48	80.40
Q Total (cfs)	1171.00	Flow (cfs)	120.38	959.74	90.87
Top Width (ft)	120.30	Top Width (ft)	50.00	20.30	50.00
Vel Total (ft/s)	4.35	Avg. Vel. (ft/s)	1.26	10.27	1.13
Max Chl Dpth (ft)	5.01	Hydr. Depth (ft)	1.91	4.60	1.61
Conv. Total (cfs)	20686.4	Conv. (cfs)	2126.6	16954.4	1605.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	51.91	24.51	51.61
Min Ch EI (ft)	1376.30	Shear (lb/sq ft)	0.37	0.76	0.31
Alpha	4.58	Stream Power (lb/ft s)	0.46	7.83	0.35
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	6.93	34.31	6.75
C & E Loss (ft)	0.23	Cum SA (acres)	2.73	6.01	2.86

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36712 Profile: PF 1

E.G. Elev (ft)	1378.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1378.21	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)	95.71	38.27	90.71
E.G. Slope (ft/ft)	0.002899	Area (sq ft)	95.71	38.27	90.71
Q Total (cfs)	498.00	Flow (cfs)	115.13	277.46	105.42
Top Width (ft)	115.50	Top Width (ft)	50.00	15.50	50.00
Vel Total (ft/s)	2.22	Avg. Vel. (ft/s)	1.20	7.25	1.16
Max Chl Dpth (ft)	2.61	Hydr. Depth (ft)	1.91	2.47	1.81
Conv. Total (cfs)	9249.4	Conv. (cfs)	2138.3	5153.2	1957.9
Length Wtd. (ft)	48.00	Wetted Per. (ft)	51.91	15.69	51.81
Min Ch EI (ft)	1375.60	Shear (lb/sq ft)	0.33	0.44	0.32
Alpha	6.09	Stream Power (lb/ft s)	0.40	3.20	0.37
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	2.16	18.85	1.81
C & E Loss (ft)	0.06	Cum SA (acres)	1.71	5.37	1.49

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36712 Profile: PF 2

E.G. Elev (ft)	1380.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1380.29	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)	199.46	70.43	194.46
E.G. Slope (ft/ft)	0.001734	Area (sq ft)	199.46	70.43	194.46
Q Total (cfs)	1171.00	Flow (cfs)	294.91	593.04	283.05
Top Width (ft)	115.50	Top Width (ft)	50.00	15.50	50.00
Vel Total (ft/s)	2.52	Avg. Vel. (ft/s)	1.48	8.42	1.46
Max Chl Dpth (ft)	4.69	Hydr. Depth (ft)	3.99	4.54	3.89
Conv. Total (cfs)	28123.3	Conv. (cfs)	7082.8	14242.6	6797.8
Length Wtd. (ft)	48.00	Wetted Per. (ft)	53.99	15.69	53.89
Min Ch EI (ft)	1375.60	Shear (lb/sq ft)	0.40	0.49	0.39
Alpha	5.81	Stream Power (lb/ft s)	0.59	4.09	0.57
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	6.26	33.94	6.12
C & E Loss (ft)	0.04	Cum SA (acres)	2.50	5.93	2.63

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36664 Profile: PF 1

E.G. Elev (ft)	1378.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1378.27	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	123.38	47.66	123.38
E.G. Slope (ft/ft)	0.001317	Area (sq ft)	123.38	47.66	123.38
Q Total (cfs)	498.00	Flow (cfs)	117.66	262.68	117.66
Top Width (ft)	116.20	Top Width (ft)	50.00	16.20	50.00
Vel Total (ft/s)	1.69	Avg. Vel. (ft/s)	0.95	5.51	0.95
Max Chl Dpth (ft)	3.07	Hydr. Depth (ft)	2.47	2.94	2.47
Conv. Total (cfs)	13722.3	Conv. (cfs)	3242.1	7238.2	3242.1
Length Wtd. (ft)	85.00	Wetted Per. (ft)	52.47	16.31	52.47
Min Ch EI (ft)	1375.20	Shear (lb/sq ft)	0.19	0.24	0.19
Alpha	5.75	Stream Power (lb/ft s)	0.18	1.32	0.18
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	2.03	18.80	1.69
C & E Loss (ft)	0.07	Cum SA (acres)	1.66	5.35	1.43

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36664 Profile: PF 2

E.G. Elev (ft)	1380.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1380.32	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	226.15	80.95	226.15
E.G. Slope (ft/ft)	0.001129	Area (sq ft)	226.15	80.95	226.15
Q Total (cfs)	1171.00	Flow (cfs)	291.45	588.09	291.45
Top Width (ft)	116.20	Top Width (ft)	50.00	16.20	50.00
Vel Total (ft/s)	2.20	Avg. Vel. (ft/s)	1.29	7.26	1.29
Max Chl Dpth (ft)	5.12	Hydr. Depth (ft)	4.52	5.00	4.52
Conv. Total (cfs)	34855.1	Conv. (cfs)	8675.2	17504.7	8675.2
Length Wtd. (ft)	85.00	Wetted Per. (ft)	54.52	16.31	54.52
Min Ch EI (ft)	1375.20	Shear (lb/sq ft)	0.29	0.35	0.29
Alpha	5.67	Stream Power (lb/ft s)	0.38	2.54	0.38
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	6.02	33.85	5.88
C & E Loss (ft)	0.13	Cum SA (acres)	2.45	5.91	2.57

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36579 Profile: PF 1

E.G. Elev (ft)	1378.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.100	0.020	0.035
W.S. Elev (ft)	1377.31	Reach Len. (ft)	273.00	273.00	273.00
Crit W.S. (ft)	1377.31	Flow Area (sq ft)	85.26	36.79	9.03
E.G. Slope (ft/ft)	0.004861	Area (sq ft)	85.26	36.79	9.03
Q Total (cfs)	498.00	Flow (cfs)	123.28	342.47	32.25
Top Width (ft)	70.00	Top Width (ft)	50.00	15.00	5.00
Vel Total (ft/s)	3.80	Avg. Vel. (ft/s)	1.45	9.31	3.57
Max Chl Dpth (ft)	2.61	Hydr. Depth (ft)	1.71	2.45	1.81
Conv. Total (cfs)	7142.9	Conv. (cfs)	1768.3	4912.1	462.6
Length Wtd. (ft)	273.00	Wetted Per. (ft)	51.71	15.27	6.81
Min Ch El (ft)	1374.70	Shear (lb/sq ft)	0.50	0.73	0.40
Alpha	4.22	Stream Power (lb/ft s)	0.72	6.80	1.44
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)	1.83	18.72	1.56
C & E Loss (ft)	0.13	Cum SA (acres)	1.56	5.32	1.38

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36579 Profile: PF 2

E.G. Elev (ft)	1380.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.69	Wt. n-Val.	0.100	0.020	0.035
W.S. Elev (ft)	1378.76	Reach Len. (ft)	273.00	273.00	273.00
Crit W.S. (ft)	1378.76	Flow Area (sq ft)	158.07	58.64	16.31
E.G. Slope (ft/ft)	0.004960	Area (sq ft)	158.07	58.64	16.31
Q Total (cfs)	1171.00	Flow (cfs)	342.06	752.22	76.72
Top Width (ft)	70.00	Top Width (ft)	50.00	15.00	5.00
Vel Total (ft/s)	5.03	Avg. Vel. (ft/s)	2.16	12.83	4.70
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)	3.16	3.91	3.26
Conv. Total (cfs)	16626.6	Conv. (cfs)	4856.7	10680.5	1089.4
Length Wtd. (ft)	273.00	Wetted Per. (ft)	53.16	15.27	8.26
Min Ch El (ft)	1374.70	Shear (lb/sq ft)	0.92	1.19	0.61
Alpha	4.30	Stream Power (lb/ft s)	1.99	15.25	2.88
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	5.65	33.72	5.65
C & E Loss (ft)	0.25	Cum SA (acres)	2.35	5.88	2.52

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36306 Profile: PF 1

E.G. Elev (ft)	1375.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1374.74	Reach Len. (ft)	73.00	73.00	73.00
Crit W.S. (ft)	1374.74	Flow Area (sq ft)	51.24	26.51	54.24
E.G. Slope (ft/ft)	0.003804	Area (sq ft)	51.24	26.51	54.24
Q Total (cfs)	498.00	Flow (cfs)	134.53	215.68	147.79
Top Width (ft)	115.44	Top Width (ft)	50.00	15.44	50.00
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)	2.63	8.14	2.72
Max Chl Dpth (ft)	1.88	Hydr. Depth (ft)	1.02	1.72	1.08
Conv. Total (cfs)	8074.9	Conv. (cfs)	2181.4	3497.1	2396.3
Length Wtd. (ft)	73.00	Wetted Per. (ft)	51.02	15.66	51.08
Min Ch El (ft)	1372.85	Shear (lb/sq ft)	0.24	0.40	0.25
Alpha	2.30	Stream Power (lb/ft s)	0.63	3.27	0.69
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)	1.40	18.52	1.37
C & E Loss (ft)	0.01	Cum SA (acres)	1.25	5.23	1.21

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36306 Profile: PF 2

E.G. Elev (ft)	1376.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.86	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1375.51	Reach Len. (ft)	73.00	73.00	73.00
Crit W.S. (ft)	1375.51	Flow Area (sq ft)	89.96	38.47	92.96
E.G. Slope (ft/ft)	0.004306	Area (sq ft)	89.96	38.47	92.96
Q Total (cfs)	1171.00	Flow (cfs)	362.10	426.78	382.13
Top Width (ft)	115.44	Top Width (ft)	50.00	15.44	50.00
Vel Total (ft/s)	5.29	Avg. Vel. (ft/s)	4.03	11.09	4.11
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)	1.80	2.49	1.86
Conv. Total (cfs)	17845.4	Conv. (cfs)	5518.1	6503.9	5823.4
Length Wtd. (ft)	73.00	Wetted Per. (ft)	51.80	15.66	51.86
Min Ch EI (ft)	1372.85	Shear (lb/sq ft)	0.47	0.66	0.48
Alpha	1.98	Stream Power (lb/ft s)	1.88	7.33	1.98
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	4.87	33.41	5.30
C & E Loss (ft)	0.01	Cum SA (acres)	2.04	5.78	2.35

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36233 Profile: PF 1

E.G. Elev (ft)	1374.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1373.55	Reach Len. (ft)	145.00	145.00	145.00
Crit W.S. (ft)	1373.55	Flow Area (sq ft)	42.03	43.89	45.53
E.G. Slope (ft/ft)	0.003460	Area (sq ft)	42.03	43.89	45.53
Q Total (cfs)	498.00	Flow (cfs)	92.48	299.97	105.56
Top Width (ft)	130.55	Top Width (ft)	50.00	30.55	50.00
Vel Total (ft/s)	3.79	Avg. Vel. (ft/s)	2.20	6.83	2.32
Max Chl Dpth (ft)	1.50	Hydr. Depth (ft)	0.84	1.44	0.91
Conv. Total (cfs)	8465.8	Conv. (cfs)	1572.1	5099.3	1794.4
Length Wtd. (ft)	145.00	Wetted Per. (ft)	50.84	31.37	50.91
Min Ch EI (ft)	1372.05	Shear (lb/sq ft)	0.18	0.30	0.19
Alpha	2.10	Stream Power (lb/ft s)	0.39	2.07	0.45
Frctn Loss (ft)	0.48	Cum Volume (acre-ft)	1.33	18.46	1.28
C & E Loss (ft)	0.00	Cum SA (acres)	1.16	5.19	1.12

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36233 Profile: PF 2

E.G. Elev (ft)	1375.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.81	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1374.26	Reach Len. (ft)	145.00	145.00	145.00
Crit W.S. (ft)	1374.26	Flow Area (sq ft)	77.57	65.60	81.07
E.G. Slope (ft/ft)	0.003823	Area (sq ft)	77.57	65.60	81.07
Q Total (cfs)	1171.00	Flow (cfs)	267.39	616.08	287.52
Top Width (ft)	130.55	Top Width (ft)	50.00	30.55	50.00
Vel Total (ft/s)	5.22	Avg. Vel. (ft/s)	3.45	9.39	3.55
Max Chl Dpth (ft)	2.21	Hydr. Depth (ft)	1.55	2.15	1.62
Conv. Total (cfs)	18937.8	Conv. (cfs)	4324.3	9963.5	4649.9
Length Wtd. (ft)	145.00	Wetted Per. (ft)	51.55	31.37	51.62
Min Ch EI (ft)	1372.05	Shear (lb/sq ft)	0.36	0.50	0.37
Alpha	1.91	Stream Power (lb/ft s)	1.24	4.69	1.33
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	4.73	33.33	5.16
C & E Loss (ft)	0.00	Cum SA (acres)	1.95	5.75	2.26

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36088 Profile: PF 1

E.G. Elev (ft)	1373.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1372.55	Reach Len. (ft)	243.00	243.00	243.00
Crit W.S. (ft)	1372.55	Flow Area (sq ft)	42.16	47.74	42.16
E.G. Slope (ft/ft)	0.003125	Area (sq ft)	42.16	47.74	42.16
Q Total (cfs)	498.00	Flow (cfs)	88.31	321.38	88.31
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)	2.09	6.73	2.09
Max Chl Dpth (ft)	1.69	Hydr. Depth (ft)	0.84	1.52	0.84
Conv. Total (cfs)	8908.0	Conv. (cfs)	1579.6	5748.7	1579.6
Length Wtd. (ft)	243.00	Wetted Per. (ft)	50.84	32.33	50.84
Min Ch El (ft)	1370.86	Shear (lb/sq ft)	0.16	0.29	0.16
Alpha	2.17	Stream Power (lb/ft s)	0.34	1.94	0.34
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	1.18	18.31	1.14
C & E Loss (ft)	0.00	Cum SA (acres)	1.00	5.08	0.96

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 36088 Profile: PF 2

E.G. Elev (ft)	1374.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.82	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1373.27	Reach Len. (ft)	243.00	243.00	243.00
Crit W.S. (ft)	1373.27	Flow Area (sq ft)	78.15	70.41	78.15
E.G. Slope (ft/ft)	0.003518	Area (sq ft)	78.15	70.41	78.15
Q Total (cfs)	1171.00	Flow (cfs)	259.65	651.69	259.65
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	5.17	Avg. Vel. (ft/s)	3.32	9.26	3.32
Max Chl Dpth (ft)	2.41	Hydr. Depth (ft)	1.56	2.24	1.56
Conv. Total (cfs)	19742.8	Conv. (cfs)	4377.7	10987.4	4377.7
Length Wtd. (ft)	243.00	Wetted Per. (ft)	51.56	32.33	51.56
Min Ch El (ft)	1370.86	Shear (lb/sq ft)	0.33	0.48	0.33
Alpha	1.97	Stream Power (lb/ft s)	1.11	4.43	1.11
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	4.47	33.10	4.89
C & E Loss (ft)	0.10	Cum SA (acres)	1.79	5.64	2.10

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35845 Profile: PF 1

E.G. Elev (ft)	1371.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1370.96	Reach Len. (ft)	352.00	352.00	352.00
Crit W.S. (ft)	1370.96	Flow Area (sq ft)	43.30	45.17	43.30
E.G. Slope (ft/ft)	0.003396	Area (sq ft)	43.30	45.17	43.30
Q Total (cfs)	498.00	Flow (cfs)	96.22	305.57	96.22
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	3.78	Avg. Vel. (ft/s)	2.22	6.76	2.22
Max Chl Dpth (ft)	1.51	Hydr. Depth (ft)	0.87	1.43	0.87
Conv. Total (cfs)	8545.6	Conv. (cfs)	1651.1	5243.5	1651.1
Length Wtd. (ft)	352.00	Wetted Per. (ft)	50.87	32.32	50.87
Min Ch El (ft)	1369.45	Shear (lb/sq ft)	0.18	0.30	0.18
Alpha	2.10	Stream Power (lb/ft s)	0.40	2.00	0.40
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)	0.95	18.05	0.90
C & E Loss (ft)	0.06	Cum SA (acres)	0.72	4.91	0.68

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35845 Profile: PF 2

E.G. Elev (ft)	1372.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1372.12	Reach Len. (ft)	352.00	352.00	352.00
Crit W.S. (ft)		Flow Area (sq ft)	101.24	81.67	101.24
E.G. Slope (ft/ft)	0.001817	Area (sq ft)	101.24	81.67	101.24
Q Total (cfs)	1171.00	Flow (cfs)	285.58	599.84	285.58
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	4.12	Avg. Vel. (ft/s)	2.82	7.34	2.82
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)	2.02	2.59	2.02
Conv. Total (cfs)	27470.2	Conv. (cfs)	6699.4	14071.4	6699.4
Length Wtd. (ft)	352.00	Wetted Per. (ft)	52.02	32.32	52.02
Min Ch EI (ft)	1369.45	Shear (lb/sq ft)	0.22	0.29	0.22
Alpha	1.86	Stream Power (lb/ft s)	0.62	2.11	0.62
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	3.97	32.67	4.39
C & E Loss (ft)	0.11	Cum SA (acres)	1.51	5.47	1.82

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35493 Profile: PF 1

E.G. Elev (ft)	1369.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1369.25	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)		Flow Area (sq ft)	58.65	57.90	59.16
E.G. Slope (ft/ft)	0.001376	Area (sq ft)	58.65	57.90	59.16
Q Total (cfs)	498.00	Flow (cfs)	101.18	294.20	102.61
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	2.83	Avg. Vel. (ft/s)	1.73	5.08	1.73
Max Chl Dpth (ft)	2.00	Hydr. Depth (ft)	1.17	1.84	1.18
Conv. Total (cfs)	13423.1	Conv. (cfs)	2727.3	7929.9	2765.9
Length Wtd. (ft)	82.00	Wetted Per. (ft)	51.17	32.33	51.18
Min Ch EI (ft)	1367.25	Shear (lb/sq ft)	0.10	0.15	0.10
Alpha	2.05	Stream Power (lb/ft s)	0.17	0.78	0.17
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.53	17.63	0.48
C & E Loss (ft)	0.04	Cum SA (acres)	0.31	4.65	0.28

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35493 Profile: PF 2

E.G. Elev (ft)	1372.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1372.21	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)		Flow Area (sq ft)	206.63	151.12	207.13
E.G. Slope (ft/ft)	0.000203	Area (sq ft)	206.63	151.12	207.13
Q Total (cfs)	1171.00	Flow (cfs)	305.32	559.16	306.52
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	2.07	Avg. Vel. (ft/s)	1.48	3.70	1.48
Max Chl Dpth (ft)	4.96	Hydr. Depth (ft)	4.13	4.80	4.14
Conv. Total (cfs)	82173.8	Conv. (cfs)	21425.9	39238.2	21509.8
Length Wtd. (ft)	82.00	Wetted Per. (ft)	54.13	32.33	54.14
Min Ch EI (ft)	1367.25	Shear (lb/sq ft)	0.05	0.06	0.05
Alpha	1.79	Stream Power (lb/ft s)	0.07	0.22	0.07
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.73	31.73	3.15
C & E Loss (ft)	0.01	Cum SA (acres)	1.10	5.21	1.41

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35411 Profile: PF 1

E.G. Elev (ft)	1369.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1369.29	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	88.64	74.67	88.13
E.G. Slope (ft/ft)	0.000476	Area (sq ft)	88.64	74.67	88.13
Q Total (cfs)	498.00	Flow (cfs)	117.55	263.99	116.46
Top Width (ft)	131.60	Top Width (ft)	50.00	31.60	50.00
Vel Total (ft/s)	1.98	Avg. Vel. (ft/s)	1.33	3.54	1.32
Max Chl Dpth (ft)	2.46	Hydr. Depth (ft)	1.77	2.36	1.76
Conv. Total (cfs)	22814.3	Conv. (cfs)	5385.2	12093.7	5335.3
Length Wtd. (ft)	100.00	Wetted Per. (ft)	51.77	32.42	51.76
Min Ch El (ft)	1366.83	Shear (lb/sq ft)	0.05	0.07	0.05
Alpha	1.90	Stream Power (lb/ft s)	0.07	0.24	0.07
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.40	17.51	0.35
C & E Loss (ft)	0.03	Cum SA (acres)	0.22	4.59	0.18

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35411 Profile: PF 2

E.G. Elev (ft)	1372.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1372.23	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	235.37	167.41	234.87
E.G. Slope (ft/ft)	0.000139	Area (sq ft)	235.37	167.41	234.87
Q Total (cfs)	1171.00	Flow (cfs)	311.96	548.14	310.90
Top Width (ft)	131.60	Top Width (ft)	50.00	31.60	50.00
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	1.33	3.27	1.32
Max Chl Dpth (ft)	5.40	Hydr. Depth (ft)	4.71	5.30	4.70
Conv. Total (cfs)	99220.2	Conv. (cfs)	26433.1	46444.5	26342.7
Length Wtd. (ft)	100.00	Wetted Per. (ft)	54.71	32.42	54.70
Min Ch El (ft)	1366.83	Shear (lb/sq ft)	0.04	0.04	0.04
Alpha	1.76	Stream Power (lb/ft s)	0.05	0.15	0.05
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.31	31.43	2.73
C & E Loss (ft)	0.02	Cum SA (acres)	1.01	5.15	1.32

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35311 Profile: PF 1

E.G. Elev (ft)	1369.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.025	0.016	0.025
W.S. Elev (ft)	1369.33	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)	1367.53	Flow Area (sq ft)	111.62	211.60	111.12
E.G. Slope (ft/ft)	0.000064	Area (sq ft)	111.62	211.60	111.12
Q Total (cfs)	498.00	Flow (cfs)	88.18	322.30	87.53
Top Width (ft)	171.40	Top Width (ft)	50.00	71.40	50.00
Vel Total (ft/s)	1.15	Avg. Vel. (ft/s)	0.79	1.52	0.79
Max Chl Dpth (ft)	3.33	Hydr. Depth (ft)	2.23	2.96	2.22
Conv. Total (cfs)	62166.3	Conv. (cfs)	11007.1	40232.9	10926.3
Length Wtd. (ft)	59.00	Wetted Per. (ft)	52.23	72.23	52.22
Min Ch El (ft)	1366.00	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.31	Stream Power (lb/ft s)	0.01	0.02	0.01
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.17	17.18	0.12
C & E Loss (ft)	0.12	Cum SA (acres)	0.10	4.48	0.07

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35311 Profile: PF 2

E.G. Elev (ft)	1372.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.025	0.016	0.025
W.S. Elev (ft)	1372.26	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)	1368.08	Flow Area (sq ft)	258.18	420.89	257.68
E.G. Slope (ft/ft)	0.000030	Area (sq ft)	258.18	420.89	257.68
Q Total (cfs)	1171.00	Flow (cfs)	236.82	698.10	236.08
Top Width (ft)	171.40	Top Width (ft)	50.00	71.40	50.00
Vel Total (ft/s)	1.25	Avg. Vel. (ft/s)	0.92	1.66	0.92
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	5.16	5.89	5.15
Conv. Total (cfs)	212306.5	Conv. (cfs)	42935.9	126568.1	42802.5
Length Wtd. (ft)	59.00	Wetted Per. (ft)	55.16	72.23	55.15
Min Ch El (ft)	1366.00	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.27	Stream Power (lb/ft s)	0.01	0.02	0.01
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.74	30.76	2.17
C & E Loss (ft)	0.22	Cum SA (acres)	0.89	5.03	1.20

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35252 Profile: PF 1

E.G. Elev (ft)	1369.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.22	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1368.01	Reach Len. (ft)	229.00	229.00	229.00
Crit W.S. (ft)	1368.01	Flow Area (sq ft)	1.21	55.63	0.81
E.G. Slope (ft/ft)	0.003567	Area (sq ft)	1.21	55.63	0.81
Q Total (cfs)	498.00	Flow (cfs)	2.05	494.76	1.20
Top Width (ft)	24.20	Top Width (ft)	1.00	22.20	1.00
Vel Total (ft/s)	8.64	Avg. Vel. (ft/s)	1.70	8.89	1.48
Max Chl Dpth (ft)	3.01	Hydr. Depth (ft)	1.21	2.51	0.81
Conv. Total (cfs)	8338.5	Conv. (cfs)	34.3	8284.2	20.0
Length Wtd. (ft)	229.00	Wetted Per. (ft)	2.21	22.96	1.81
Min Ch El (ft)	1365.00	Shear (lb/sq ft)	0.12	0.54	0.10
Alpha	1.05	Stream Power (lb/ft s)	0.21	4.80	0.15
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)	0.09	17.00	0.04
C & E Loss (ft)	0.01	Cum SA (acres)	0.07	4.41	0.03

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35252 Profile: PF 2

E.G. Elev (ft)	1372.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.19	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1369.89	Reach Len. (ft)	229.00	229.00	229.00
Crit W.S. (ft)	1369.89	Flow Area (sq ft)	3.08	97.32	2.69
E.G. Slope (ft/ft)	0.003039	Area (sq ft)	3.08	97.32	2.69
Q Total (cfs)	1171.00	Flow (cfs)	5.99	1159.92	5.09
Top Width (ft)	24.20	Top Width (ft)	1.00	22.20	1.00
Vel Total (ft/s)	11.36	Avg. Vel. (ft/s)	1.94	11.92	1.90
Max Chl Dpth (ft)	4.89	Hydr. Depth (ft)	3.08	4.38	2.69
Conv. Total (cfs)	21241.1	Conv. (cfs)	108.6	21040.2	92.3
Length Wtd. (ft)	229.00	Wetted Per. (ft)	4.08	22.96	3.69
Min Ch El (ft)	1365.00	Shear (lb/sq ft)	0.14	0.80	0.14
Alpha	1.09	Stream Power (lb/ft s)	0.28	9.59	0.26
Frctn Loss (ft)	0.69	Cum Volume (acre-ft)	1.57	30.41	1.99
C & E Loss (ft)	0.02	Cum SA (acres)	0.86	4.97	1.17

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35023 Profile: PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1368.13				
Vel Head (ft)	1.33	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1366.80	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1366.80	Flow Area (sq ft)	1.40	52.99	1.40
E.G. Slope (ft/ft)	0.003598	Area (sq ft)	1.40	52.99	1.40
Q Total (cfs)	498.00	Flow (cfs)	2.48	493.03	2.48
Top Width (ft)	22.00	Top Width (ft)	1.00	20.00	1.00
Vel Total (ft/s)	8.93	Avg. Vel. (ft/s)	1.78	9.30	1.78
Max Chl Dpth (ft)	3.10	Hydr. Depth (ft)	1.40	2.65	1.40
Conv. Total (cfs)	8302.2	Conv. (cfs)	41.4	8219.4	41.4
Length Wtd. (ft)	150.00	Wetted Per. (ft)	2.40	20.57	2.40
Min Ch El (ft)	1363.70	Shear (lb/sq ft)	0.13	0.58	0.13
Alpha	1.08	Stream Power (lb/ft s)	0.23	5.38	0.23
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)	0.08	16.71	0.04
C & E Loss (ft)	0.07	Cum SA (acres)	0.06	4.30	0.03

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 35023 Profile: PF 2

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1371.18				
Vel Head (ft)	2.35	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1368.82	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1368.82	Flow Area (sq ft)	3.42	93.51	3.42
E.G. Slope (ft/ft)	0.002987	Area (sq ft)	3.42	93.51	3.42
Q Total (cfs)	1171.00	Flow (cfs)	6.70	1157.61	6.70
Top Width (ft)	22.00	Top Width (ft)	1.00	20.00	1.00
Vel Total (ft/s)	11.67	Avg. Vel. (ft/s)	1.96	12.38	1.96
Max Chl Dpth (ft)	5.12	Hydr. Depth (ft)	3.42	4.68	3.42
Conv. Total (cfs)	21426.1	Conv. (cfs)	122.5	21181.0	122.5
Length Wtd. (ft)	150.00	Wetted Per. (ft)	4.42	20.57	4.42
Min Ch El (ft)	1363.70	Shear (lb/sq ft)	0.14	0.85	0.14
Alpha	1.11	Stream Power (lb/ft s)	0.28	10.49	0.28
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	1.55	29.91	1.97
C & E Loss (ft)	0.03	Cum SA (acres)	0.85	4.86	1.16

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34873 Profile: PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1367.57				
Vel Head (ft)	1.09	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1366.49	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1366.27	Flow Area (sq ft)	1.68	58.66	1.48
E.G. Slope (ft/ft)	0.002702	Area (sq ft)	1.68	58.66	1.48
Q Total (cfs)	498.00	Flow (cfs)	2.73	492.95	2.32
Top Width (ft)	22.90	Top Width (ft)	1.00	20.90	1.00
Vel Total (ft/s)	8.05	Avg. Vel. (ft/s)	1.62	8.40	1.57
Max Chl Dpth (ft)	3.18	Hydr. Depth (ft)	1.68	2.81	1.48
Conv. Total (cfs)	9579.8	Conv. (cfs)	52.4	9482.6	44.7
Length Wtd. (ft)	200.00	Wetted Per. (ft)	2.68	21.41	2.48
Min Ch El (ft)	1363.30	Shear (lb/sq ft)	0.11	0.46	0.10
Alpha	1.08	Stream Power (lb/ft s)	0.17	3.88	0.16
Frctn Loss (ft)	0.62	Cum Volume (acre-ft)	0.08	16.52	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.06	4.23	0.02

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34873 Profile: PF 2

E.G. Elev (ft)	1370.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.27	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1368.24	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1368.24	Flow Area (sq ft)	3.44	95.29	3.24
E.G. Slope (ft/ft)	0.002960	Area (sq ft)	3.44	95.29	3.24
Q Total (cfs)	1171.00	Flow (cfs)	6.70	1158.05	6.25
Top Width (ft)	22.90	Top Width (ft)	1.00	20.90	1.00
Vel Total (ft/s)	11.48	Avg. Vel. (ft/s)	1.95	12.15	1.93
Max Chl Dpth (ft)	4.94	Hydr. Depth (ft)	3.44	4.56	3.24
Conv. Total (cfs)	21524.2	Conv. (cfs)	123.1	21286.3	114.9
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.44	21.41	4.24
Min Ch EI (ft)	1363.30	Shear (lb/sq ft)	0.14	0.82	0.14
Alpha	1.11	Stream Power (lb/ft s)	0.28	9.99	0.27
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	1.54	29.58	1.96
C & E Loss (ft)	0.00	Cum SA (acres)	0.85	4.79	1.16

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34673 Profile: PF 1

E.G. Elev (ft)	1366.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.27	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1365.66	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1365.66	Flow Area (sq ft)	1.06	54.35	1.26
E.G. Slope (ft/ft)	0.003572	Area (sq ft)	1.06	54.35	1.26
Q Total (cfs)	498.00	Flow (cfs)	1.72	494.12	2.16
Top Width (ft)	23.00	Top Width (ft)	1.00	21.00	1.00
Vel Total (ft/s)	8.79	Avg. Vel. (ft/s)	1.63	9.09	1.72
Max Chl Dpth (ft)	2.96	Hydr. Depth (ft)	1.06	2.59	1.26
Conv. Total (cfs)	8332.9	Conv. (cfs)	28.8	8268.0	36.1
Length Wtd. (ft)	295.00	Wetted Per. (ft)	2.06	21.72	2.26
Min Ch EI (ft)	1362.70	Shear (lb/sq ft)	0.11	0.56	0.12
Alpha	1.06	Stream Power (lb/ft s)	0.19	5.07	0.21
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.07	16.26	0.02
C & E Loss (ft)	0.31	Cum SA (acres)	0.06	4.14	0.02

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34673 Profile: PF 2

E.G. Elev (ft)	1369.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1367.63	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1367.63	Flow Area (sq ft)	3.03	95.70	3.23
E.G. Slope (ft/ft)	0.002980	Area (sq ft)	3.03	95.70	3.23
Q Total (cfs)	1171.00	Flow (cfs)	5.80	1158.96	6.25
Top Width (ft)	23.00	Top Width (ft)	1.00	21.00	1.00
Vel Total (ft/s)	11.49	Avg. Vel. (ft/s)	1.92	12.11	1.94
Max Chl Dpth (ft)	4.93	Hydr. Depth (ft)	3.03	4.56	3.23
Conv. Total (cfs)	21452.3	Conv. (cfs)	106.2	21231.6	114.4
Length Wtd. (ft)	295.00	Wetted Per. (ft)	4.03	21.72	4.23
Min Ch EI (ft)	1362.70	Shear (lb/sq ft)	0.14	0.82	0.14
Alpha	1.10	Stream Power (lb/ft s)	0.27	9.92	0.27
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	1.52	29.14	1.95
C & E Loss (ft)	0.61	Cum SA (acres)	0.85	4.69	1.16

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34378 Profile: PF 1

E.G. Elev (ft)	1360.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.030	
W.S. Elev (ft)	1360.04	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)		Flow Area (sq ft)		173.43	
E.G. Slope (ft/ft)	0.001279	Area (sq ft)		173.43	
Q Total (cfs)	660.00	Flow (cfs)		660.00	
Top Width (ft)	53.79	Top Width (ft)		53.79	
Vel Total (ft/s)	3.81	Avg. Vel. (ft/s)		3.81	
Max Chl Dpth (ft)	5.04	Hydr. Depth (ft)		3.22	
Conv. Total (cfs)	18452.6	Conv. (cfs)		18452.6	
Length Wtd. (ft)	40.00	Wetted Per. (ft)		55.08	
Min Ch El (ft)	1355.00	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		0.96	
Frcn Loss (ft)	0.05	Cum Volume (acre-ft)	0.07	15.49	0.02
C & E Loss (ft)	0.02	Cum SA (acres)	0.05	3.88	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34378 Profile: PF 2

E.G. Elev (ft)	1363.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.030	0.035
W.S. Elev (ft)	1362.89	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)		Flow Area (sq ft)		349.38	49.66
E.G. Slope (ft/ft)	0.000715	Area (sq ft)		349.38	49.66
Q Total (cfs)	1448.00	Flow (cfs)		1363.32	84.68
Top Width (ft)	92.31	Top Width (ft)		67.31	25.00
Vel Total (ft/s)	3.63	Avg. Vel. (ft/s)		3.90	1.71
Max Chl Dpth (ft)	7.89	Hydr. Depth (ft)		5.19	1.99
Conv. Total (cfs)	54142.6	Conv. (cfs)		50976.2	3166.4
Length Wtd. (ft)	40.00	Wetted Per. (ft)		69.11	26.99
Min Ch El (ft)	1355.00	Shear (lb/sq ft)		0.23	0.08
Alpha	1.10	Stream Power (lb/ft s)		0.88	0.14
Frcn Loss (ft)	0.02	Cum Volume (acre-ft)	1.51	27.64	1.77
C & E Loss (ft)	0.03	Cum SA (acres)	0.84	4.39	1.07

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34338 Profile: PF 1

E.G. Elev (ft)	1360.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.		0.030	
W.S. Elev (ft)	1359.71	Reach Len. (ft)	31.00	31.00	31.00
Crit W.S. (ft)	1357.31	Flow Area (sq ft)		119.51	
E.G. Slope (ft/ft)	0.001302	Area (sq ft)		312.56	
Q Total (cfs)	660.00	Flow (cfs)		660.00	
Top Width (ft)	59.07	Top Width (ft)		59.07	
Vel Total (ft/s)	5.52	Avg. Vel. (ft/s)		5.52	
Max Chl Dpth (ft)	5.43	Hydr. Depth (ft)		5.43	
Conv. Total (cfs)	18292.8	Conv. (cfs)		18292.8	
Length Wtd. (ft)	31.00	Wetted Per. (ft)		22.00	
Min Ch El (ft)	1354.28	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		2.44	
Frcn Loss (ft)		Cum Volume (acre-ft)	0.07	15.27	0.02
C & E Loss (ft)		Cum SA (acres)	0.05	3.83	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34338 Profile: PF 2

E.G. Elev (ft)	1363.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (ft)	1362.94	Reach Len. (ft)	31.00	31.00	31.00
Crit W.S. (ft)	1359.41	Flow Area (sq ft)	1.59	505.65	39.83
E.G. Slope (ft/ft)	0.000231	Area (sq ft)	1.59	505.65	39.83
Q Total (cfs)	1448.00	Flow (cfs)	0.74	1413.60	33.65
Top Width (ft)	86.00	Top Width (ft)	1.00	60.00	25.00
Vel Total (ft/s)	2.65	Avg. Vel. (ft/s)	0.47	2.80	0.84
Max Chl Dpth (ft)	8.66	Hydr. Depth (ft)	1.59	8.43	1.59
Conv. Total (cfs)	95235.8	Conv. (cfs)	48.9	92973.5	2213.5
Length Wtd. (ft)	31.00	Wetted Per. (ft)	2.59	70.69	26.59
Min Ch El (ft)	1354.28	Shear (lb/sq ft)	0.01	0.10	0.02
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.29	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	1.51	27.24	1.73
C & E Loss (ft)		Cum SA (acres)	0.84	4.34	1.04

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34307 Profile: PF 1

E.G. Elev (ft)	1359.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.		0.030	
W.S. Elev (ft)	1359.22	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1356.82	Flow Area (sq ft)		119.16	
E.G. Slope (ft/ft)	0.001315	Area (sq ft)		311.41	
Q Total (cfs)	660.00	Flow (cfs)		660.00	
Top Width (ft)	58.99	Top Width (ft)		58.99	
Vel Total (ft/s)	5.54	Avg. Vel. (ft/s)		5.54	
Max Chl Dpth (ft)	5.42	Hydr. Depth (ft)		5.42	
Conv. Total (cfs)	18203.1	Conv. (cfs)		18203.1	
Length Wtd. (ft)	62.00	Wetted Per. (ft)		22.00	
Min Ch El (ft)	1353.80	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		2.46	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.07	15.05	0.02
C & E Loss (ft)	0.05	Cum SA (acres)	0.05	3.79	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34307 Profile: PF 2

E.G. Elev (ft)	1361.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.030	0.020
W.S. Elev (ft)	1361.53	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1358.92	Flow Area (sq ft)	0.48	449.18	11.95
E.G. Slope (ft/ft)	0.000357	Area (sq ft)	0.48	449.18	11.95
Q Total (cfs)	1448.00	Flow (cfs)	0.18	1437.69	10.13
Top Width (ft)	86.00	Top Width (ft)	1.00	60.00	25.00
Vel Total (ft/s)	3.14	Avg. Vel. (ft/s)	0.38	3.20	0.85
Max Chl Dpth (ft)	7.73	Hydr. Depth (ft)	0.48	7.49	0.48
Conv. Total (cfs)	76619.4	Conv. (cfs)	9.6	76073.8	536.0
Length Wtd. (ft)	62.00	Wetted Per. (ft)	1.48	71.04	25.48
Min Ch El (ft)	1353.80	Shear (lb/sq ft)	0.01	0.14	0.01
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.45	0.01
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	1.51	26.90	1.71
C & E Loss (ft)	0.14	Cum SA (acres)	0.84	4.29	1.03

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34245 Profile: PF 1

E.G. Elev (ft)	1359.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.030	
W.S. Elev (ft)	1359.16	Reach Len. (ft)	413.00	413.00	413.00
Crit W.S. (ft)		Flow Area (sq ft)		145.08	
E.G. Slope (ft/ft)	0.002185	Area (sq ft)		145.08	
Q Total (cfs)	713.00	Flow (cfs)		713.00	
Top Width (ft)	45.20	Top Width (ft)		45.20	
Vel Total (ft/s)	4.91	Avg. Vel. (ft/s)		4.91	
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		3.21	
Conv. Total (cfs)	15254.5	Conv. (cfs)		15254.5	
Length Wtd. (ft)	413.00	Wetted Per. (ft)		46.91	
Min Ch El (ft)	1353.50	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		2.07	
Frctn Loss (ft)	1.70	Cum Volume (acre-ft)	0.07	14.72	0.02
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	3.71	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 34245 Profile: PF 2

E.G. Elev (ft)	1361.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.	0.035	0.030	0.020
W.S. Elev (ft)	1360.89	Reach Len. (ft)	413.00	413.00	413.00
Crit W.S. (ft)		Flow Area (sq ft)	0.39	232.03	22.23
E.G. Slope (ft/ft)	0.002437	Area (sq ft)	0.39	232.03	22.23
Q Total (cfs)	1557.00	Flow (cfs)	0.35	1482.98	73.67
Top Width (ft)	78.90	Top Width (ft)	1.00	52.90	25.00
Vel Total (ft/s)	6.11	Avg. Vel. (ft/s)	0.90	6.39	3.31
Max Chl Dpth (ft)	7.39	Hydr. Depth (ft)	0.39	4.39	0.89
Conv. Total (cfs)	31539.5	Conv. (cfs)	7.1	30040.1	1492.3
Length Wtd. (ft)	413.00	Wetted Per. (ft)	1.39	54.91	25.89
Min Ch El (ft)	1353.50	Shear (lb/sq ft)	0.04	0.64	0.13
Alpha	1.05	Stream Power (lb/ft s)	0.04	4.11	0.43
Frctn Loss (ft)	1.39	Cum Volume (acre-ft)	1.51	26.42	1.68
C & E Loss (ft)	0.03	Cum SA (acres)	0.84	4.21	0.99

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33832 Profile: PF 1

E.G. Elev (ft)	1357.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.035	
W.S. Elev (ft)	1356.73	Reach Len. (ft)	386.00	386.00	386.00
Crit W.S. (ft)	1356.45	Flow Area (sq ft)		87.57	
E.G. Slope (ft/ft)	0.010489	Area (sq ft)		87.57	
Q Total (cfs)	713.00	Flow (cfs)		713.00	
Top Width (ft)	32.47	Top Width (ft)		32.47	
Vel Total (ft/s)	8.14	Avg. Vel. (ft/s)		8.14	
Max Chl Dpth (ft)	5.23	Hydr. Depth (ft)		2.70	
Conv. Total (cfs)	6961.7	Conv. (cfs)		6961.7	
Length Wtd. (ft)	386.00	Wetted Per. (ft)		34.17	
Min Ch El (ft)	1351.50	Shear (lb/sq ft)		1.68	
Alpha	1.00	Stream Power (lb/ft s)		13.66	
Frctn Loss (ft)	2.30	Cum Volume (acre-ft)	0.07	13.62	0.02
C & E Loss (ft)	0.13	Cum SA (acres)	0.05	3.35	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33832 Profile: PF 2

E.G. Elev (ft)	1360.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.94	Wt. n-Val.		0.035	0.030
W.S. Elev (ft)	1359.14	Reach Len. (ft)	386.00	386.00	386.00
Crit W.S. (ft)	1358.29	Flow Area (sq ft)		173.01	32.13
E.G. Slope (ft/ft)	0.004960	Area (sq ft)		173.01	32.13
Q Total (cfs)	1557.00	Flow (cfs)		1386.64	170.37
Top Width (ft)	51.00	Top Width (ft)		36.00	15.00
Vel Total (ft/s)	7.59	Avg. Vel. (ft/s)		8.01	5.30
Max Chl Dpth (ft)	7.64	Hydr. Depth (ft)		4.81	2.14
Conv. Total (cfs)	22107.7	Conv. (cfs)		19688.7	2419.0
Length Wtd. (ft)	386.00	Wetted Per. (ft)		39.42	17.14
Min Ch El (ft)	1351.50	Shear (lb/sq ft)		1.36	0.58
Alpha	1.05	Stream Power (lb/ft s)		10.89	3.08
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	1.51	24.50	1.43
C & E Loss (ft)	0.10	Cum SA (acres)	0.83	3.79	0.80

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33446 Profile: PF 1

E.G. Elev (ft)	1355.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.		0.035	
W.S. Elev (ft)	1354.74	Reach Len. (ft)	33.00	33.00	33.00
Crit W.S. (ft)		Flow Area (sq ft)		126.65	
E.G. Slope (ft/ft)	0.003983	Area (sq ft)		126.65	
Q Total (cfs)	793.00	Flow (cfs)		793.00	
Top Width (ft)	32.37	Top Width (ft)		32.37	
Vel Total (ft/s)	6.26	Avg. Vel. (ft/s)		6.26	
Max Chl Dpth (ft)	5.24	Hydr. Depth (ft)		3.91	
Conv. Total (cfs)	12565.2	Conv. (cfs)		12565.2	
Length Wtd. (ft)	33.00	Wetted Per. (ft)		35.45	
Min Ch El (ft)	1349.50	Shear (lb/sq ft)		0.89	
Alpha	1.00	Stream Power (lb/ft s)		5.56	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.07	12.67	0.02
C & E Loss (ft)	0.06	Cum SA (acres)	0.05	3.06	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33446 Profile: PF 2

E.G. Elev (ft)	1358.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.	0.035	0.035	0.100
W.S. Elev (ft)	1358.30	Reach Len. (ft)	33.00	33.00	33.00
Crit W.S. (ft)		Flow Area (sq ft)	4.81	252.96	48.09
E.G. Slope (ft/ft)	0.001845	Area (sq ft)	4.81	252.96	48.09
Q Total (cfs)	1644.00	Flow (cfs)	9.30	1583.63	51.07
Top Width (ft)	58.00	Top Width (ft)	2.00	36.00	20.00
Vel Total (ft/s)	5.38	Avg. Vel. (ft/s)	1.93	6.26	1.06
Max Chl Dpth (ft)	8.80	Hydr. Depth (ft)	2.40	7.03	2.40
Conv. Total (cfs)	38272.9	Conv. (cfs)	216.5	36867.4	1189.0
Length Wtd. (ft)	33.00	Wetted Per. (ft)	4.40	39.77	22.40
Min Ch El (ft)	1349.50	Shear (lb/sq ft)	0.13	0.73	0.25
Alpha	1.31	Stream Power (lb/ft s)	0.24	4.59	0.26
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	1.49	22.61	1.07
C & E Loss (ft)	0.05	Cum SA (acres)	0.83	3.47	0.65

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33413 Profile: PF 1

E.G. Elev (ft)	1355.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.		0.035	
W.S. Elev (ft)	1354.79	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	1352.52	Flow Area (sq ft)		154.80	
E.G. Slope (ft/ft)	0.001706	Area (sq ft)		168.13	
Q Total (cfs)	793.00	Flow (cfs)		793.00	
Top Width (ft)	36.34	Top Width (ft)		36.34	
Vel Total (ft/s)	5.12	Avg. Vel. (ft/s)		5.12	
Max Chl Dpth (ft)	4.99	Hydr. Depth (ft)		4.99	
Conv. Total (cfs)	19200.0	Conv. (cfs)		19200.0	
Length Wtd. (ft)	61.00	Wetted Per. (ft)		31.00	
Min Ch EI (ft)	1349.80	Shear (lb/sq ft)		0.53	
Alpha	1.00	Stream Power (lb/ft s)		2.72	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.07	12.56	0.02
C & E Loss (ft)		Cum SA (acres)	0.05	3.03	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33413 Profile: PF 2

E.G. Elev (ft)	1358.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.	0.035	0.035	0.100
W.S. Elev (ft)	1358.38	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	1354.22	Flow Area (sq ft)	8.33	301.35	53.54
E.G. Slope (ft/ft)	0.001210	Area (sq ft)	8.33	301.35	53.54
Q Total (cfs)	1644.00	Flow (cfs)	15.71	1579.22	49.07
Top Width (ft)	60.30	Top Width (ft)	3.00	37.30	20.00
Vel Total (ft/s)	4.53	Avg. Vel. (ft/s)	1.89	5.24	0.92
Max Chl Dpth (ft)	8.58	Hydr. Depth (ft)	2.78	8.08	2.68
Conv. Total (cfs)	47253.1	Conv. (cfs)	451.4	45391.2	1410.5
Length Wtd. (ft)	61.00	Wetted Per. (ft)	5.78	45.09	22.68
Min Ch EI (ft)	1349.80	Shear (lb/sq ft)	0.11	0.50	0.18
Alpha	1.29	Stream Power (lb/ft s)	0.21	2.65	0.16
Frctn Loss (ft)		Cum Volume (acre-ft)	1.48	22.40	1.03
C & E Loss (ft)		Cum SA (acres)	0.82	3.44	0.63

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33352 Profile: PF 1

E.G. Elev (ft)	1354.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.030	
W.S. Elev (ft)	1354.49	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1352.02	Flow Area (sq ft)		160.74	
E.G. Slope (ft/ft)	0.001105	Area (sq ft)		175.11	
Q Total (cfs)	793.00	Flow (cfs)		793.00	
Top Width (ft)	36.54	Top Width (ft)		36.54	
Vel Total (ft/s)	4.93	Avg. Vel. (ft/s)		4.93	
Max Chl Dpth (ft)	5.19	Hydr. Depth (ft)		5.19	
Conv. Total (cfs)	23851.1	Conv. (cfs)		23851.1	
Length Wtd. (ft)	62.00	Wetted Per. (ft)		31.00	
Min Ch EI (ft)	1349.30	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		1.77	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.07	12.32	0.02
C & E Loss (ft)	0.30	Cum SA (acres)	0.05	2.98	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33352 Profile: PF 2

E.G. Elev (ft)	1357.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	1357.32	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1353.73	Flow Area (sq ft)	55.45	280.51	52.95
E.G. Slope (ft/ft)	0.001101	Area (sq ft)	55.45	280.51	52.95
Q Total (cfs)	1644.00	Flow (cfs)	43.93	1559.28	40.78
Top Width (ft)	87.30	Top Width (ft)	25.00	37.30	25.00
Vel Total (ft/s)	4.23	Avg. Vel. (ft/s)	0.79	5.56	0.77
Max Chl Dpth (ft)	8.02	Hydr. Depth (ft)	2.22	7.52	2.12
Conv. Total (cfs)	49545.1	Conv. (cfs)	1324.0	46992.0	1229.1
Length Wtd. (ft)	62.00	Wetted Per. (ft)	27.22	45.09	27.12
Min Ch El (ft)	1349.30	Shear (lb/sq ft)	0.14	0.43	0.13
Alpha	1.64	Stream Power (lb/ft s)	0.11	2.38	0.10
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	1.44	21.99	0.96
C & E Loss (ft)	0.07	Cum SA (acres)	0.80	3.39	0.60

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33290 Profile: PF 1

E.G. Elev (ft)	1354.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.39	Wt. n-Val.		0.030	
W.S. Elev (ft)	1353.02	Reach Len. (ft)	391.00	391.00	391.00
Crit W.S. (ft)	1353.02	Flow Area (sq ft)		83.86	
E.G. Slope (ft/ft)	0.010153	Area (sq ft)		83.86	
Q Total (cfs)	793.00	Flow (cfs)		793.00	
Top Width (ft)	30.51	Top Width (ft)		30.51	
Vel Total (ft/s)	9.46	Avg. Vel. (ft/s)		9.46	
Max Chl Dpth (ft)	3.92	Hydr. Depth (ft)		2.75	
Conv. Total (cfs)	7870.1	Conv. (cfs)		7870.1	
Length Wtd. (ft)	391.00	Wetted Per. (ft)		32.15	
Min Ch El (ft)	1349.10	Shear (lb/sq ft)		1.65	
Alpha	1.00	Stream Power (lb/ft s)		15.63	
Frctn Loss (ft)	1.08	Cum Volume (acre-ft)	0.07	12.13	0.02
C & E Loss (ft)	0.08	Cum SA (acres)	0.05	2.93	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 33290 Profile: PF 2

E.G. Elev (ft)	1357.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.70	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	1356.90	Reach Len. (ft)	391.00	391.00	391.00
Crit W.S. (ft)		Flow Area (sq ft)	32.07	229.26	40.07
E.G. Slope (ft/ft)	0.002037	Area (sq ft)	32.07	229.26	40.07
Q Total (cfs)	1644.00	Flow (cfs)	27.98	1575.95	40.07
Top Width (ft)	80.00	Top Width (ft)	20.00	40.00	20.00
Vel Total (ft/s)	5.45	Avg. Vel. (ft/s)	0.87	6.87	1.00
Max Chl Dpth (ft)	7.80	Hydr. Depth (ft)	1.60	5.73	2.00
Conv. Total (cfs)	36425.3	Conv. (cfs)	620.0	34917.5	887.8
Length Wtd. (ft)	391.00	Wetted Per. (ft)	21.60	42.52	22.00
Min Ch El (ft)	1349.10	Shear (lb/sq ft)	0.19	0.69	0.23
Alpha	1.52	Stream Power (lb/ft s)	0.16	4.71	0.23
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	1.37	21.63	0.89
C & E Loss (ft)	0.21	Cum SA (acres)	0.77	3.34	0.57

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32899 Profile: PF 1

E.G. Elev (ft)	1352.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.12	Wt. n-Val.		0.018	
W.S. Elev (ft)	1351.03	Reach Len. (ft)	357.00	357.00	357.00
Crit W.S. (ft)	1347.77	Flow Area (sq ft)		93.36	
E.G. Slope (ft/ft)	0.001265	Area (sq ft)		97.31	
Q Total (cfs)	793.00	Flow (cfs)		793.00	
Top Width (ft)	11.65	Top Width (ft)		11.65	
Vel Total (ft/s)	8.49	Avg. Vel. (ft/s)		8.49	
Max Chl Dpth (ft)	9.03	Hydr. Depth (ft)		8.67	
Conv. Total (cfs)	22296.4	Conv. (cfs)		22296.4	
Length Wtd. (ft)	357.00	Wetted Per. (ft)		18.97	
Min Ch EI (ft)	1342.00	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		3.30	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.07	11.32	0.02
C & E Loss (ft)		Cum SA (acres)	0.05	2.74	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32899 Profile: PF 2

E.G. Elev (ft)	1356.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.80	Wt. n-Val.		0.018	
W.S. Elev (ft)	1353.69	Reach Len. (ft)	357.00	357.00	357.00
Crit W.S. (ft)	1351.32	Flow Area (sq ft)		122.38	
E.G. Slope (ft/ft)	0.002629	Area (sq ft)		129.00	
Q Total (cfs)	1644.00	Flow (cfs)		1644.00	
Top Width (ft)	12.16	Top Width (ft)		12.16	
Vel Total (ft/s)	13.43	Avg. Vel. (ft/s)		13.43	
Max Chl Dpth (ft)	11.69	Hydr. Depth (ft)		11.09	
Conv. Total (cfs)	32060.5	Conv. (cfs)		32060.5	
Length Wtd. (ft)	357.00	Wetted Per. (ft)		21.65	
Min Ch EI (ft)	1342.00	Shear (lb/sq ft)		0.93	
Alpha	1.00	Stream Power (lb/ft s)		12.47	
Frctn Loss (ft)		Cum Volume (acre-ft)	1.23	20.02	0.71
C & E Loss (ft)		Cum SA (acres)	0.68	3.10	0.48

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32542 Profile: PF 1

E.G. Elev (ft)	1348.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.75	Wt. n-Val.		0.018	
W.S. Elev (ft)	1347.12	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1345.91	Flow Area (sq ft)		77.54	
E.G. Slope (ft/ft)	0.001373	Area (sq ft)		120.39	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	25.26	Top Width (ft)		25.26	
Vel Total (ft/s)	10.61	Avg. Vel. (ft/s)		10.61	
Max Chl Dpth (ft)	6.46	Hydr. Depth (ft)		6.46	
Conv. Total (cfs)	22207.1	Conv. (cfs)		22207.1	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		12.00	
Min Ch EI (ft)	1340.66	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		5.88	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.07	10.43	0.02
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	2.59	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32542 Profile: PF 2

E.G. Elev (ft)	1351.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.018	0.018	0.100
W.S. Elev (ft)	1351.24	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1349.20	Flow Area (sq ft)	36.85	239.52	20.85
E.G. Slope (ft/ft)	0.000561	Area (sq ft)	36.85	239.52	20.85
Q Total (cfs)	1703.00	Flow (cfs)	102.12	1593.58	7.30
Top Width (ft)	70.70	Top Width (ft)	20.00	30.70	20.00
Vel Total (ft/s)	5.73	Avg. Vel. (ft/s)	2.77	6.65	0.35
Max Chl Dpth (ft)	10.58	Hydr. Depth (ft)	1.84	7.80	1.04
Conv. Total (cfs)	71893.6	Conv. (cfs)	4311.2	67274.4	308.0
Length Wtd. (ft)	150.00	Wetted Per. (ft)	21.84	38.17	21.04
Min Ch El (ft)	1340.66	Shear (lb/sq ft)	0.06	0.22	0.03
Alpha	1.28	Stream Power (lb/ft s)	0.16	1.46	0.01
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	1.08	18.51	0.63
C & E Loss (ft)	0.35	Cum SA (acres)	0.60	2.93	0.40

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32392 Profile: PF 1

E.G. Elev (ft)	1348.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.018	
W.S. Elev (ft)	1346.81	Reach Len. (ft)	368.00	368.00	368.00
Crit W.S. (ft)	1346.81	Flow Area (sq ft)		77.85	
E.G. Slope (ft/ft)	0.003857	Area (sq ft)		77.85	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	22.54	Top Width (ft)		22.54	
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)		10.57	
Max Chl Dpth (ft)	6.61	Hydr. Depth (ft)		3.45	
Conv. Total (cfs)	13252.0	Conv. (cfs)		13252.0	
Length Wtd. (ft)	368.00	Wetted Per. (ft)		26.29	
Min Ch El (ft)	1340.20	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		7.54	
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	0.07	10.09	0.02
C & E Loss (ft)	0.39	Cum SA (acres)	0.05	2.51	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32392 Profile: PF 2

E.G. Elev (ft)	1351.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.83	Wt. n-Val.	0.018	0.018	
W.S. Elev (ft)	1349.56	Reach Len. (ft)	368.00	368.00	368.00
Crit W.S. (ft)	1349.56	Flow Area (sq ft)	13.14	151.55	
E.G. Slope (ft/ft)	0.002546	Area (sq ft)	13.14	151.55	
Q Total (cfs)	1703.00	Flow (cfs)	40.51	1662.49	
Top Width (ft)	50.33	Top Width (ft)	20.00	30.33	
Vel Total (ft/s)	10.34	Avg. Vel. (ft/s)	3.08	10.97	
Max Chl Dpth (ft)	9.36	Hydr. Depth (ft)	0.66	5.00	
Conv. Total (cfs)	33750.3	Conv. (cfs)	802.8	32947.5	
Length Wtd. (ft)	368.00	Wetted Per. (ft)	20.66	35.46	
Min Ch El (ft)	1340.20	Shear (lb/sq ft)	0.10	0.68	
Alpha	1.10	Stream Power (lb/ft s)	0.31	7.45	
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.99	17.84	0.59
C & E Loss (ft)	0.26	Cum SA (acres)	0.53	2.82	0.36

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32024 Profile: PF 1

E.G. Elev (ft)	1345.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.018	
W.S. Elev (ft)	1344.76	Reach Len. (ft)	72.00	72.00	72.00
Crit W.S. (ft)	1340.45	Flow Area (sq ft)		154.62	
E.G. Slope (ft/ft)	0.000562	Area (sq ft)		154.62	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	19.31	Top Width (ft)		19.31	
Vel Total (ft/s)	5.32	Avg. Vel. (ft/s)		5.32	
Max Chl Dpth (ft)	8.38	Hydr. Depth (ft)		8.01	
Conv. Total (cfs)	34703.1	Conv. (cfs)		34703.1	
Length Wtd. (ft)	72.00	Wetted Per. (ft)		34.49	
Min Ch EI (ft)	1336.38	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.84	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.07	9.10	0.02
C & E Loss (ft)		Cum SA (acres)	0.05	2.33	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 32024 Profile: PF 2

E.G. Elev (ft)	1347.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.018	0.018	0.100
W.S. Elev (ft)	1346.81	Reach Len. (ft)	72.00	72.00	72.00
Crit W.S. (ft)	1342.99	Flow Area (sq ft)	32.26	194.42	32.26
E.G. Slope (ft/ft)	0.000991	Area (sq ft)	32.26	194.42	32.26
Q Total (cfs)	1703.00	Flow (cfs)	109.52	1573.76	19.71
Top Width (ft)	59.40	Top Width (ft)	20.00	19.40	20.00
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)	3.39	8.09	0.61
Max Chl Dpth (ft)	10.43	Hydr. Depth (ft)	1.61	10.02	1.61
Conv. Total (cfs)	54084.3	Conv. (cfs)	3478.3	49979.9	626.1
Length Wtd. (ft)	72.00	Wetted Per. (ft)	21.61	35.38	21.61
Min Ch EI (ft)	1336.38	Shear (lb/sq ft)	0.09	0.34	0.09
Alpha	1.42	Stream Power (lb/ft s)	0.31	2.75	0.06
Frctn Loss (ft)		Cum Volume (acre-ft)	0.80	16.38	0.45
C & E Loss (ft)		Cum SA (acres)	0.36	2.61	0.28

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31952 Profile: PF 1

E.G. Elev (ft)	1344.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.		0.018	
W.S. Elev (ft)	1343.50	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1340.17	Flow Area (sq ft)		141.19	
E.G. Slope (ft/ft)	0.000367	Area (sq ft)		147.97	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	21.89	Top Width (ft)		21.89	
Vel Total (ft/s)	5.83	Avg. Vel. (ft/s)		5.83	
Max Chl Dpth (ft)	7.07	Hydr. Depth (ft)		7.07	
Conv. Total (cfs)	42934.6	Conv. (cfs)		42934.6	
Length Wtd. (ft)	295.00	Wetted Per. (ft)		19.97	
Min Ch EI (ft)	1336.43	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.95	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.07	8.85	0.02
C & E Loss (ft)	0.28	Cum SA (acres)	0.05	2.30	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31952 Profile: PF 2

E.G. Elev (ft)	1346.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1345.76	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1342.50	Flow Area (sq ft)	3.33	198.11	0.48
E.G. Slope (ft/ft)	0.001184	Area (sq ft)	3.33	198.11	0.48
Q Total (cfs)	1703.00	Flow (cfs)	3.97	1698.64	0.38
Top Width (ft)	28.44	Top Width (ft)	5.00	22.37	1.07
Vel Total (ft/s)	8.43	Avg. Vel. (ft/s)	1.19	8.57	0.81
Max Chl Dpth (ft)	9.33	Hydr. Depth (ft)	0.67	8.86	0.45
Conv. Total (cfs)	49493.6	Conv. (cfs)	115.5	49367.0	11.1
Length Wtd. (ft)	295.00	Wetted Per. (ft)	5.68	37.77	1.47
Min Ch El (ft)	1336.43	Shear (lb/sq ft)	0.04	0.39	0.02
Alpha	1.03	Stream Power (lb/ft s)	0.05	3.32	0.02
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)	0.77	16.05	0.43
C & E Loss (ft)	0.29	Cum SA (acres)	0.34	2.58	0.26

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31657 Profile: PF 1

E.G. Elev (ft)	1343.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.44	Wt. n-Val.	0.018	0.018	
W.S. Elev (ft)	1342.07	Reach Len. (ft)	365.00	365.00	365.00
Crit W.S. (ft)	1342.07	Flow Area (sq ft)	5.58	81.76	
E.G. Slope (ft/ft)	0.003290	Area (sq ft)	5.58	81.76	
Q Total (cfs)	823.00	Flow (cfs)	24.85	798.15	
Top Width (ft)	30.52	Top Width (ft)	5.00	25.52	
Vel Total (ft/s)	9.42	Avg. Vel. (ft/s)	4.45	9.76	
Max Chl Dpth (ft)	5.57	Hydr. Depth (ft)	1.11	3.20	
Conv. Total (cfs)	14348.9	Conv. (cfs)	433.3	13915.6	
Length Wtd. (ft)	365.00	Wetted Per. (ft)	6.12	27.62	
Min Ch El (ft)	1336.50	Shear (lb/sq ft)	0.19	0.61	
Alpha	1.05	Stream Power (lb/ft s)	0.83	5.94	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.05	8.08	0.02
C & E Loss (ft)	0.29	Cum SA (acres)	0.04	2.14	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31657 Profile: PF 2

E.G. Elev (ft)	1346.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.12	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1343.97	Reach Len. (ft)	365.00	365.00	365.00
Crit W.S. (ft)	1343.97	Flow Area (sq ft)	15.10	133.20	2.83
E.G. Slope (ft/ft)	0.002918	Area (sq ft)	15.10	133.20	2.83
Q Total (cfs)	1703.00	Flow (cfs)	102.68	1592.27	8.04
Top Width (ft)	37.91	Top Width (ft)	5.01	27.90	5.00
Vel Total (ft/s)	11.27	Avg. Vel. (ft/s)	6.80	11.95	2.84
Max Chl Dpth (ft)	7.47	Hydr. Depth (ft)	3.01	4.77	0.57
Conv. Total (cfs)	31528.6	Conv. (cfs)	1901.1	29478.6	148.9
Length Wtd. (ft)	365.00	Wetted Per. (ft)	8.02	30.35	5.57
Min Ch El (ft)	1336.50	Shear (lb/sq ft)	0.34	0.80	0.09
Alpha	1.07	Stream Power (lb/ft s)	2.33	9.56	0.26
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.71	14.93	0.42
C & E Loss (ft)	0.44	Cum SA (acres)	0.31	2.41	0.24

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31292 Profile: PF 1

E.G. Elev (ft)	1341.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.		0.018	
W.S. Elev (ft)	1340.95	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1338.70	Flow Area (sq ft)		146.06	
E.G. Slope (ft/ft)	0.000511	Area (sq ft)		155.08	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	31.21	Top Width (ft)		31.21	
Vel Total (ft/s)	5.63	Avg. Vel. (ft/s)		5.63	
Max Chl Dpth (ft)	5.37	Hydr. Depth (ft)		5.25	
Conv. Total (cfs)	36413.3	Conv. (cfs)		36413.3	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		27.83	
Min Ch EI (ft)	1335.58	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.94	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03	7.08	0.02
C & E Loss (ft)		Cum SA (acres)	0.01	1.90	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31292 Profile: PF 2

E.G. Elev (ft)	1344.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1344.22	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1340.58	Flow Area (sq ft)	10.22	259.34	2.13
E.G. Slope (ft/ft)	0.000544	Area (sq ft)	10.22	259.34	2.13
Q Total (cfs)	1703.00	Flow (cfs)	15.16	1685.88	1.95
Top Width (ft)	38.20	Top Width (ft)	5.10	32.00	1.10
Vel Total (ft/s)	6.27	Avg. Vel. (ft/s)	1.48	6.50	0.92
Max Chl Dpth (ft)	8.64	Hydr. Depth (ft)	2.00	8.10	1.94
Conv. Total (cfs)	73013.5	Conv. (cfs)	650.2	72279.5	83.8
Length Wtd. (ft)	100.00	Wetted Per. (ft)	7.02	41.80	3.02
Min Ch EI (ft)	1335.58	Shear (lb/sq ft)	0.05	0.21	0.02
Alpha	1.07	Stream Power (lb/ft s)	0.07	1.37	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	0.60	13.29	0.40
C & E Loss (ft)		Cum SA (acres)	0.27	2.16	0.21

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31192 Profile: PF 1

E.G. Elev (ft)	1340.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.		0.035	
W.S. Elev (ft)	1339.72	Reach Len. (ft)	126.00	126.00	126.00
Crit W.S. (ft)	1337.89	Flow Area (sq ft)		134.88	
E.G. Slope (ft/ft)	0.002539	Area (sq ft)		182.27	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	47.68	Top Width (ft)		47.68	
Vel Total (ft/s)	6.10	Avg. Vel. (ft/s)		6.10	
Max Chl Dpth (ft)	4.82	Hydr. Depth (ft)		4.82	
Conv. Total (cfs)	16333.0	Conv. (cfs)		16333.0	
Length Wtd. (ft)	126.00	Wetted Per. (ft)		28.00	
Min Ch EI (ft)	1334.90	Shear (lb/sq ft)		0.76	
Alpha	1.00	Stream Power (lb/ft s)		4.66	
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	0.03	6.70	0.02
C & E Loss (ft)	0.02	Cum SA (acres)	0.01	1.81	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31192 Profile: PF 2

E.G. Elev (ft)	1342.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1342.23	Reach Len. (ft)	126.00	126.00	126.00
Crit W.S. (ft)	1339.75	Flow Area (sq ft)	0.03	313.79	0.00
E.G. Slope (ft/ft)	0.001735	Area (sq ft)	0.03	313.79	0.00
Q Total (cfs)	1703.00	Flow (cfs)	0.00	1703.00	0.00
Top Width (ft)	55.08	Top Width (ft)	0.05	55.00	0.03
Vel Total (ft/s)	5.43	Avg. Vel. (ft/s)	0.16	5.43	0.11
Max Chl Dpth (ft)	7.33	Hydr. Depth (ft)	0.47	5.71	0.17
Conv. Total (cfs)	40882.5	Conv. (cfs)	0.1	40882.3	0.0
Length Wtd. (ft)	126.00	Wetted Per. (ft)	0.93	58.37	0.33
Min Ch El (ft)	1334.90	Shear (lb/sq ft)	0.00	0.58	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	3.16	0.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.59	12.63	0.39
C & E Loss (ft)	0.04	Cum SA (acres)	0.26	2.06	0.21

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31066 Profile: PF 1

E.G. Elev (ft)	1339.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.		0.035	
W.S. Elev (ft)	1339.14	Reach Len. (ft)	177.00	177.00	177.00
Crit W.S. (ft)		Flow Area (sq ft)		127.63	
E.G. Slope (ft/ft)	0.006652	Area (sq ft)		127.63	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	49.04	Top Width (ft)		49.04	
Vel Total (ft/s)	6.45	Avg. Vel. (ft/s)		6.45	
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	10091.1	Conv. (cfs)		10091.1	
Length Wtd. (ft)	177.00	Wetted Per. (ft)		50.22	
Min Ch El (ft)	1335.00	Shear (lb/sq ft)		1.06	
Alpha	1.00	Stream Power (lb/ft s)		6.80	
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	0.03	6.25	0.02
C & E Loss (ft)	0.14	Cum SA (acres)	0.01	1.67	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 31066 Profile: PF 2

E.G. Elev (ft)	1342.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	1341.78	Reach Len. (ft)	177.00	177.00	177.00
Crit W.S. (ft)		Flow Area (sq ft)	0.02	277.55	
E.G. Slope (ft/ft)	0.003001	Area (sq ft)	0.02	277.55	
Q Total (cfs)	1703.00	Flow (cfs)	0.00	1703.00	
Top Width (ft)	62.95	Top Width (ft)	0.04	62.91	
Vel Total (ft/s)	6.14	Avg. Vel. (ft/s)	0.18	6.14	
Max Chl Dpth (ft)	6.77	Hydr. Depth (ft)	0.44	4.41	
Conv. Total (cfs)	31087.4	Conv. (cfs)	0.1	31087.3	
Length Wtd. (ft)	177.00	Wetted Per. (ft)	0.88	64.77	
Min Ch El (ft)	1335.00	Shear (lb/sq ft)	0.00	0.80	
Alpha	1.00	Stream Power (lb/ft s)	0.00	4.93	
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.59	11.77	0.39
C & E Loss (ft)	0.14	Cum SA (acres)	0.26	1.89	0.21

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30889 Profile: PF 1

E.G. Elev (ft)	1339.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.035	
W.S. Elev (ft)	1339.13	Reach Len. (ft)	45.00	45.00	45.00
Crit W.S. (ft)	1336.43	Flow Area (sq ft)		236.23	
E.G. Slope (ft/ft)	0.000849	Area (sq ft)		312.65	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	82.35	Top Width (ft)		82.35	
Vel Total (ft/s)	3.48	Avg. Vel. (ft/s)		3.48	
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)		4.72	
Conv. Total (cfs)	28238.4	Conv. (cfs)		28238.4	
Length Wtd. (ft)	45.00	Wetted Per. (ft)		50.00	
Min Ch El (ft)	1334.40	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		0.87	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03	5.35	0.02
C & E Loss (ft)		Cum SA (acres)	0.01	1.40	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30889 Profile: PF 2

E.G. Elev (ft)	1342.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.93	Reach Len. (ft)	45.00	45.00	45.00
Crit W.S. (ft)	1337.69	Flow Area (sq ft)	19.26	556.81	20.26
E.G. Slope (ft/ft)	0.000429	Area (sq ft)	19.26	556.81	20.26
Q Total (cfs)	1703.00	Flow (cfs)	23.30	1654.50	25.21
Top Width (ft)	108.00	Top Width (ft)	10.00	88.00	10.00
Vel Total (ft/s)	2.86	Avg. Vel. (ft/s)	1.21	2.97	1.24
Max Chl Dpth (ft)	7.53	Hydr. Depth (ft)	1.93	6.33	2.03
Conv. Total (cfs)	82252.5	Conv. (cfs)	1125.2	79909.8	1217.5
Length Wtd. (ft)	45.00	Wetted Per. (ft)	11.93	89.59	12.03
Min Ch El (ft)	1334.40	Shear (lb/sq ft)	0.04	0.17	0.05
Alpha	1.06	Stream Power (lb/ft s)	0.05	0.49	0.06
Frctn Loss (ft)		Cum Volume (acre-ft)	0.55	10.08	0.35
C & E Loss (ft)		Cum SA (acres)	0.24	1.58	0.19

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30844 Profile: PF 1

E.G. Elev (ft)	1339.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.86	Reach Len. (ft)	345.00	345.00	345.00
Crit W.S. (ft)	1336.10	Flow Area (sq ft)		256.04	
E.G. Slope (ft/ft)	0.000737	Area (sq ft)		385.08	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	110.44	Top Width (ft)		110.44	
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)		3.21	
Max Chl Dpth (ft)	4.66	Hydr. Depth (ft)		4.66	
Conv. Total (cfs)	30306.2	Conv. (cfs)		30306.2	
Length Wtd. (ft)	345.00	Wetted Per. (ft)		55.00	
Min Ch El (ft)	1334.20	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.69	
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.03	4.99	0.02
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	1.31	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30844 Profile: PF 2

E.G. Elev (ft)	1341.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.72	Reach Len. (ft)	345.00	345.00	345.00
Crit W.S. (ft)	1337.29	Flow Area (sq ft)	38.46	727.38	40.46
E.G. Slope (ft/ft)	0.000256	Area (sq ft)	38.46	727.38	40.46
Q Total (cfs)	1703.00	Flow (cfs)	37.97	1623.84	41.19
Top Width (ft)	161.00	Top Width (ft)	20.00	121.00	20.00
Vel Total (ft/s)	2.11	Avg. Vel. (ft/s)	0.99	2.23	1.02
Max Chl Dpth (ft)	7.52	Hydr. Depth (ft)	1.92	6.01	2.02
Conv. Total (cfs)	106514.4	Conv. (cfs)	2374.8	101563.1	2576.5
Length Wtd. (ft)	345.00	Wetted Per. (ft)	21.92	121.95	22.02
Min Ch El (ft)	1334.20	Shear (lb/sq ft)	0.03	0.10	0.03
Alpha	1.08	Stream Power (lb/ft s)	0.03	0.21	0.03
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)	0.52	9.42	0.32
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	1.47	0.18

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30499 Profile: PF 1

E.G. Elev (ft)	1338.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.44	Reach Len. (ft)	369.00	369.00	369.00
Crit W.S. (ft)		Flow Area (sq ft)		218.40	
E.G. Slope (ft/ft)	0.001529	Area (sq ft)		218.40	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	62.43	Top Width (ft)		62.43	
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)		3.77	
Max Chl Dpth (ft)	5.03	Hydr. Depth (ft)		3.50	
Conv. Total (cfs)	21047.5	Conv. (cfs)		21047.5	
Length Wtd. (ft)	369.00	Wetted Per. (ft)		63.86	
Min Ch El (ft)	1333.40	Shear (lb/sq ft)		0.33	
Alpha	1.00	Stream Power (lb/ft s)		1.23	
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	0.03	2.60	0.02
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.62	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30499 Profile: PF 2

E.G. Elev (ft)	1341.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.41	Reach Len. (ft)	369.00	369.00	369.00
Crit W.S. (ft)		Flow Area (sq ft)	16.05	428.07	11.05
E.G. Slope (ft/ft)	0.000830	Area (sq ft)	16.05	428.07	11.05
Q Total (cfs)	1703.00	Flow (cfs)	24.37	1665.15	13.48
Top Width (ft)	93.50	Top Width (ft)	10.00	73.50	10.00
Vel Total (ft/s)	3.74	Avg. Vel. (ft/s)	1.52	3.89	1.22
Max Chl Dpth (ft)	8.01	Hydr. Depth (ft)	1.61	5.82	1.11
Conv. Total (cfs)	59129.3	Conv. (cfs)	846.2	57815.1	467.9
Length Wtd. (ft)	369.00	Wetted Per. (ft)	11.61	75.44	11.11
Min Ch El (ft)	1333.40	Shear (lb/sq ft)	0.07	0.29	0.05
Alpha	1.06	Stream Power (lb/ft s)	0.11	1.14	0.06
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.31	4.84	0.12
C & E Loss (ft)	0.00	Cum SA (acres)	0.11	0.70	0.06

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30130 Profile: PF 1

E.G. Elev (ft)	1338.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.035	
W.S. Elev (ft)	1337.82	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)		209.63	
E.G. Slope (ft/ft)	0.001688	Area (sq ft)		209.63	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	60.75	Top Width (ft)		60.75	
Vel Total (ft/s)	3.93	Avg. Vel. (ft/s)		3.93	
Max Chl Dpth (ft)	5.42	Hydr. Depth (ft)		3.45	
Conv. Total (cfs)	20033.3	Conv. (cfs)		20033.3	
Length Wtd. (ft)	47.00	Wetted Per. (ft)		62.07	
Min Ch El (ft)	1332.40	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		1.40	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.03	0.79	0.02
C & E Loss (ft)	0.06	Cum SA (acres)	0.01	0.10	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30130 Profile: PF 2

E.G. Elev (ft)	1341.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.13	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	31.29	429.23	0.06
E.G. Slope (ft/ft)	0.000713	Area (sq ft)	31.29	429.23	0.06
Q Total (cfs)	1703.00	Flow (cfs)	63.30	1639.69	0.01
Top Width (ft)	77.97	Top Width (ft)	10.00	67.90	0.07
Vel Total (ft/s)	3.70	Avg. Vel. (ft/s)	2.02	3.82	0.12
Max Chl Dpth (ft)	8.73	Hydr. Depth (ft)	3.13	6.32	0.91
Conv. Total (cfs)	63763.3	Conv. (cfs)	2370.2	61392.8	0.3
Length Wtd. (ft)	47.00	Wetted Per. (ft)	13.13	69.41	1.83
Min Ch El (ft)	1332.40	Shear (lb/sq ft)	0.11	0.28	0.00
Alpha	1.04	Stream Power (lb/ft s)	0.21	1.05	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.11	1.21	0.07
C & E Loss (ft)	0.07	Cum SA (acres)	0.02	0.10	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30083 Profile: PF 1

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.		0.035	
W.S. Elev (ft)	1337.46	Reach Len. (ft)	83.00	83.00	83.00
Crit W.S. (ft)	1334.70	Flow Area (sq ft)		153.12	
E.G. Slope (ft/ft)	0.002232	Area (sq ft)	13.57	153.12	13.57
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	46.00	Top Width (ft)	10.00	26.00	10.00
Vel Total (ft/s)	5.37	Avg. Vel. (ft/s)		5.37	
Max Chl Dpth (ft)	6.06	Hydr. Depth (ft)		5.89	
Conv. Total (cfs)	17420.2	Conv. (cfs)		17420.2	
Length Wtd. (ft)	83.00	Wetted Per. (ft)		34.90	
Min Ch El (ft)	1331.40	Shear (lb/sq ft)		0.61	
Alpha	1.00	Stream Power (lb/ft s)		3.29	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.60	0.01
C & E Loss (ft)		Cum SA (acres)	0.01	0.05	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30083 Profile: PF 2

E.G. Elev (ft)	1341.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.45	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1340.78	Reach Len. (ft)	83.00	83.00	83.00
Crit W.S. (ft)	1336.66	Flow Area (sq ft)	46.81	239.54	46.81
E.G. Slope (ft/ft)	0.001411	Area (sq ft)	46.81	239.54	46.81
Q Total (cfs)	1703.00	Flow (cfs)	161.70	1379.60	161.70
Top Width (ft)	46.00	Top Width (ft)	10.00	26.00	10.00
Vel Total (ft/s)	5.11	Avg. Vel. (ft/s)	3.45	5.76	3.45
Max Chl Dpth (ft)	9.38	Hydr. Depth (ft)	4.68	9.21	4.68
Conv. Total (cfs)	45335.8	Conv. (cfs)	4304.7	36726.4	4304.7
Length Wtd. (ft)	83.00	Wetted Per. (ft)	14.68	34.90	14.68
Min Ch El (ft)	1331.40	Shear (lb/sq ft)	0.28	0.60	0.28
Alpha	1.12	Stream Power (lb/ft s)	0.97	3.48	0.97
Frctn Loss (ft)		Cum Volume (acre-ft)	0.06	0.85	0.04
C & E Loss (ft)		Cum SA (acres)	0.01	0.05	0.01

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30000 Profile: PF 1

E.G. Elev (ft)	1337.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.035	
W.S. Elev (ft)	1336.83	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		162.25	
E.G. Slope (ft/ft)	0.002212	Area (sq ft)		162.25	
Q Total (cfs)	823.00	Flow (cfs)		823.00	
Top Width (ft)	28.80	Top Width (ft)		28.80	
Vel Total (ft/s)	5.07	Avg. Vel. (ft/s)		5.07	
Max Chl Dpth (ft)	5.63	Hydr. Depth (ft)		5.63	
Conv. Total (cfs)	17500.1	Conv. (cfs)		17500.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		40.07	
Min Ch El (ft)	1331.20	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		2.84	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	0.29	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch 71 St. Channel Lower Reach RS: 30000 Profile: PF 2

E.G. Elev (ft)	1339.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.99	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.62	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		213.54	
E.G. Slope (ft/ft)	0.004246	Area (sq ft)		213.54	
Q Total (cfs)	1703.00	Flow (cfs)		1703.00	
Top Width (ft)	28.80	Top Width (ft)		28.80	
Vel Total (ft/s)	7.97	Avg. Vel. (ft/s)		7.97	
Max Chl Dpth (ft)	7.41	Hydr. Depth (ft)		7.41	
Conv. Total (cfs)	26134.6	Conv. (cfs)		26134.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		43.63	
Min Ch El (ft)	1331.20	Shear (lb/sq ft)		1.30	
Alpha	1.00	Stream Power (lb/ft s)		10.35	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.42	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 18515 Profile: PF 1

E.G. Elev (ft)	1336.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1336.85	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)		Flow Area (sq ft)	45.75	190.70	
E.G. Slope (ft/ft)	0.000054	Area (sq ft)	45.75	190.70	
Q Total (cfs)	176.00	Flow (cfs)	19.27	156.73	
Top Width (ft)	89.86	Top Width (ft)	34.90	54.96	
Vel Total (ft/s)	0.74	Avg. Vel. (ft/s)	0.42	0.82	
Max Chl Dpth (ft)	5.15	Hydr. Depth (ft)	1.31	3.47	
Conv. Total (cfs)	24023.6	Conv. (cfs)	2630.1	21393.4	
Length Wtd. (ft)	320.00	Wetted Per. (ft)	36.59	55.95	
Min Ch El (ft)	1331.70	Shear (lb/sq ft)	0.00	0.01	
Alpha	1.12	Stream Power (lb/ft s)	0.00	0.01	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.41	3.66	
C & E Loss (ft)	0.00	Cum SA (acres)	0.27	0.86	

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 18515 Profile: PF 2

E.G. Elev (ft)	1338.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1338.84	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)		Flow Area (sq ft)	115.16	301.76	
E.G. Slope (ft/ft)	0.000015	Area (sq ft)	115.16	301.76	
Q Total (cfs)	215.00	Flow (cfs)	45.11	169.89	
Top Width (ft)	90.80	Top Width (ft)	34.90	55.90	
Vel Total (ft/s)	0.52	Avg. Vel. (ft/s)	0.39	0.56	
Max Chl Dpth (ft)	7.14	Hydr. Depth (ft)	3.30	5.40	
Conv. Total (cfs)	56365.2	Conv. (cfs)	11826.2	44539.0	
Length Wtd. (ft)	320.00	Wetted Per. (ft)	38.58	58.66	
Min Ch El (ft)	1331.70	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.06	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.99	5.72	
C & E Loss (ft)	0.00	Cum SA (acres)	0.27	0.89	

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 18195 Profile: PF 1

E.G. Elev (ft)	1336.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1336.84	Reach Len. (ft)	235.00	235.00	235.00
Crit W.S. (ft)	1332.57	Flow Area (sq ft)	29.42	268.35	
E.G. Slope (ft/ft)	0.000027	Area (sq ft)	29.42	268.35	
Q Total (cfs)	176.00	Flow (cfs)	9.63	166.37	
Top Width (ft)	88.90	Top Width (ft)	18.00	70.90	
Vel Total (ft/s)	0.59	Avg. Vel. (ft/s)	0.33	0.62	
Max Chl Dpth (ft)	5.64	Hydr. Depth (ft)	1.63	3.79	
Conv. Total (cfs)	33848.6	Conv. (cfs)	1851.2	31997.4	
Length Wtd. (ft)	235.00	Wetted Per. (ft)	20.54	71.85	
Min Ch El (ft)	1331.20	Shear (lb/sq ft)	0.00	0.01	
Alpha	1.06	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.13	1.98	
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.39	

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 18195 Profile: PF 2

E.G. Elev (ft)	1338.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1338.84	Reach Len. (ft)	235.00	235.00	235.00
Crit W.S. (ft)	1332.72	Flow Area (sq ft)	65.32	414.28	
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	65.32	414.28	
Q Total (cfs)	215.00	Flow (cfs)	20.16	194.84	
Top Width (ft)	91.60	Top Width (ft)	18.00	73.60	
Vel Total (ft/s)	0.45	Avg. Vel. (ft/s)	0.31	0.47	
Max Chl Dpth (ft)	7.64	Hydr. Depth (ft)	3.63	5.63	
Conv. Total (cfs)	70152.0	Conv. (cfs)	6577.6	63574.4	
Length Wtd. (ft)	235.00	Wetted Per. (ft)	22.53	75.97	
Min Ch EI (ft)	1331.20	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.33	3.09	
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.41	

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 17960 Profile: PF 1

E.G. Elev (ft)	1336.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1336.83	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)		Flow Area (sq ft)	12.01	253.66	
E.G. Slope (ft/ft)	0.000038	Area (sq ft)	12.01	253.66	
Q Total (cfs)	176.00	Flow (cfs)	3.59	172.41	
Top Width (ft)	85.46	Top Width (ft)	10.50	74.96	
Vel Total (ft/s)	0.66	Avg. Vel. (ft/s)	0.30	0.68	
Max Chl Dpth (ft)	5.53	Hydr. Depth (ft)	1.14	3.38	
Conv. Total (cfs)	28670.3	Conv. (cfs)	585.2	28085.1	
Length Wtd. (ft)	82.00	Wetted Per. (ft)	12.32	75.90	
Min Ch EI (ft)	1331.30	Shear (lb/sq ft)	0.00	0.01	
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.01	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.57	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Upper East Reach RS: 17960 Profile: PF 2

E.G. Elev (ft)	1338.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.030	0.030	
W.S. Elev (ft)	1338.83	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)	1332.87	Flow Area (sq ft)	33.02	410.82	
E.G. Slope (ft/ft)	0.000012	Area (sq ft)	33.02	410.82	
Q Total (cfs)	215.00	Flow (cfs)	9.81	205.19	
Top Width (ft)	90.20	Top Width (ft)	10.50	79.70	
Vel Total (ft/s)	0.48	Avg. Vel. (ft/s)	0.30	0.50	
Max Chl Dpth (ft)	7.53	Hydr. Depth (ft)	3.14	5.15	
Conv. Total (cfs)	62543.7	Conv. (cfs)	2854.8	59688.9	
Length Wtd. (ft)	82.00	Wetted Per. (ft)	14.32	81.77	
Min Ch EI (ft)	1331.30	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.06	0.87	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17873 Profile: PF 1

E.G. Elev (ft)	1336.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1336.63	Reach Len. (ft)	168.00	168.00	168.00
Crit W.S. (ft)	1333.45	Flow Area (sq ft)	9.10	351.61	
E.G. Slope (ft/ft)	0.000179	Area (sq ft)	9.10	351.61	
Q Total (cfs)	993.00	Flow (cfs)	4.50	988.50	
Top Width (ft)	93.89	Top Width (ft)	12.88	81.01	
Vel Total (ft/s)	2.75	Avg. Vel. (ft/s)	0.49	2.81	
Max Chl Dpth (ft)	5.57	Hydr. Depth (ft)	0.71	4.34	
Conv. Total (cfs)	74131.5	Conv. (cfs)	335.8	73795.7	
Length Wtd. (ft)	168.00	Wetted Per. (ft)	14.16	86.73	
Min Ch El (ft)	1331.06	Shear (lb/sq ft)	0.01	0.05	
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.13	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.03	9.22	
C & E Loss (ft)	0.02	Cum SA (acres)	0.11	2.58	

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17873 Profile: PF 2

E.G. Elev (ft)	1338.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1338.62	Reach Len. (ft)	168.00	168.00	168.00
Crit W.S. (ft)	1334.69	Flow Area (sq ft)	34.71	512.69	
E.G. Slope (ft/ft)	0.000207	Area (sq ft)	34.71	512.69	
Q Total (cfs)	2003.00	Flow (cfs)	41.22	1961.78	
Top Width (ft)	93.91	Top Width (ft)	12.88	81.03	
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)	1.19	3.83	
Max Chl Dpth (ft)	7.55	Hydr. Depth (ft)	2.69	6.33	
Conv. Total (cfs)	139152.9	Conv. (cfs)	2863.4	136289.5	
Length Wtd. (ft)	168.00	Wetted Per. (ft)	16.15	88.72	
Min Ch El (ft)	1331.06	Shear (lb/sq ft)	0.03	0.07	
Alpha	1.07	Stream Power (lb/ft s)	0.03	0.29	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.34	15.58	0.04
C & E Loss (ft)	0.01	Cum SA (acres)	0.18	3.12	0.20

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17705 Profile: PF 1

E.G. Elev (ft)	1336.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	1336.38	Reach Len. (ft)	477.00	477.00	477.00
Crit W.S. (ft)		Flow Area (sq ft)	2.09	232.04	
E.G. Slope (ft/ft)	0.002156	Area (sq ft)	2.09	232.04	
Q Total (cfs)	993.00	Flow (cfs)	1.32	991.68	
Top Width (ft)	82.28	Top Width (ft)	11.09	71.19	
Vel Total (ft/s)	4.24	Avg. Vel. (ft/s)	0.63	4.27	
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)	0.19	3.26	
Conv. Total (cfs)	21385.6	Conv. (cfs)	28.4	21357.2	
Length Wtd. (ft)	477.00	Wetted Per. (ft)	11.47	72.69	
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.02	0.43	
Alpha	1.01	Stream Power (lb/ft s)	0.02	1.84	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	0.01	8.10	
C & E Loss (ft)	0.01	Cum SA (acres)	0.06	2.29	

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17705 Profile: PF 2

E.G. Elev (ft)	1338.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.37	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	1338.38	Reach Len. (ft)	477.00	477.00	477.00
Crit W.S. (ft)		Flow Area (sq ft)	36.77	385.22	
E.G. Slope (ft/ft)	0.001688	Area (sq ft)	36.77	385.22	
Q Total (cfs)	2003.00	Flow (cfs)	95.99	1907.01	
Top Width (ft)	95.60	Top Width (ft)	17.70	77.90	
Vel Total (ft/s)	4.75	Avg. Vel. (ft/s)	2.61	4.95	
Max Chl Dpth (ft)	8.38	Hydr. Depth (ft)	2.08	4.95	
Conv. Total (cfs)	48747.0	Conv. (cfs)	2336.1	46411.0	
Length Wtd. (ft)	477.00	Wetted Per. (ft)	20.09	80.58	
Min Ch El (ft)	1330.00	Shear (lb/sq ft)	0.19	0.50	
Alpha	1.05	Stream Power (lb/ft s)	0.50	2.49	
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	0.20	13.85	0.04
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	2.81	0.20

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17228 Profile: PF 1

E.G. Elev (ft)	1335.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.		0.030	
W.S. Elev (ft)	1335.35	Reach Len. (ft)	698.00	698.00	698.00
Crit W.S. (ft)		Flow Area (sq ft)		207.25	
E.G. Slope (ft/ft)	0.001824	Area (sq ft)		207.25	
Q Total (cfs)	993.00	Flow (cfs)		993.00	
Top Width (ft)	59.31	Top Width (ft)		59.31	
Vel Total (ft/s)	4.79	Avg. Vel. (ft/s)		4.79	
Max Chl Dpth (ft)	5.95	Hydr. Depth (ft)		3.49	
Conv. Total (cfs)	23250.7	Conv. (cfs)		23250.7	
Length Wtd. (ft)	698.00	Wetted Per. (ft)		60.80	
Min Ch El (ft)	1329.40	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		1.86	
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)		5.69	
C & E Loss (ft)	0.02	Cum SA (acres)		1.57	

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 17228 Profile: PF 2

E.G. Elev (ft)	1337.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	1337.32	Reach Len. (ft)	698.00	698.00	698.00
Crit W.S. (ft)		Flow Area (sq ft)	0.01	337.77	0.15
E.G. Slope (ft/ft)	0.001941	Area (sq ft)	0.01	337.77	0.15
Q Total (cfs)	2003.00	Flow (cfs)	0.00	2002.98	0.02
Top Width (ft)	83.18	Top Width (ft)	1.61	73.37	8.20
Vel Total (ft/s)	5.93	Avg. Vel. (ft/s)	0.09	5.93	0.15
Max Chl Dpth (ft)	7.92	Hydr. Depth (ft)	0.01	4.60	0.02
Conv. Total (cfs)	45467.3	Conv. (cfs)	0.0	45466.7	0.5
Length Wtd. (ft)	698.00	Wetted Per. (ft)	1.63	75.39	8.22
Min Ch El (ft)	1329.40	Shear (lb/sq ft)	0.00	0.54	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	3.22	0.00
Frctn Loss (ft)	1.54	Cum Volume (acre-ft)	0.00	9.89	0.04
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	1.98	0.16

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 16530 Profile: PF 1

E.G. Elev (ft)	1334.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.030	
W.S. Elev (ft)	1333.53	Reach Len. (ft)	475.00	475.00	475.00
Crit W.S. (ft)		Flow Area (sq ft)		170.88	
E.G. Slope (ft/ft)	0.003144	Area (sq ft)		170.88	
Q Total (cfs)	993.00	Flow (cfs)		993.00	
Top Width (ft)	55.17	Top Width (ft)		55.17	
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)		5.81	
Max Chl Dpth (ft)	5.03	Hydr. Depth (ft)		3.10	
Conv. Total (cfs)	17710.4	Conv. (cfs)		17710.4	
Length Wtd. (ft)	475.00	Wetted Per. (ft)		56.46	
Min Ch EI (ft)	1328.50	Shear (lb/sq ft)		0.59	
Alpha	1.00	Stream Power (lb/ft s)		3.45	
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)		2.66	
C & E Loss (ft)	0.07	Cum SA (acres)		0.65	

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 16530 Profile: PF 2

E.G. Elev (ft)	1336.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.		0.030	0.030
W.S. Elev (ft)	1335.68	Reach Len. (ft)	475.00	475.00	475.00
Crit W.S. (ft)		Flow Area (sq ft)		308.95	3.19
E.G. Slope (ft/ft)	0.002514	Area (sq ft)		308.95	3.19
Q Total (cfs)	2003.00	Flow (cfs)		1998.38	4.62
Top Width (ft)	78.47	Top Width (ft)		71.77	6.70
Vel Total (ft/s)	6.42	Avg. Vel. (ft/s)		6.47	1.45
Max Chl Dpth (ft)	7.18	Hydr. Depth (ft)		4.30	0.48
Conv. Total (cfs)	39948.9	Conv. (cfs)		39856.8	92.1
Length Wtd. (ft)	475.00	Wetted Per. (ft)		73.50	7.18
Min Ch EI (ft)	1328.50	Shear (lb/sq ft)		0.66	0.07
Alpha	1.01	Stream Power (lb/ft s)		4.27	0.10
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)		4.71	0.02
C & E Loss (ft)	0.08	Cum SA (acres)		0.82	0.04

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 16055 Profile: PF 1

E.G. Elev (ft)	1332.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.		0.030	
W.S. Elev (ft)	1332.70	Reach Len. (ft)	110.00	110.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		228.68	
E.G. Slope (ft/ft)	0.001469	Area (sq ft)		228.68	
Q Total (cfs)	993.00	Flow (cfs)		993.00	
Top Width (ft)	64.67	Top Width (ft)		64.67	
Vel Total (ft/s)	4.34	Avg. Vel. (ft/s)		4.34	
Max Chl Dpth (ft)	4.50	Hydr. Depth (ft)		3.54	
Conv. Total (cfs)	25906.9	Conv. (cfs)		25906.9	
Length Wtd. (ft)	110.00	Wetted Per. (ft)		66.11	
Min Ch EI (ft)	1328.20	Shear (lb/sq ft)		0.32	
Alpha	1.00	Stream Power (lb/ft s)		1.38	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.49	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Lower East Reach RS: 16055 Profile: PF 2

E.G. Elev (ft)	1335.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.030	
W.S. Elev (ft)	1335.03	Reach Len. (ft)	110.00	110.00	110.00
Crit W.S. (ft)	1332.20	Flow Area (sq ft)		395.96	
E.G. Slope (ft/ft)	0.001261	Area (sq ft)		395.96	
Q Total (cfs)	2003.00	Flow (cfs)		2003.00	
Top Width (ft)	79.00	Top Width (ft)		79.00	
Vel Total (ft/s)	5.06	Avg. Vel. (ft/s)		5.06	
Max Chl Dpth (ft)	6.83	Hydr. Depth (ft)		5.01	
Conv. Total (cfs)	56409.6	Conv. (cfs)		56409.6	
Length Wtd. (ft)	110.00	Wetted Per. (ft)		81.17	
Min Ch El (ft)	1328.20	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.94	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.86	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22527 Profile: PF 1

E.G. Elev (ft)	1340.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.018	
W.S. Elev (ft)	1340.25	Reach Len. (ft)	245.00	245.00	245.00
Crit W.S. (ft)	1340.10	Flow Area (sq ft)		29.07	
E.G. Slope (ft/ft)	0.003337	Area (sq ft)		29.07	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	20.97	Top Width (ft)		20.97	
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)		5.81	
Max Chl Dpth (ft)	1.95	Hydr. Depth (ft)		1.39	
Conv. Total (cfs)	2925.8	Conv. (cfs)		2925.8	
Length Wtd. (ft)	245.00	Wetted Per. (ft)		21.59	
Min Ch El (ft)	1338.30	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		1.63	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)		3.31	
C & E Loss (ft)	0.02	Cum SA (acres)		1.17	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22527 Profile: PF 2

E.G. Elev (ft)	1342.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1341.69	Reach Len. (ft)	245.00	245.00	245.00
Crit W.S. (ft)		Flow Area (sq ft)	4.82	66.83	
E.G. Slope (ft/ft)	0.001693	Area (sq ft)	4.82	66.83	
Q Total (cfs)	359.00	Flow (cfs)	0.98	358.02	
Top Width (ft)	57.75	Top Width (ft)	25.00	32.75	
Vel Total (ft/s)	5.01	Avg. Vel. (ft/s)	0.20	5.36	
Max Chl Dpth (ft)	3.39	Hydr. Depth (ft)	0.19	2.04	
Conv. Total (cfs)	8723.8	Conv. (cfs)	23.8	8700.0	
Length Wtd. (ft)	245.00	Wetted Per. (ft)	25.19	33.75	
Min Ch El (ft)	1338.30	Shear (lb/sq ft)	0.02	0.21	
Alpha	1.14	Stream Power (lb/ft s)	0.00	1.12	
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	1.32	8.39	0.11
C & E Loss (ft)	0.05	Cum SA (acres)	1.22	1.62	0.05

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22282 Profile: PF 1

E.G. Elev (ft)	1339.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.		0.018	
W.S. Elev (ft)	1339.10	Reach Len. (ft)	95.00	95.00	95.00
Crit W.S. (ft)	1339.10	Flow Area (sq ft)		24.98	
E.G. Slope (ft/ft)	0.004500	Area (sq ft)		24.98	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	17.69	Top Width (ft)		17.69	
Vel Total (ft/s)	6.77	Avg. Vel. (ft/s)		6.77	
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	2519.2	Conv. (cfs)		2519.2	
Length Wtd. (ft)	95.00	Wetted Per. (ft)		18.50	
Min Ch El (ft)	1337.30	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		2.57	
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)		3.15	
C & E Loss (ft)	0.00	Cum SA (acres)		1.06	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22282 Profile: PF 2

E.G. Elev (ft)	1341.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1341.55	Reach Len. (ft)	95.00	95.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)	23.70	80.04	
E.G. Slope (ft/ft)	0.000688	Area (sq ft)	23.70	80.04	
Q Total (cfs)	359.00	Flow (cfs)	8.70	350.30	
Top Width (ft)	51.17	Top Width (ft)	25.00	26.17	
Vel Total (ft/s)	3.46	Avg. Vel. (ft/s)	0.37	4.38	
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)	0.95	3.06	
Conv. Total (cfs)	13690.2	Conv. (cfs)	331.6	13358.6	
Length Wtd. (ft)	95.00	Wetted Per. (ft)	25.95	27.84	
Min Ch El (ft)	1337.30	Shear (lb/sq ft)	0.04	0.12	
Alpha	1.56	Stream Power (lb/ft s)	0.01	0.54	
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	1.24	7.98	0.11
C & E Loss (ft)	0.02	Cum SA (acres)	1.08	1.45	0.05

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22187 Profile: PF 1

E.G. Elev (ft)	1339.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.		0.018	
W.S. Elev (ft)	1338.52	Reach Len. (ft)	404.00	404.00	404.00
Crit W.S. (ft)	1338.52	Flow Area (sq ft)		24.91	
E.G. Slope (ft/ft)	0.004764	Area (sq ft)		24.91	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	17.63	Top Width (ft)		17.63	
Vel Total (ft/s)	6.78	Avg. Vel. (ft/s)		6.78	
Max Chl Dpth (ft)	1.62	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	2448.6	Conv. (cfs)		2448.6	
Length Wtd. (ft)	404.00	Wetted Per. (ft)		19.17	
Min Ch El (ft)	1336.90	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		2.62	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)		3.10	
C & E Loss (ft)	0.14	Cum SA (acres)		1.03	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 22187 Profile: PF 2

E.G. Elev (ft)	1341.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.018	
W.S. Elev (ft)	1341.53	Reach Len. (ft)	404.00	404.00	404.00
Crit W.S. (ft)		Flow Area (sq ft)		92.69	
E.G. Slope (ft/ft)	0.000496	Area (sq ft)		92.69	
Q Total (cfs)	359.00	Flow (cfs)		359.00	
Top Width (ft)	26.28	Top Width (ft)		26.28	
Vel Total (ft/s)	3.87	Avg. Vel. (ft/s)		3.87	
Max Chl Dpth (ft)	4.63	Hydr. Depth (ft)		3.53	
Conv. Total (cfs)	16118.8	Conv. (cfs)		16118.8	
Length Wtd. (ft)	404.00	Wetted Per. (ft)		30.32	
Min Ch El (ft)	1336.90	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.37	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	1.21	7.79	0.11
C & E Loss (ft)	0.05	Cum SA (acres)	1.05	1.40	0.05

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21783 Profile: PF 1

E.G. Elev (ft)	1338.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.86	Reach Len. (ft)	232.00	232.00	232.00
Crit W.S. (ft)		Flow Area (sq ft)		42.89	
E.G. Slope (ft/ft)	0.001010	Area (sq ft)		42.89	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	22.16	Top Width (ft)		22.16	
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)		3.94	
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)		1.94	
Conv. Total (cfs)	5318.1	Conv. (cfs)		5318.1	
Length Wtd. (ft)	232.00	Wetted Per. (ft)		23.30	
Min Ch El (ft)	1335.20	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.46	
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)		2.79	
C & E Loss (ft)	0.04	Cum SA (acres)		0.84	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21783 Profile: PF 2

E.G. Elev (ft)	1341.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1341.58	Reach Len. (ft)	232.00	232.00	232.00
Crit W.S. (ft)		Flow Area (sq ft)	49.53	146.87	14.62
E.G. Slope (ft/ft)	0.000088	Area (sq ft)	49.53	146.87	14.62
Q Total (cfs)	359.00	Flow (cfs)	34.46	315.42	9.12
Top Width (ft)	62.00	Top Width (ft)	25.00	29.80	7.20
Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	0.70	2.15	0.62
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)	1.98	4.93	2.03
Conv. Total (cfs)	38320.7	Conv. (cfs)	3678.0	33669.2	973.5
Length Wtd. (ft)	232.00	Wetted Per. (ft)	26.98	31.74	9.39
Min Ch El (ft)	1335.20	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	1.42	Stream Power (lb/ft s)	0.01	0.05	0.01
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.98	6.68	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.93	1.14	0.02

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21551 Profile: PF 1

E.G. Elev (ft)	1337.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.85	Reach Len. (ft)	162.00	162.00	162.00
Crit W.S. (ft)		Flow Area (sq ft)		65.60	
E.G. Slope (ft/ft)	0.000296	Area (sq ft)		65.60	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	23.77	Top Width (ft)		23.77	
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)		2.58	
Max Chl Dpth (ft)	3.55	Hydr. Depth (ft)		2.76	
Conv. Total (cfs)	9815.1	Conv. (cfs)		9815.1	
Length Wtd. (ft)	162.00	Wetted Per. (ft)		26.89	
Min Ch El (ft)	1334.30	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.12	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)		2.50	
C & E Loss (ft)	0.01	Cum SA (acres)		0.72	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21551 Profile: PF 2

E.G. Elev (ft)	1341.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	162.00	162.00	162.00
Crit W.S. (ft)		Flow Area (sq ft)	25.44	169.17	
E.G. Slope (ft/ft)	0.000081	Area (sq ft)	25.44	169.17	
Q Total (cfs)	359.00	Flow (cfs)	11.18	347.82	
Top Width (ft)	55.71	Top Width (ft)	25.00	30.71	
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	0.44	2.06	
Max Chl Dpth (ft)	7.27	Hydr. Depth (ft)	1.02	5.51	
Conv. Total (cfs)	39914.7	Conv. (cfs)	1242.9	38671.8	
Length Wtd. (ft)	162.00	Wetted Per. (ft)	25.97	36.71	
Min Ch El (ft)	1334.30	Shear (lb/sq ft)	0.00	0.02	
Alpha	1.21	Stream Power (lb/ft s)	0.00	0.05	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.78	5.84	
C & E Loss (ft)	0.00	Cum SA (acres)	0.80	0.98	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21389 Profile: PF 1

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.84	Reach Len. (ft)	34.00	34.00	34.00
Crit W.S. (ft)		Flow Area (sq ft)		77.47	
E.G. Slope (ft/ft)	0.000184	Area (sq ft)		77.47	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	24.90	Top Width (ft)		24.90	
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)		2.18	
Max Chl Dpth (ft)	4.04	Hydr. Depth (ft)		3.11	
Conv. Total (cfs)	12475.6	Conv. (cfs)		12475.6	
Length Wtd. (ft)	34.00	Wetted Per. (ft)		28.43	
Min Ch El (ft)	1333.80	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.07	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		2.23	
C & E Loss (ft)	0.00	Cum SA (acres)		0.63	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21389 Profile: PF 2

E.G. Elev (ft)	1341.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	34.00	34.00	34.00
Crit W.S. (ft)		Flow Area (sq ft)	37.93	184.59	
E.G. Slope (ft/ft)	0.000059	Area (sq ft)	37.93	184.59	
Q Total (cfs)	359.00	Flow (cfs)	18.38	340.62	
Top Width (ft)	55.99	Top Width (ft)	25.00	30.99	
Vel Total (ft/s)	1.61	Avg. Vel. (ft/s)	0.48	1.85	
Max Chl Dpth (ft)	7.77	Hydr. Depth (ft)	1.52	5.96	
Conv. Total (cfs)	46647.6	Conv. (cfs)	2388.0	44259.5	
Length Wtd. (ft)	34.00	Wetted Per. (ft)	26.47	37.29	
Min Ch El (ft)	1333.80	Shear (lb/sq ft)	0.01	0.02	
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.03	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.66	5.18	
C & E Loss (ft)	0.00	Cum SA (acres)	0.71	0.86	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21355 Profile: PF 1

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.84	Reach Len. (ft)	828.00	828.00	828.00
Crit W.S. (ft)		Flow Area (sq ft)		79.90	
E.G. Slope (ft/ft)	0.000168	Area (sq ft)		79.90	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	25.13	Top Width (ft)		25.13	
Vel Total (ft/s)	2.12	Avg. Vel. (ft/s)		2.12	
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)		3.18	
Conv. Total (cfs)	13041.0	Conv. (cfs)		13041.0	
Length Wtd. (ft)	828.00	Wetted Per. (ft)		28.74	
Min Ch El (ft)	1333.70	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)		2.17	
C & E Loss (ft)	0.14	Cum SA (acres)		0.61	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 21355 Profile: PF 2

E.G. Elev (ft)	1341.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	828.00	828.00	828.00
Crit W.S. (ft)		Flow Area (sq ft)	40.42	187.68	
E.G. Slope (ft/ft)	0.000056	Area (sq ft)	40.42	187.68	
Q Total (cfs)	359.00	Flow (cfs)	19.78	339.22	
Top Width (ft)	56.05	Top Width (ft)	25.00	31.05	
Vel Total (ft/s)	1.57	Avg. Vel. (ft/s)	0.49	1.81	
Max Chl Dpth (ft)	7.87	Hydr. Depth (ft)	1.62	6.04	
Conv. Total (cfs)	48057.0	Conv. (cfs)	2648.4	45408.6	
Length Wtd. (ft)	828.00	Wetted Per. (ft)	26.57	37.40	
Min Ch El (ft)	1333.70	Shear (lb/sq ft)	0.01	0.02	
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.03	
Frctn Loss (ft)	0.48	Cum Volume (acre-ft)	0.63	5.04	
C & E Loss (ft)	0.21	Cum SA (acres)	0.69	0.84	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 20527 Profile: PF 1

E.G. Elev (ft)	1336.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.		0.018	
W.S. Elev (ft)	1335.55	Reach Len. (ft)	527.00	527.00	527.00
Crit W.S. (ft)	1335.55	Flow Area (sq ft)		47.64	
E.G. Slope (ft/ft)	0.004164	Area (sq ft)		47.64	
Q Total (cfs)	456.00	Flow (cfs)		456.00	
Top Width (ft)	16.98	Top Width (ft)		16.98	
Vel Total (ft/s)	9.57	Avg. Vel. (ft/s)		9.57	
Max Chl Dpth (ft)	4.15	Hydr. Depth (ft)		2.81	
Conv. Total (cfs)	7066.7	Conv. (cfs)		7066.7	
Length Wtd. (ft)	527.00	Wetted Per. (ft)		19.78	
Min Ch EI (ft)	1331.40	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		5.99	
Frctn Loss (ft)	2.17	Cum Volume (acre-ft)		0.96	
C & E Loss (ft)	0.01	Cum SA (acres)		0.21	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 20527 Profile: PF 2

E.G. Elev (ft)	1340.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1338.80	Reach Len. (ft)	527.00	527.00	527.00
Crit W.S. (ft)	1338.80	Flow Area (sq ft)	15.05	116.66	
E.G. Slope (ft/ft)	0.003239	Area (sq ft)	15.05	116.66	
Q Total (cfs)	1379.00	Flow (cfs)	8.94	1370.06	
Top Width (ft)	49.71	Top Width (ft)	25.00	24.71	
Vel Total (ft/s)	10.47	Avg. Vel. (ft/s)	0.59	11.74	
Max Chl Dpth (ft)	7.40	Hydr. Depth (ft)	0.60	4.72	
Conv. Total (cfs)	24229.4	Conv. (cfs)	157.0	24072.4	
Length Wtd. (ft)	527.00	Wetted Per. (ft)	25.60	29.52	
Min Ch EI (ft)	1331.40	Shear (lb/sq ft)	0.12	0.80	
Alpha	1.25	Stream Power (lb/ft s)	0.07	9.38	
Frctn Loss (ft)	1.78	Cum Volume (acre-ft)	0.10	2.14	
C & E Loss (ft)	0.01	Cum SA (acres)	0.21	0.31	

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 20000 Profile: PF 1

E.G. Elev (ft)	1334.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.38	Wt. n-Val.		0.018	
W.S. Elev (ft)	1333.21	Reach Len. (ft)	160.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		48.42	
E.G. Slope (ft/ft)	0.004057	Area (sq ft)		48.42	
Q Total (cfs)	456.00	Flow (cfs)		456.00	
Top Width (ft)	17.58	Top Width (ft)		17.58	
Vel Total (ft/s)	9.42	Avg. Vel. (ft/s)		9.42	
Max Chl Dpth (ft)	4.11	Hydr. Depth (ft)		2.75	
Conv. Total (cfs)	7158.8	Conv. (cfs)		7158.8	
Length Wtd. (ft)	160.00	Wetted Per. (ft)		20.20	
Min Ch EI (ft)	1329.10	Shear (lb/sq ft)		0.61	
Alpha	1.00	Stream Power (lb/ft s)		5.72	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.38	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Mtn. View Chnl RS: 20000 Profile: PF 2

E.G. Elev (ft)	1338.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.21	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1336.27	Reach Len. (ft)	160.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)	1.73	115.55	
E.G. Slope (ft/ft)	0.003535	Area (sq ft)	1.73	115.55	
Q Total (cfs)	1379.00	Flow (cfs)	0.47	1378.53	
Top Width (ft)	35.97	Top Width (ft)	10.00	25.97	
Vel Total (ft/s)	11.76	Avg. Vel. (ft/s)	0.27	11.93	
Max Chl Dpth (ft)	7.17	Hydr. Depth (ft)	0.17	4.45	
Conv. Total (cfs)	23193.6	Conv. (cfs)	7.9	23185.7	
Length Wtd. (ft)	160.00	Wetted Per. (ft)	10.17	30.49	
Min Ch EI (ft)	1329.10	Shear (lb/sq ft)	0.04	0.84	
Alpha	1.03	Stream Power (lb/ft s)	0.01	9.98	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.00	0.74	
C & E Loss (ft)		Cum SA (acres)			

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15922 Profile: PF 1

E.G. Elev (ft)	1332.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.		0.018	
W.S. Elev (ft)	1331.66	Reach Len. (ft)	380.00	380.00	380.00
Crit W.S. (ft)	1331.37	Flow Area (sq ft)		156.11	
E.G. Slope (ft/ft)	0.002588	Area (sq ft)		156.11	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	56.03	Top Width (ft)		56.03	
Vel Total (ft/s)	8.21	Avg. Vel. (ft/s)		8.21	
Max Chl Dpth (ft)	3.56	Hydr. Depth (ft)		2.79	
Conv. Total (cfs)	25201.1	Conv. (cfs)		25201.1	
Length Wtd. (ft)	380.00	Wetted Per. (ft)		57.09	
Min Ch EI (ft)	1328.10	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		3.63	
Frctn Loss (ft)	0.84	Cum Volume (acre-ft)		23.69	
C & E Loss (ft)	0.06	Cum SA (acres)		8.27	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15922 Profile: PF 2

E.G. Elev (ft)	1335.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.67	Wt. n-Val.		0.018	
W.S. Elev (ft)	1333.76	Reach Len. (ft)	380.00	380.00	380.00
Crit W.S. (ft)		Flow Area (sq ft)		287.45	
E.G. Slope (ft/ft)	0.002457	Area (sq ft)		287.45	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	69.56	Top Width (ft)		69.56	
Vel Total (ft/s)	10.37	Avg. Vel. (ft/s)		10.37	
Max Chl Dpth (ft)	5.66	Hydr. Depth (ft)		4.13	
Conv. Total (cfs)	60133.8	Conv. (cfs)		60133.8	
Length Wtd. (ft)	380.00	Wetted Per. (ft)		71.25	
Min Ch EI (ft)	1328.10	Shear (lb/sq ft)		0.62	
Alpha	1.00	Stream Power (lb/ft s)		6.42	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	0.05	42.98	0.07
C & E Loss (ft)	0.09	Cum SA (acres)	0.09	9.93	0.15

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15542 Profile: PF 1

E.G. Elev (ft)	1331.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.96	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		173.73	
E.G. Slope (ft/ft)	0.001919	Area (sq ft)		173.73	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	58.41	Top Width (ft)		58.41	
Vel Total (ft/s)	7.38	Avg. Vel. (ft/s)		7.38	
Max Chl Dpth (ft)	3.76	Hydr. Depth (ft)		2.97	
Conv. Total (cfs)	29264.6	Conv. (cfs)		29264.6	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		59.60	
Min Ch El (ft)	1327.20	Shear (lb/sq ft)		0.35	
Alpha	1.00	Stream Power (lb/ft s)		2.58	
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)		22.25	
C & E Loss (ft)	0.03	Cum SA (acres)		7.77	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15542 Profile: PF 2

E.G. Elev (ft)	1334.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.37	Wt. n-Val.		0.018	0.035
W.S. Elev (ft)	1333.16	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		317.39	0.70
E.G. Slope (ft/ft)	0.001831	Area (sq ft)		317.39	0.70
Q Total (cfs)	2981.00	Flow (cfs)		2980.57	0.43
Top Width (ft)	74.66	Top Width (ft)		71.36	3.30
Vel Total (ft/s)	9.37	Avg. Vel. (ft/s)		9.39	0.62
Max Chl Dpth (ft)	5.96	Hydr. Depth (ft)		4.45	0.21
Conv. Total (cfs)	69660.8	Conv. (cfs)		69650.6	10.1
Length Wtd. (ft)	300.00	Wetted Per. (ft)		73.23	3.56
Min Ch El (ft)	1327.20	Shear (lb/sq ft)		0.50	0.02
Alpha	1.00	Stream Power (lb/ft s)		4.65	0.01
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.05	40.34	0.06
C & E Loss (ft)	0.03	Cum SA (acres)	0.09	9.31	0.14

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15242 Profile: PF 1

E.G. Elev (ft)	1331.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.51	Reach Len. (ft)	201.00	201.00	201.00
Crit W.S. (ft)		Flow Area (sq ft)		184.24	
E.G. Slope (ft/ft)	0.001591	Area (sq ft)		184.24	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	58.74	Top Width (ft)		58.74	
Vel Total (ft/s)	6.96	Avg. Vel. (ft/s)		6.96	
Max Chl Dpth (ft)	4.01	Hydr. Depth (ft)		3.14	
Conv. Total (cfs)	32144.9	Conv. (cfs)		32144.9	
Length Wtd. (ft)	201.00	Wetted Per. (ft)		59.97	
Min Ch El (ft)	1326.50	Shear (lb/sq ft)		0.31	
Alpha	1.00	Stream Power (lb/ft s)		2.12	
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)		21.02	
C & E Loss (ft)	0.06	Cum SA (acres)		7.36	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15242 Profile: PF 2

E.G. Elev (ft)	1333.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.28	Wt. n-Val.		0.018	
W.S. Elev (ft)	1332.70	Reach Len. (ft)	201.00	201.00	201.00
Crit W.S. (ft)		Flow Area (sq ft)		328.30	
E.G. Slope (ft/ft)	0.001678	Area (sq ft)		328.30	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	72.70	Top Width (ft)		72.70	
Vel Total (ft/s)	9.08	Avg. Vel. (ft/s)		9.08	
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)		4.52	
Conv. Total (cfs)	72779.6	Conv. (cfs)		72779.6	
Length Wtd. (ft)	201.00	Wetted Per. (ft)		74.60	
Min Ch EI (ft)	1326.50	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		4.19	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.05	38.12	0.06
C & E Loss (ft)	0.07	Cum SA (acres)	0.09	8.82	0.13

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15041 Profile: PF 1

E.G. Elev (ft)	1330.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.31	Wt. n-Val.		0.018	
W.S. Elev (ft)	1329.43	Reach Len. (ft)	515.00	515.00	515.00
Crit W.S. (ft)	1329.43	Flow Area (sq ft)		139.79	
E.G. Slope (ft/ft)	0.003576	Area (sq ft)		139.79	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	54.22	Top Width (ft)		54.22	
Vel Total (ft/s)	9.17	Avg. Vel. (ft/s)		9.17	
Max Chl Dpth (ft)	3.23	Hydr. Depth (ft)		2.58	
Conv. Total (cfs)	21436.8	Conv. (cfs)		21436.8	
Length Wtd. (ft)	515.00	Wetted Per. (ft)		55.21	
Min Ch EI (ft)	1326.20	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)		5.18	
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		20.27	
C & E Loss (ft)	0.18	Cum SA (acres)		7.10	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 15041 Profile: PF 2

E.G. Elev (ft)	1333.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.99	Wt. n-Val.		0.018	
W.S. Elev (ft)	1331.47	Reach Len. (ft)	515.00	515.00	515.00
Crit W.S. (ft)	1331.47	Flow Area (sq ft)		263.38	
E.G. Slope (ft/ft)	0.003133	Area (sq ft)		263.38	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	67.09	Top Width (ft)		67.09	
Vel Total (ft/s)	11.32	Avg. Vel. (ft/s)		11.32	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)		3.93	
Conv. Total (cfs)	53253.8	Conv. (cfs)		53253.8	
Length Wtd. (ft)	515.00	Wetted Per. (ft)		68.71	
Min Ch EI (ft)	1326.20	Shear (lb/sq ft)		0.75	
Alpha	1.00	Stream Power (lb/ft s)		8.49	
Frctn Loss (ft)	1.06	Cum Volume (acre-ft)	0.05	36.75	0.06
C & E Loss (ft)	0.25	Cum SA (acres)	0.09	8.49	0.13

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 14526 Profile: PF 1

E.G. Elev (ft)	1329.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.72	Wt. n-Val.		0.018	
W.S. Elev (ft)	1328.58	Reach Len. (ft)	610.00	610.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)		188.88	
E.G. Slope (ft/ft)	0.001483	Area (sq ft)		188.88	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	59.20	Top Width (ft)		59.20	
Vel Total (ft/s)	6.79	Avg. Vel. (ft/s)		6.79	
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)		3.19	
Conv. Total (cfs)	33291.0	Conv. (cfs)		33291.0	
Length Wtd. (ft)	610.00	Wetted Per. (ft)		60.54	
Min Ch EI (ft)	1324.20	Shear (lb/sq ft)		0.29	
Alpha	1.00	Stream Power (lb/ft s)		1.96	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)		18.33	
C & E Loss (ft)	0.02	Cum SA (acres)		6.43	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 14526 Profile: PF 2

E.G. Elev (ft)	1332.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.17	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.91	Reach Len. (ft)	610.00	610.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)		343.22	
E.G. Slope (ft/ft)	0.001462	Area (sq ft)		343.22	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	73.09	Top Width (ft)		73.09	
Vel Total (ft/s)	8.69	Avg. Vel. (ft/s)		8.69	
Max Chl Dpth (ft)	6.71	Hydr. Depth (ft)		4.70	
Conv. Total (cfs)	77953.7	Conv. (cfs)		77953.7	
Length Wtd. (ft)	610.00	Wetted Per. (ft)		75.21	
Min Ch EI (ft)	1324.20	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		3.62	
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.05	33.17	0.06
C & E Loss (ft)	0.03	Cum SA (acres)	0.09	7.67	0.13

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 13916 Profile: PF 1

E.G. Elev (ft)	1328.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.64	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.82	Reach Len. (ft)	176.00	176.00	176.00
Crit W.S. (ft)		Flow Area (sq ft)		199.41	
E.G. Slope (ft/ft)	0.001176	Area (sq ft)		199.41	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	56.47	Top Width (ft)		56.47	
Vel Total (ft/s)	6.43	Avg. Vel. (ft/s)		6.43	
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)		3.53	
Conv. Total (cfs)	37391.5	Conv. (cfs)		37391.5	
Length Wtd. (ft)	176.00	Wetted Per. (ft)		58.25	
Min Ch EI (ft)	1323.10	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		1.62	
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)		15.61	
C & E Loss (ft)	0.01	Cum SA (acres)		5.62	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 13916 Profile: PF 2

E.G. Elev (ft)	1331.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.45	Wt. n-Val.		0.018	
W.S. Elev (ft)	1329.61	Reach Len. (ft)	176.00	176.00	176.00
Crit W.S. (ft)	1328.77	Flow Area (sq ft)		308.39	
E.G. Slope (ft/ft)	0.001817	Area (sq ft)		308.39	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	65.26	Top Width (ft)		65.26	
Vel Total (ft/s)	9.67	Avg. Vel. (ft/s)		9.67	
Max Chl Dpth (ft)	6.51	Hydr. Depth (ft)		4.73	
Conv. Total (cfs)	69924.9	Conv. (cfs)		69924.9	
Length Wtd. (ft)	176.00	Wetted Per. (ft)		67.75	
Min Ch El (ft)	1323.10	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		4.99	
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.05	28.60	0.06
C & E Loss (ft)	0.02	Cum SA (acres)	0.09	6.70	0.13

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 13740 Profile: PF 1

E.G. Elev (ft)	1328.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.70	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.52	Reach Len. (ft)	1505.00	1505.00	1505.00
Crit W.S. (ft)	1326.70	Flow Area (sq ft)		190.43	
E.G. Slope (ft/ft)	0.001513	Area (sq ft)		190.43	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	61.37	Top Width (ft)		61.37	
Vel Total (ft/s)	6.73	Avg. Vel. (ft/s)		6.73	
Max Chl Dpth (ft)	3.92	Hydr. Depth (ft)		3.10	
Conv. Total (cfs)	32962.7	Conv. (cfs)		32962.7	
Length Wtd. (ft)	1505.00	Wetted Per. (ft)		62.72	
Min Ch El (ft)	1323.60	Shear (lb/sq ft)		0.29	
Alpha	1.00	Stream Power (lb/ft s)		1.93	
Frctn Loss (ft)	3.34	Cum Volume (acre-ft)		14.82	
C & E Loss (ft)	0.06	Cum SA (acres)		5.38	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 13740 Profile: PF 2

E.G. Elev (ft)	1330.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.69	Wt. n-Val.		0.018	
W.S. Elev (ft)	1328.98	Reach Len. (ft)	1505.00	1505.00	1505.00
Crit W.S. (ft)	1328.68	Flow Area (sq ft)		285.76	
E.G. Slope (ft/ft)	0.002514	Area (sq ft)		285.76	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	69.55	Top Width (ft)		69.55	
Vel Total (ft/s)	10.43	Avg. Vel. (ft/s)		10.43	
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)		4.11	
Conv. Total (cfs)	59451.4	Conv. (cfs)		59451.4	
Length Wtd. (ft)	1505.00	Wetted Per. (ft)		71.43	
Min Ch El (ft)	1323.60	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		6.55	
Frctn Loss (ft)	2.22	Cum Volume (acre-ft)	0.05	27.40	0.06
C & E Loss (ft)	0.24	Cum SA (acres)	0.09	6.42	0.13

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12235 Profile: PF 1

E.G. Elev (ft)	1324.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.		0.018	
W.S. Elev (ft)	1323.52	Reach Len. (ft)	27.00	27.00	27.00
Crit W.S. (ft)	1323.52	Flow Area (sq ft)		139.89	
E.G. Slope (ft/ft)	0.003572	Area (sq ft)		139.89	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	54.33	Top Width (ft)		54.33	
Vel Total (ft/s)	9.16	Avg. Vel. (ft/s)		9.16	
Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)		2.57	
Conv. Total (cfs)	21450.2	Conv. (cfs)		21450.2	
Length Wtd. (ft)	27.00	Wetted Per. (ft)		55.26	
Min Ch El (ft)	1320.20	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		5.17	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		9.11	
C & E Loss (ft)	0.45	Cum SA (acres)		3.39	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12235 Profile: PF 2

E.G. Elev (ft)	1328.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.88	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1327.32	Reach Len. (ft)	27.00	27.00	27.00
Crit W.S. (ft)		Flow Area (sq ft)	2.61	395.82	3.40
E.G. Slope (ft/ft)	0.000970	Area (sq ft)	2.61	395.82	3.40
Q Total (cfs)	2981.00	Flow (cfs)	2.45	2975.51	3.04
Top Width (ft)	89.50	Top Width (ft)	5.00	77.30	7.20
Vel Total (ft/s)	7.42	Avg. Vel. (ft/s)	0.94	7.52	0.89
Max Chl Dpth (ft)	7.12	Hydr. Depth (ft)	0.52	5.12	0.47
Conv. Total (cfs)	95709.9	Conv. (cfs)	78.6	95533.8	97.6
Length Wtd. (ft)	27.00	Wetted Per. (ft)	5.52	79.18	7.72
Min Ch El (ft)	1320.20	Shear (lb/sq ft)	0.03	0.30	0.03
Alpha	1.02	Stream Power (lb/ft s)	0.03	2.28	0.02
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.00	15.63	0.00
C & E Loss (ft)	0.17	Cum SA (acres)	0.00	3.89	0.00

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12208 Profile: PF 1

E.G. Elev (ft)	1324.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.018	
W.S. Elev (ft)	1323.63	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1322.07	Flow Area (sq ft)		251.33	
E.G. Slope (ft/ft)	0.000637	Area (sq ft)		251.54	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	65.71	Top Width (ft)		65.71	
Vel Total (ft/s)	5.10	Avg. Vel. (ft/s)		5.10	
Max Chl Dpth (ft)	3.83	Hydr. Depth (ft)		3.83	
Conv. Total (cfs)	50800.7	Conv. (cfs)		50800.7	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		65.60	
Min Ch El (ft)	1319.80	Shear (lb/sq ft)		0.15	
Alpha	1.00	Stream Power (lb/ft s)		0.78	
Frctn Loss (ft)		Cum Volume (acre-ft)		8.99	
C & E Loss (ft)		Cum SA (acres)		3.35	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12208 Profile: PF 2

E.G. Elev (ft)	1328.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.47	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1323.79	Flow Area (sq ft)		503.74	
E.G. Slope (ft/ft)	0.000449	Area (sq ft)		503.74	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	65.80	Top Width (ft)		65.80	
Vel Total (ft/s)	5.92	Avg. Vel. (ft/s)		5.92	
Max Chl Dpth (ft)	7.67	Hydr. Depth (ft)		7.66	
Conv. Total (cfs)	140704.8	Conv. (cfs)		140704.8	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		80.93	
Min Ch El (ft)	1319.80	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		1.03	
Frctn Loss (ft)		Cum Volume (acre-ft)		15.35	
C & E Loss (ft)		Cum SA (acres)		3.84	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12158 Profile: PF 1

E.G. Elev (ft)	1321.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.		0.018	
W.S. Elev (ft)	1320.78	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1320.78	Flow Area (sq ft)		149.79	
E.G. Slope (ft/ft)	0.003575	Area (sq ft)		149.86	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	65.66	Top Width (ft)		65.66	
Vel Total (ft/s)	8.56	Avg. Vel. (ft/s)		8.56	
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)		2.28	
Conv. Total (cfs)	21442.6	Conv. (cfs)		21442.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		65.60	
Min Ch El (ft)	1318.50	Shear (lb/sq ft)		0.51	
Alpha	1.00	Stream Power (lb/ft s)		4.36	
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)		8.76	
C & E Loss (ft)	0.11	Cum SA (acres)		3.27	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12158 Profile: PF 2

E.G. Elev (ft)	1324.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.01	Wt. n-Val.		0.018	
W.S. Elev (ft)	1322.50	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1322.50	Flow Area (sq ft)		262.09	
E.G. Slope (ft/ft)	0.002995	Area (sq ft)		262.28	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	65.70	Top Width (ft)		65.70	
Vel Total (ft/s)	11.37	Avg. Vel. (ft/s)		11.37	
Max Chl Dpth (ft)	4.00	Hydr. Depth (ft)		4.00	
Conv. Total (cfs)	54475.1	Conv. (cfs)		54475.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		65.60	
Min Ch El (ft)	1318.50	Shear (lb/sq ft)		0.75	
Alpha	1.00	Stream Power (lb/ft s)		8.50	
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)		14.91	
C & E Loss (ft)	0.26	Cum SA (acres)		3.77	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12058 Profile: PF 1

E.G. Elev (ft)	1320.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.91	Wt. n-Val.		0.018	
W.S. Elev (ft)	1319.20	Reach Len. (ft)	650.00	650.00	650.00
Crit W.S. (ft)	1318.80	Flow Area (sq ft)		167.09	
E.G. Slope (ft/ft)	0.002285	Area (sq ft)		167.09	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	60.44	Top Width (ft)		60.44	
Vel Total (ft/s)	7.67	Avg. Vel. (ft/s)		7.67	
Max Chl Dpth (ft)	3.20	Hydr. Depth (ft)		2.76	
Conv. Total (cfs)	26816.9	Conv. (cfs)		26816.9	
Length Wtd. (ft)	650.00	Wetted Per. (ft)		61.64	
Min Ch El (ft)	1316.00	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		2.97	
Frctn Loss (ft)	1.72	Cum Volume (acre-ft)		8.40	
C & E Loss (ft)	0.07	Cum SA (acres)		3.13	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 12058 Profile: PF 2

E.G. Elev (ft)	1322.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.48	Wt. n-Val.		0.018	
W.S. Elev (ft)	1321.30	Reach Len. (ft)	650.00	650.00	650.00
Crit W.S. (ft)	1320.74	Flow Area (sq ft)		305.21	
E.G. Slope (ft/ft)	0.002088	Area (sq ft)		305.21	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	71.27	Top Width (ft)		71.27	
Vel Total (ft/s)	9.77	Avg. Vel. (ft/s)		9.77	
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)		4.28	
Conv. Total (cfs)	65236.1	Conv. (cfs)		65236.1	
Length Wtd. (ft)	650.00	Wetted Per. (ft)		73.25	
Min Ch El (ft)	1316.00	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		5.30	
Frctn Loss (ft)	1.63	Cum Volume (acre-ft)		14.26	
C & E Loss (ft)	0.14	Cum SA (acres)		3.61	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 11408 Profile: PF 1

E.G. Elev (ft)	1318.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.		0.018	
W.S. Elev (ft)	1317.19	Reach Len. (ft)	600.00	600.00	600.00
Crit W.S. (ft)		Flow Area (sq ft)		149.71	
E.G. Slope (ft/ft)	0.003088	Area (sq ft)		149.71	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	57.56	Top Width (ft)		57.56	
Vel Total (ft/s)	8.56	Avg. Vel. (ft/s)		8.56	
Max Chl Dpth (ft)	3.19	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	23069.3	Conv. (cfs)		23069.3	
Length Wtd. (ft)	600.00	Wetted Per. (ft)		58.70	
Min Ch El (ft)	1314.00	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.21	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)		6.03	
C & E Loss (ft)	0.16	Cum SA (acres)		2.25	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 11408 Profile: PF 2

E.G. Elev (ft)	1321.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.96	Wt. n-Val.		0.018	
W.S. Elev (ft)	1319.05	Reach Len. (ft)	600.00	600.00	600.00
Crit W.S. (ft)	1319.02	Flow Area (sq ft)		265.22	
E.G. Slope (ft/ft)	0.003066	Area (sq ft)		265.22	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	66.92	Top Width (ft)		66.92	
Vel Total (ft/s)	11.24	Avg. Vel. (ft/s)		11.24	
Max Chl Dpth (ft)	5.05	Hydr. Depth (ft)		3.96	
Conv. Total (cfs)	53839.2	Conv. (cfs)		53839.2	
Length Wtd. (ft)	600.00	Wetted Per. (ft)		68.78	
Min Ch El (ft)	1314.00	Shear (lb/sq ft)		0.74	
Alpha	1.00	Stream Power (lb/ft s)		8.30	
Frctn Loss (ft)	1.40	Cum Volume (acre-ft)		10.00	
C & E Loss (ft)	0.19	Cum SA (acres)		2.58	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 10808 Profile: PF 1

E.G. Elev (ft)	1317.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.018	
W.S. Elev (ft)	1316.42	Reach Len. (ft)	808.00	808.00	808.00
Crit W.S. (ft)	1315.47	Flow Area (sq ft)		205.56	
E.G. Slope (ft/ft)	0.001284	Area (sq ft)		205.56	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	65.73	Top Width (ft)		65.73	
Vel Total (ft/s)	6.24	Avg. Vel. (ft/s)		6.24	
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	35778.3	Conv. (cfs)		35778.3	
Length Wtd. (ft)	808.00	Wetted Per. (ft)		67.15	
Min Ch El (ft)	1312.80	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		1.53	
Frctn Loss (ft)	1.45	Cum Volume (acre-ft)		3.59	
C & E Loss (ft)	0.02	Cum SA (acres)		1.40	

Plan: BerneilDitch Berneil Ditch Lower Reach RS: 10808 Profile: PF 2

E.G. Elev (ft)	1319.42	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.33	Wt. n-Val.		0.018	
W.S. Elev (ft)	1318.09	Reach Len. (ft)	808.00	808.00	808.00
Crit W.S. (ft)	1317.35	Flow Area (sq ft)		322.03	
E.G. Slope (ft/ft)	0.001834	Area (sq ft)		322.03	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	73.95	Top Width (ft)		73.95	
Vel Total (ft/s)	9.26	Avg. Vel. (ft/s)		9.26	
Max Chl Dpth (ft)	5.29	Hydr. Depth (ft)		4.35	
Conv. Total (cfs)	69601.1	Conv. (cfs)		69601.1	
Length Wtd. (ft)	808.00	Wetted Per. (ft)		76.02	
Min Ch El (ft)	1312.80	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.49	
Frctn Loss (ft)	1.78	Cum Volume (acre-ft)		5.96	
C & E Loss (ft)	0.00	Cum SA (acres)		1.61	

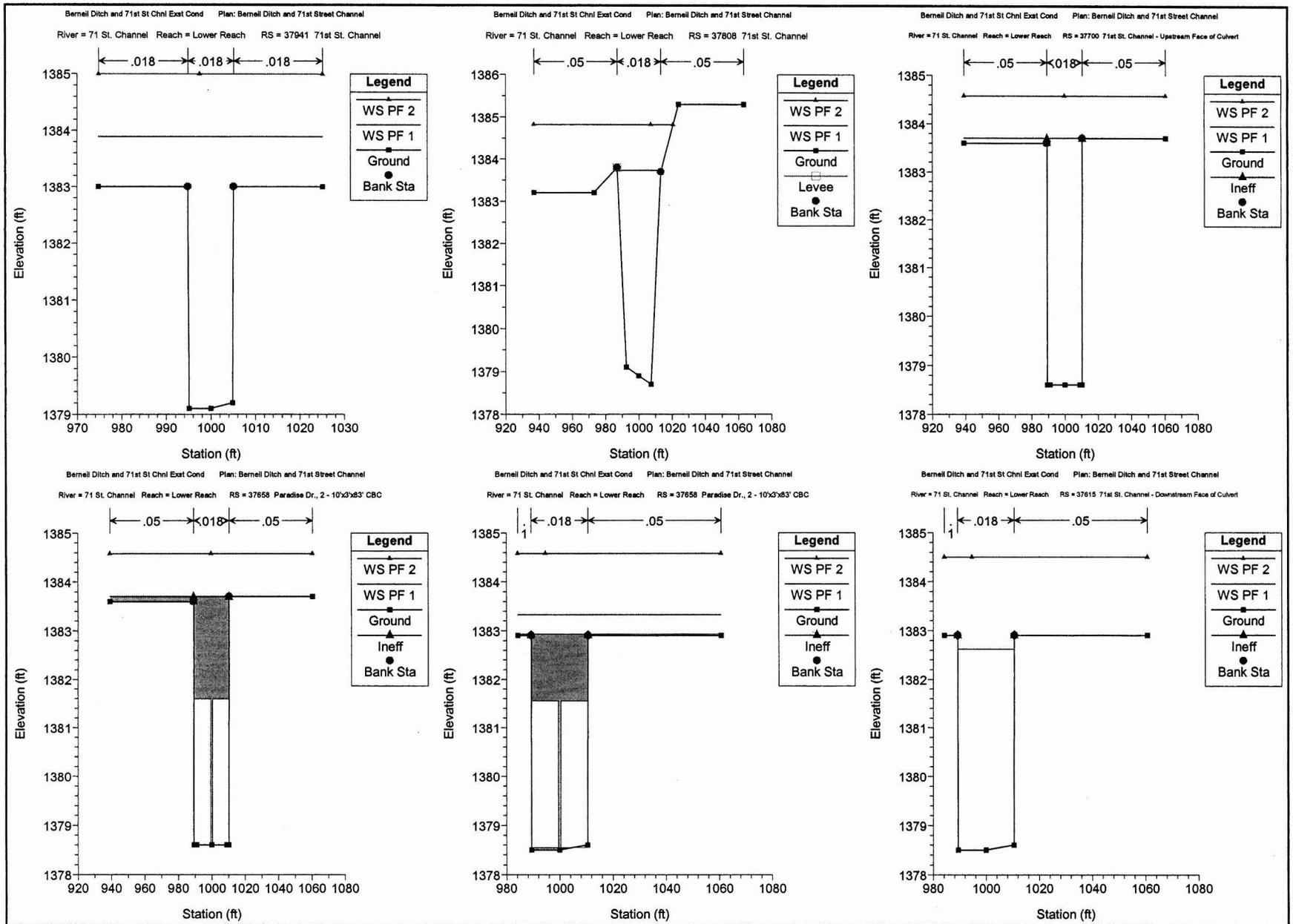
Plan: BerneilDitch Berneil Ditch Lower Reach RS: 10000 Profile: PF 1

E.G. Elev (ft)	1315.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.		0.018	
W.S. Elev (ft)	1314.77	Reach Len. (ft)			
Crit W.S. (ft)	1314.53	Flow Area (sq ft)		181.22	
E.G. Slope (ft/ft)	0.002704	Area (sq ft)		181.22	
Q Total (cfs)	1282.00	Flow (cfs)		1282.00	
Top Width (ft)	85.14	Top Width (ft)		85.14	
Vel Total (ft/s)	7.07	Avg. Vel. (ft/s)		7.07	
Max Chl Dpth (ft)	2.47	Hydr. Depth (ft)		2.13	
Conv. Total (cfs)	24655.0	Conv. (cfs)		24655.0	
Length Wtd. (ft)		Wetted Per. (ft)		85.65	
Min Ch EI (ft)	1312.30	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		2.53	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

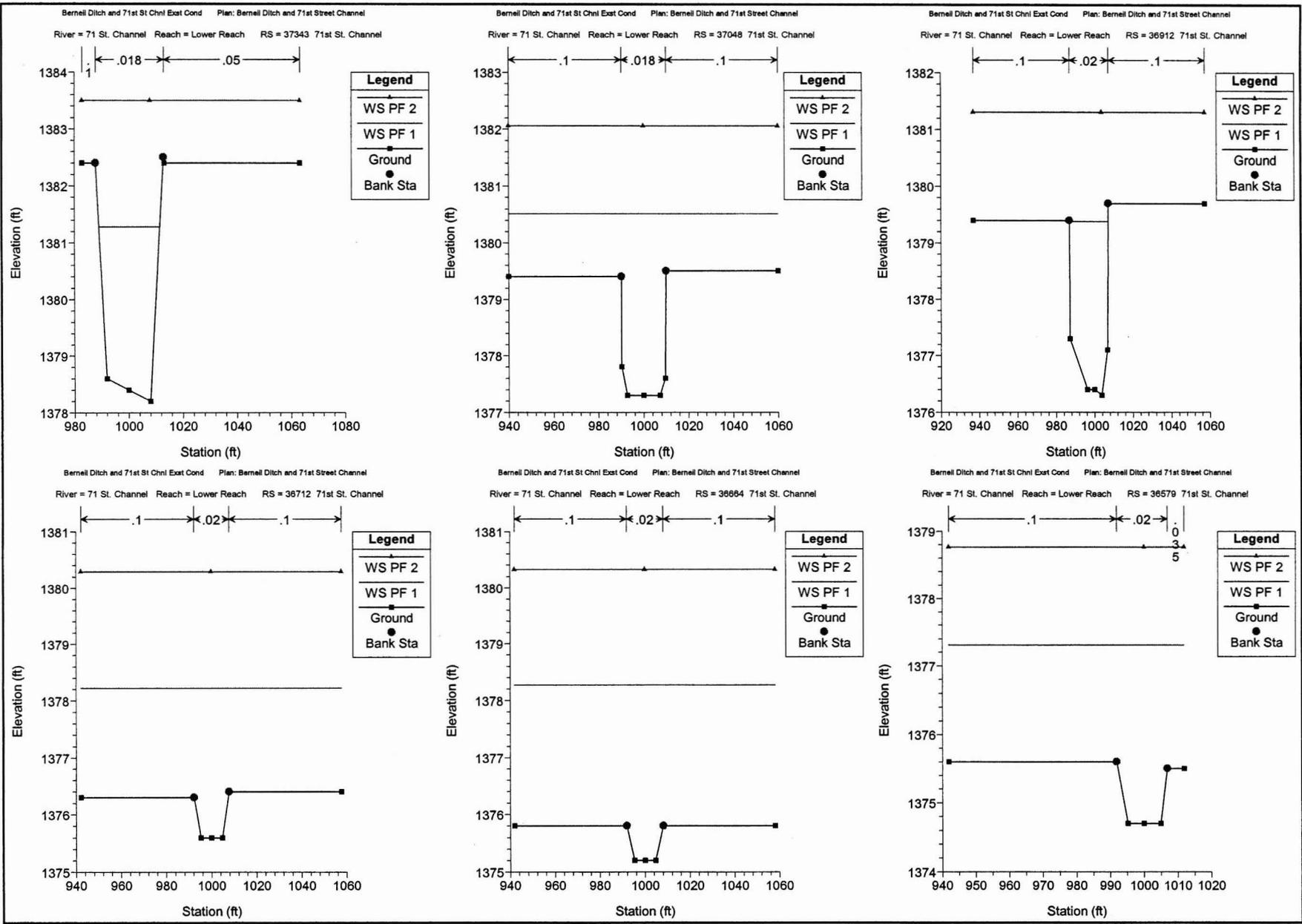
Plan: BerneilDitch Berneil Ditch Lower Reach RS: 10000 Profile: PF 2

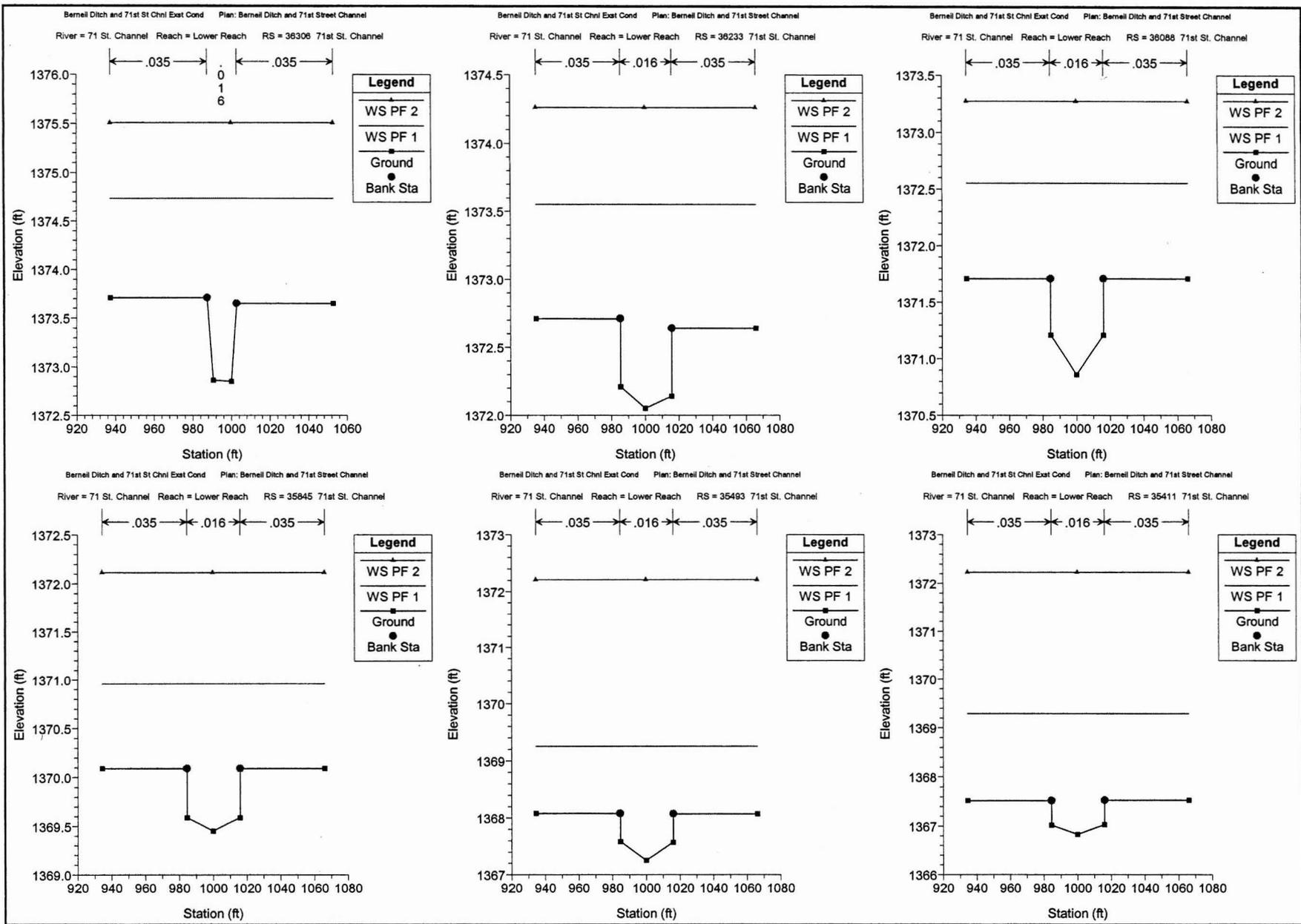
E.G. Elev (ft)	1317.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.		0.018	
W.S. Elev (ft)	1316.28	Reach Len. (ft)			
Crit W.S. (ft)	1316.07	Flow Area (sq ft)		320.46	
E.G. Slope (ft/ft)	0.002703	Area (sq ft)		320.46	
Q Total (cfs)	2981.00	Flow (cfs)		2981.00	
Top Width (ft)	99.61	Top Width (ft)		99.61	
Vel Total (ft/s)	9.30	Avg. Vel. (ft/s)		9.30	
Max Chl Dpth (ft)	3.98	Hydr. Depth (ft)		3.22	
Conv. Total (cfs)	57337.0	Conv. (cfs)		57337.0	
Length Wtd. (ft)		Wetted Per. (ft)		100.43	
Min Ch EI (ft)	1312.30	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		5.01	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

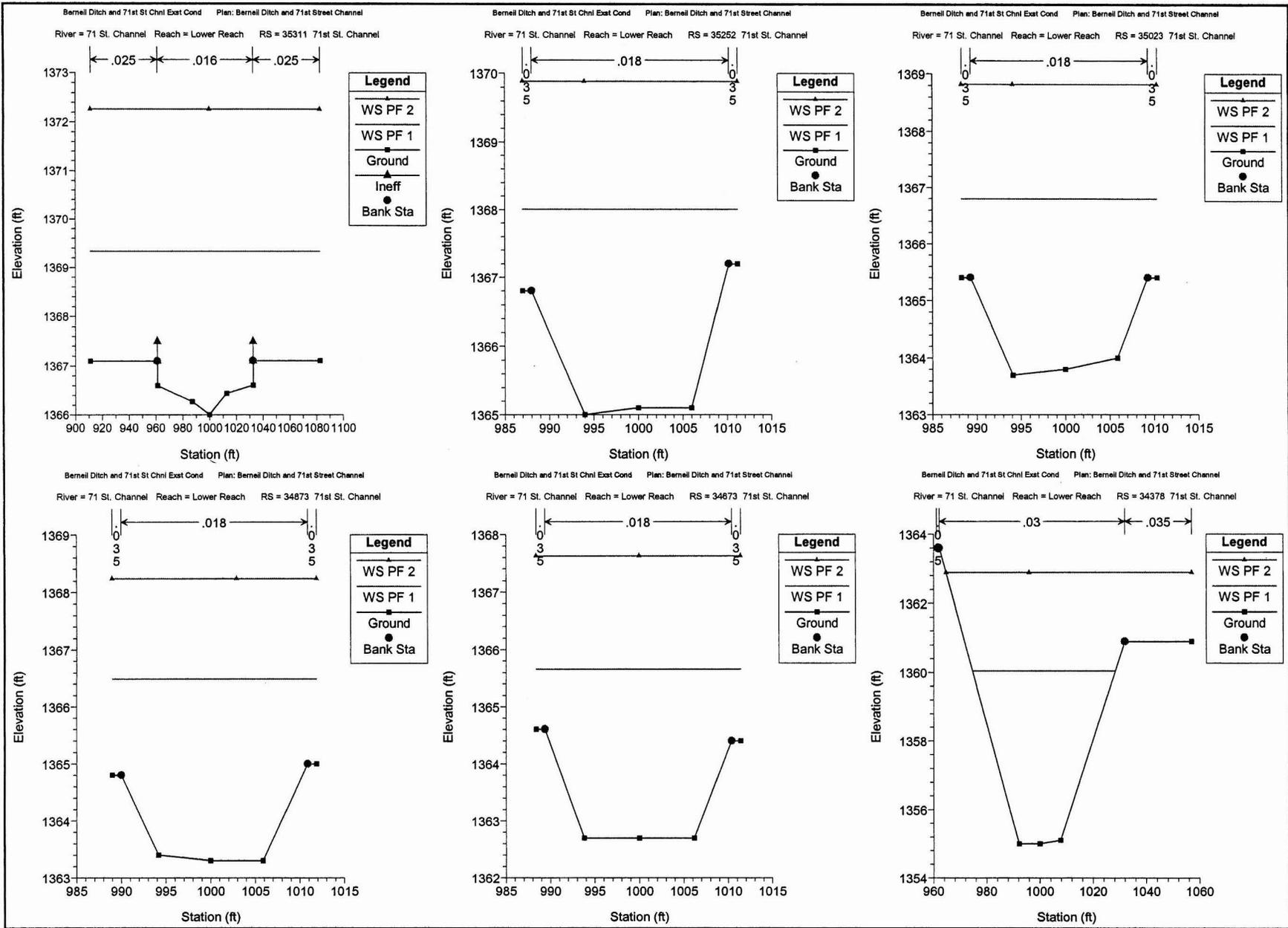
EXISTING CONDITIONS HEC-RAS CROSS-SECTIONS

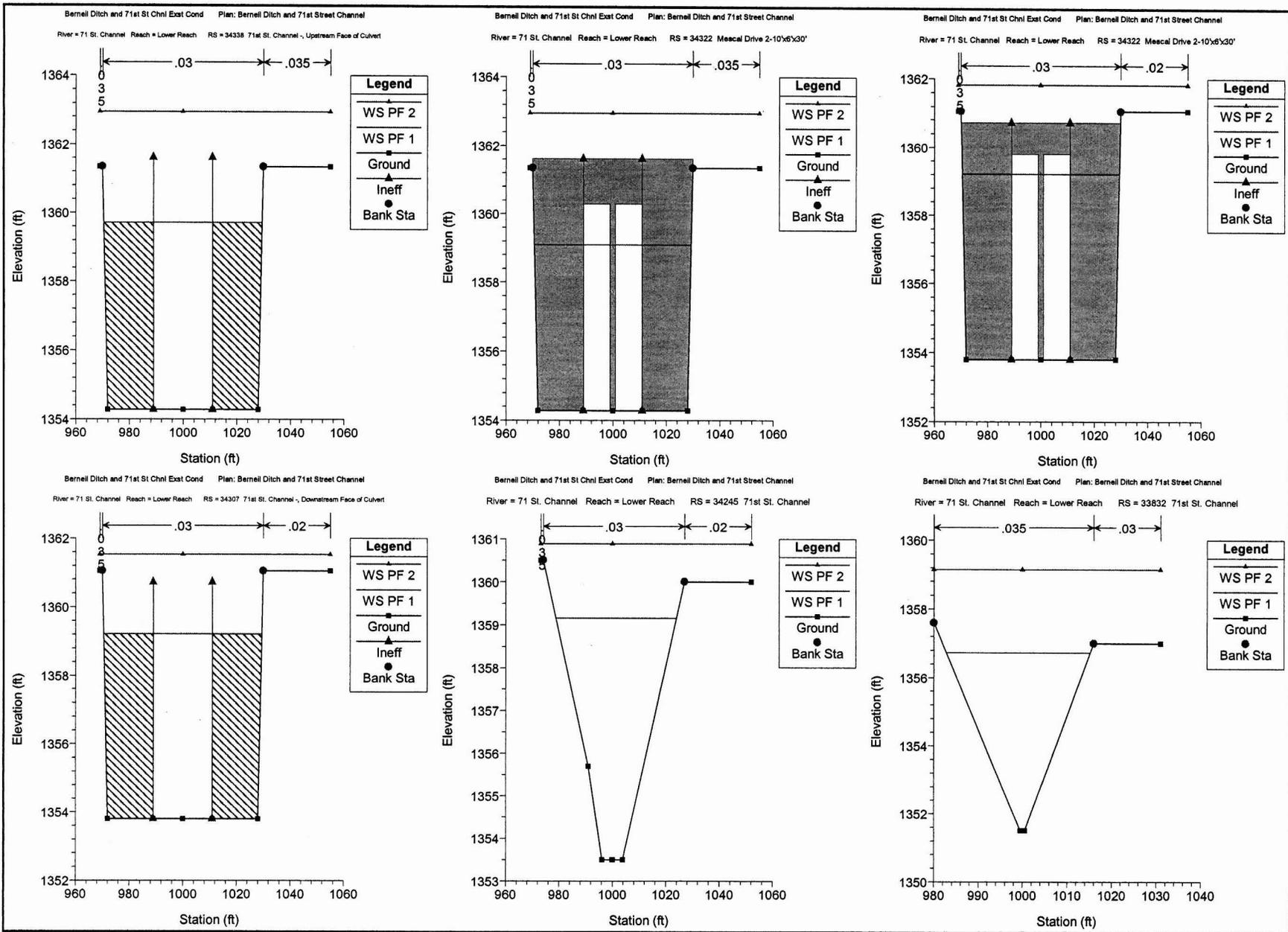


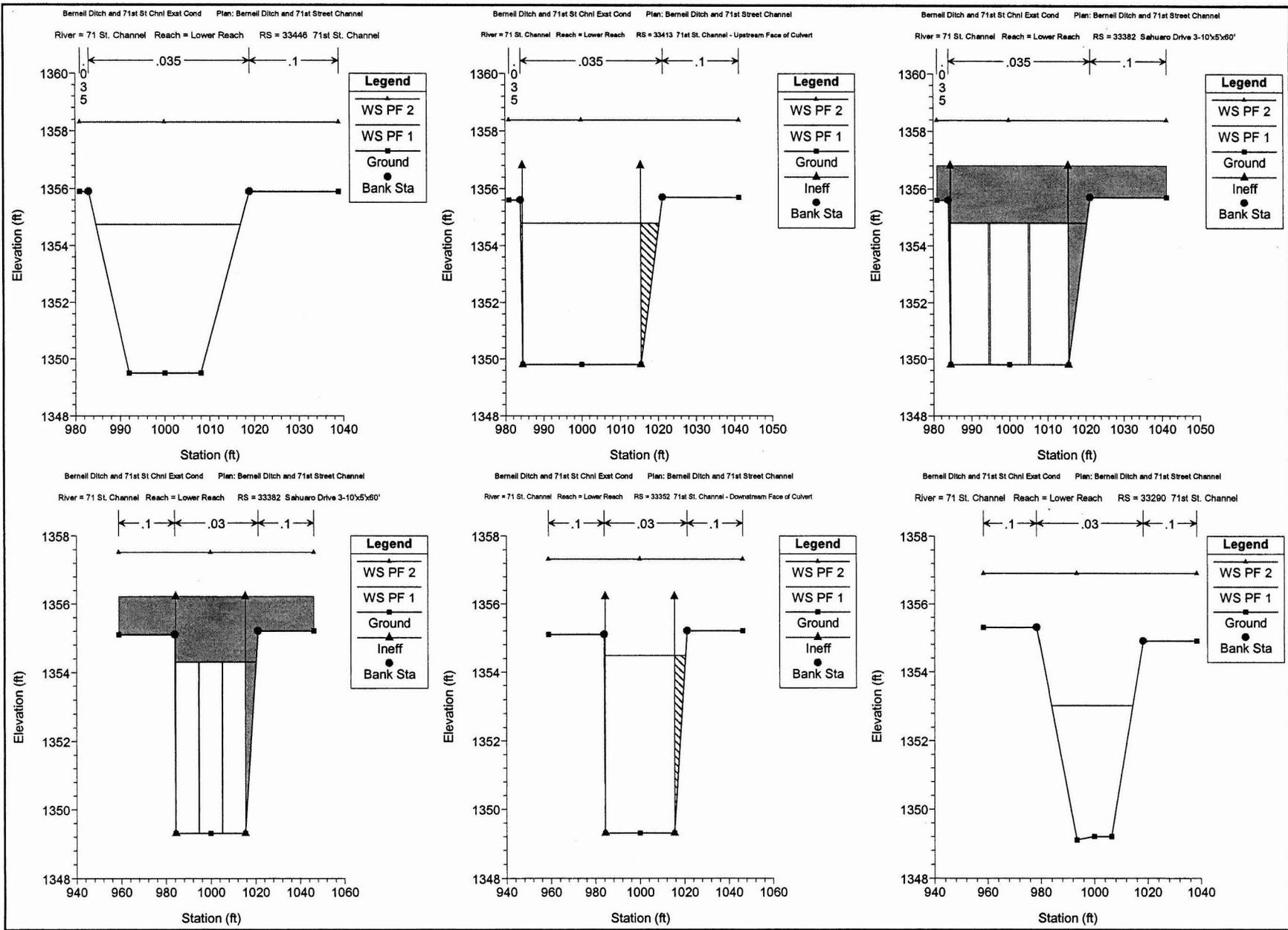
EXISTING CONDITIONS  
 HEC-RAS CROSS-SECTIONS  
 SCI # 15586

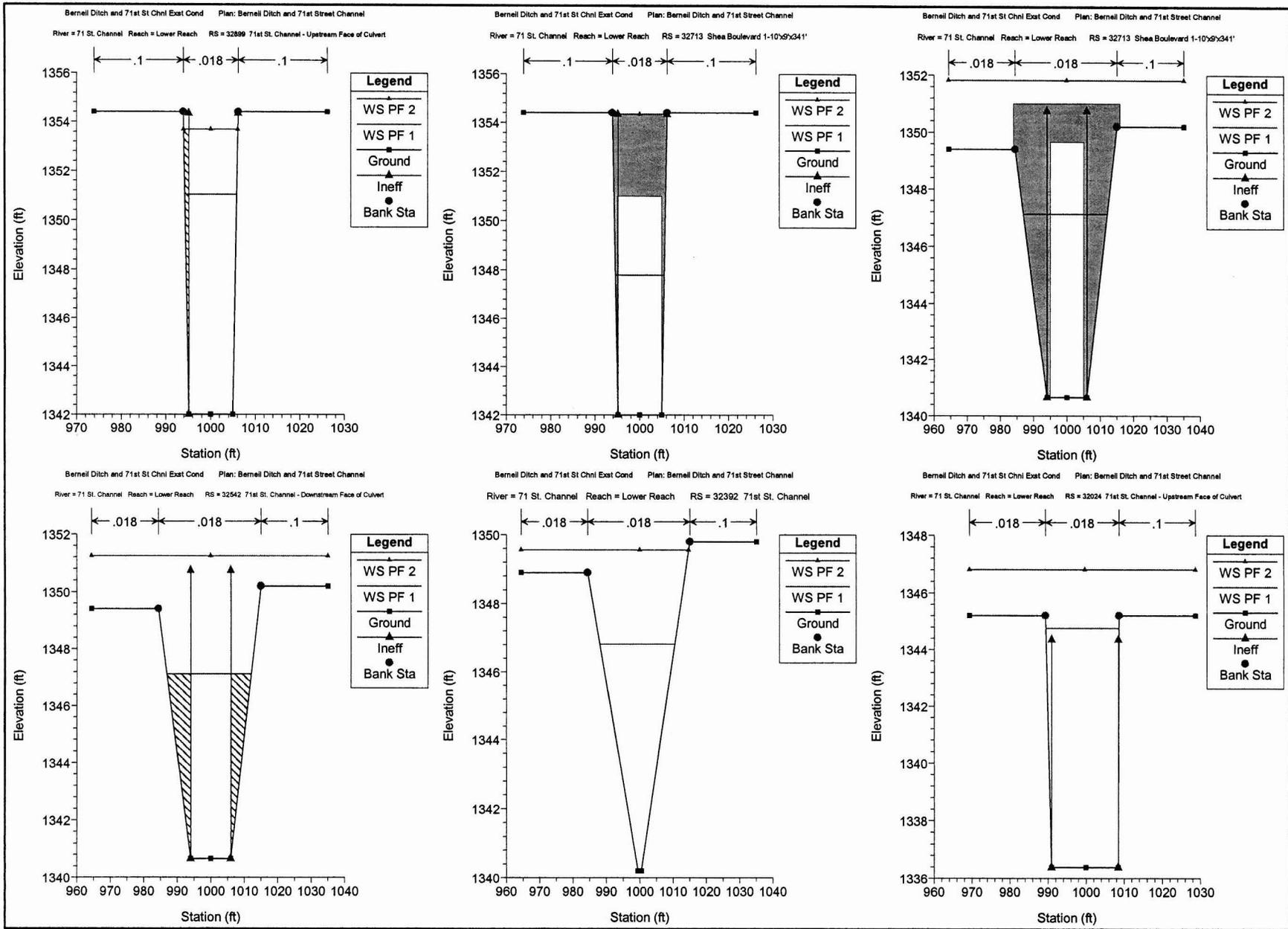


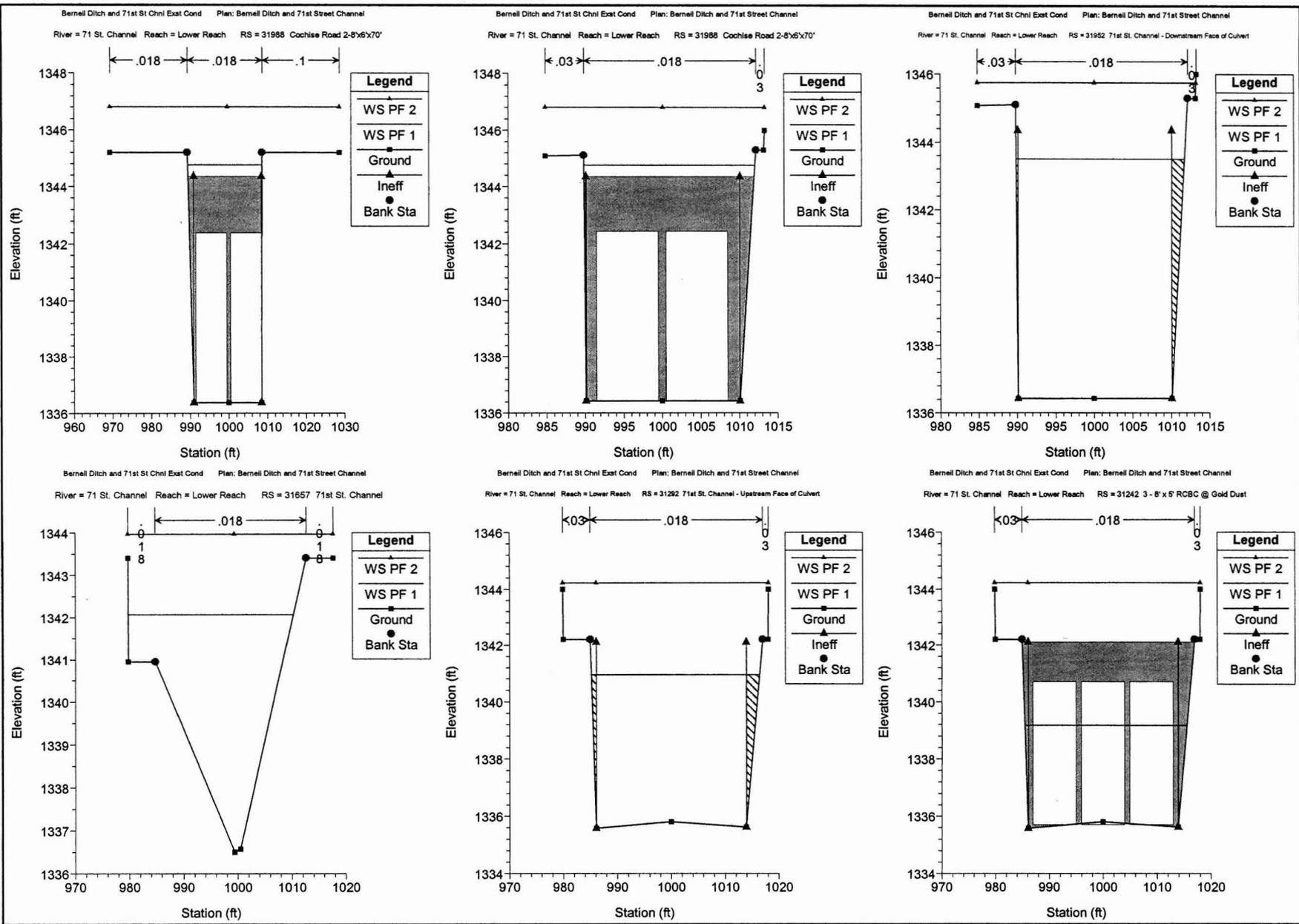


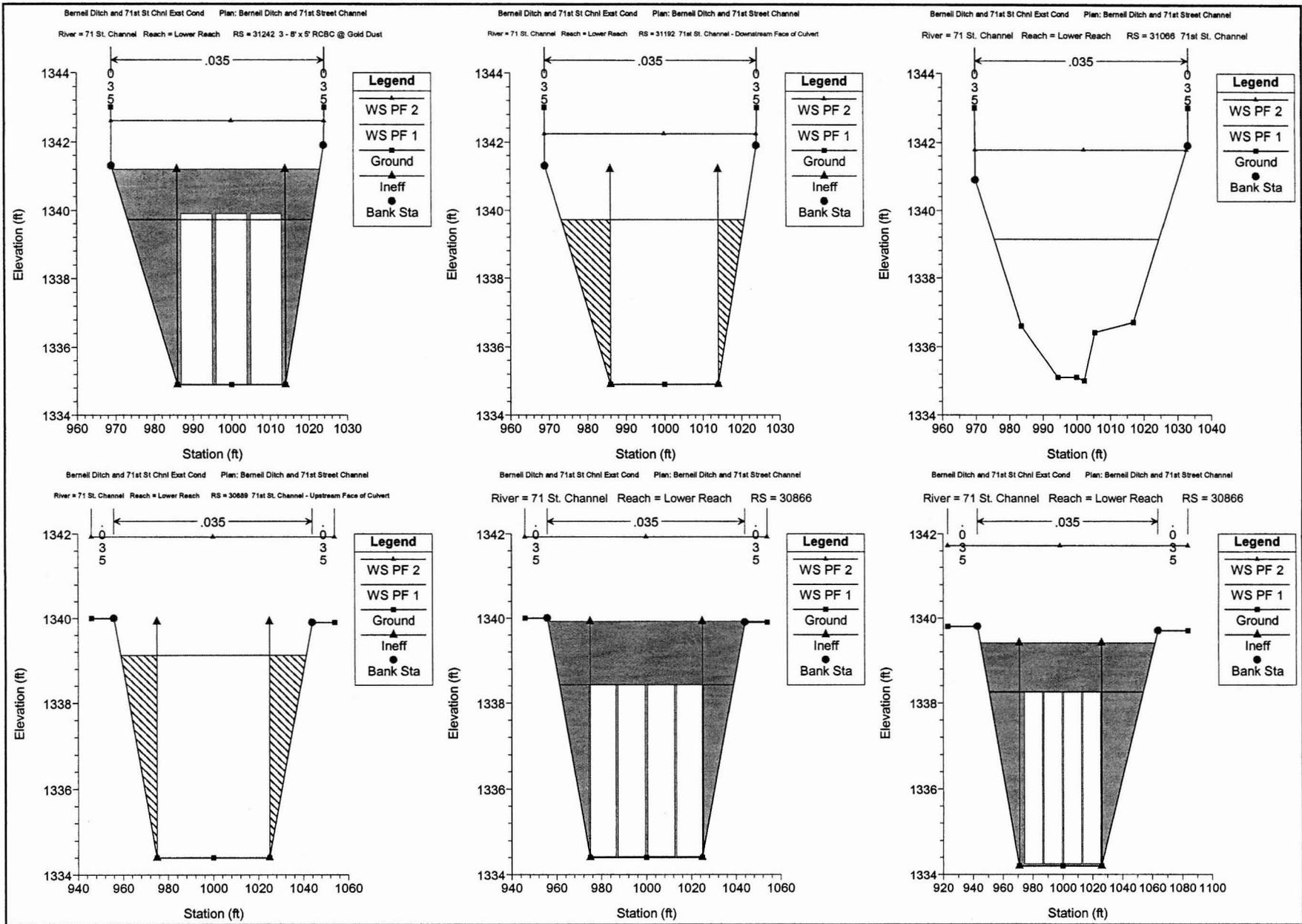


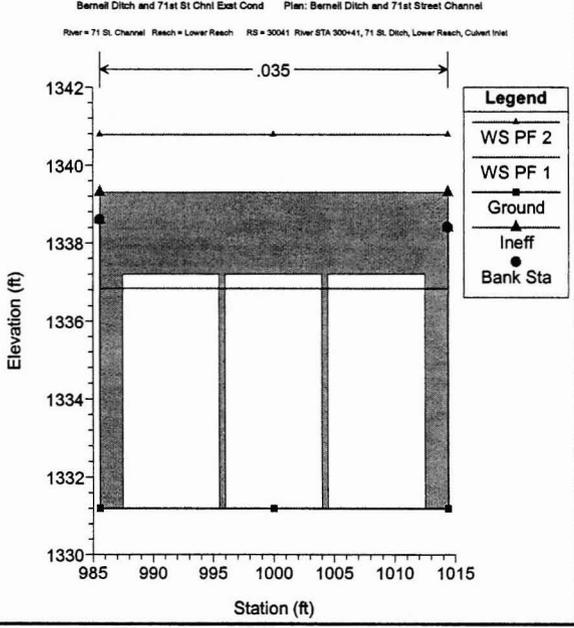
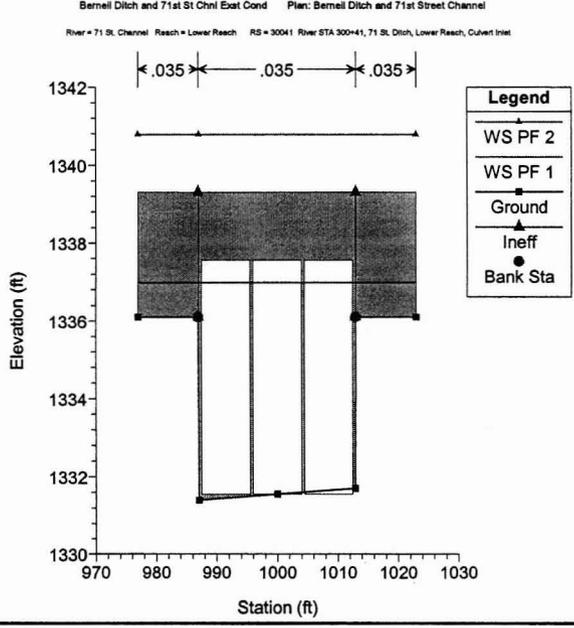
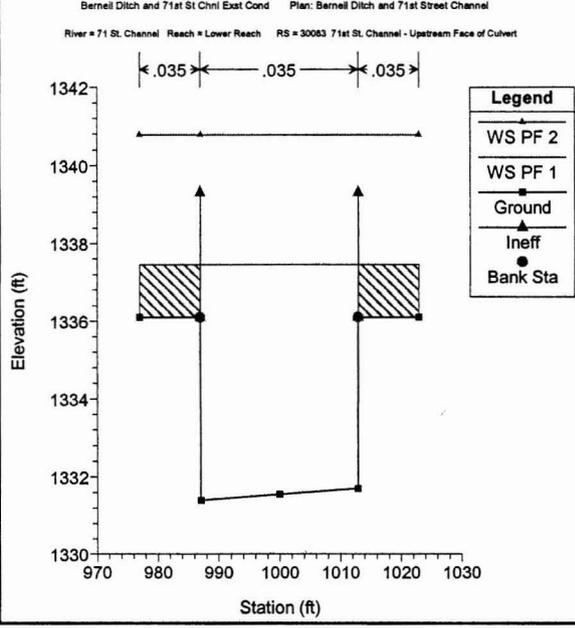
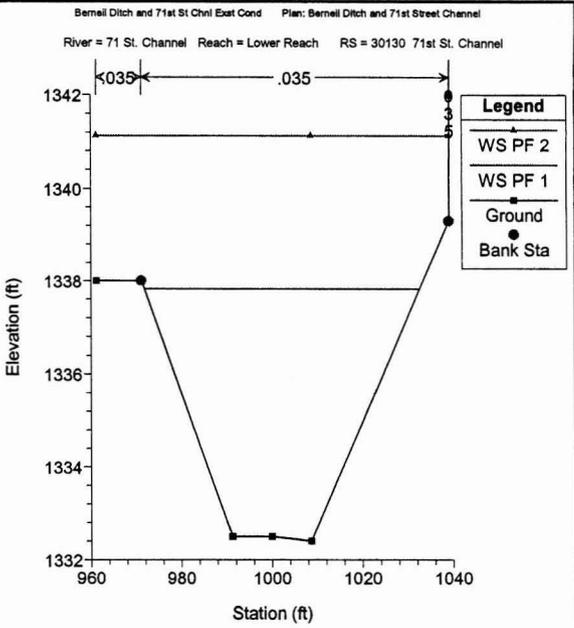
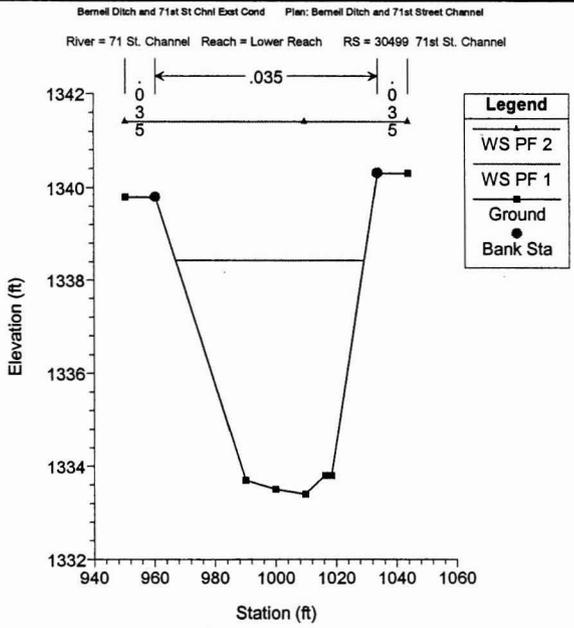
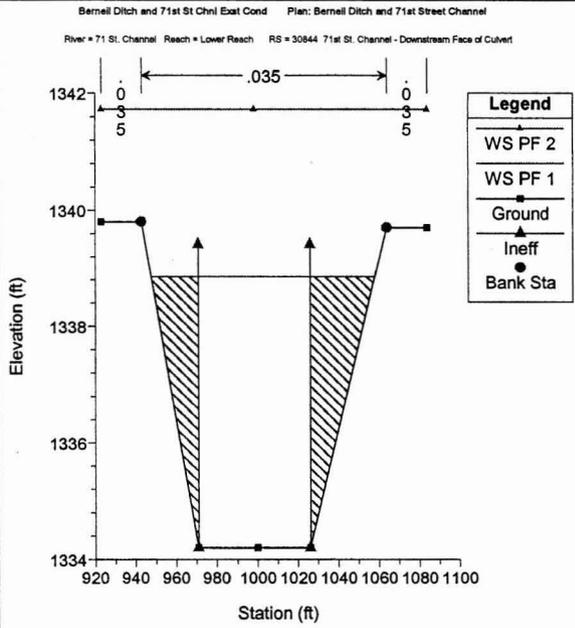


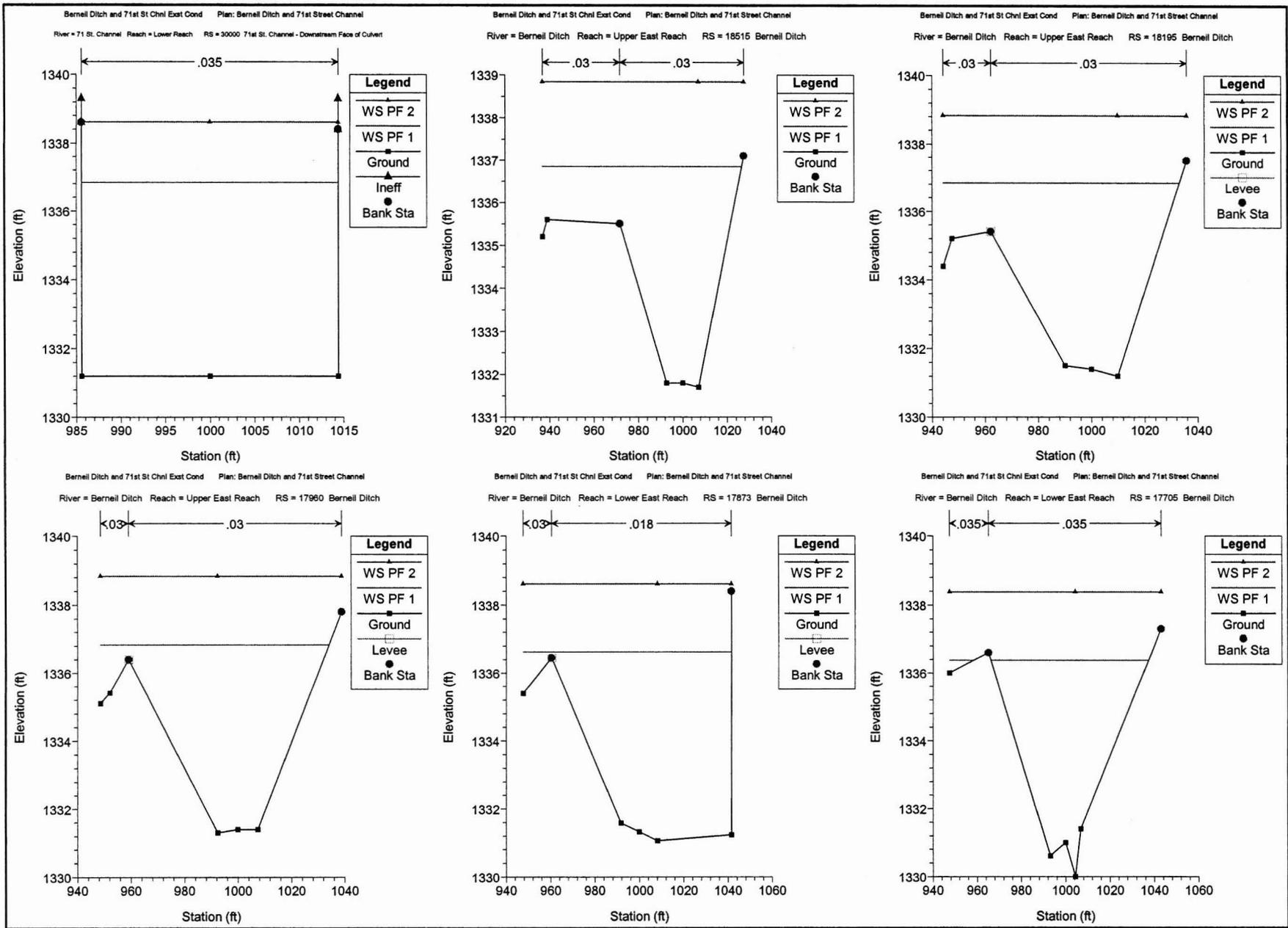


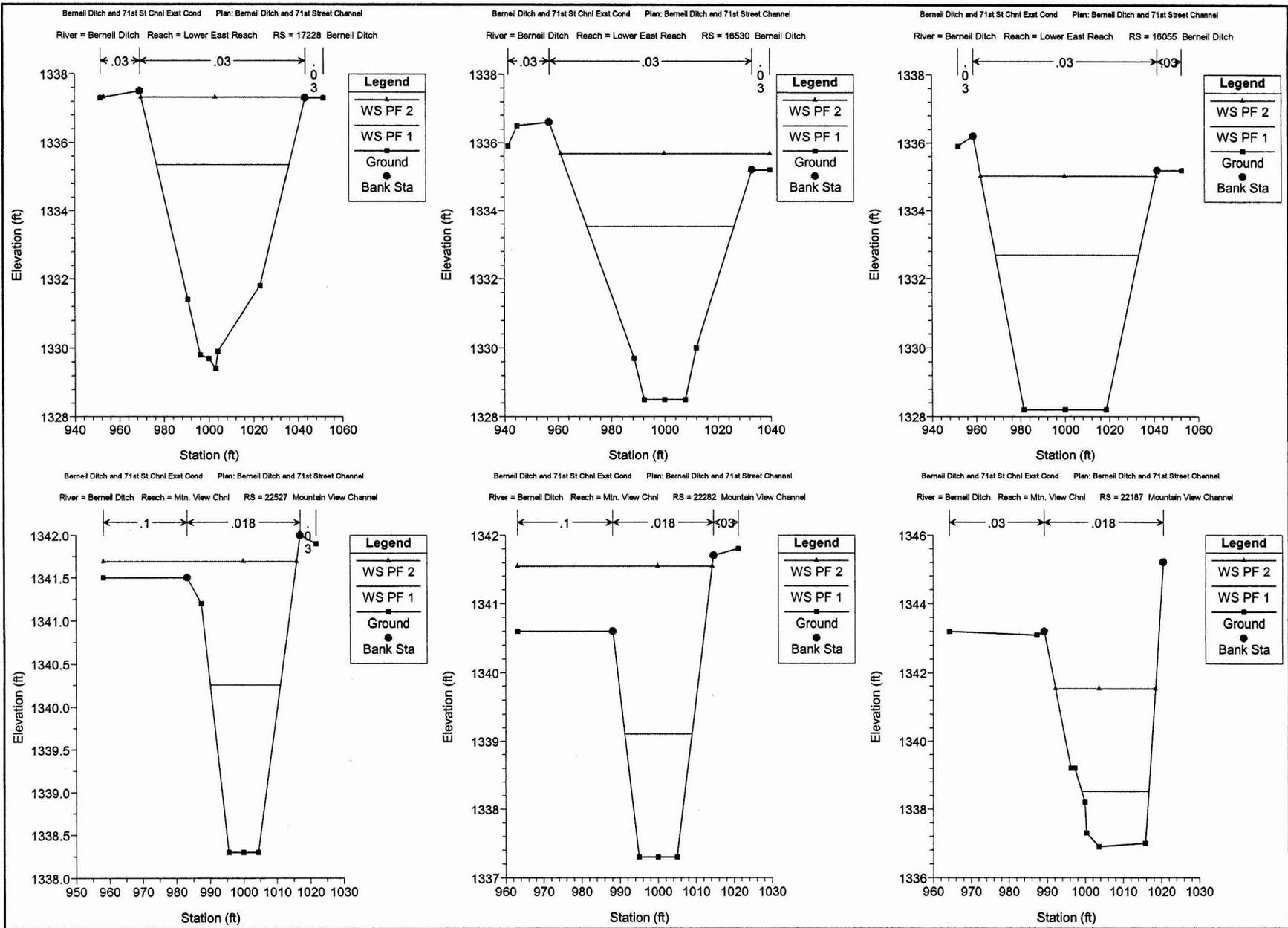


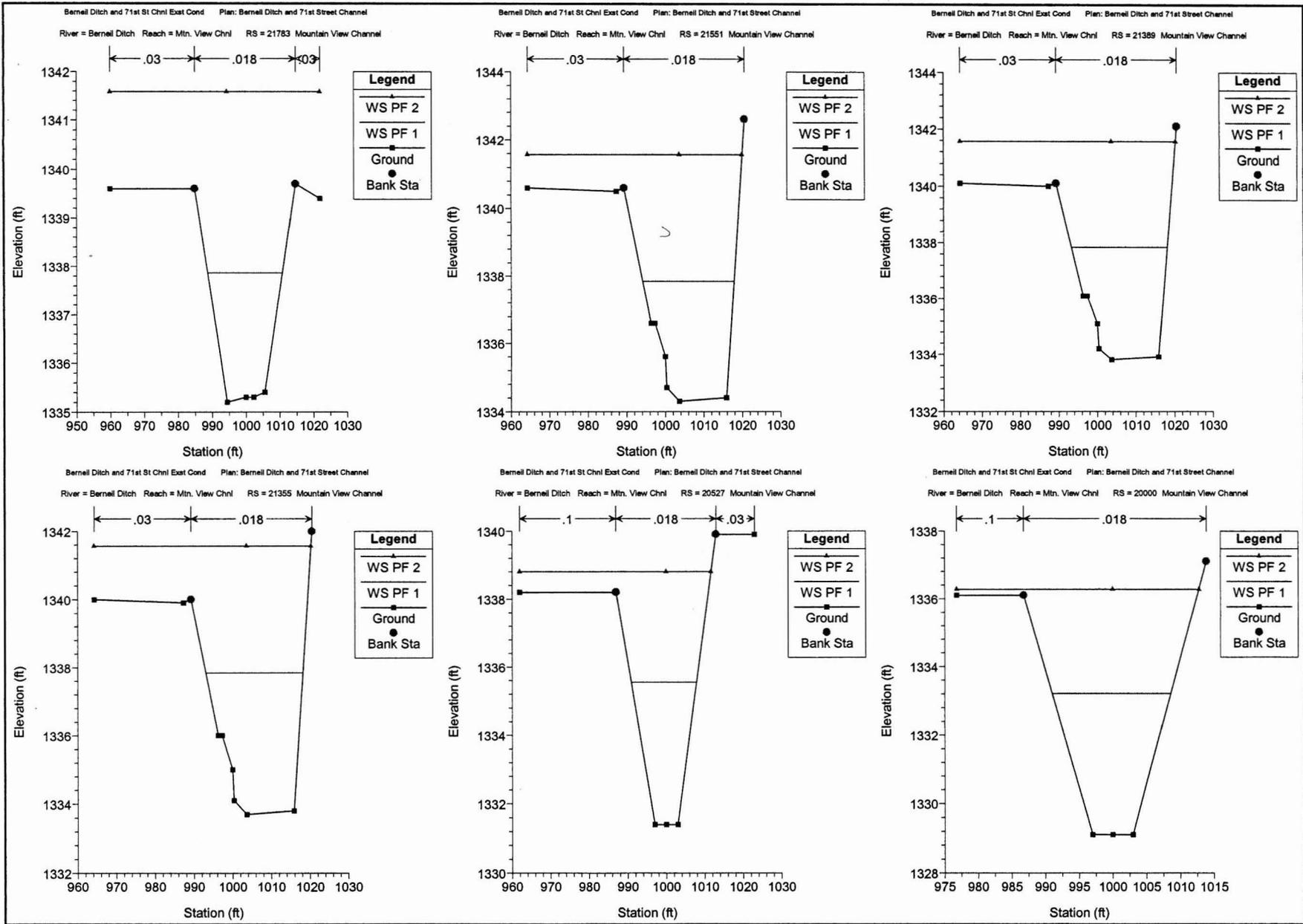


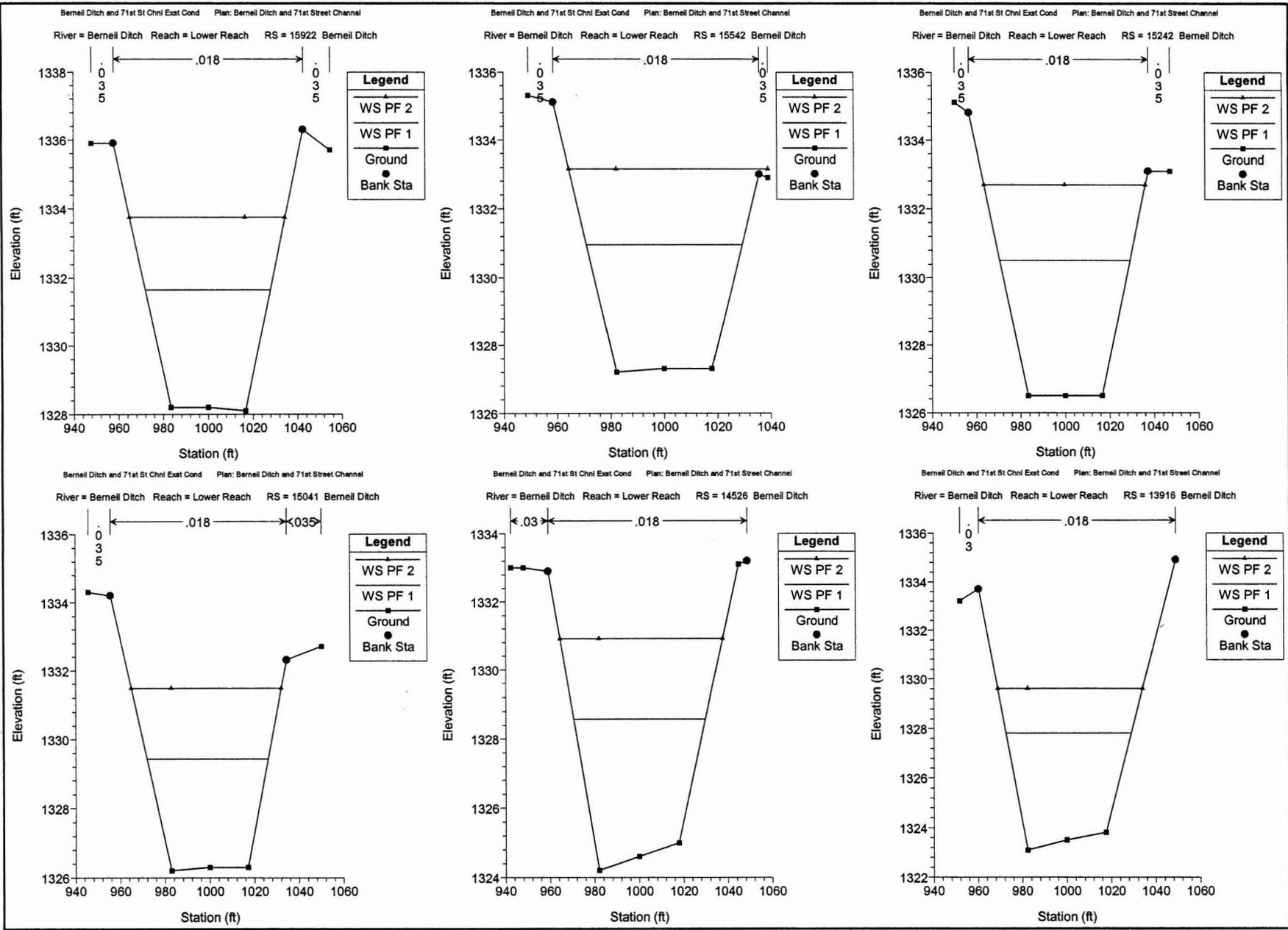


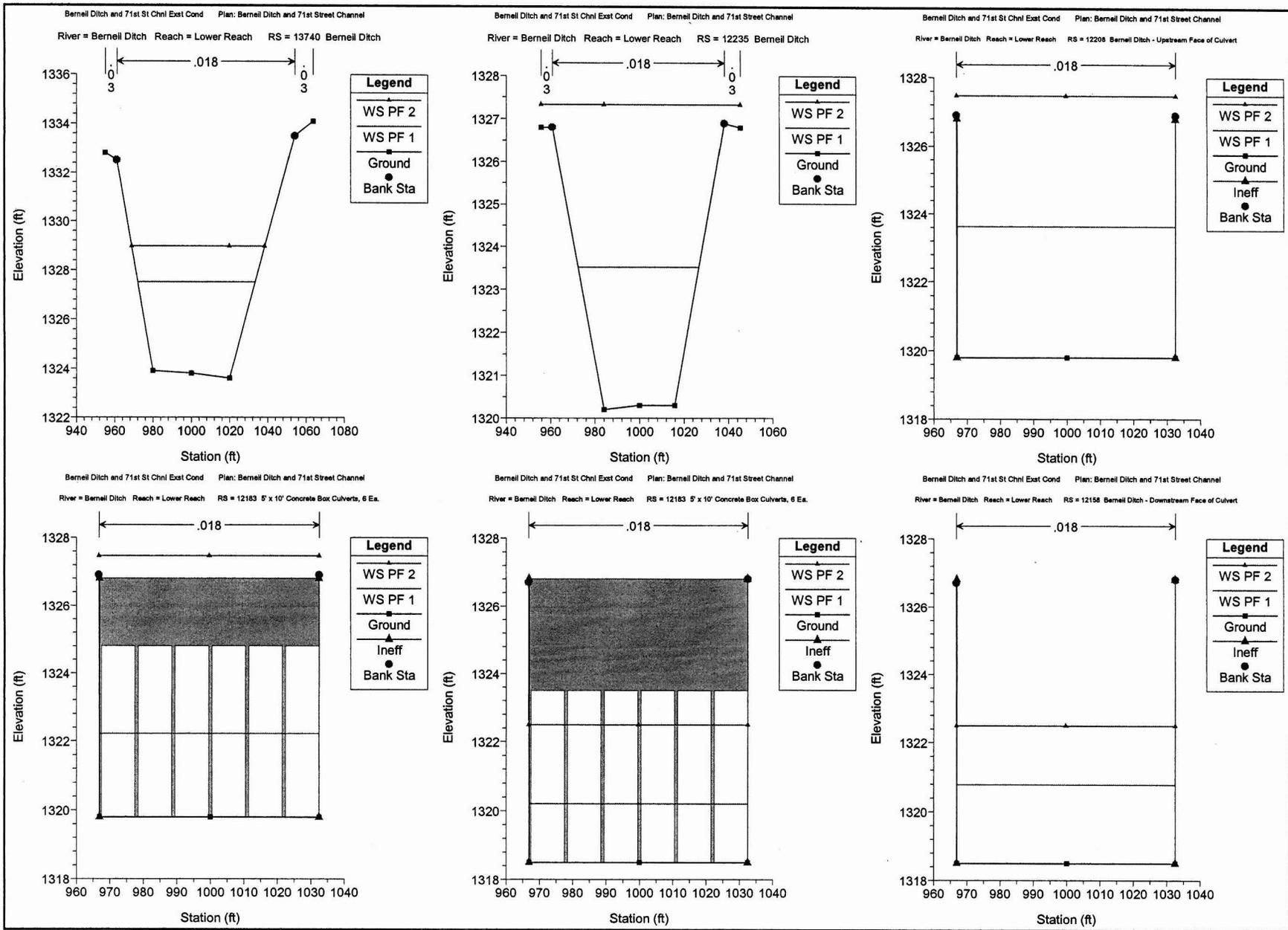






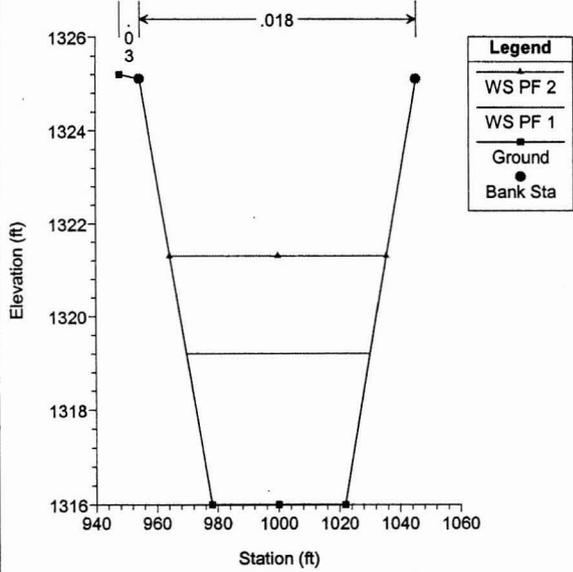






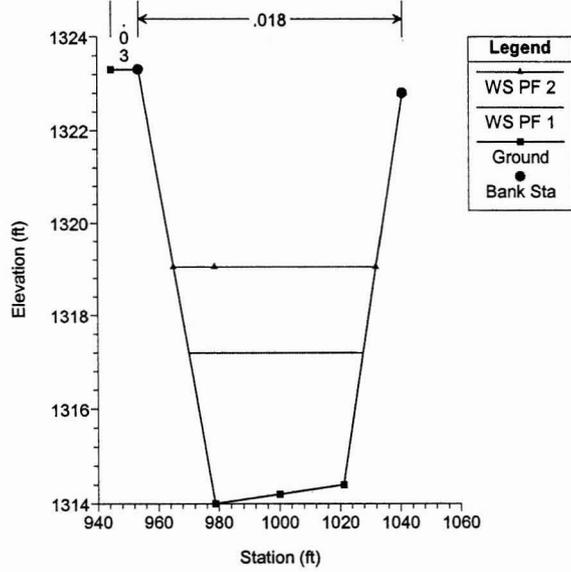
Berneil Ditch and 71st St Chnl Exit Cond Plan: Berneil Ditch and 71st Street Channel

River = Berneil Ditch Reach = Lower Reach RS = 12058 Berneil Ditch



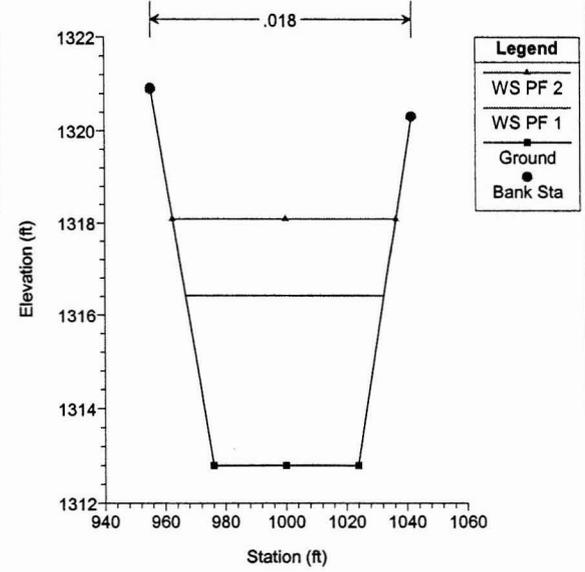
Berneil Ditch and 71st St Chnl Exit Cond Plan: Berneil Ditch and 71st Street Channel

River = Berneil Ditch Reach = Lower Reach RS = 11408 Berneil Ditch



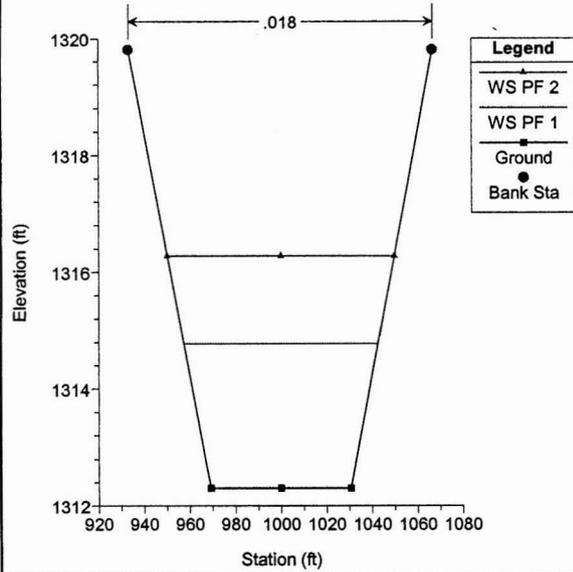
Berneil Ditch and 71st St Chnl Exit Cond Plan: Berneil Ditch and 71st Street Channel

River = Berneil Ditch Reach = Lower Reach RS = 10808 Berneil Ditch



Berneil Ditch and 71st St Chnl Exit Cond Plan: Berneil Ditch and 71st Street Channel

River = Berneil Ditch Reach = Lower Reach RS = 10000 Berneil Ditch



EXISTING CONDITIONS HEC-RAS  
HYDRAULICS REPORT & CULVERT TABLE

```

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
XXXXXXXX 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   XXXXXX   XXXX   X   X   X   X   XXXXX
  
```

**PROJECT DATA**

Project Title: Berneil Ditch and 71st St Chnl Exst Cond  
 Project File : exstcondrev01.prj  
 Run Date and Time: 10/18/02 8:28:33 AM

Project in English units

**Project Description:**

Scottsdale Rd Corridor Master Drainage  
 Berneil Ditch, Mountain View Ditch and  
 71st Street Channel

**Existing Conditions**

Profile No. 1: 10-yr 6-hr

**Profile**

No. 2: 100-yr 6-hr

Flow Rates Based on 15586C.DAT and 15586C10.DAT Existing  
 Conditions HEC-1 Models

**PLAN DATA**

Plan Title: Berneil Ditch and 71st Street Channel  
 Plan File : q:\15586\Final\Models\HEC-RAS\exstcondrev01.p01

Geometry Title: Berneil Ditch and 71st Street Channel  
 Geometry File : q:\15586\Final\Models\HEC-RAS\exstcondrev01.g01

Flow Title : Berneil Ditch and 71st Street Channel  
 Flow File : q:\15586\Final\Models\HEC-RAS\exstcondrev01.f01

**Plan Summary Information:**

Number of: Cross Sections = 76    Muiltple Openings = 0  
 Culverts        = 9        Inline Weirs        = 0  
 Bridges         = 0

**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: Berneil Ditch and 71st Street Channel  
 Flow File : q:\15586\Final\Models\HEC-RAS\exstcondrev01.f01

**Flow Data (cfs)**

River	Reach	RS	PF 1	PF 2
71 St. Channel	Lower Reach	37941	498	1171
71 St. Channel	Lower Reach	34378	660	1448
71 St. Channel	Lower Reach	34245	713	1557
71 St. Channel	Lower Reach	33446	793	1644
71 St. Channel	Lower Reach	32542	823	1703
Berneil Ditch	Upper East Reach	18515	176	215
Berneil Ditch	Lower East Reach	17873	993	2003
Berneil Ditch	Mtn. View Chnl	22527	169	359
Berneil Ditch	Mtn. View Chnl	20527	456	1379
Berneil Ditch	Lower Reach	15922	1282	2981

**Boundary Conditions**

River	Reach	Profile	Upstream	Downstream
Berneil Ditch	Lower Reach	PF 1		Normal S = .0027
Berneil Ditch	Lower Reach	PF 2		Normal S = .0027

GEOMETRY DATA

Geometry Title: Berneil Ditch and 71st Street Channel  
 Geometry File : q:\15586\Final\Models\HEC-RAS\exstcondrev01.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
71 St. Channel	Lower Reach		Bern/71 Jct
Berneil Ditch	Upper East Reach		Bern/71 Jct
Berneil Ditch	Lower East Reach	Bern/71 Jct	Berneil Jct
Berneil Ditch	Mtn. View Chnl		Berneil Jct
Berneil Ditch	Lower Reach	Berneil Jct	

JUNCTION INFORMATION

Name: Berneil Jct  
 Description: West Reach/Lower East Reach/Lower Reach  
 Momentum computation Method  
 Add Friction  
 Do Not Add Weight

Length across Junction		Tributary		Length	Angle
River	Reach	River	Reach		
Berneil Ditch	Lower East Reach	to Berneil Ditch	Lower Reach	110	45
Berneil Ditch	Mtn. View Chnl	to Berneil Ditch	Lower Reach	160	10

Name: Bern/71 Jct  
 Description: 71 st ditch/Berneil Lower East Reach/Berneil East Reach  
 Momentum computation Method  
 Add Friction  
 Do Not Add Weight

Length across Junction		Tributary		Length	Angle
River	Reach	River	Reach		
Berneil Ditch	Upper East Reach	to Berneil Ditch	Lower East Reach	82	0
71 St. Channel	Lower Reach	to Berneil Ditch	Lower East Reach	50	45

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37941

INPUT

Description: 71st St. Channel  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
974.9	1383	994.9	1383	995.1	1379.1	1000	1379.1	1004.9	1379.2
1005.2	1383	1025.2	1383						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
974.9	.018	994.9	.018	1005.2	.018

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 994.9 1005.2 133 133 133 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37808

INPUT

Description: 71st St. Channel  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
937.2	1383.2	973.5	1383.2	987.2	1383.8	992.5	1379.1	1000	1378.9
1007.5	1378.7	1013.5	1383.7	1024.1	1385.3	1063.5	1385.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
937.2	.05	987.2	.018	1013.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 987.2 1013.5 108 108 108 .1 .3  
 Left Levee Station= 987.2 Elevation=

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37700

INPUT

Description: 71st St. Channel - Upstream Face of Culvert  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
939.3	1383.6	989.3	1383.6	989.5	1378.6	991	1378.6	1000	1378.6
1009	1378.6	1010.3	1378.6	1010.5	1383.7	1060.5	1383.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
939.3	.05	989.3	.018	1010.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 989.3 1010.5 85 85 85 .1 .3

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CULVERT RIVER: 71 St. Channel

REACH: Lower Reach RS: 37658

INPUT

Description: Paradise Dr., 2 - 10'x3'x83' CBC
Distance from Upstream XS = 1
Deck/Roadway Width = 82
Weir Coefficient = 3
Upstream Deck/Roadway Coordinates
num= 2
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
940 1383.69 1060 1383.69

Upstream Bridge Cross Section Data

Station Elevation Data num= 9
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
939.3 1383.6 989.3 1383.6 989.5 1378.6 991 1378.6 1000 1378.6
1009 1378.6 1010.3 1378.6 1010.5 1383.7 1060.5 1383.7

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
939.3 .05 989.3 .018 1010.5 .05

Bank Sta: Left Right Coeff Contr. Expan.
989.3 1010.5 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
888 F
888 F

Downstream Deck/Roadway Coordinates

num= 2
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
940 1382.93 1060 1382.93

Downstream Bridge Cross Section Data

Station Elevation Data num= 7
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
984.3 1382.9 989.3 1382.9 989.5 1378.5 1000 1378.5 1010.5 1378.6
1010.7 1382.9 1060.7 1382.9

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
984.3 .1 989.3 .018 1010.7 .05

Bank Sta: Left Right Coeff Contr. Expan.
989.3 1010.7 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
888 F
888 F

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 = 1383.69
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
Paradise Dr. Box 3 10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef
1 83 .013 .5 1

Number of Barrels = 2
Upstream Elevation = 1378.59

Centerline Stations
Sta. Sta.
994.5 1005.5

Downstream Elevation = 1378.55

Centerline Stations
Sta. Sta.
994.5 1005.5

CROSS SECTION RIVER: 71 St. Channel
REACH: Lower Reach RS: 37615

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data num= 7
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
984.3 1382.9 989.3 1382.9 989.5 1378.5 1000 1378.5 1010.5 1378.6
1010.7 1382.9 1060.7 1382.9

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
984.3 .1 989.3 .018 1010.7 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
989.3 1010.7 272 272 272 .1 .3

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
888 F
888 F

CROSS SECTION RIVER: 71 St. Channel

REACH: Lower Reach RS: 37343

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 8							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
982.9	1382.4	987.9	1382.4	992	1378.6	1000	1378.4	1008	1378.2
1013	1382.5	1013.3	1382.4	1063.3	1382.4				

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
982.9	.1	987.9	.018	1013	.05

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	987.9	1013		295	295		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 37048

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 9							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
940	1379.4	990.1	1379.4	990.3	1377.8	992.7	1377.3	1000	1377.3
1007.3	1377.3	1009.6	1377.6	1010.1	1379.5	1060	1379.5		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
940	.1	990.1	.018	1010.1	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	990.1	1010.1		136	136		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36912

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 9							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
937	1379.4	987	1379.4	987.2	1377.3	996.2	1376.4	1000	1376.4
1003.8	1376.3	1006.8	1377.1	1007.3	1379.7	1057.3	1379.7		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
937	.1	987	.02	1007.3	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	987	1007.3		200	200		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36712

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
942.3	1376.3	992.3	1376.3	995.3	1375.6	1000	1375.6	1004.8	1375.6
1007.8	1376.4	1057.8	1376.4						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
942.3	.1	992.3	.02	1007.8	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	992.3	1007.8		48	48		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36664

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.9	1375.8	991.9	1375.8	995.3	1375.2	1000	1375.2	1004.7	1375.2
1008.1	1375.8	1058.1	1375.8						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
941.9	.1	991.9	.02	1008.1	.1

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	991.9	1008.1		85	85		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36579

INPUT

Description: 71st St. Channel

Station Elevation Data		num= 7							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.9	1375.6	991.9	1375.6	995.2	1374.7	1000	1374.7	1004.9	1374.7
1006.9	1375.5	1011.9	1375.5						

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
941.9	.1	991.9	.02	1006.9	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	991.9	1006.9		273	273		.1	.3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36306

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 6  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
937.46 1373.71 987.46 1373.71 990.64 1372.86 1000 1372.85 1002.9 1373.65  
1052.9 1373.65

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
937.46 .035 987.46 .016 1002.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
987.46 1002.9 73 73 73 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36233

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
935.3 1372.71 985.3 1372.71 985.4 1372.21 1000 1372.05 1015.75 1372.14  
1015.85 1372.64 1065.85 1372.64

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
935.3 .035 985.3 .016 1015.85 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
985.3 1015.85 145 145 145 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36088

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
934.6 1371.71 984.6 1371.71 984.7 1371.21 1000 1370.86 1016 1371.21  
1016.1 1371.71 1066.1 1371.71

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
934.6 .035 984.6 .016 1016.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.6 1016.1 243 243 243 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35845

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
934.6 1370.09 984.6 1370.09 984.7 1369.59 1000 1369.45 1016 1369.59  
1016.1 1370.09 1066.1 1370.09

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
934.6 .035 984.6 .016 1016.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.6 1016.1 352 352 352 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35493

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
934.6 1368.08 984.6 1368.08 984.7 1367.58 1000 1367.25 1016 1367.57  
1016.1 1368.07 1066.1 1368.07

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
934.6 .035 984.6 .016 1016.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.6 1016.1 82 82 82 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35411

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
934.5 1367.52 984.5 1367.52 984.6 1367.02 1000 1366.83 1016 1367.03  
1016.1 1367.53 1066.1 1367.53

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
934.5 .035 984.5 .016 1016.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.5 1016.1 100 100 100 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35311

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
911.3 1367.1 961.3 1367.1 961.4 1366.6 987.2 1366.27 1000 1366  
1012.8 1366.44 1032.6 1366.61 1032.7 1367.11 1082.7 1367.11

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
911.3 .025 961.3 .016 1032.7 .025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
961.3 1032.7 59 59 59 .1 .3

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35252

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
987 1366.8 988 1366.8 994 1365 1000 1365.1 1006 1365.1  
1010.2 1367.2 1011.2 1367.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
987 .035 988 .018 1010.2 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
988 1010.2 229 229 229 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35023

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
988.3 1365.4 989.3 1365.4 994.1 1363.7 1000 1363.8 1005.9 1364  
1009.3 1365.4 1010.3 1365.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
988.3 .035 989.3 .018 1009.3 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
989.3 1009.3 150 150 150 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34873

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
989 1364.8 990 1364.8 994.2 1363.4 1000 1363.3 1005.9 1363.3  
1010.9 1365 1011.9 1365

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
989 .035 990 .018 1010.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
990 1010.9 200 200 200 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34673

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
988.4 1364.6 989.4 1364.6 993.8 1362.7 1000 1362.7 1006.2 1362.7  
1010.4 1364.4 1011.4 1364.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
988.4 .035 989.4 .018 1010.4 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
989.4 1010.4 295 295 295 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34378

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
961.2 1363.6 962.2 1363.6 992.2 1355 1000 1355 1007.8 1355.1

1032 1360.9 1057 1360.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
961.2 .035 962.2 .03 1032 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
962.2 1032 40 40 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34338

INPUT  
Description: 71st St. Channel -, Upstream Face of Culvert

Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
969 1361.35 970 1361.35 972 1354.28 989 1354.28 1000 1354.28  
1011 1354.28 1028 1354.28 1030 1361.35 1055 1361.35

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
969 .035 970 .03 1030 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
970 1030 31 31 31 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34322

INPUT  
Description: Mescal Drive 2-10'x6'x30'

Distance from Upstream XS = 1  
Deck/Roadway Width = 25  
Weir Coefficient = 3

Upstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
970 1361.61 1030 1361.61

Upstream Bridge Cross Section Data num= 9  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
969 1361.35 970 1361.35 972 1354.28 989 1354.28 1000 1354.28  
1011 1354.28 1028 1354.28 1030 1361.35 1055 1361.35

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
969 .035 970 .03 1030 .035

Bank Sta: Left Right Coeff Contr. Expan.  
970 1030 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
970 1360.72 1030 1360.72

Downstream Bridge Cross Section Data num= 9  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
969 1361.05 970 1361.05 972 1353.8 989 1353.8 1000 1353.8  
1011 1353.8 1028 1353.8 1030 1361.05 1055 1361.05

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
969 .035 970 .03 1030 .02

Bank Sta: Left Right Coeff Contr. Expan.  
970 1030 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

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 = 1361.61  
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 6 10  
FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
Solution Criteria = Highest U.S. EG  
Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
1 30 .013 .5 1  
Number of Barrels = 2

Upstream Elevation = 1354.28  
 Centerline Stations  
 Sta. Sta.  
 994 1006  
 Downstream Elevation = 1353.8  
 Centerline Stations  
 Sta. Sta.  
 994 1006

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #1

Culv Q (cfs)	660.00	Culv Ful Lngh (ft)	
# Barrels	2	Culv Vel US (ft/s)	6.86
Q Barrel (cfs)	330.00	Culv Vel DS (ft/s)	6.09
E.G. US. (ft)	1360.19	Culv Inv El Up (ft)	1354.28
W.S. US. (ft)	1359.71	Culv Inv El Dn (ft)	1353.80
E.G. DS (ft)	1359.69	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	1359.22	Culv Ext Lss (ft)	0.10
Delta EG (ft)	0.49	Culv Ent Lss (ft)	0.37
Delta WS (ft)	0.50	Q Weir (cfs)	
E.G. IC (ft)	1359.43	Weir Sta Lft (ft)	
E.G. OC (ft)	1360.19	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1359.09	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1359.22	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.86	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	3.23	Min El Weir Flow (ft)	1361.62

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #1

Culv Q (cfs)	956.22	Culv Ful Lngh (ft)	30.00
# Barrels	2	Culv Vel US (ft/s)	7.97
Q Barrel (cfs)	478.11	Culv Vel DS (ft/s)	7.97
E.G. US. (ft)	1363.07	Culv Inv El Up (ft)	1354.28
W.S. US. (ft)	1362.94	Culv Inv El Dn (ft)	1353.80
E.G. DS (ft)	1361.69	Culv Frctn Ls (ft)	0.06
W.S. DS (ft)	1361.53	Culv Ext Lss (ft)	0.83
Delta EG (ft)	1.38	Culv Ent Lss (ft)	0.49
Delta WS (ft)	1.42	Q Weir (cfs)	491.78
E.G. IC (ft)	1362.58	Weir Sta Lft (ft)	969.00
E.G. OC (ft)	1363.07	Weir Sta Rgt (ft)	1055.00
Culvert Control	Outlet	Weir Submerg	0.04
Culv WS Inlet (ft)	1360.28	Weir Max Depth (ft)	1.72
Culv WS Outlet (ft)	1359.80	Weir Avg Depth (ft)	1.54
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	132.01
Culv Crt Depth (ft)	4.14	Min El Weir Flow (ft)	1361.62

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 34307

INPUT

Description: 71st St. Channel -, Downstream Face of Culvert

Station Elevation Data		num=	9						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
969	1361.05	970	1361.05	972	1353.8	989	1353.8	1000	1353.8
1011	1353.8	1028	1353.8	1030	1361.05	1055	1361.05		

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
969	.035	970	.03
1030	.02		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
970	1030	62	62	.3	.5

Ineffective Flow		num=	2
Sta L	Sta R	Elev	Permanent
888	F		
888	F		

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 34245

INPUT

Description: 71st St. Channel

Station Elevation Data		num=	8						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
973.1	1360.5	974.1	1360.5	991	1355.7	996.2	1353.5	1000	1353.5
1003.8	1353.5	1027	1360	1052	1360				

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
973.1	.035	974.1	.03
1027	.02		

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
974.1	1027	413	413	.1	.3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33832

INPUT

Description: 71st St. Channel

Station Elevation Data		num=	6						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
980	1357.6	999.5	1351.5	1000	1351.5	1000.5	1351.5	1016	1357
1031	1357								

Manning's n Values	num=	3
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Sta	n Val	Sta	n Val	Sta	n Val						
980	.035	980	.035	1016	.03						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 980 1016 386 386 386 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33446

INPUT  
 Description: 71st St. Channel  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
981	1355.9	983	1355.9	992	1349.5	1000	1349.5	1008	1349.5
1019	1355.9	1039	1355.9						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
981	.035	983	.035	1019	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 983 1019 33 33 33 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33413

INPUT  
 Description: 71st St. Channel - Upstream Face of Culvert  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
981	1355.6	984	1355.6	984.5	1349.8	1000	1349.8	1015.5	1349.8
1021.3	1355.7	1041.3	1355.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
981	.035	984	.035	1021.3	.1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 984 1021.3 61 61 61 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CULVERT RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33382

INPUT  
 Description: Sahuaro Drive 3-10'x5'x60'  
 Distance from Upstream XS = 1  
 Deck/Roadway Width = 59  
 Weir Coefficient = 3  
 Upstream Deck/Roadway Coordinates num= 2

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
978	1356.8				1042	1356.8			

Upstream Bridge Cross Section Data  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
981	1355.6	984	1355.6	984.5	1349.8	1000	1349.8	1015.5	1349.8
1021.3	1355.7	1041.3	1355.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
981	.035	984	.035	1021.3	.1

Bank Sta: Left Right Coeff Contr. Expan.  
 984 1021.3 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

Downstream Deck/Roadway Coordinates num= 2

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
950	1356.22				1050	1356.22			

Downstream Bridge Cross Section Data  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
959	1355.1	984	1355.1	984.5	1349.3	1000	1349.3	1015.5	1349.3
1021.3	1355.2	1046.3	1355.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
959	.1	984	.03	1021.3	.1

Bank Sta: Left Right Coeff Contr. Expan.  
 984 1021.3 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1357.38

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 5 10  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 60 .013 .5 1

Number of Barrels = 3  
 Upstream Elevation = 1349.8  
 Centerline Stations  
 Sta. Sta. Sta.  
 989.5 1000 1010.5  
 Downstream Elevation = 1349.3  
 Centerline Stations  
 Sta. Sta. Sta.  
 989.5 1000 1010.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #1

Culv Q (cfs)	793.00	Culv Ful Lngh (ft)	60.00
# Barrels	3	Culv Vel US (ft/s)	5.29
Q Barrel (cfs)	264.33	Culv Vel DS (ft/s)	5.29
E.G. US. (ft)	1355.20	Culv Inv El Up (ft)	1349.80
W.S. US. (ft)	1354.79	Culv Inv El Dn (ft)	1349.30
E.G. DS (ft)	1354.86	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	1354.49	Culv Ext Lss (ft)	0.06
Delta EG (ft)	0.34	Culv Ent Lss (ft)	0.22
Delta WS (ft)	0.31	Q Weir (cfs)	
E.G. IC (ft)	1354.27	Weir Sta Lft (ft)	
E.G. OC (ft)	1355.20	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1354.80	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1354.30	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	2.79	Min El Weir Flow (ft)	1357.38

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #1

Culv Q (cfs)	1136.13	Culv Ful Lngh (ft)	60.00
# Barrels	3	Culv Vel US (ft/s)	7.57
Q Barrel (cfs)	378.71	Culv Vel DS (ft/s)	7.57
E.G. US. (ft)	1358.79	Culv Inv El Up (ft)	1349.80
W.S. US. (ft)	1358.38	Culv Inv El Dn (ft)	1349.30
E.G. DS (ft)	1357.77	Culv Frctn Ls (ft)	0.13
W.S. DS (ft)	1357.32	Culv Ext Lss (ft)	0.44
Delta EG (ft)	1.01	Culv Ent Lss (ft)	0.45
Delta WS (ft)	1.06	Q Weir (cfs)	507.87
E.G. IC (ft)	1357.78	Weir Sta Lft (ft)	981.00
E.G. OC (ft)	1358.79	Weir Sta Rgt (ft)	1041.30
Culvert Control	Outlet	Weir Submerg	0.26
Culv WS Inlet (ft)	1354.80	Weir Max Depth (ft)	1.99
Culv WS Outlet (ft)	1354.30	Weir Avg Depth (ft)	1.99
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	120.00
Culv Crt Depth (ft)	3.54	Min El Weir Flow (ft)	1357.38

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33352

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data num=	7								
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
959 1355.1 984 1355.1 984.5 1349.3 1000 1349.3 1015.5 1349.3									
1021.3 1355.2 1046.3 1355.2									

Manning's n Values num=	3				
Sta n Val Sta n Val Sta n Val					
959 .1 984 .03 1021.3 .1					

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.									
984 1021.3 62 62 62 .3 .5									

Ineffective Flow num=	2				
Sta L Sta R Elev Permanent					
888 F					
888 F					

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33290

INPUT

Description: 71st St. Channel

Station Elevation Data num=	7								
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
958.5 1355.3 978.5 1355.3 993.5 1349.1 1000 1349.2 1006.5 1349.2									
1018.5 1354.9 1038.5 1354.9									

Manning's n Values num=	3				
Sta n Val Sta n Val Sta n Val					
958.5 .1 978.5 .03 1018.5 .1					

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
978.5 1018.5 391 391 391 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 32899

INPUT

Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
973.9 1354.4 993.9 1354.4 995.1 1342 1000 1342 1005 1342  
1006.2 1354.4 1026.2 1354.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
973.9 .1 993.9 .018 1006.2 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
993.9 1006.2 357 357 357 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 32713

INPUT

Description: Shea Boulevard 1-10'x9'x341'

Distance from Upstream XS = 15  
Deck/Roadway Width = 340  
Weir Coefficient = 3

Upstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
984 1354.33 1016 1354.33

Upstream Bridge Cross Section Data  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
973.9 1354.4 993.9 1354.4 995.1 1342 1000 1342 1005 1342  
1006.2 1354.4 1026.2 1354.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
973.9 .1 993.9 .018 1006.2 .1

Bank Sta: Left Right Coeff Contr. Expan.  
993.9 1006.2 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
984 1351 1016 1351

Downstream Bridge Cross Section Data  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
964.4 1349.4 984.4 1349.4 994 1340.66 1000 1340.66 1006 1340.66  
1015.1 1350.2 1035.1 1350.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
964.4 .018 984.4 .018 1015.1 .1

Bank Sta: Left Right Coeff Contr. Expan.  
984.4 1015.1 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

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 9 10  
FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG  
Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
15 341 .013 .5 1

Upstream Elevation = 1342  
Centerline Station = 1000  
Downstream Elevation = 1340.66  
Centerline Station = 1000

CULVERT OUTPUT Profile #PF 1  
Culvert ID : Culvert #1

Culv Q (cfs)	793.00	Culv Ful Lngh (ft)	
# Barrels	1	Culv Vel US (ft/s)	13.67
Q Barrel (cfs)	793.00	Culv Vel DS (ft/s)	12.27
E.G. US. (ft)	1352.15	Culv Inv El Up (ft)	1342.00
W.S. US. (ft)	1351.03	Culv Inv El Dn (ft)	1340.66
E.G. DS (ft)	1348.87	Culv Frctn Ls (ft)	1.24
W.S. DS (ft)	1347.12	Culv Ext Lss (ft)	0.59
Delta EG (ft)	3.28	Culv Ent Lss (ft)	1.45
Delta WS (ft)	3.91	Q Weir (cfs)	
E.G. IC (ft)	1351.37	Weir Sta Lft (ft)	
E.G. OC (ft)	1352.15	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1347.80	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1347.12	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	5.75	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	5.80	Min El Weir Flow (ft)	1354.34

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #PF 2

Culvert ID : Culvert #1

Culv Q (cfs)	1161.26	Culv Ful Lngh (ft)	341.00
# Barrels	1	Culv Vel US (ft/s)	12.90
Q Barrel (cfs)	1161.26	Culv Vel DS (ft/s)	12.90
E.G. US. (ft)	1356.50	Culv Inv El Up (ft)	1342.00
W.S. US. (ft)	1353.69	Culv Inv El Dn (ft)	1340.66
E.G. DS (ft)	1351.89	Culv Frctn Ls (ft)	1.38
W.S. DS (ft)	1351.24	Culv Ext Lss (ft)	1.93
Delta EG (ft)	4.60	Culv Ent Lss (ft)	1.29
Delta WS (ft)	2.45	Q Weir (cfs)	482.74
E.G. IC (ft)	1356.28	Weir Sta Lft (ft)	973.90
E.G. OC (ft)	1356.50	Weir Sta Rgt (ft)	1026.20
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1351.00	Weir Max Depth (ft)	2.16
Culv WS Outlet (ft)	1349.66	Weir Avg Depth (ft)	2.12
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	110.63
Culv Crt Depth (ft)	7.48	Min El Weir Flow (ft)	1354.34

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 32542

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev									
964.4 1349.4 984.4 1349.4 994 1340.66 1000 1340.66 1006 1340.66									
1015.1 1350.2 1035.1 1350.2									

Manning's n Values	num=	3			
Sta n Val Sta n Val Sta n Val					
964.4 .018 984.4 .018 1015.1 .1					

Bank Sta: Left Right Lengths: Left Channel Right									
984.4 1015.1 150 150 150									
Coeff Contr. Expan.									
.3 .5									

Ineffective Flow	num=	2			
Sta L Sta R Elev Permanent					
888 F					
888 F					

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 32392

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev									
964.4 1348.9 984.4 1348.9 999.5 1340.2 1000 1340.2 1000.5 1340.2									
1015.1 1349.8 1035.1 1349.8									

Manning's n Values	num=	3			
Sta n Val Sta n Val Sta n Val					
964.4 .018 984.4 .018 1015.1 .1					

Bank Sta: Left Right Lengths: Left Channel Right									
984.4 1015.1 368 368 368									
Coeff Contr. Expan.									
.1 .3									

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 32024

INPUT

Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev									
969.3 1345.2 989.3 1345.2 990.91 1336.38 1000 1336.38 1008.5 1336.38									
1008.7 1345.2 1028.7 1345.2									

Manning's n Values	num=	3			
Sta n Val Sta n Val Sta n Val					
969.3 .018 989.3 .018 1008.7 .1					

Bank Sta: Left Right Lengths: Left Channel Right									
989.3 1008.7 72 72 72									
Coeff Contr. Expan.									
.3 .5									

Ineffective Flow	num=	2			
Sta L Sta R Elev Permanent					

888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31988

INPUT

Description: Cochise Road 2-8'x6'x70'  
Distance from Upstream XS = 1  
Deck/Roadway Width = 70  
Weir Coefficient = 3

Upstream Deck/Roadway Coordinates  
num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
987 1344.35 1012 1344.35

Upstream Bridge Cross Section Data

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
969.3 1345.2 989.3 1345.2 990.91 1336.38 1000 1336.38 1008.5 1336.38  
1008.7 1345.2 1028.7 1345.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
969.3 .018 989.3 .018 1008.7 .1

Bank Sta: Left Right Coeff Contr. Expan.  
989.3 1008.7 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
987 1344.35 1012 1344.35

Downstream Bridge Cross Section Data

Station Elevation Data num= 8  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
984.83 1345.08 989.83 1345.11 990.11 1336.43 1000 1336.43 1010.08 1336.43  
1012.2 1345.3 1013.2 1345.3 1013.3 1346

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
984.83 .03 989.83 .018 1012.2 .03

Bank Sta: Left Right Coeff Contr. Expan.  
989.83 1012.2 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

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 6 8  
FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
Solution Criteria = Highest U.S. EG  
Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
1 70 .013 .5 1

Number of Barrels = 2  
Upstream Elevation = 1336.38  
Centerline Stations  
Sta. Sta.  
995.5 1004.5  
Downstream Elevation = 1336.43  
Centerline Stations  
Sta. Sta.  
995.5 1004.5

CULVERT OUTPUT Profile #PF 1  
Culvert ID : Culvert #1

Culv Q (cfs) 777.85 Culv Ful Lngh (ft) 70.00  
# Barrels 2 Culv Vel US (ft/s) 8.10  
Q Barrel (cfs) 388.93 Culv Vel DS (ft/s) 8.10  
E.G. US. (ft) 1345.20 Culv Inv El Up (ft) 1336.38  
W.S. US. (ft) 1344.76 Culv Inv El Dn (ft) 1336.43  
E.G. DS (ft) 1344.03 Culv Frctn Ls (ft) 0.17  
W.S. DS (ft) 1343.50 Culv Ext Lss (ft) 0.49  
Delta EG (ft) 1.17 Culv Ent Lss (ft) 0.51  
Delta WS (ft) 1.26 Q Weir (cfs) 45.15  
E.G. IC (ft) 1343.45 Weir Sta Lft (ft) 989.30  
E.G. OC (ft) 1345.20 Weir Sta Rgt (ft) 1008.70  
Culvert Control Outlet Weir Submerg 0.00  
Culv WS Inlet (ft) 1342.38 Weir Max Depth (ft) 0.85  
Culv WS Outlet (ft) 1342.43 Weir Avg Depth (ft) 0.84  
Culv Nml Depth (ft) Wr Flw Area (sq ft) 16.37

Culv Crt Depth (ft) 4.19 Min El Weir Flow (ft) 1344.36

Warning: During the culvert inlet computations, the program could not balance the culvert/weir flow. The reported inlet energy grade answer may not be valid.

CULVERT OUTPUT Profile #PF 2  
Culvert ID : Culvert #1

Culv Q (cfs)	845.24	Culv Ful Lngh (ft)	70.00
# Barrels	2	Culv Vel US (ft/s)	8.80
Q Barrel (cfs)	422.62	Culv Vel DS (ft/s)	8.80
E.G. US. (ft)	1347.77	Culv Inv El Up (ft)	1336.38
W.S. US. (ft)	1346.81	Culv Inv El Dn (ft)	1336.43
E.G. DS (ft)	1346.90	Culv Frctn Ls (ft)	0.20
W.S. DS (ft)	1345.76	Culv Ext Lss (ft)	0.07
Delta EG (ft)	0.87	Culv Ent Lss (ft)	0.60
Delta WS (ft)	1.05	Q Weir (cfs)	857.76
E.G. IC (ft)	1346.93	Weir Sta Lft (ft)	969.30
E.G. OC (ft)	1347.77	Weir Sta Rgt (ft)	1028.70
Culvert Control	Outlet	Weir Submerg	0.30
Culv WS Inlet (ft)	1342.38	Weir Max Depth (ft)	3.41
Culv WS Outlet (ft)	1342.43	Weir Avg Depth (ft)	2.84
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	168.53
Culv Crt Depth (ft)	4.43	Min El Weir Flow (ft)	1344.36

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31952

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	8									
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
984.83 1345.08	989.83 1345.11	990.11 1336.43	1000 1336.43	1010.08 1336.43							
1012.2 1345.3	1013.2 1345.3	1013.3 1346									

Manning's n Values	num=	3									
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
984.83 .03	989.83 .018	1012.2 .03									

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
989.83	1012.2	295	295	295	.3	.5	

Ineffective Flow	num=	2									
Sta L	Sta R	Elev	Permanent								
888 F											
888 F											

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31657

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	7									
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
979.77 1343.4	979.78 1340.95	984.78 1340.95	999.44 1336.5	1000.5 1336.57							
1012.68 1343.4	1017.68 1343.4										

Manning's n Values	num=	3									
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
979.77 .018	984.78 .018	1012.68 .018									

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
984.78	1012.68	365	365	365	.1	.3	

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31292

INPUT

Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	9									
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
979.9 1344	980 1342.2	985 1342.2	986.1 1335.58	1000 1335.8							
1013.93 1335.62	1017 1342.2	1018 1342.2	1018.1 1344								

Manning's n Values	num=	3									
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
979.9 .03	985 .018	1017 .03									

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
985	1017	100	100	100	.3	.5	

Ineffective Flow	num=	2									
Sta L	Sta R	Elev	Permanent								
888 F											
888 F											

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31242

INPUT

Description: 3 - 8' x 5' RCBC @ Gold Dust

Distance from Upstream XS =	1
Deck/Roadway Width =	70
Weir Coefficient =	3

Upstream Deck/Roadway Coordinates	num=	2									
Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord
975 1342.1		1020 1342.1									

Upstream Bridge Cross Section Data

Station Elevation Data num= 9  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 979.9 1344 980 1342.2 985 1342.2 986.1 1335.58 1000 1335.8  
 1013.93 1335.62 1017 1342.2 1018 1342.2 1018.1 1344

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 979.9 .03 985 .018 1017 .03

Bank Sta: Left Right Coeff Contr. Expan.  
 985 1017 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent

888 F  
 888 F

Downstream Deck/Roadway Coordinates

num= 2  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 960 1341.2 1030 1341.2

Downstream Bridge Cross Section Data

Station Elevation Data num= 7  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 968.9 1343 969 1341.3 986 1334.9 1000 1334.9 1014 1334.9  
 1024 1341.9 1024.1 1343

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 968.9 .035 969 .035 1024 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 969 1024 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent

888 F  
 888 F

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  
 Gold Dust Box 5 8  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 3.5 93 .013 .5 1

Number of Barrels = 3  
 Upstream Elevation = 1335.7

Centerline Stations  
 Sta. Sta. Sta.  
 991 1000 1009

Downstream Elevation = 1334.9  
 Centerline Stations

Sta. Sta. Sta.  
 991 1000 1009

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Gold Dust

Culv Q (cfs)	823.00	Culv Ful Lngh (ft)	
# Barrels	3	Culv Vel US (ft/s)	9.85
Q Barrel (cfs)	274.33	Culv Vel DS (ft/s)	7.12
E.G. US. (ft)	1341.44	Culv Inv El Up (ft)	1335.70
W.S. US. (ft)	1340.95	Culv Inv El Dn (ft)	1334.90
E.G. DS (ft)	1340.30	Culv Frctn Ls (ft)	0.18
W.S. DS (ft)	1339.72	Culv Ext Lss (ft)	0.21
Delta EG (ft)	1.15	Culv Ent Lss (ft)	0.75
Delta WS (ft)	1.23	Q Weir (cfs)	
E.G. IC (ft)	1341.05	Weir Sta Lft (ft)	
E.G. OC (ft)	1341.44	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1339.18	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1339.72	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.45	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	3.32	Min El Weir Flow (ft)	1342.11

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Gold Dust

Culv Q (cfs)	1180.32	Culv Ful Lngh (ft)	93.00
# Barrels	3	Culv Vel US (ft/s)	9.84
Q Barrel (cfs)	393.44	Culv Vel DS (ft/s)	9.84
E.G. US. (ft)	1344.87	Culv Inv El Up (ft)	1335.70
W.S. US. (ft)	1344.22	Culv Inv El Dn (ft)	1334.90
E.G. DS (ft)	1342.69	Culv Frctn Ls (ft)	0.39
W.S. DS (ft)	1342.23	Culv Ext Lss (ft)	1.04
Delta EG (ft)	2.18	Culv Ent Lss (ft)	0.75
Delta WS (ft)	1.99	Q Weir (cfs)	522.68
E.G. IC (ft)	1344.29	Weir Sta Lft (ft)	979.90
E.G. OC (ft)	1344.87	Weir Sta Rgt (ft)	1018.10

Culvert Control	Outlet	Weir Submerg	0.04
Culv WS Inlet (ft)	1340.70	Weir Max Depth (ft)	2.77
Culv WS Outlet (ft)	1339.90	Weir Avg Depth (ft)	2.75
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	105.03
Culv Crt Depth (ft)	4.22	Min El Weir Flow (ft)	1342.11

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31192

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
968.9 1343	969 1341.3	986 1334.9	1000 1334.9	1014 1334.9					
1024 1341.9	1024.1 1343								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
968.9 .035	969 .035	1024 .035			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
969	1024	126	126	126	.3	.5	

Ineffective Flow	num=	2	
Sta L Sta R	Elev	Permanent	
888 F			
888 F			

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31066

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	10							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
969.8 1343	969.9 1340.9	983.6 1336.6	994.4 1335.1	1000 1335.1	1000 1335.1	1033.2 1341.9	1033.3 1343		
1002.3 1335	1005.4 1336.4	1016.9 1336.7							

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
969.8 .035	969.9 .035	1033.2 .035			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
969.9	1033.2	177	177	177	.1	.3	

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30889

INPUT

Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
946 1340	956 1340	975 1334.4	1000 1334.4	1025 1334.4					
1044 1339.9	1054 1339.9								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
946 .035	956 .035	1044 .035			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
956	1044	45	45	45	.3	.5	

Ineffective Flow	num=	2	
Sta L Sta R	Elev	Permanent	
888 F			
888 F			

CULVERT RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30866

INPUT

Description:

Distance from Upstream XS = 1  
 Deck/Roadway Width = 40  
 Weir Coefficient = 3

Upstream Deck/Roadway Coordinates	num=	2			
Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord				
940 1339.92	1070 1339.92				

Upstream Bridge Cross Section Data

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
946 1340	956 1340	975 1334.4	1000 1334.4	1025 1334.4					
1044 1339.9	1054 1339.9								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
946 .035	956 .035	1044 .035			

Bank Sta: Left	Right	Coeff	Contr.	Expan.
956	1044	.3	.5	

Ineffective Flow	num=	2	
Sta L Sta R	Elev	Permanent	
888 F			
888 F			

Downstream Deck/Roadway Coordinates

num=	2				
Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord				
940 1339.41	1070 1339.41				

Downstream Bridge Cross Section Data

Station Elevation Data		num= 7		Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
923	1339.8	943	1339.8	971	1334.2	1000	1334.2	1026	1334.2		
1064	1339.7	1084	1339.7								

Manning's n Values		num= 3		Sta	n Val	Sta	n Val	Sta	n Val
923	.035	943	.035	1064	.035				

Bank Sta: Left 943 Right 1064 Coeff Contr. .1 Expan. .3

Ineffective Flow		num= 2		Sta L	Sta R	Elev	Permanent
888	F						
888	F						

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 = 1339.92  
 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 #2 Box 4 12  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef	Exit Loss Coef
1	42	.013	.5	1

Number of Barrels = 4  
 Upstream Elevation = 1334.42  
 Centerline Stations

Sta.	Sta.	Sta.	Sta.
980.5	993.5	1006.5	1019.5

Downstream Elevation = 1334.25  
 Centerline Stations

Sta.	Sta.	Sta.	Sta.
980.5	993.5	1006.5	1019.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #2

Culv Q (cfs)	823.00	Culv Ful Lngh (ft)	42.00
# Barrels	4	Culv Vel US (ft/s)	4.29
Q Barrel (cfs)	205.75	Culv Vel DS (ft/s)	4.29
E.G. US. (ft)	1339.32	Culv Inv El Up (ft)	1334.42
W.S. US. (ft)	1339.13	Culv Inv El Dn (ft)	1334.25
E.G. DS (ft)	1339.02	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	1338.86	Culv Ext Lss (ft)	0.12
Delta EG (ft)	0.30	Culv Ent Lss (ft)	0.14
Delta WS (ft)	0.27	Q Weir (cfs)	
E.G. IC (ft)	1337.77	Weir Sta Lft (ft)	
E.G. OC (ft)	1339.32	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1338.42	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1338.25	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Wr FLW Area (sq ft)	
Culv Crt Depth (ft)	2.09	Min El Weir Flow (ft)	1339.93

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #2

Culv Q (cfs)	705.23	Culv Ful Lngh (ft)	42.00
# Barrels	4	Culv Vel US (ft/s)	3.67
Q Barrel (cfs)	176.31	Culv Vel DS (ft/s)	3.67
E.G. US. (ft)	1342.06	Culv Inv El Up (ft)	1334.42
W.S. US. (ft)	1341.93	Culv Inv El Dn (ft)	1334.25
E.G. DS (ft)	1341.80	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	1341.72	Culv Ext Lss (ft)	0.13
Delta EG (ft)	0.27	Culv Ent Lss (ft)	0.10
Delta WS (ft)	0.20	Q Weir (cfs)	997.78
E.G. IC (ft)	1340.58	Weir Sta Lft (ft)	946.00
E.G. OC (ft)	1342.06	Weir Sta Rgt (ft)	1054.00
Culvert Control	Outlet	Weir Submerg	0.84
Culv WS Inlet (ft)	1338.42	Weir Max Depth (ft)	2.15
Culv WS Outlet (ft)	1338.25	Weir Avg Depth (ft)	2.14
Culv Nml Depth (ft)		Wr FLW Area (sq ft)	230.92
Culv Crt Depth (ft)	1.89	Min El Weir Flow (ft)	1339.93

Warning: During the culvert inlet computations, the program could not balance the culvert/weir flow.  
 The reported inlet energy grade answer may not be valid.

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30844

INPUT  
 Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data		num= 7		Sta	Elev	Sta	Elev	Sta	Elev
923	1339.8	943	1339.8	971	1334.2	1000	1334.2	1026	1334.2
1064	1339.7	1084	1339.7						

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
923 .035 943 .035 1064 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
943 1064 345 345 345 .1 .3

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 30499

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
950.5 1339.8 960.5 1339.8 990.1 1333.7 1000 1333.5 1009.9 1333.4  
1016.5 1333.8 1018.5 1333.8 1034 1340.3 1044 1340.3

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
950.5 .035 960.5 .035 1034 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
960.5 1034 369 369 369 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 30130

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
961.2 1338 971.2 1338 991.3 1332.5 1000 1332.5 1008.7 1332.4  
1039.1 1339.3 1039.2 1342

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
961.2 .035 971.2 .035 1039.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
971.2 1039.1 47 47 47 .3 .5

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 30083

INPUT

Description: 71st St. Channel - Upstream Face of Culvert  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
977 1336.1 987 1336.1 987.1 1331.4 1000 1331.55 1012.9 1331.7  
1013 1336.1 1023 1336.1

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
977 .035 987 .035 1013 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
987 1013 83 83 83 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 30041

INPUT

Description: River STA 300+41, 71 St. Ditch, Lower Reach, Culvert Inlet  
Distance from Upstream XS = 1  
Deck/Roadway Width = 80  
Weir Coefficient = 3  
Upstream Deck/Roadway Coordinates  
num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
967 1339.3 1024 1339.3

Upstream Bridge Cross Section Data

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
977 1336.1 987 1336.1 987.1 1331.4 1000 1331.55 1012.9 1331.7  
1013 1336.1 1023 1336.1

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
977 .035 987 .035 1013 .035

Bank Sta: Left Right Coeff Contr. Expan.  
987 1013 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
967 1339.3 1024 1339.3

Downstream Bridge Cross Section Data

Station Elevation Data num= 5  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 985.6 1338.6 985.6 1331.2 1000 1331.2 1014.4 1331.2 1014.4 1338.4

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 985.6 .035 985.6 .035 1014.4 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 985.6 1014.4 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1339.3  
 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  
 Berneil Box 6 8  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 82 .02 .5 1

Number of Barrels = 3  
 Upstream Elevation = 1331.55

Centerline Stations  
 Sta. Sta. Sta.  
 991.5 1000 1008.5

Downstream Elevation = 1331.2  
 Centerline Stations

Sta. Sta. Sta.  
 991.5 1000 1008.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Berneil

Culv Q (cfs)	823.00	Culv Ful Lngh (ft)	
# Barrels	3	Culv Vel US (ft/s)	6.32
Q Barrel (cfs)	274.33	Culv Vel DS (ft/s)	6.09
E.G. US. (ft)	1337.91	Culv Inv El Up (ft)	1331.55
W.S. US. (ft)	1337.46	Culv Inv El Dn (ft)	1331.20
E.G. DS (ft)	1337.23	Culv Frctn Ls (ft)	0.19
W.S. DS (ft)	1336.83	Culv Ext Lss (ft)	0.18
Delta EG (ft)	0.67	Culv Ent Lss (ft)	0.31
Delta WS (ft)	0.62	Q Weir (cfs)	
E.G. IC (ft)	1336.88	Weir Sta Lft (ft)	
E.G. OC (ft)	1337.91	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1336.98	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1336.83	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	4.34	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	3.32	Min El Weir Flow (ft)	1339.31

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Berneil

Culv Q (cfs)	1333.57	Culv Ful Lngh (ft)	82.00
# Barrels	3	Culv Vel US (ft/s)	9.26
Q Barrel (cfs)	444.52	Culv Vel DS (ft/s)	9.26
E.G. US. (ft)	1341.23	Culv Inv El Up (ft)	1331.55
W.S. US. (ft)	1340.78	Culv Inv El Dn (ft)	1331.20
E.G. DS (ft)	1339.60	Culv Frctn Ls (ft)	0.62
W.S. DS (ft)	1338.62	Culv Ext Lss (ft)	0.34
Delta EG (ft)	1.63	Culv Ent Lss (ft)	0.67
Delta WS (ft)	2.17	Q Weir (cfs)	369.43
E.G. IC (ft)	1340.54	Weir Sta Lft (ft)	977.00
E.G. OC (ft)	1341.23	Weir Sta Rgt (ft)	1023.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1337.55	Weir Max Depth (ft)	1.93
Culv WS Outlet (ft)	1337.20	Weir Avg Depth (ft)	1.93
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	88.69
Culv Crt Depth (ft)	4.58	Min El Weir Flow (ft)	1339.31

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30000

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data num= 5  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 985.6 1338.6 985.6 1331.2 1000 1331.2 1014.4 1331.2 1014.4 1338.4

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 985.6 .035 985.6 .035 1014.4 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

985.6 1014.4 0 0 0 .3 .5  
 Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Upper East Reach RS: 18515

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
936.9	1335.2	939.1	1335.6	971.8	1335.5	992.8	1331.8	1000	1331.8
1007.2	1331.7	1027.7	1337.1						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
936.9	.03	971.8	.03	1027.7	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
971.8	1027.7	320	320	320	.1	.3	

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Upper East Reach RS: 18195

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
944.2	1334.4	947.5	1335.2	962.2	1335.4	990.1	1331.5	1000	1331.4
1009.9	1331.2	1035.8	1337.5						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
944.2	.03	962.2	.03	1035.8	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
962.2	1035.8	235	235	235	.1	.3	

  
 Left Levee Station= 962.2 Elevation=

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Upper East Reach RS: 17960

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
948.7	1335.1	952.1	1335.4	959.2	1336.4	992.5	1331.3	1000	1331.4
1007.5	1331.4	1038.9	1337.8						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
948.7	.03	959.2	.03	1038.9	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
959.2	1038.9	0	0	0	.1	.3	

  
 Left Levee Station= 959.2 Elevation=

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower East Reach RS: 17873

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
947.69	1335.39	960.57	1336.45	991.72	1331.58	1000	1331.32	1008.28	1331.06
1041.52	1331.23	1041.6	1338.4						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
947.69	.03	960.57	.018	1041.6	.018

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
960.57	1041.6	168	168	168	.1	.3	

  
 Left Levee Station= 960.57 Elevation=

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower East Reach RS: 17705

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
947.5	1336	965.2	1336.6	993.1	1330.6	1000	1331	1004.4	1330
1006.9	1331.4	1043.1	1337.3						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
947.5	.035	965.2	.035	1043.1	.035

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
965.2	1043.1	477	477	477	.1	.3	

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower East Reach RS: 17228

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
951.6	1337.3	969.3	1337.5	990.6	1331.4	996	1329.8	1000	1329.7
1003	1329.4	1004	1329.9	1023	1331.8	1043.3	1337.3	1051.5	1337.3

Manning's n Values num= 3  
 Sta n Val Sta n Val  
 951.6 .03 969.3 .03 1043.3 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 969.3 1043.3 698 698 698 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower East Reach RS: 16530

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.5	1335.9	944.9	1336.5	957	1336.6	988.6	1329.7	992.3	1328.5
1000	1328.5	1007.8	1328.5	1012	1330	1033	1335.2	1039.7	1335.2

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 941.5 .03 957 .03 1033 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 957 1033 475 475 475 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower East Reach RS: 16055

INPUT  
 Description: Berneil Ditch  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
951.9	1335.9	958.8	1336.2	981.5	1328.2	1000	1328.2	1018.5	1328.2
1041.7	1335.2	1052.6	1335.2						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 951.9 .03 958.8 .03 1041.7 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 958.8 1041.7 0 0 0 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 22527

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
958.2	1341.5	983.2	1341.5	987.4	1341.2	995.6	1338.3	1000	1338.3
1004.4	1338.3	1017	1342	1021.8	1341.9				

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 958.2 .1 983.2 .018 1017 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 983.2 1017 245 245 245 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 22282

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
963.2	1340.6	988.2	1340.6	995	1337.3	1000	1337.3	1005	1337.3
1014.7	1341.7	1021.2	1341.8						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 963.2 .1 988.2 .018 1014.7 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 988.2 1014.7 95 95 95 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 22187

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
964.3	1343.2	987.4	1343.1	989.3	1343.2	996.3	1339.2	997.3	1339.2
1000	1338.2	1000.4	1337.3	1003.7	1336.9	1015.9	1337	1020.6	1345.2

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 964.3 .03 989.3 .018 1020.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 989.3 1020.6 404 404 404 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21783

INPUT

Description: Mountain View Channel  
 Station Elevation Data num= 8  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
959.9	1339.6	984.9	1339.6	994.4	1335.2	1000	1335.3	1002.3	1335.3
1005.6	1335.4	1014.7	1339.7	1021.9	1339.4				

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
959.9	.03	984.9	.018	1014.7	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           984.9 1014.7       232 232 232       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21551

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 10  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
964.3	1340.6	987.4	1340.5	989.3	1340.6	996.3	1336.6	997.3	1336.6
1000	1335.6	1000.4	1334.7	1003.7	1334.3	1015.9	1334.4	1020.6	1342.6

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
964.3	.03	989.3	.018	1020.6	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           989.3 1020.6       162 162 162       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21389

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 10  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
964.3	1340.1	987.4	1340	989.3	1340.1	996.3	1336.1	997.3	1336.1
1000	1335.1	1000.4	1334.2	1003.7	1333.8	1015.9	1333.9	1020.6	1342.1

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
964.3	.03	989.3	.018	1020.6	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           989.3 1020.6       34 34 34       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21355

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 10  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
964.3	1340	987.4	1339.9	989.3	1340	996.3	1336	997.3	1336
1000	1335	1000.4	1334.1	1003.7	1333.7	1015.9	1333.8	1020.6	1342

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
964.3	.03	989.3	.018	1020.6	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           989.3 1020.6       828 828 828       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 20527

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
962	1338.2	987	1338.2	997	1331.4	1000	1331.4	1003	1331.4
1013	1339.9	1023	1339.9						

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
962	.1	987	.018	1013	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           987 1013       527 527 527       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 20000

INPUT  
 Description: Mountain View Channel  
 Station Elevation Data num= 6  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
976.8	1336.1	986.8	1336.1	997	1329.1	1000	1329.1	1003	1329.1
1013.9	1337.1								

  
 Manning's n Values num= 3  

Sta	n Val	Sta	n Val	Sta	n Val
976.8	.1	986.8	.018	1013.9	.03

  
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
           986.8 1013.9       0 0 0       .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15922

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 7		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
948	1335.9	958	1335.9	983.4	1328.2	1000	1328.2	1016.7	1328.1
1042.7	1336.3	1054.9	1335.7						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
948	.035	958	.018	1042.7	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	958	1042.7		380	380		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15542

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 7		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
949.3	1335.3	958.7	1335.1	982.1	1327.2	1000	1327.3	1017.9	1327.3
1035.8	1333	1039.1	1332.9						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
949.3	.035	958.7	.018	1035.8	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	958.7	1035.8		300	300		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15242

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 7		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
950.4	1335.1	956.8	1334.8	983.4	1326.5	1000	1326.5	1016.6	1326.5
1037.5	1333.1	1047.2	1333.1						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
950.4	.035	956.8	.018	1037.5	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	956.8	1037.5		201	201		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15041

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 7		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
945.8	1334.3	955.7	1334.2	983	1326.2	1000	1326.3	1017.1	1326.3
1034.5	1332.3	1050.1	1332.7						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
945.8	.035	955.7	.018	1034.5	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	955.7	1034.5		515	515		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 14526

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 8		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
942.5	1333	948.1	1333	959.3	1332.9	982.1	1324.2	1000	1324.6
1017.9	1325	1044.9	1333.1	1048.8	1333.2				

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
942.5	.03	959.3	.018	1048.8	.03		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	959.3	1048.8		610	610		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 13916

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 6		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
951.9	1333.2	960.4	1333.7	982.4	1323.1	1000	1323.5	1017.7	1323.8
1049.1	1334.9								

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
951.9	.03	960.4	.018	1049.1	.03		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	960.4	1049.1		176	176		.1	.3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 13740

INPUT

Description: Berneil Ditch

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
955.1 1332.8 961.3 1332.5 980 1323.9 1000 1323.8 1020 1323.6  
1054.1 1333.5 1063.7 1334.1

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
955.1 .03 961.3 .018 1054.1 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
961.3 1054.1 1505 1505 1505 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 12235

INPUT

Description: Berneil Ditch

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
955.8 1326.8 960.8 1326.8 984.1 1320.2 1000 1320.3 1015.9 1320.3  
1038.1 1326.9 1045.3 1326.8

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
955.8 .03 960.8 .018 1038.1 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
960.8 1038.1 27 27 27 .3 .5

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 12208

INPUT

Description: Berneil Ditch - Upstream Face of Culvert

Station Elevation Data num= 5  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
966.8 1326.9 966.9 1319.8 1000 1319.8 1032.5 1319.8 1032.6 1326.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
966.8 1032.6 50 50 50 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: Berneil Ditch  
REACH: Lower Reach RS: 12183

INPUT

Description: 5' x 10' Concrete Box Culverts, 6 Ea.

Distance from Upstream XS = 1  
Deck/Roadway Width = 48  
Weir Coefficient = 3

Upstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
960 1326.8 1040 1326.8

Upstream Bridge Cross Section Data num= 5  
Station Elevation Data num= 5  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
966.8 1326.9 966.9 1319.8 1000 1319.8 1032.5 1319.8 1032.6 1326.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Coeff Contr. Expan.  
966.8 1032.6 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
960 1326.8 1040 1326.8

Downstream Bridge Cross Section Data num= 5  
Station Elevation Data num= 5  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
966.8 1326.7 966.9 1318.5 1000 1318.5 1032.5 1318.5 1032.6 1326.8

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Coeff Contr. Expan.  
966.8 1032.6 .3 .5

Ineffective Flow num= 2

Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1330  
 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 5 10  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 3 - Wingwall flared 0 deg. (sides extended straight)  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 49 .02 .5 1

Number of Barrels = 6

Upstream Elevation = 1319.8

Centerline Stations

Sta. Sta. Sta. Sta. Sta. Sta.  
 972.5 983.5 994.5 1005.5 1016.5 1027.5

Downstream Elevation = 1318.5

Centerline Stations

Sta. Sta. Sta. Sta. Sta. Sta.  
 972.5 983.5 994.5 1005.5 1016.5 1027.5

CULVERT OUTPUT Profile #PF 1

Culvert ID : Culvert #1

Culv Q (cfs)	1282.00	Culv Ful Lngh (ft)	
# Barrels	6	Culv Vel US (ft/s)	8.83
Q Barrel (cfs)	213.67	Culv Vel DS (ft/s)	12.51
E.G. US. (ft)	1324.04	Culv Inv El Up (ft)	1319.80
W.S. US. (ft)	1323.63	Culv Inv El Dn (ft)	1318.50
E.G. DS (ft)	1321.92	Culv Frctn Ls (ft)	0.79
W.S. DS (ft)	1320.78	Culv Ext Lss (ft)	0.72
Delta EG (ft)	2.11	Culv Ent Lss (ft)	0.61
Delta WS (ft)	2.85	Q Weir (cfs)	
E.G. IC (ft)	1323.86	Weir Sta Lft (ft)	
E.G. OC (ft)	1324.04	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1322.22	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1320.21	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.56	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	2.42	Min El Weir Flow (ft)	1330.00

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #PF 2

Culvert ID : Culvert #1

Culv Q (cfs)	2981.00	Culv Ful Lngh (ft)	
# Barrels	6	Culv Vel US (ft/s)	9.94
Q Barrel (cfs)	496.83	Culv Vel DS (ft/s)	17.57
E.G. US. (ft)	1328.01	Culv Inv El Up (ft)	1319.80
W.S. US. (ft)	1327.47	Culv Inv El Dn (ft)	1318.50
E.G. DS (ft)	1324.50	Culv Frctn Ls (ft)	1.12
W.S. DS (ft)	1322.50	Culv Ext Lss (ft)	1.62
Delta EG (ft)	3.51	Culv Ent Lss (ft)	0.77
Delta WS (ft)	4.97	Q Weir (cfs)	
E.G. IC (ft)	1328.01	Weir Sta Lft (ft)	
E.G. OC (ft)	1327.23	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	1324.80	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1321.33	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.78	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	4.25	Min El Weir Flow (ft)	1330.00

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 12158

INPUT

Description: Berneil Ditch - Downstream Face of Culvert

Station Elevation Data	num=	5
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
966.8 1326.7 966.9 1318.5 1000 1318.5 1032.5 1318.5 1032.6 1326.8		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
966.8 .03 966.8 .018 1032.6 .03		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
966.8 1032.6	100 100	.3	.5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent

888 F  
 888 F

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 12058

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 6		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
947.9	1325.2	954.6	1325.1	978.1	1316	1000	1316	1022	1316
1045.5	1325.1								

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
947.9	.03	954.6	.018	1045.5	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	954.6	1045.5		650	650		.3	.5

CROSS SECTION

RIVER: Berneil Ditch

REACH: Lower Reach

RS: 11408

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 6		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
944.6	1323.3	953.7	1323.3	978.8	1314	1000	1314.2	1021.2	1314.4
1040.9	1322.8								

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
944.6	.03	953.7	.018	1040.9	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	953.7	1040.9		600	600		.1	.3

CROSS SECTION

RIVER: Berneil Ditch

REACH: Lower Reach

RS: 10808

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 5		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
955.4	1320.9	976.1	1312.8	1000	1312.8	1024	1312.8	1041.8	1320.3

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
955.4	.03	955.4	.018	1041.8	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	955.4	1041.8		808	808		.1	.3

CROSS SECTION

RIVER: Berneil Ditch

REACH: Lower Reach

RS: 10000

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 5		Sta	Elev	Sta	Elev	Sta	Elev
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
933.3	1319.8	969.3	1312.3	1000	1312.3	1030.7	1312.3	1066.7	1319.8

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
933.3	.03	933.3	.018	1066.7	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	933.3	1066.7		0	0		.1	.3

SUMMARY OF MANNING'S N VALUES

River:71 St. Channel

Reach	River Sta.	n1	n2	n3
Lower Reach	37941	.018	.018	.018
Lower Reach	37808	.05	.018	.05
Lower Reach	37700	.05	.018	.05
Lower Reach	37658	Culvert		
Lower Reach	37615	.1	.018	.05
Lower Reach	37343	.1	.018	.05
Lower Reach	37048	.1	.018	.1
Lower Reach	36912	.1	.02	.1
Lower Reach	36712	.1	.02	.1
Lower Reach	36664	.1	.02	.1
Lower Reach	36579	.1	.02	.035
Lower Reach	36306	.035	.016	.035
Lower Reach	36233	.035	.016	.035
Lower Reach	36088	.035	.016	.035
Lower Reach	35845	.035	.016	.035
Lower Reach	35493	.035	.016	.035
Lower Reach	35411	.035	.016	.035
Lower Reach	35311	.025	.016	.025
Lower Reach	35252	.035	.018	.035
Lower Reach	35023	.035	.018	.035
Lower Reach	34873	.035	.018	.035
Lower Reach	34673	.035	.018	.035
Lower Reach	34378	.035	.03	.035
Lower Reach	34338	.035	.03	.035
Lower Reach	34322	Culvert		
Lower Reach	34307	.035	.03	.02
Lower Reach	34245	.035	.03	.02
Lower Reach	33832	.035	.035	.03
Lower Reach	33446	.035	.035	.1

Lower Reach	33413	.035	.035	.1
Lower Reach	33382	Culvert		
Lower Reach	33352	.1	.03	.1
Lower Reach	33290	.1	.03	.1
Lower Reach	32899	.1	.018	.1
Lower Reach	32713	Culvert		
Lower Reach	32542	.018	.018	.1
Lower Reach	32392	.018	.018	.1
Lower Reach	32024	.018	.018	.1
Lower Reach	31988	Culvert		
Lower Reach	31952	.03	.018	.03
Lower Reach	31657	.018	.018	.018
Lower Reach	31292	.03	.018	.03
Lower Reach	31242	Culvert		
Lower Reach	31192	.035	.035	.035
Lower Reach	31066	.035	.035	.035
Lower Reach	30889	.035	.035	.035
Lower Reach	30866	Culvert		
Lower Reach	30844	.035	.035	.035
Lower Reach	30499	.035	.035	.035
Lower Reach	30130	.035	.035	.035
Lower Reach	30083	.035	.035	.035
Lower Reach	30041	Culvert		
Lower Reach	30000	.035	.035	.035

River:Berneil Ditch

Reach	River Sta.	n1	n2	n3
Upper East Reach	18515	.03	.03	.03
Upper East Reach	18195	.03	.03	.03
Upper East Reach	17960	.03	.03	.03
Lower East Reach	17873	.03	.018	.018
Lower East Reach	17705	.035	.035	.035
Lower East Reach	17228	.03	.03	.03
Lower East Reach	16530	.03	.03	.03
Lower East Reach	16055	.03	.03	.03
Mtn. View Chnl	22527	.1	.018	.03
Mtn. View Chnl	22282	.1	.018	.03
Mtn. View Chnl	22187	.03	.018	.03
Mtn. View Chnl	21783	.03	.018	.03
Mtn. View Chnl	21551	.03	.018	.03
Mtn. View Chnl	21389	.03	.018	.03
Mtn. View Chnl	21355	.03	.018	.03
Mtn. View Chnl	20527	.1	.018	.03
Mtn. View Chnl	20000	.1	.018	.03
Lower Reach	15922	.035	.018	.035
Lower Reach	15542	.035	.018	.035
Lower Reach	15242	.035	.018	.035
Lower Reach	15041	.035	.018	.035
Lower Reach	14526	.03	.018	.03
Lower Reach	13916	.03	.018	.03
Lower Reach	13740	.03	.018	.03
Lower Reach	12235	.03	.018	.03
Lower Reach	12208	.03	.018	.03
Lower Reach	12183	Culvert		
Lower Reach	12158	.03	.018	.03
Lower Reach	12058	.03	.018	.03
Lower Reach	11408	.03	.018	.03
Lower Reach	10808	.03	.018	.03
Lower Reach	10000	.03	.018	.03

SUMMARY OF REACH LENGTHS

River: 71 St. Channel

Reach	River Sta.	Left	Channel	Right
Lower Reach	37941	133	133	133
Lower Reach	37808	108	108	108
Lower Reach	37700	85	85	85
Lower Reach	37658	Culvert		
Lower Reach	37615	272	272	272
Lower Reach	37343	295	295	295
Lower Reach	37048	136	136	136
Lower Reach	36912	200	200	200
Lower Reach	36712	48	48	48
Lower Reach	36664	85	85	85
Lower Reach	36579	273	273	273
Lower Reach	36306	73	73	73
Lower Reach	36233	145	145	145
Lower Reach	36088	243	243	243
Lower Reach	35845	352	352	352
Lower Reach	35493	82	82	82
Lower Reach	35411	100	100	100
Lower Reach	35311	59	59	59
Lower Reach	35252	229	229	229
Lower Reach	35023	150	150	150
Lower Reach	34873	200	200	200
Lower Reach	34673	295	295	295
Lower Reach	34378	40	40	40
Lower Reach	34338	31	31	31
Lower Reach	34322	Culvert		
Lower Reach	34307	62	62	62
Lower Reach	34245	413	413	413
Lower Reach	33832	386	386	386

Lower Reach	33446	33	33	33
Lower Reach	33413	61	61	61
Lower Reach	33382	Culvert		
Lower Reach	33352	62	62	62
Lower Reach	33290	391	391	391
Lower Reach	32899	357	357	357
Lower Reach	32713	Culvert		
Lower Reach	32542	150	150	150
Lower Reach	32392	368	368	368
Lower Reach	32024	72	72	72
Lower Reach	31988	Culvert		
Lower Reach	31952	295	295	295
Lower Reach	31657	365	365	365
Lower Reach	31292	100	100	100
Lower Reach	31242	Culvert		
Lower Reach	31192	126	126	126
Lower Reach	31066	177	177	177
Lower Reach	30889	45	45	45
Lower Reach	30866	Culvert		
Lower Reach	30844	345	345	345
Lower Reach	30499	369	369	369
Lower Reach	30130	47	47	47
Lower Reach	30083	83	83	83
Lower Reach	30041	Culvert		
Lower Reach	30000	0	0	0

River: Berneil Ditch

Reach	River Sta.	Left	Channel	Right
Upper East Reach	18515	320	320	320
Upper East Reach	18195	235	235	235
Upper East Reach	17960	0	0	0
Lower East Reach	17873	168	168	168
Lower East Reach	17705	477	477	477
Lower East Reach	17228	698	698	698
Lower East Reach	16530	475	475	475
Lower East Reach	16055	0	0	0
Mtn. View Chnl	22527	245	245	245
Mtn. View Chnl	22282	95	95	95
Mtn. View Chnl	22187	404	404	404
Mtn. View Chnl	21783	232	232	232
Mtn. View Chnl	21551	162	162	162
Mtn. View Chnl	21389	34	34	34
Mtn. View Chnl	21355	828	828	828
Mtn. View Chnl	20527	527	527	527
Mtn. View Chnl	20000	0	0	0
Lower Reach	15922	380	380	380
Lower Reach	15542	300	300	300
Lower Reach	15242	201	201	201
Lower Reach	15041	515	515	515
Lower Reach	14526	610	610	610
Lower Reach	13916	176	176	176
Lower Reach	13740	1505	1505	1505
Lower Reach	12235	27	27	27
Lower Reach	12208	50	50	50
Lower Reach	12183	Culvert		
Lower Reach	12158	100	100	100
Lower Reach	12058	650	650	650
Lower Reach	11408	600	600	600
Lower Reach	10808	808	808	808
Lower Reach	10000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS  
River: 71 St. Channel

Reach	River Sta.	Contr.	Expan.
Lower Reach	37941	.1	.3
Lower Reach	37808	.1	.3
Lower Reach	37700	.1	.3
Lower Reach	37658	Culvert	
Lower Reach	37615	.1	.3
Lower Reach	37343	.1	.3
Lower Reach	37048	.1	.3
Lower Reach	36912	.1	.3
Lower Reach	36712	.1	.3
Lower Reach	36664	.1	.3
Lower Reach	36579	.1	.3
Lower Reach	36306	.1	.3
Lower Reach	36233	.1	.3
Lower Reach	36088	.1	.3
Lower Reach	35845	.1	.3
Lower Reach	35493	.1	.3
Lower Reach	35411	.1	.3
Lower Reach	35311	.1	.3
Lower Reach	35252	.1	.3
Lower Reach	35023	.1	.3
Lower Reach	34873	.1	.3
Lower Reach	34673	.1	.3
Lower Reach	34378	.1	.3
Lower Reach	34338	.3	.5
Lower Reach	34322	Culvert	
Lower Reach	34307	.3	.5
Lower Reach	34245	.1	.3

Lower Reach	33832	.1	.3
Lower Reach	33446	.1	.3
Lower Reach	33413	.3	.5
Lower Reach	33382	Culvert	
Lower Reach	33352	.3	.5
Lower Reach	33290	.1	.3
Lower Reach	32899	.3	.5
Lower Reach	32713	Culvert	
Lower Reach	32542	.3	.5
Lower Reach	32392	.1	.3
Lower Reach	32024	.3	.5
Lower Reach	31988	Culvert	
Lower Reach	31952	.3	.5
Lower Reach	31657	.1	.3
Lower Reach	31292	.3	.5
Lower Reach	31242	Culvert	
Lower Reach	31192	.3	.5
Lower Reach	31066	.1	.3
Lower Reach	30889	.3	.5
Lower Reach	30866	Culvert	
Lower Reach	30844	.1	.3
Lower Reach	30499	.1	.3
Lower Reach	30130	.3	.5
Lower Reach	30083	.3	.5
Lower Reach	30041	Culvert	
Lower Reach	30000	.3	.5

River: Berneil Ditch

Reach	River Sta.	Contr.	Expan.
Upper East Reach	18515	.1	.3
Upper East Reach	18195	.1	.3
Upper East Reach	17960	.1	.3
Lower East Reach	17873	.1	.3
Lower East Reach	17705	.1	.3
Lower East Reach	17228	.1	.3
Lower East Reach	16530	.1	.3
Lower East Reach	16055	.1	.3
Mtn. View Chnl	22527	.1	.3
Mtn. View Chnl	22282	.1	.3
Mtn. View Chnl	22187	.1	.3
Mtn. View Chnl	21783	.1	.3
Mtn. View Chnl	21551	.1	.3
Mtn. View Chnl	21389	.1	.3
Mtn. View Chnl	21355	.1	.3
Mtn. View Chnl	20527	.1	.3
Mtn. View Chnl	20000	.1	.3
Lower Reach	15922	.1	.3
Lower Reach	15542	.1	.3
Lower Reach	15242	.1	.3
Lower Reach	15041	.1	.3
Lower Reach	14526	.1	.3
Lower Reach	13916	.1	.3
Lower Reach	13740	.1	.3
Lower Reach	12235	.3	.5
Lower Reach	12208	.3	.5
Lower Reach	12183	Culvert	
Lower Reach	12158	.3	.5
Lower Reach	12058	.3	.5
Lower Reach	11408	.1	.3
Lower Reach	10808	.1	.3
Lower Reach	10000	.1	.3

Profile Output Table - Standard Table 1

River	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Ar (sq f)
Berneil Ditch	Upper East Reach	18515	176.00	1331.70	1336.85		1336.86	0.000054		0.82
Berneil Ditch	Upper East Reach	18515	215.00	1331.70	1338.84		1338.85	0.000015		0.56
Berneil Ditch	Upper East Reach	18195	176.00	1331.20	1336.84	1332.57	1336.85	0.000027		0.62
Berneil Ditch	Upper East Reach	18195	215.00	1331.20	1338.84	1332.72	1338.84	0.000009		0.47
Berneil Ditch	Upper East Reach	17960	176.00	1331.30	1336.83		1336.84	0.000038		0.68
Berneil Ditch	Upper East Reach	17960	215.00	1331.30	1338.83	1332.87	1338.84	0.000012		0.50
Berneil Ditch	Lower East Reach	17873	993.00	1331.06	1336.63	1333.45	1336.75	0.000179		2.81
Berneil Ditch	Lower East Reach	17873	2003.00	1331.06	1338.62	1334.69	1338.84	0.000207		3.83
Berneil Ditch	Lower East Reach	17705	993.00	1330.00	1336.38		1336.66	0.002156		4.27
Berneil Ditch	Lower East Reach	17705	2003.00	1330.00	1338.38		1338.75	0.001688		4.95
Berneil Ditch	Lower East Reach	17228	993.00	1329.40	1335.35		1335.71	0.001824		4.79
Berneil Ditch	Lower East Reach	17228	2003.00	1329.40	1337.32		1337.86	0.001941		5.93
Berneil Ditch	Lower East Reach	16530	993.00	1328.50	1333.53		1334.05	0.003144		5.81
Berneil Ditch	Lower East Reach	16530	2003.00	1328.50	1335.68		1336.33	0.002514		6.47
Berneil Ditch	Lower East Reach	16055	993.00	1328.20	1332.70		1332.99	0.001469		4.34
Berneil Ditch	Lower East Reach	16055	2003.00	1328.20	1335.03	1332.20	1335.42	0.001261		5.06
Berneil Ditch	Mtn. View Chnl	22527	169.00	1338.30	1340.25	1340.10	1340.78	0.003337		5.81
Berneil Ditch	Mtn. View Chnl	22527	359.00	1338.30	1341.69		1342.14	0.001693		5.36
Berneil Ditch	Mtn. View Chnl	22282	169.00	1337.30	1339.10	1339.10	1339.82	0.004500		6.77
Berneil Ditch	Mtn. View Chnl	22282	359.00	1337.30	1341.55		1341.84	0.000688		4.38

Berneil Ditch	Mtn. View Chnl	22187	169.00	1336.90	1338.52	1338.52	1339.23	0.004764	6.78	
Berneil Ditch	Mtn. View Chnl	22187	359.00	1336.90	1341.53		1341.77	0.000496	3.87	
Berneil Ditch	Mtn. View Chnl	21783	169.00	1335.20	1337.86		1338.10	0.001010	3.94	
Berneil Ditch	Mtn. View Chnl	21783	359.00	1335.20	1341.58		1341.65	0.000088	2.15	2
Berneil Ditch	Mtn. View Chnl	21551	169.00	1334.30	1337.85		1337.95	0.000296	2.58	
Berneil Ditch	Mtn. View Chnl	21551	359.00	1334.30	1341.57		1341.63	0.000081	2.06	
Berneil Ditch	Mtn. View Chnl	21389	169.00	1333.80	1337.84		1337.91	0.000184	2.18	
Berneil Ditch	Mtn. View Chnl	21389	359.00	1333.80	1341.57		1341.62	0.000059	1.85	2
Berneil Ditch	Mtn. View Chnl	21355	169.00	1333.70	1337.84		1337.91	0.000168	2.12	
Berneil Ditch	Mtn. View Chnl	21355	359.00	1333.70	1341.57		1341.62	0.000056	1.81	2
Berneil Ditch	Mtn. View Chnl	20527	456.00	1331.40	1335.55	1335.55	1336.97	0.004164	9.57	
Berneil Ditch	Mtn. View Chnl	20527	1379.00	1331.40	1338.80	1338.80	1340.93	0.003239	11.74	1
Berneil Ditch	Mtn. View Chnl	20000	456.00	1329.10	1333.21		1334.58	0.004057	9.42	
Berneil Ditch	Mtn. View Chnl	20000	1379.00	1329.10	1336.27		1338.48	0.003535	11.93	1
Berneil Ditch	Lower Reach	15922	1282.00	1328.10	1331.66	1331.37	1332.71	0.002588	8.21	156
Berneil Ditch	Lower Reach	15922	2981.00	1328.10	1333.76		1335.43	0.002457	10.37	287
Berneil Ditch	Lower Reach	15542	1282.00	1327.20	1330.96		1331.80	0.001919	7.38	173
Berneil Ditch	Lower Reach	15542	2981.00	1327.20	1333.16		1334.53	0.001831	9.39	318
Berneil Ditch	Lower Reach	15242	1282.00	1326.50	1330.51		1331.26	0.001591	6.96	184
Berneil Ditch	Lower Reach	15242	2981.00	1326.50	1332.70		1333.98	0.001678	9.08	328
Berneil Ditch	Lower Reach	15041	1282.00	1326.20	1329.43	1329.43	1330.74	0.003576	9.17	139
Berneil Ditch	Lower Reach	15041	2981.00	1326.20	1331.47	1331.47	1333.46	0.003133	11.32	263
Berneil Ditch	Lower Reach	14526	1282.00	1324.20	1328.58		1329.29	0.001483	6.79	188
Berneil Ditch	Lower Reach	14526	2981.00	1324.20	1330.91		1332.08	0.001462	8.69	343
Berneil Ditch	Lower Reach	13916	1282.00	1323.10	1327.82		1328.46	0.001176	6.43	199
Berneil Ditch	Lower Reach	13916	2981.00	1323.10	1329.61	1328.77	1331.06	0.001817	9.67	308
Berneil Ditch	Lower Reach	13740	1282.00	1323.60	1327.52	1326.70	1328.22	0.001513	6.73	190
Berneil Ditch	Lower Reach	13740	2981.00	1323.60	1328.98	1328.68	1330.67	0.002514	10.43	285
Berneil Ditch	Lower Reach	12235	1282.00	1320.20	1323.52	1323.52	1324.82	0.003572	9.16	139
Berneil Ditch	Lower Reach	12235	2981.00	1320.20	1327.32		1328.20	0.000970	7.52	401
Berneil Ditch	Lower Reach	12208	1282.00	1319.80	1323.63	1322.07	1324.04	0.000637	5.10	251
Berneil Ditch	Lower Reach	12208	2981.00	1319.80	1327.47	1323.79	1328.01	0.000449	5.92	503
Berneil Ditch	Lower Reach	12183		Culvert						
Berneil Ditch	Lower Reach	12158	1282.00	1318.50	1320.78	1320.78	1321.92	0.003575	8.56	149
Berneil Ditch	Lower Reach	12158	2981.00	1318.50	1322.50	1322.50	1324.50	0.002995	11.37	262
Berneil Ditch	Lower Reach	12058	1282.00	1316.00	1319.20	1318.80	1320.12	0.002285	7.67	167
Berneil Ditch	Lower Reach	12058	2981.00	1316.00	1321.30	1320.74	1322.78	0.002088	9.77	305
Berneil Ditch	Lower Reach	11408	1282.00	1314.00	1317.19		1318.33	0.003088	8.56	149
Berneil Ditch	Lower Reach	11408	2981.00	1314.00	1319.05	1319.02	1321.01	0.003066	11.24	265
Berneil Ditch	Lower Reach	10808	1282.00	1312.80	1316.42	1315.47	1317.02	0.001284	6.24	205
Berneil Ditch	Lower Reach	10808	2981.00	1312.80	1318.09	1317.35	1319.42	0.001834	9.26	322
Berneil Ditch	Lower Reach	10000	1282.00	1312.30	1314.77	1314.53	1315.55	0.002704	7.07	181
Berneil Ditch	Lower Reach	10000	2981.00	1312.30	1316.28	1316.07	1317.62	0.002703	9.30	320
71 St. Channel	Lower Reach	37941	498.00	1379.10	1383.89	1383.89	1384.63	0.002280	7.73	8
71 St. Channel	Lower Reach	37941	1171.00	1379.10	1385.00	1385.00	1386.24	0.003136	10.45	13
71 St. Channel	Lower Reach	37808	498.00	1378.70	1383.74	1381.88	1384.13	0.000724	4.98	10
71 St. Channel	Lower Reach	37808	1171.00	1378.70	1384.82	1384.22	1385.77	0.001423	8.22	20
71 St. Channel	Lower Reach	37700	498.00	1378.60	1383.71	1381.20	1384.04	0.000600	4.63	11
71 St. Channel	Lower Reach	37700	1171.00	1378.60	1384.58	1383.19	1385.60	0.001624	8.48	21
71 St. Channel	Lower Reach	37658		Culvert						
71 St. Channel	Lower Reach	37615	498.00	1378.50	1382.62	1381.11	1383.13	0.001127	5.74	8
71 St. Channel	Lower Reach	37615	1171.00	1378.50	1384.50	1383.64	1385.44	0.001431	8.23	21
71 St. Channel	Lower Reach	37343	498.00	1378.20	1381.28	1381.28	1382.53	0.004009	8.97	5
71 St. Channel	Lower Reach	37343	1171.00	1378.20	1383.50	1383.50	1384.91	0.002350	9.89	17
71 St. Channel	Lower Reach	37048	498.00	1377.30	1380.52		1381.15	0.001817	6.86	16
71 St. Channel	Lower Reach	37048	1171.00	1377.30	1382.06		1383.03	0.001923	9.22	35
71 St. Channel	Lower Reach	36912	498.00	1376.30	1379.38	1379.38	1380.68	0.005150	9.16	5
71 St. Channel	Lower Reach	36912	1171.00	1376.30	1381.31	1381.31	1382.65	0.003204	10.27	26
71 St. Channel	Lower Reach	36712	498.00	1375.60	1378.21		1378.68	0.002899	7.25	?
71 St. Channel	Lower Reach	36712	1171.00	1375.60	1380.29		1380.86	0.001734	8.42	?
71 St. Channel	Lower Reach	36664	498.00	1375.20	1378.27		1378.52	0.001317	5.51	29
71 St. Channel	Lower Reach	36664	1171.00	1375.20	1380.32		1380.75	0.001129	7.26	53
71 St. Channel	Lower Reach	36579	498.00	1374.70	1377.31	1377.31	1378.25	0.004861	9.31	13
71 St. Channel	Lower Reach	36579	1171.00	1374.70	1378.76	1378.76	1380.45	0.004960	12.83	23
71 St. Channel	Lower Reach	36306	498.00	1372.85	1374.74	1374.74	1375.24	0.003804	8.14	13
71 St. Channel	Lower Reach	36306	1171.00	1372.85	1375.51	1375.51	1376.37	0.004306	11.09	22

71 St. Channel	Lower Reach	36233	498.00	1372.05	1373.55	1373.55	1374.02	0.003460	6.83	13
71 St. Channel	Lower Reach	36233	1171.00	1372.05	1374.26	1374.26	1375.07	0.003823	9.39	22
71 St. Channel	Lower Reach	36088	498.00	1370.86	1372.55	1372.55	1373.03	0.003125	6.73	13
71 St. Channel	Lower Reach	36088	1171.00	1370.86	1373.27	1373.27	1374.09	0.003518	9.26	22
71 St. Channel	Lower Reach	35845	498.00	1369.45	1370.96	1370.96	1371.42	0.003396	6.76	13
71 St. Channel	Lower Reach	35845	1171.00	1369.45	1372.12		1372.60	0.001817	7.34	28
71 St. Channel	Lower Reach	35493	498.00	1367.25	1369.25		1369.51	0.001376	5.08	17
71 St. Channel	Lower Reach	35493	1171.00	1367.25	1372.21		1372.33	0.000203	3.70	56
71 St. Channel	Lower Reach	35411	498.00	1366.83	1369.29		1369.41	0.000476	3.54	25
71 St. Channel	Lower Reach	35411	1171.00	1366.83	1372.23		1372.32	0.000139	3.27	63
71 St. Channel	Lower Reach	35311	498.00	1366.00	1369.33	1367.53	1369.36	0.000064	1.52	43
71 St. Channel	Lower Reach	35311	1171.00	1366.00	1372.26	1368.08	1372.29	0.000030	1.66	93
71 St. Channel	Lower Reach	35252	498.00	1365.00	1368.01	1368.01	1369.23	0.003567	8.89	5
71 St. Channel	Lower Reach	35252	1171.00	1365.00	1369.89	1369.89	1372.07	0.003039	11.92	10
71 St. Channel	Lower Reach	35023	498.00	1363.70	1366.80	1366.80	1368.13	0.003598	9.30	5
71 St. Channel	Lower Reach	35023	1171.00	1363.70	1368.82	1368.82	1371.18	0.002987	12.38	10
71 St. Channel	Lower Reach	34873	498.00	1363.30	1366.49	1366.27	1367.57	0.002702	8.40	6
71 St. Channel	Lower Reach	34873	1171.00	1363.30	1368.24	1368.24	1370.51	0.002960	12.15	10
71 St. Channel	Lower Reach	34673	498.00	1362.70	1365.66	1365.66	1366.93	0.003572	9.09	5
71 St. Channel	Lower Reach	34673	1171.00	1362.70	1367.63	1367.63	1369.88	0.002980	12.11	10
71 St. Channel	Lower Reach	34378	660.00	1355.00	1360.04		1360.26	0.001279	3.81	17
71 St. Channel	Lower Reach	34378	1448.00	1355.00	1362.89		1363.11	0.000715	3.90	39
71 St. Channel	Lower Reach	34338	660.00	1354.28	1359.71	1357.31	1360.19	0.001302	5.52	11
71 St. Channel	Lower Reach	34338	1448.00	1354.28	1362.94	1359.41	1363.06	0.000231	2.80	54
71 St. Channel	Lower Reach	34322		Culvert						
71 St. Channel	Lower Reach	34307	660.00	1353.80	1359.22	1356.82	1359.69	0.001315	5.54	11
71 St. Channel	Lower Reach	34307	1448.00	1353.80	1361.53	1358.92	1361.69	0.000357	3.20	46
71 St. Channel	Lower Reach	34245	713.00	1353.50	1359.16		1359.54	0.002185	4.91	14
71 St. Channel	Lower Reach	34245	1557.00	1353.50	1360.89		1361.50	0.002437	6.39	25
71 St. Channel	Lower Reach	33832	713.00	1351.50	1356.73	1356.45	1357.76	0.010489	8.14	8
71 St. Channel	Lower Reach	33832	1557.00	1351.50	1359.14	1358.29	1360.08	0.004960	8.01	20
71 St. Channel	Lower Reach	33446	793.00	1349.50	1354.74		1355.35	0.003983	6.26	12
71 St. Channel	Lower Reach	33446	1644.00	1349.50	1358.30		1358.89	0.001845	6.26	30
71 St. Channel	Lower Reach	33413	793.00	1349.80	1354.79	1352.52	1355.20	0.001706	5.12	15
71 St. Channel	Lower Reach	33413	1644.00	1349.80	1358.38	1354.22	1358.79	0.001210	5.24	36
71 St. Channel	Lower Reach	33382		Culvert						
71 St. Channel	Lower Reach	33352	793.00	1349.30	1354.49	1352.02	1354.86	0.001105	4.93	16
71 St. Channel	Lower Reach	33352	1644.00	1349.30	1357.32	1353.73	1357.77	0.001101	5.56	38
71 St. Channel	Lower Reach	33290	793.00	1349.10	1353.02	1353.02	1354.41	0.010153	9.46	8
71 St. Channel	Lower Reach	33290	1644.00	1349.10	1356.90		1357.61	0.002037	6.87	30
71 St. Channel	Lower Reach	32899	793.00	1342.00	1351.03	1347.77	1352.15	0.001265	8.49	9
71 St. Channel	Lower Reach	32899	1644.00	1342.00	1353.69	1351.32	1356.50	0.002629	13.43	12
71 St. Channel	Lower Reach	32713		Culvert						
71 St. Channel	Lower Reach	32542	823.00	1340.66	1347.12	1345.91	1348.87	0.001373	10.61	7
71 St. Channel	Lower Reach	32542	1703.00	1340.66	1351.24	1349.20	1351.89	0.000561	6.65	29
71 St. Channel	Lower Reach	32392	823.00	1340.20	1346.81	1346.81	1348.55	0.003857	10.57	7
71 St. Channel	Lower Reach	32392	1703.00	1340.20	1349.56	1349.56	1351.39	0.002546	10.97	16
71 St. Channel	Lower Reach	32024	823.00	1336.38	1344.76	1340.45	1345.20	0.000562	5.32	15
71 St. Channel	Lower Reach	32024	1703.00	1336.38	1346.81	1342.99	1347.77	0.000991	8.09	25
71 St. Channel	Lower Reach	31988		Culvert						
71 St. Channel	Lower Reach	31952	823.00	1336.43	1343.50	1340.17	1344.03	0.000367	5.83	14
71 St. Channel	Lower Reach	31952	1703.00	1336.43	1345.76	1342.50	1346.90	0.001184	8.57	20
71 St. Channel	Lower Reach	31657	823.00	1336.50	1342.07	1342.07	1343.51	0.003290	9.76	8
71 St. Channel	Lower Reach	31657	1703.00	1336.50	1343.97	1343.97	1346.09	0.002918	11.95	15
71 St. Channel	Lower Reach	31292	823.00	1335.58	1340.95	1338.70	1341.44	0.000511	5.63	14
71 St. Channel	Lower Reach	31292	1703.00	1335.58	1344.22	1340.58	1344.87	0.000544	6.50	27
71 St. Channel	Lower Reach	31242		Culvert						
71 St. Channel	Lower Reach	31192	823.00	1334.90	1339.72	1337.89	1340.30	0.002539	6.10	13
71 St. Channel	Lower Reach	31192	1703.00	1334.90	1342.23	1339.75	1342.69	0.001735	5.43	31
71 St. Channel	Lower Reach	31066	823.00	1335.00	1339.14		1339.79	0.006652	6.45	12
71 St. Channel	Lower Reach	31066	1703.00	1335.00	1341.78		1342.36	0.003001	6.14	27
71 St. Channel	Lower Reach	30889	823.00	1334.40	1339.13	1336.43	1339.31	0.000849	3.48	23
71 St. Channel	Lower Reach	30889	1703.00	1334.40	1341.93	1337.69	1342.06	0.000429	2.97	59
71 St. Channel	Lower Reach	30866		Culvert						

71 St. Channel	Lower Reach	30844	823.00	1334.20	1338.86	1336.10	1339.02	0.000737	3.21	25
71 St. Channel	Lower Reach	30844	1703.00	1334.20	1341.72	1337.29	1341.80	0.000256	2.23	80
71 St. Channel	Lower Reach	30499	823.00	1333.40	1338.44		1338.66	0.001529	3.77	21
71 St. Channel	Lower Reach	30499	1703.00	1333.40	1341.41		1341.64	0.000830	3.89	45
71 St. Channel	Lower Reach	30130	823.00	1332.40	1337.82		1338.06	0.001688	3.93	20
71 St. Channel	Lower Reach	30130	1703.00	1332.40	1341.13		1341.35	0.000713	3.82	6
71 St. Channel	Lower Reach	30083	823.00	1331.40	1337.46	1334.70	1337.91	0.002232	5.37	5
71 St. Channel	Lower Reach	30083	1703.00	1331.40	1340.78	1336.66	1341.23	0.001411	5.76	33
71 St. Channel	Lower Reach	30041		Culvert						
71 St. Channel	Lower Reach	30000	823.00	1331.20	1336.83		1337.23	0.002212	5.07	16
71 St. Channel	Lower Reach	30000	1703.00	1331.20	1338.62		1339.60	0.004246	7.97	21

Profile Output Table - Culvert Only

River	Reach	River Sta	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir (ft)	Flow (cfs)	Culv Q (cfs)	Q Weir (cfs)
Berneil Ditch	Lower Reach	12183	Culvert #1	1324.04	1323.63	1323.86	1324.04		1330.00	1282.00
Berneil Ditch	Lower Reach	12183	Culvert #1	1328.01	1327.47	1328.01	1327.23		1330.00	2981.00
71 St. Channel	Lower Reach	37658	Paradise Dr.	1384.04	1383.71	1383.56	1384.04		1383.70	422.96
71 St. Channel	Lower Reach	37658	Paradise Dr.	1385.61	1384.58	1385.46	1385.61		1383.70	210.87
71 St. Channel	Lower Reach	34322	Culvert #1	1360.19	1359.71	1359.43	1360.19		1361.62	660.00
71 St. Channel	Lower Reach	34322	Culvert #1	1363.07	1362.94	1362.58	1363.07		1361.62	956.22
71 St. Channel	Lower Reach	33382	Culvert #1	1355.20	1354.79	1354.27	1355.20		1357.38	793.00
71 St. Channel	Lower Reach	33382	Culvert #1	1358.79	1358.38	1357.78	1358.79		1357.38	1136.13
71 St. Channel	Lower Reach	32713	Culvert #1	1352.15	1351.03	1351.37	1352.15		1354.34	793.00
71 St. Channel	Lower Reach	32713	Culvert #1	1356.50	1353.69	1356.28	1356.50		1354.34	1161.26
71 St. Channel	Lower Reach	31988	Culvert #1	1345.20	1344.76	1343.45	1345.20		1344.36	777.85
71 St. Channel	Lower Reach	31988	Culvert #1	1347.77	1346.81	1346.93	1347.77		1344.36	845.24
71 St. Channel	Lower Reach	31242	Gold Dust	1341.44	1340.95	1341.05	1341.44		1342.11	823.00
71 St. Channel	Lower Reach	31242	Gold Dust	1344.87	1344.22	1344.29	1344.87		1342.11	1180.32
71 St. Channel	Lower Reach	30866	Culvert #2	1339.32	1339.13	1337.77	1339.32		1339.93	823.00
71 St. Channel	Lower Reach	30866	Culvert #2	1342.06	1341.93	1340.58	1342.06		1339.93	705.23
71 St. Channel	Lower Reach	30041	Berneil	1337.91	1337.46	1336.88	1337.91		1339.31	823.00
71 St. Channel	Lower Reach	30041	Berneil	1341.23	1340.78	1340.54	1341.23		1339.31	1333.00



**APPENDIX C**

**SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN  
EXISTING CONDITIONS NORMAL DEPTH AND CULVERT  
HYDRAULIC COMPUTATION SHEETS**

**NORMAL DEPTH OUTPUT DATA AND CROSS-SECTION PLOTS**

**HY-8 OUTPUT FILES**

## Normal Depth Section A, 64th St. Channel from Gary to Shea, 100yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect A, 64St. - Gary to Shea Blvd, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006000 ft/ft
Discharge	987.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.021
Water Surface Elevation	105.18 ft
Elevation Range	100.00 to 105.00
Flow Area	110.8 ft <sup>2</sup>
Wetted Perimeter	54.42 ft
Top Width	49.00 ft
Actual Depth	5.18 ft
Critical Elevation	105.25 ft
Critical Slope	0.005462 ft/ft
Velocity	8.91 ft/s
Velocity Head	1.23 ft
Specific Energy	106.41 ft
Froude Number	1.04
Flow Type	Supercritical

Calculation Messages:  
Water elevation exceeds lowest end station by 1.17912762 ft.

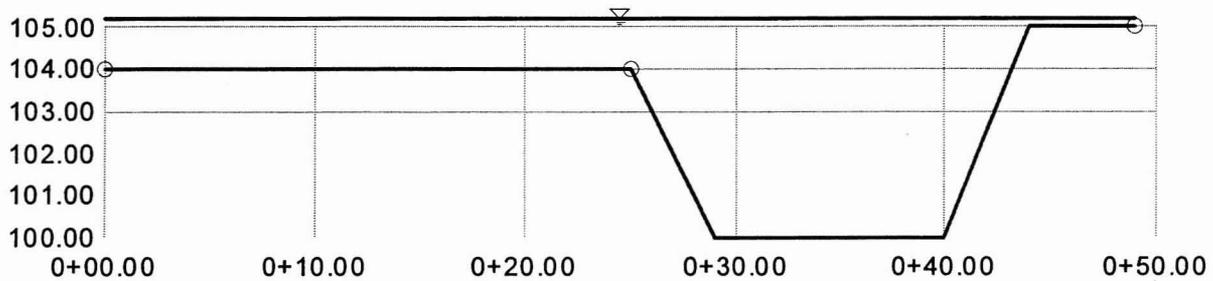
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+25.00	0.016
0+25.00	0+49.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	104.00
0+25.00	104.00
0+29.00	100.00
0+40.00	100.00
0+44.00	105.00
0+49.00	105.00

## Normal Depth Section A, 64th St Channel from Gary to Shea, 100yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect A, 64St. - Gary to Shea Blvd, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.021
Slope	0.006000 ft/ft
Water Surface Elevation	105.18 ft
Elevation Range	100.00 to 105.00
Discharge	987.00 cfs



V:2.0  
H:1  
NTS

## Normal Depth Section A, 64th St. Channel from Gary to Shea, 10yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect A, 64St. - Gary to Shea Blvd, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006000 ft/ft
Discharge	303.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	102.93 ft
Elevation Range	100.00 to 105.00
Flow Area	40.0 ft <sup>2</sup>
Wetted Perimeter	18.89 ft
Top Width	16.27 ft
Actual Depth	2.93 ft
Critical Elevation	102.66 ft
Critical Slope	0.008375 ft/ft
Velocity	7.58 ft/s
Velocity Head	0.89 ft
Specific Energy	103.82 ft
Froude Number	0.85
Flow Type	Subcritical

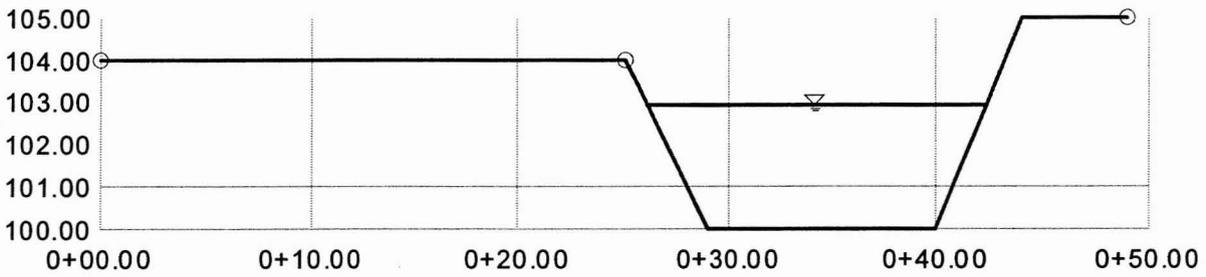
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+25.00	0.016
0+25.00	0+49.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	104.00
0+25.00	104.00
0+29.00	100.00
0+40.00	100.00
0+44.00	105.00
0+49.00	105.00

# Normal Depth Section A, 64th St Channel from Gary to Shea, 10yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect A, 64St. - Gary to Shea Blvd, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	102.93 ft
Elevation Range	100.00 to 105.00
Discharge	303.00 cfs



V:2.0  
H:1  
NTS

# Normal Depth Section A, 64th St. Channel from Gary to Shea, Channel Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	RR067A, 64St. - Gary to Shea Blvd, channel capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.006000 ft/ft
Water Surface Elevation	104.00 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Elevation Range	100.00 to 105.00
Discharge	518.95 cfs
Flow Area	58.4 ft <sup>2</sup>
Wetted Perimeter	21.78 ft
Top Width	18.20 ft
Actual Depth	4.00 ft
Critical Elevation	103.69 ft
Critical Slope	0.007942 ft/ft
Velocity	8.89 ft/s
Velocity Head	1.23 ft
Specific Energy	105.23 ft
Froude Number	0.87
Flow Type	Subcritical

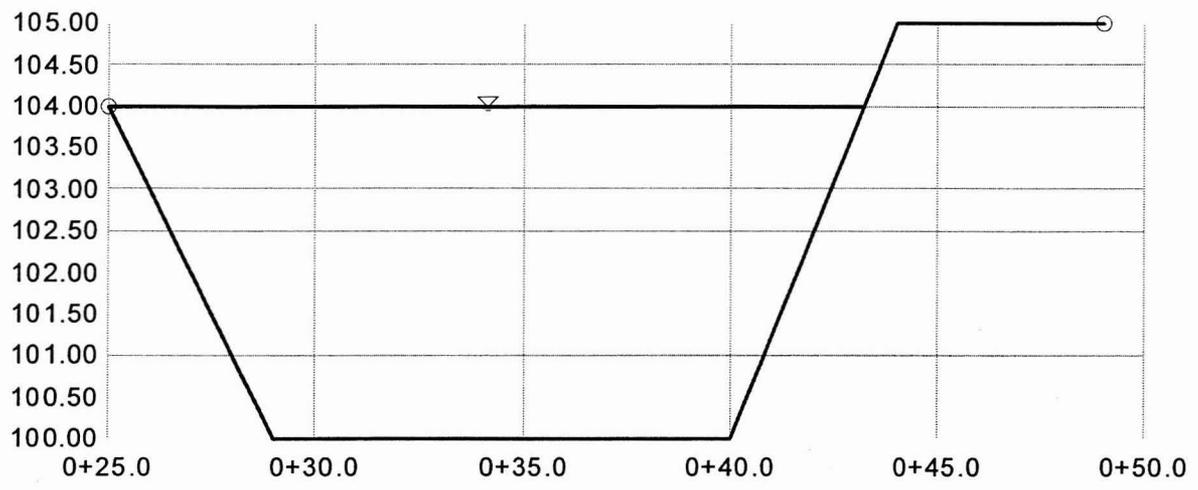
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+25.0	0+49.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+25.0	104.00
0+29.0	100.00
0+40.0	100.00
0+44.0	105.00
0+49.0	105.00

# Normal Depth Section A, 64th St Channel from Gary to Shea, Channel Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	RR067A, 64St. - Gary to Shea Blvd, channel capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	104.00 ft
Elevation Range	100.00 to 105.00
Discharge	518.95 cfs



V:2.0  
H:1  
NTS

CURRENT DATE: 09-05-2002  
 START TIME: 13:59:03

FILE DATE: 09-05-2002  
 FILE NAME: SHEA64TH

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.0

C U L V E R T N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	100.21	100.00	35.00	2 RCB	10.00	4.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs)                      FILE: SHEA64TH                      DATE: 09-05-2002

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
102.49	98.7	98.7	0.0	0.0	0.0	0.0	0.0	0.00	1
102.88	197.4	197.4	0.0	0.0	0.0	0.0	0.0	0.00	1
103.41	296.1	296.1	0.0	0.0	0.0	0.0	0.0	0.00	1
103.46	303.0	303.0	0.0	0.0	0.0	0.0	0.0	0.00	1
104.77	493.5	493.5	0.0	0.0	0.0	0.0	0.0	0.00	1
105.50	592.2	592.2	0.0	0.0	0.0	0.0	0.0	0.00	1
106.16	690.9	671.3	0.0	0.0	0.0	0.0	0.0	18.37	5
106.43	789.6	703.0	0.0	0.0	0.0	0.0	0.0	85.47	4
106.65	888.3	727.6	0.0	0.0	0.0	0.0	0.0	157.86	3
106.88	987.0	736.0	0.0	0.0	0.0	0.0	0.0	248.82	3
106.00	653.7	653.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS                      FILE: SHEA64TH                      DATE: 09-05-2002

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
100.21	0.000	0.00	0.00	0.00
102.49	0.000	98.70	0.00	0.00
102.88	0.000	197.40	0.00	0.00
103.41	0.000	296.10	0.00	0.00
103.46	0.000	303.00	0.00	0.00
104.77	0.000	493.50	0.00	0.00
105.50	0.000	592.20	0.00	0.00
106.16	-0.003	690.90	1.18	0.17
106.43	-0.002	789.60	1.08	0.14
106.65	-0.005	888.30	2.82	0.32
106.88	-0.003	987.00	2.13	0.22

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000



REPORT DATE: 09-05-2002  
 CURRENT TIME: 13:59:03

FILE DATE: 09-05-2002  
 FILE NAME: SHEA64TH

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*

BOTTOM WIDTH	10.00 ft
SIDE SLOPE H/V (X:1)	2.5
CHANNEL SLOPE V/H (ft/ft)	0.006
MANNING'S n (.01-0.1)	0.025
CHANNEL INVERT ELEVATION	100.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	100.00 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	100.00	0.000	0.00	0.00	0.00
98.70	101.46	0.722	1.46	4.95	0.55
197.40	102.12	0.735	2.12	6.08	0.80
296.10	102.62	0.741	2.62	6.82	0.98
303.00	102.65	0.742	2.65	6.86	0.99
493.50	103.40	0.749	3.40	7.84	1.27
592.20	103.72	0.752	3.72	8.23	1.39
690.90	104.02	0.755	4.02	8.59	1.50
789.60	104.29	0.757	4.29	8.89	1.61
888.30	104.54	0.759	4.54	9.18	1.70
987.00	104.77	0.761	4.77	9.43	1.79

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	32.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	106.00 ft

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**Normal Dept Sect B, 64th St Channel from Shea to Mtn View, 100yr, 6hr  
Worksheet for Irregular Channel**

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006000 ft/ft
Discharge	717.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	104.15 ft
Elevation Range	100.00 to 107.50
Flow Area	80.1 ft <sup>2</sup>
Wetted Perimeter	29.56 ft
Top Width	27.60 ft
Actual Depth	4.15 ft
Critical Elevation	103.98 ft
Critical Slope	0.007067 ft/ft
Velocity	8.95 ft/s
Velocity Head	1.24 ft
Specific Energy	105.40 ft
Froude Number	0.93
Flow Type	Subcritical

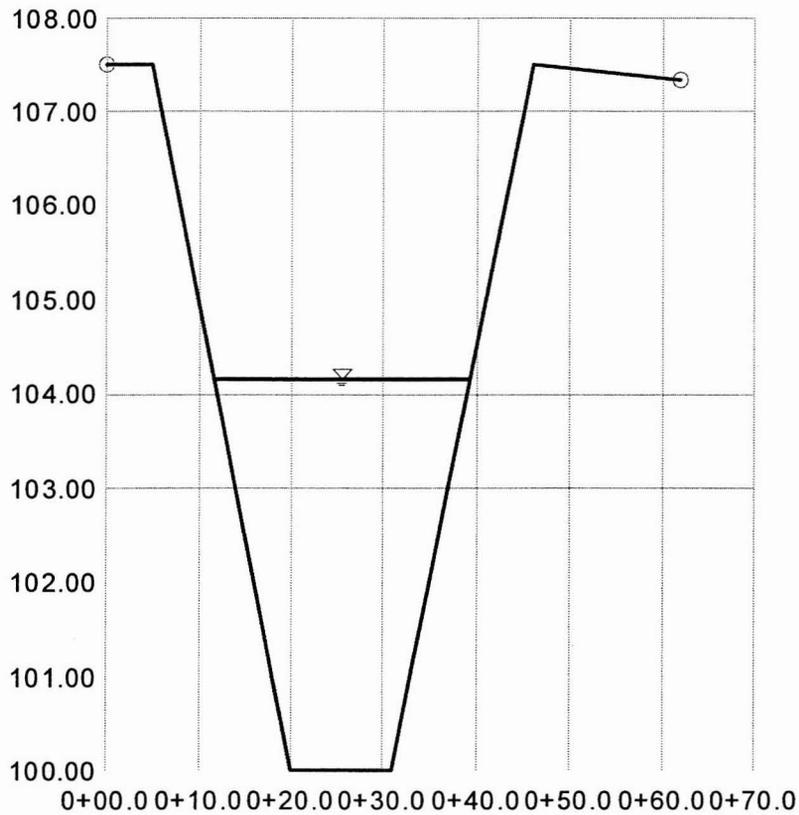
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+62.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	107.50
0+05.0	107.50
0+20.0	100.00
0+31.0	100.00
0+46.0	107.50
0+62.0	107.34

# Normal Depth Sect B, 64th St Channel from Shea to Mtn View, 100yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	104.15 ft
Elevation Range	100.00 to 107.50
Discharge	717.00 cfs



V:10.0  
H:1  
NTS

## Normal Depth Sect B, 64th St. Channel from Shea to Mtn View, 10yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, 10yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006000 ft/ft
Discharge	337.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	102.80 ft
Elevation Range	100.00 to 107.50
Flow Area	46.5 ft <sup>2</sup>
Wetted Perimeter	23.52 ft
Top Width	22.20 ft
Actual Depth	2.80 ft
Critical Elevation	102.61 ft
Critical Slope	0.007822 ft/ft
Velocity	7.25 ft/s
Velocity Head	0.82 ft
Specific Energy	103.62 ft
Froude Number	0.88
Flow Type	Subcritical

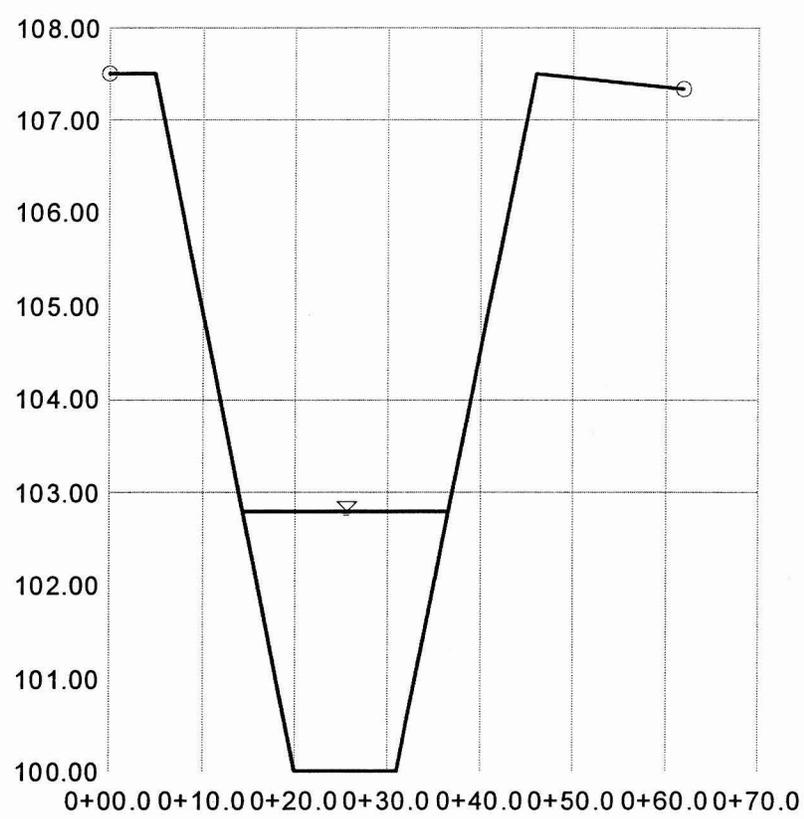
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+62.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	107.50
0+05.0	107.50
0+20.0	100.00
0+31.0	100.00
0+46.0	107.50
0+62.0	107.34

# Normal Depth Sect B, 64th St Channel from Shea to Mtn View, 10yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, 10yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	102.80 ft
Elevation Range	100.00 to 107.50
Discharge	337.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect B, 64th St Channel from Shea to Mtn View, Channel Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, Channel Capacit
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.006000 ft/ft
Water Surface Elevation	107.50 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results	
Mannings Coefficient	0.025
Elevation Range	100.00 to 107.50
Discharge	2,402.60 cfs
Flow Area	195.0 ft <sup>2</sup>
Wetted Perimeter	44.54 ft
Top Width	41.00 ft
Actual Depth	7.50 ft
Critical Elevation	107.49 ft
Critical Slope	0.006051 ft/ft
Velocity	12.32 ft/s
Velocity Head	2.36 ft
Specific Energy	109.86 ft
Froude Number	1.00
Flow Type	Subcritical

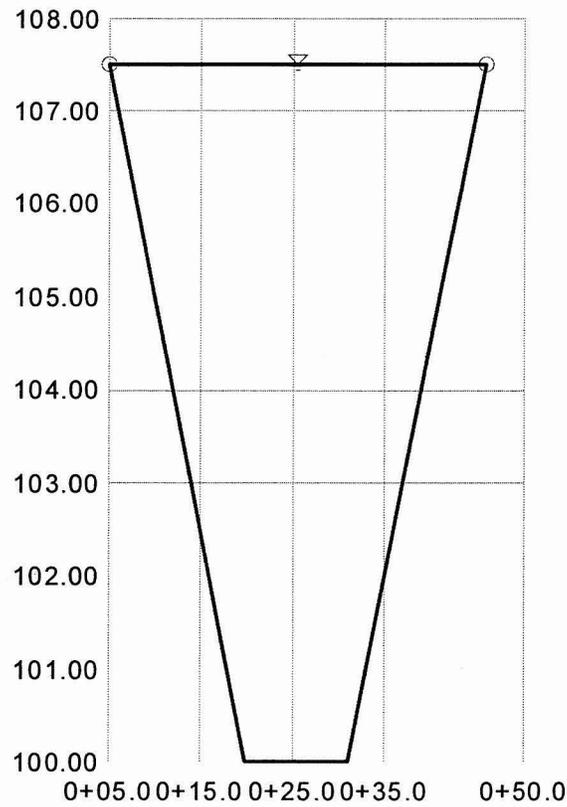
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+05.0	0+46.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+05.0	107.50
0+20.0	100.00
0+31.0	100.00
0+46.0	107.50

# Normal Depth Sect B, 64th St Channel from Shea to Mtn View, Channel Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	RR067B, 64St, Shea to Mtn View, Channel Capacit
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	107.50 ft
Elevation Range	100.00 to 107.50
Discharge	2,402.60 cfs



V:10.0  
H:1  
NTS



CURRENT DATE: 03-12-2002  
 START TIME: 11:07:55

FILE DATE: 03-12-2002  
 FILE NAME: 64STCHA

PERFORMANCE CURVE FOR CULVERT 1 - 2 ( 10.00 (ft) BY 5.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	100.21	0.00	-0.21	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
71.70	102.88	1.27	2.67	1-S2n	0.57	0.74	0.60	1.17	5.98	4.42
143.40	103.14	2.00	2.93	1-S2n	0.88	1.17	0.96	1.71	7.45	5.47
215.10	103.38	2.61	3.17	1-S2n	1.15	1.53	1.28	2.14	8.38	6.17
286.80	103.63	3.15	3.42	1-S2n	1.40	1.86	1.57	2.49	9.12	6.70
337.00	103.81	3.49	3.60	1-S2n	1.56	2.07	1.76	2.71	9.57	7.01
430.20	104.31	4.10	3.96	1-S2n	1.83	2.44	2.10	3.07	10.26	7.51
501.90	104.75	4.54	4.26	1-S2n	2.04	2.70	2.34	3.32	10.72	7.83
573.60	105.19	4.98	4.57	1-S2n	2.23	2.95	2.57	3.55	11.15	8.12
645.30	105.64	5.43	4.90	1-S2n	2.42	3.19	2.79	3.77	11.55	8.39
717.00	106.09	5.88	5.26	5-S2n	2.60	3.42	3.01	3.97	11.89	8.63

El. inlet face invert	100.21 ft	El. outlet invert	100.00 ft
El. inlet throat invert	0.00 ft	El. inlet crest	0.00 ft

\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION 0.00 ft  
 INLET ELEVATION 100.21 ft  
 OUTLET STATION 35.00 ft  
 OUTLET ELEVATION 100.00 ft  
 NUMBER OF BARRELS 2  
 SLOPE (V/H) 0.0060  
 CULVERT LENGTH ALONG SLOPE 35.00 ft

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE BOX  
 BARREL SPAN 10.00 ft  
 BARREL RISE 5.00 ft  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S n 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (90-45 DEG.)  
 INLET DEPRESSION NONE

CURRENT DATE: 03-12-2002  
 CURRENT TIME: 11:07:55

FILE DATE: 03-12-2002  
 FILE NAME: 64STCHA

TAILWATER

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
 BOTTOM WIDTH 11.00 ft  
 SIDE SLOPE H/V (X:1) 2.5  
 CHANNEL SLOPE V/H (ft/ft) 0.006  
 MANNING'S n (.01-0.1) 0.025  
 CHANNEL INVERT ELEVATION 100.00 ft  
 CULVERT NO.1 OUTLET INVERT ELEVATION 100.00 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	100.00	0.000	0.00	0.00	0.00
71.70	101.17	0.721	1.17	4.42	0.44
143.40	101.71	0.736	1.71	5.47	0.64
215.10	102.14	0.744	2.14	6.17	0.80
286.80	102.49	0.749	2.49	6.70	0.93
337.00	102.71	0.751	2.71	7.01	1.01
430.20	103.07	0.755	3.07	7.51	1.15
501.90	103.32	0.757	3.32	7.83	1.24
573.60	103.55	0.760	3.55	8.12	1.33
645.30	103.77	0.761	3.77	8.39	1.41
717.00	103.97	0.763	3.97	8.63	1.49

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	30.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	107.50 ft

# Normal Depth Sect B, 64th Street Channel Conveyance Under Bridge Crossing Worksheet for Irregular Channel

Project Description	
Worksheet	64th Street Channel Bridge Opening
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.006000 ft/ft
Water Surface Elevation	1,250.83 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Elevation Range	1,244.35 to 1,250.83
Discharge	1,738.60 cfs
Flow Area	150.7 ft <sup>2</sup>
Wetted Perimeter	37.97 ft
Top Width	34.50 ft
Actual Depth	6.48 ft
Critical Elevation	1,250.74 ft
Critical Slope	0.006351 ft/ft
Velocity	11.54 ft/s
Velocity Head	2.07 ft
Specific Energy	1,252.90 ft
Froude Number	0.97
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+34.5	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	1,250.83
0+11.3	1,244.35
0+23.3	1,244.35
0+34.5	1,250.83

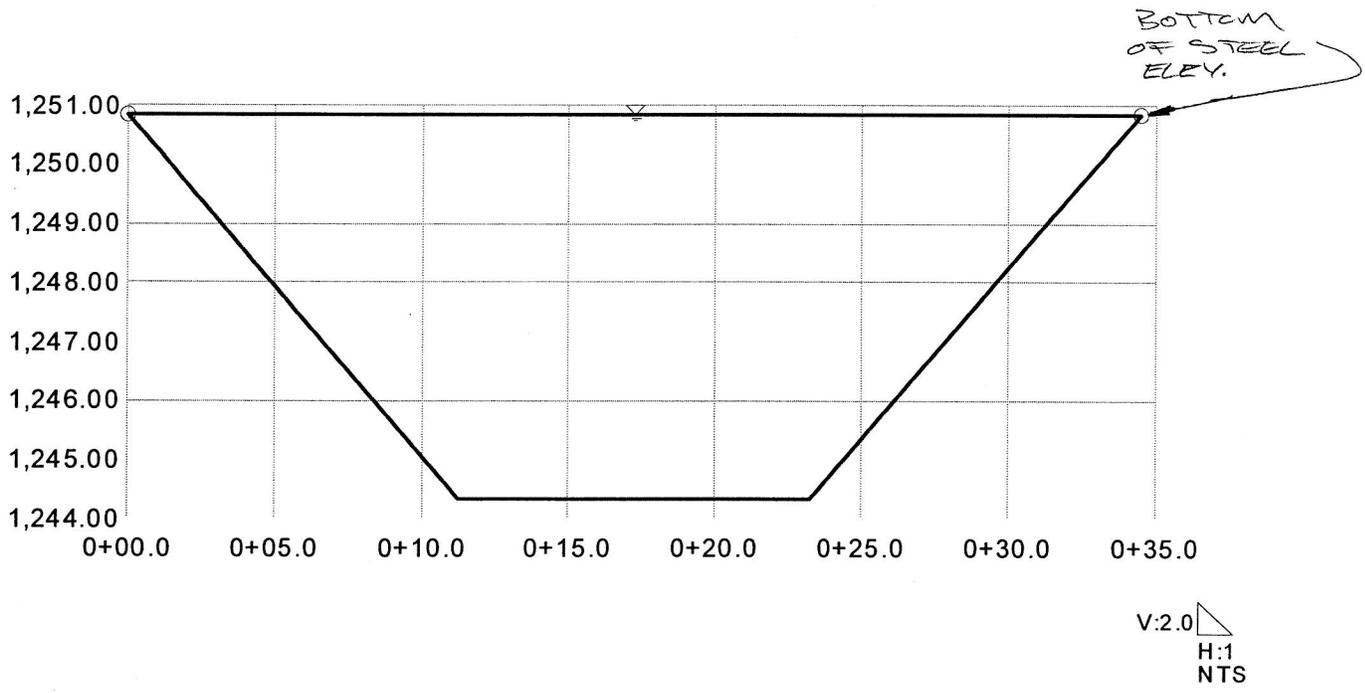
*BOTTOM OF STEEL*

*STATIONING AND ELEVATIONS  
FROM CITY OF SDALE DWG #16578*

# Normal Depth Sect B, 64th Street Channel Conveyance Under Bridge Crossing Cross Section for Irregular Channel

Project Description	
Worksheet	64th Street Channel Bridge Opening
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.025
Slope	0.006000 ft/ft
Water Surface Elevation	1,250.83 ft
Elevation Range	1,244.35 to 1,250.83
Discharge	1,738.60 cfs



**Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 100yr, 6hr (50/50 Flow Split)**  
**Worksheet for Irregular Channel**

Project Description	
Worksheet	Normal Depth Sect C, Mtn View to IBW, 100yr, 6hr, 50/50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	496.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	103.88 ft
Elevation Range	100.00 to 105.83
Flow Area	63.3 ft <sup>2</sup>
Wetted Perimeter	24.84 ft
Top Width	22.65 ft
Actual Depth	3.88 ft
Critical Elevation	103.49 ft
Critical Slope	0.007488 ft/ft
Velocity	7.84 ft/s
Velocity Head	0.96 ft
Specific Energy	104.83 ft
Froude Number	0.83
Flow Type	Subcritical

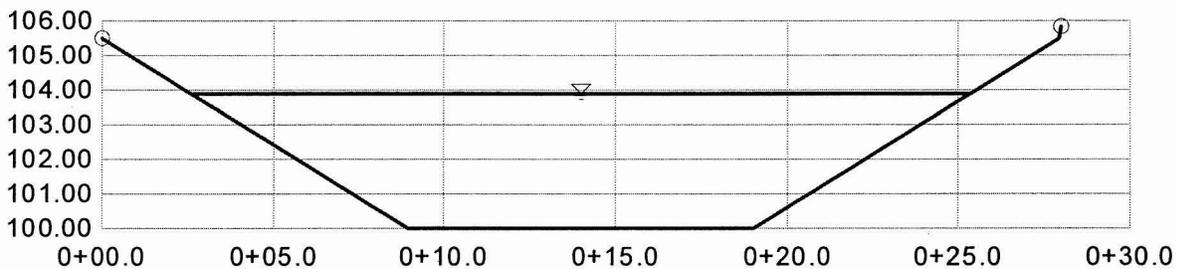
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+28.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	105.50
0+09.0	100.00
0+19.0	100.00
0+28.0	105.50
0+28.0	105.83

# Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 100yr, 6hr (50/50 Flow Split) Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect C, Mtn View to IBW, 100yr, 6hr, 50/50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	103.88 ft
Elevation Range	100.00 to 105.83
Discharge	496.00 cfs



V:1  
 H:1.0  
 NTS

**Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 10yr, 6hr (50/50 Flow Split)  
Worksheet for Irregular Channel**

Project Description	
Worksheet	RR069, Mtn View to IBW, 10yr, 6hr, 50/50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	219.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	102.50 ft
Elevation Range	100.00 to 105.83
Flow Area	35.2 ft <sup>2</sup>
Wetted Perimeter	19.57 ft
Top Width	18.16 ft
Actual Depth	2.50 ft
Critical Elevation	102.17 ft
Critical Slope	0.008334 ft/ft
Velocity	6.22 ft/s
Velocity Head	0.60 ft
Specific Energy	103.10 ft
Froude Number	0.79
Flow Type	Subcritical

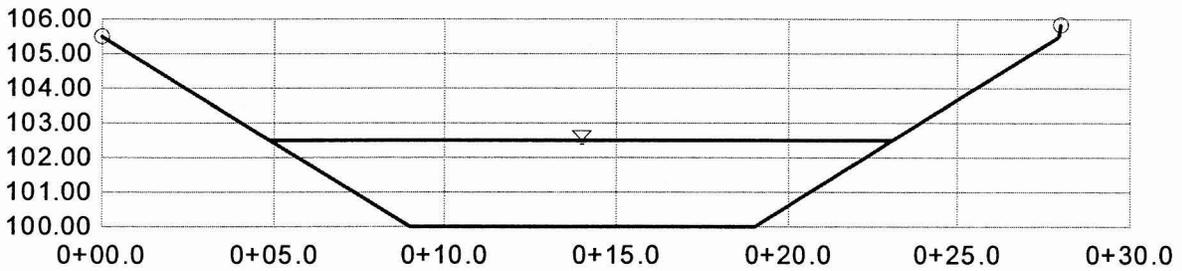
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+28.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	105.50
0+09.0	100.00
0+19.0	100.00
0+28.0	105.50
0+28.0	105.83

# Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 10yr, 6hr (50/50 Flow Split) Cross Section for Irregular Channel

Project Description	
Worksheet	RR069, Mtn View to IBW, 10yr, 6hr, 50/50
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	102.50 ft
Elevation Range	100.00 to 105.83
Discharge	219.00 cfs



V:1  
H:1.0  
NTS

CURRENT DATE: 03-12-2002  
 CURRENT TIME: 11:45:00

FILE DATE: 03-12-2002  
 FILE NAME: INVCHNL

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.0

C U L V E R T N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	100.18	100.00	35.00	2 RCB	6.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: INVCHNL DATE: 03-12-2002

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
102.43	49.6	49.6	0.0	0.0	0.0	0.0	0.0	0.00	1
102.75	99.2	99.2	0.0	0.0	0.0	0.0	0.0	0.00	1
103.08	148.8	148.8	0.0	0.0	0.0	0.0	0.0	0.00	1
103.62	198.4	198.4	0.0	0.0	0.0	0.0	0.0	0.00	1
103.86	219.0	219.0	0.0	0.0	0.0	0.0	0.0	0.00	1
104.76	297.6	297.6	0.0	0.0	0.0	0.0	0.0	0.00	1
105.37	347.2	347.2	0.0	0.0	0.0	0.0	0.0	0.00	1
105.69	396.8	370.8	0.0	0.0	0.0	0.0	0.0	24.06	5
105.85	446.4	382.9	0.0	0.0	0.0	0.0	0.0	62.25	4
105.98	496.0	392.6	0.0	0.0	0.0	0.0	0.0	100.49	3
105.50	356.8	356.8	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: INVCHNL DATE: 03-12-2002

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
100.18	0.000	0.00	0.00	0.00
102.43	0.000	49.60	0.00	0.00
102.75	0.000	99.20	0.00	0.00
103.08	0.000	148.80	0.00	0.00
103.62	0.000	198.40	0.00	0.00
103.86	0.000	219.00	0.00	0.00
104.76	0.000	297.60	0.00	0.00
105.37	0.000	347.20	0.00	0.00
105.69	-0.005	396.80	1.96	0.49
105.85	-0.003	446.40	1.22	0.27
105.98	-0.006	496.00	2.89	0.58

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 03-12-2002  
 CURRENT TIME: 11:45:00

FILE DATE: 03-12-2002  
 FILE NAME: INVCHNL

PERFORMANCE CURVE FOR CULVERT 1 - 2( 6.00 (ft) BY 4.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	100.18	0.00	-0.18	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
49.60	102.43	1.38	2.25	1-S2n	0.67	0.81	0.67	1.08	6.13	3.93
99.20	102.75	2.19	2.57	1-S2n	1.08	1.29	1.13	1.62	7.33	4.93
148.80	103.08	2.85	2.90	1-S2n	1.42	1.69	1.50	2.04	8.27	5.59
198.40	103.62	3.44	3.27	1-S2n	1.74	2.04	1.83	2.39	9.01	6.10
219.00	103.86	3.68	3.43	1-S2n	1.87	2.18	1.96	2.53	9.29	6.28
297.60	104.76	4.58	4.12	5-S2n	2.33	2.68	2.45	2.99	10.13	6.86
347.20	105.37	5.19	4.62	5-S2n	2.61	2.97	2.74	3.25	10.58	7.17
370.77	105.68	5.50	4.87	5-S2n	2.74	3.10	2.86	3.50	10.80	7.45
382.94	105.84	5.66	5.14	5-S2n	2.81	3.17	2.93	3.72	10.89	7.70
392.62	105.98	5.80	5.43	5-S2n	2.86	3.22	2.98	3.94	10.97	7.92

El. inlet face invert 100.18 ft El. outlet invert 100.00 ft  
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION 0.00 ft  
 INLET ELEVATION 100.18 ft  
 OUTLET STATION 35.00 ft  
 OUTLET ELEVATION 100.00 ft  
 NUMBER OF BARRELS 2  
 SLOPE (V/H) 0.0051  
 CULVERT LENGTH ALONG SLOPE 35.00 ft

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE BOX  
 BARREL SPAN 6.00 ft  
 BARREL RISE 4.00 ft  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S n 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (90-45 DEG.)  
 INLET DEPRESSION NONE

CURRENT DATE: 03-12-2002  
CURRENT TIME: 11:45:00

FILE DATE: 03-12-2002  
FILE NAME: INVCHNL

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH 10.00 ft  
SIDE SLOPE H/V (X:1) 1.5  
CHANNEL SLOPE V/H (ft/ft) 0.005  
MANNING'S n (.01-0.1) 0.025  
CHANNEL INVERT ELEVATION 100.00 ft  
CULVERT NO.1 OUTLET INVERT ELEVATION 100.00 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	100.00	0.000	0.00	0.00	0.00
49.60	101.08	0.666	1.08	3.93	0.34
99.20	101.62	0.682	1.62	4.93	0.50
148.80	102.04	0.690	2.04	5.59	0.64
198.40	102.39	0.694	2.39	6.10	0.75
219.00	102.53	0.696	2.53	6.28	0.79
297.60	102.99	0.699	2.99	6.86	0.93
347.20	103.25	0.701	3.25	7.17	1.01
396.80	103.50	0.702	3.50	7.45	1.09
446.40	103.72	0.703	3.72	7.70	1.16
496.00	103.94	0.704	3.94	7.92	1.23

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE PAVED  
EMBANKMENT TOP WIDTH 30.00 ft  
CREST LENGTH 100.00 ft  
OVERTOPPING CREST ELEVATION 105.50 ft

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# Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 100yr, 6hr (60/40 Flow Split)

## Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect C, Mtn View to IBW, 100yr, 6hr, 60/40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	573.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	104.18 ft
Elevation Range	100.00 to 105.83
Flow Area	70.3 ft <sup>2</sup>
Wetted Perimeter	25.99 ft
Top Width	23.63 ft
Actual Depth	4.18 ft
Critical Elevation	103.78 ft
Critical Slope	0.007354 ft/ft
Velocity	8.16 ft/s
Velocity Head	1.03 ft
Specific Energy	105.21 ft
Froude Number	0.83
Flow Type	Subcritical

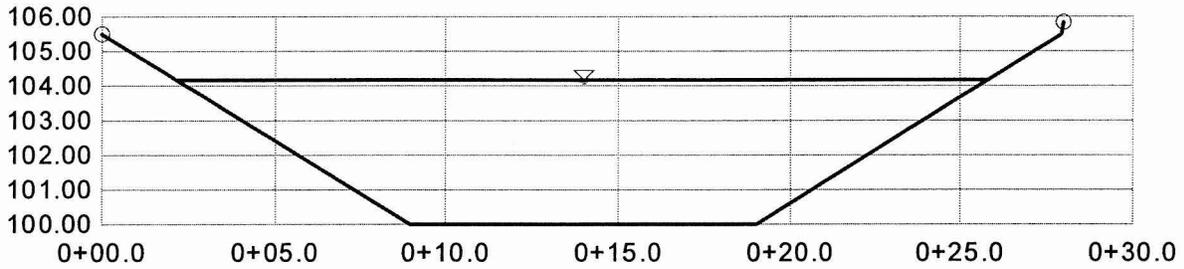
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+28.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	105.50
0+09.0	100.00
0+19.0	100.00
0+28.0	105.50
0+28.0	105.83

# Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 100yr, 6hr (60/40 Flow Split) Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect C, Mtn View to IBW, 100yr, 6hr, 60/40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	104.18 ft
Elevation Range	100.00 to 105.83
Discharge	573.00 cfs



V:1  
 H:1.0  
 NTS

**Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 10yr, 6hr (60/40 Flow Split)**  
**Worksheet for Irregular Channel**

Project Description	
Worksheet	Normal Depth Sect C, Mtn View to IBW, 10yr, 6hr, 60/40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	257.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.025
Water Surface Elevation	102.73 ft
Elevation Range	100.00 to 105.83
Flow Area	39.5 ft <sup>2</sup>
Wetted Perimeter	20.45 ft
Top Width	18.91 ft
Actual Depth	2.73 ft
Critical Elevation	102.39 ft
Critical Slope	0.008155 ft/ft
Velocity	6.51 ft/s
Velocity Head	0.66 ft
Specific Energy	103.39 ft
Froude Number	0.79
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+28.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	105.50
0+09.0	100.00
0+19.0	100.00
0+28.0	105.50
0+28.0	105.83

# Normal Depth Sect C, Invergordon Rd Chnl from Mtn View Chnl to IBW, 10yr, 6hr (60/40 Flow Split) Cross Section for Irregular Channel

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**Project Description**

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Worksheet	Normal Depth Sect C, Mtn View to IBW, 10yr, 6hr, 60/40
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

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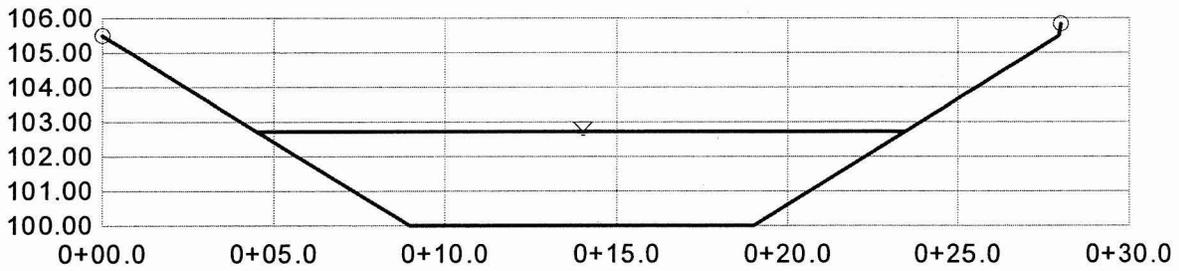
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**Section Data**

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Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	102.73 ft
Elevation Range	100.00 to 105.83
Discharge	257.00 cfs

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V:1  
H:1.0  
NTS

# Normal Depth Sect C, Invergordon Rd Channel from Mtn View Channel to IBW, Channel Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	RR069, Mtn View to IBW, Channel Capacit
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.005000 ft/ft
Water Surface Elevation	105.50 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results	
Mannings Coefficient	0.025
Elevation Range	100.00 to 105.83
Discharge	984.13 cfs
Flow Area	104.4 ft <sup>2</sup>
Wetted Perimeter	31.05 ft
Top Width	27.95 ft
Actual Depth	5.50 ft
Critical Elevation	105.08 ft
Critical Slope	0.006880 ft/ft
Velocity	9.43 ft/s
Velocity Head	1.38 ft
Specific Energy	106.88 ft
Froude Number	0.86
Flow Type	Subcritical

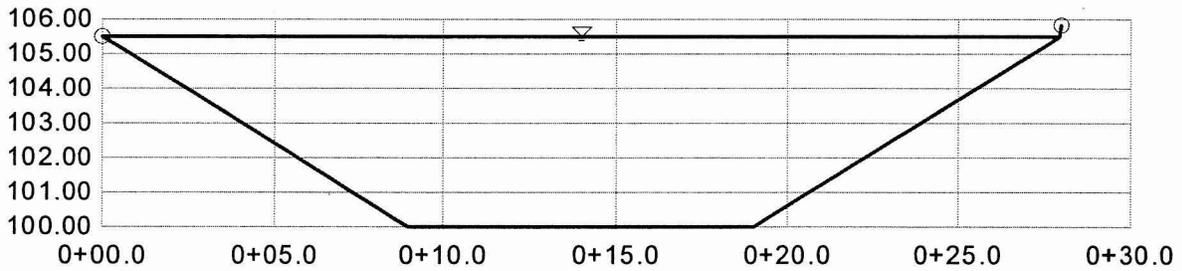
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+28.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	105.50
0+09.0	100.00
0+19.0	100.00
0+28.0	105.50
0+28.0	105.83

# Normal Depth Sect C, Invergordon Rd Channel from Mtn View Channel to IBW, Channel Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	RR069, Mtn View to IBW, Channel Capacit
Flow Element	Irregular Channel
Method	Manning's Fomula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	105.50 ft
Elevation Range	100.00 to 105.83
Discharge	984.13 cfs



V:1  
H:1.0  
NTS





CURRENT DATE: 03-12-2002  
 CURRENT TIME: 11:40:38

*6040 SPLIT*  
 FILE DATE: 03-12-2002  
 FILE NAME: INVCHNL

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
 BOTTOM WIDTH 10.00 ft  
 SIDE SLOPE H/V (X:1) 1.5  
 CHANNEL SLOPE V/H (ft/ft) 0.005  
 MANNING'S n (.01-0.1) 0.025  
 CHANNEL INVERT ELEVATION 100.00 ft  
 CULVERT NO.1 OUTLET INVERT ELEVATION 100.00 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	100.00	0.000	0.00	0.00	0.00
57.30	101.18	0.670	1.18	4.13	0.37
114.60	101.76	0.685	1.76	5.16	0.55
171.90	102.21	0.692	2.21	5.84	0.69
229.20	102.59	0.696	2.59	6.36	0.81
257.00	102.76	0.698	2.76	6.58	0.86
343.80	103.24	0.701	3.24	7.15	1.01
401.10	103.52	0.702	3.52	7.47	1.10
458.40	103.78	0.703	3.78	7.75	1.18
515.70	104.02	0.704	4.02	8.01	1.25
573.00	104.25	0.705	4.25	8.24	1.33

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	30.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	105.50 ft

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# Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, 100yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, 100y
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.011000 ft/ft
Discharge	405.00 cfs

*Q @ RR015B = 645 CFS*  
*66" Ø SD = 240 CFS*  
*645 - 240 = 405 CFS*

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	101.05 ft
Elevation Range	100.00 to 101.14
Flow Area	58.0 ft <sup>2</sup>
Wetted Perimeter	90.08 ft
Top Width	87.48 ft
Actual Depth	1.05 ft
Critical Elevation	101.28 ft
Critical Slope	0.004579 ft/ft
Velocity	6.98 ft/s
Velocity Head	0.76 ft
Specific Energy	101.81 ft
Froude Number	1.51
Flow Type	Supercritical

Calculation Messages:  
 Flow is divided.  
 Water elevation exceeds lowest end station by 0.54871775 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+10.5	0.025
0+10.5	0+98.5	0.016
0+98.5	1+03.5	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	100.50
0+05.0	100.50
0+10.5	100.50
0+10.6	100.00
0+46.5	100.72
0+46.5	101.14
0+62.5	101.14

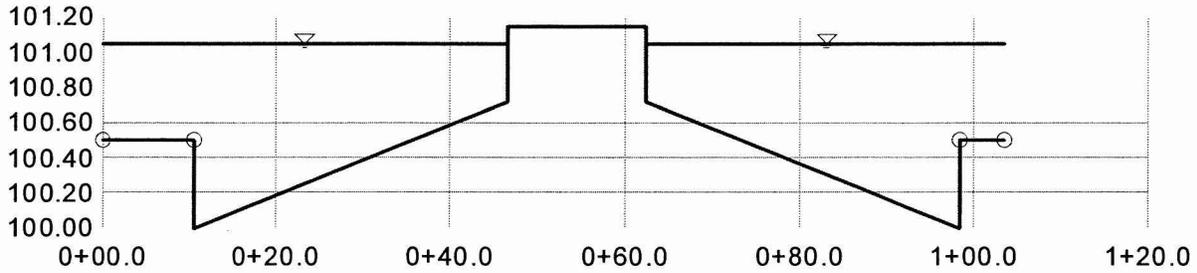
**Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, 100yr, 6hr  
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
0+62.5	100.72
0+98.5	100.00
0+98.5	100.50
1+03.5	100.50

# Normal Depth Sect D, Sdale Rd from Greenway-Hayden to Tbird, 100yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.017
Slope	0.011000 ft/ft
Water Surface Elevation	101.05 ft
Elevation Range	100.00 to 101.14
Discharge	405.00 cfs



V:20.0  
 H:1  
 NTS

# Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, 10yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, 10y
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.011000 ft/ft
Discharge	111.00 cfs

*Q @ RR015B = 351 cfs*  
*66" @ SD = 240 cfs*  
*351 - 240 = 111 cfs*

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	100.67 ft
Elevation Range	100.00 to 101.14
Flow Area	25.3 ft <sup>2</sup>
Wetted Perimeter	83.66 ft
Top Width	82.74 ft
Actual Depth	0.67 ft
Critical Elevation	100.75 ft
Critical Slope	0.005303 ft/ft
Velocity	4.38 ft/s
Velocity Head	0.30 ft
Specific Energy	100.97 ft
Froude Number	1.40
Flow Type	Supercritical

Calculation Messages:  
 Water elevation exceeds lowest end station by 0.17326554 ft.  
 Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+10.5	0.025
0+10.5	0+98.5	0.016
0+98.5	1+03.5	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	100.50
0+05.0	100.50
0+10.5	100.50
0+10.6	100.00
0+46.5	100.72
0+46.5	101.14
0+62.5	101.14

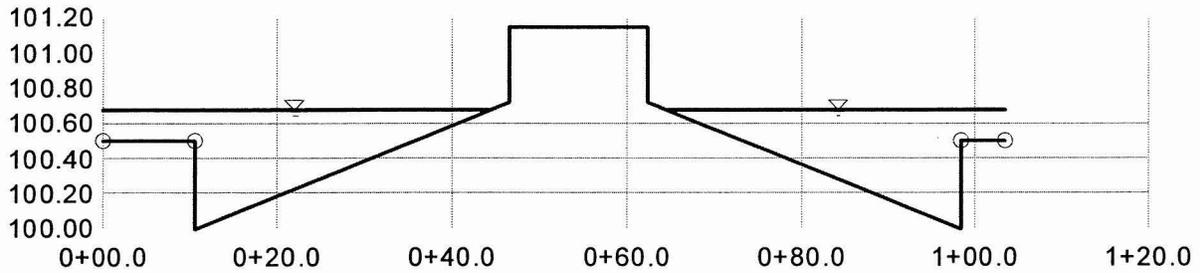
**Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, 10yr, 6hr  
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
0+62.5	100.72
0+98.5	100.00
0+98.5	100.50
1+03.5	100.50

# Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, 10yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, 10y
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.011000 ft/ft
Water Surface Elevation	100.67 ft
Elevation Range	100.00 to 101.14
Discharge	111.00 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sect D, Sdale Rd. from Greenway-Hayden to Tbird, Top-of-Curb Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, Road Capac
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.011000 ft/ft
Water Surface Elevation	100.50 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Elevation Range	100.00 to 101.14
Discharge	47.70 cfs
Flow Area	12.5 ft <sup>2</sup>
Wetted Perimeter	50.88 ft
Top Width	49.96 ft
Actual Depth	0.50 ft
Critical Elevation	100.56 ft
Critical Slope	0.005832 ft/ft
Velocity	3.82 ft/s
Velocity Head	0.23 ft
Specific Energy	100.73 ft
Froude Number	1.35
Flow Type	Supercritical

Calculation Messages:  
Flow is divided.

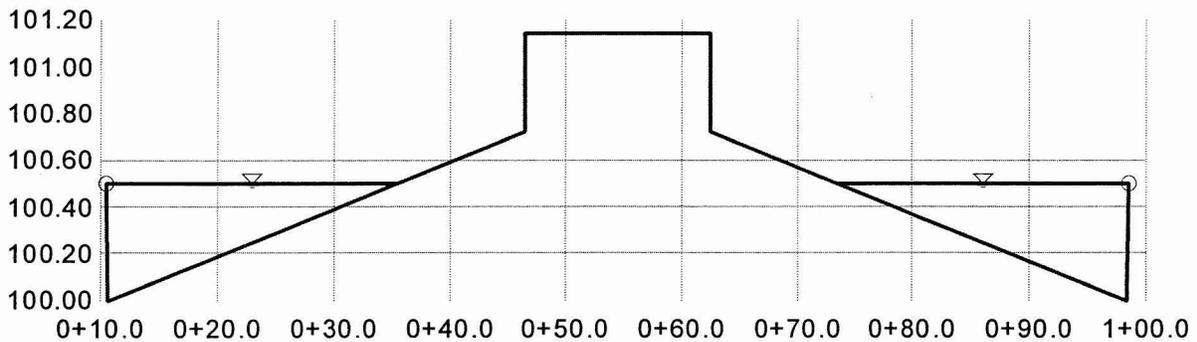
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+10.5	0+98.5	0.016

Natural Channel Points	
Station (ft)	Elevation (ft)
0+10.5	100.50
0+10.6	100.00
0+46.5	100.72
0+46.5	101.14
0+62.5	101.14
0+62.5	100.72
0+98.5	100.00
0+98.5	100.50

# Normal Depth Sect D, Sdale Rd from Greenway-Hayden to Tbird, Top-of-Curb Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	RR015A/B - Greenway-Hayden to Tbird, Road Capac
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.016
Slope	0.011000 ft/ft
Water Surface Elevation	100.50 ft
Elevation Range	100.00 to 101.14
Discharge	47.70 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 100Yr (Earth)

## Worksheet for Irregular Channel

Project Description	
Worksheet	Sdale Road Section from Tbird to Confluence with Airport Det. Outfall Channel, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.010000 ft/ft
Discharge	1,123.00 cfs <span style="margin-left: 20px;"><i>Q<sub>100</sub> @ AD015A</i></span>

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.030
Water Surface Elevation	1,422.78 ft
Elevation Range	1,419.75 to 1,426.20
Flow Area	131.9 ft <sup>2</sup>
Wetted Perimeter	58.50 ft
Top Width	57.83 ft
Actual Depth	3.03 ft
Critical Elevation	1,422.77 ft
Critical Slope	0.010126 ft/ft
Velocity	8.52 ft/s
Velocity Head	1.13 ft
Specific Energy	1,423.91 ft
Froude Number	0.99
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+95.0	0.030
0+95.0	1+14.0	0.025
1+14.0	2+22.0	0.016
2+22.0	2+32.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	1,424.97
0+21.0	1,424.29
0+46.0	1,419.80
0+76.0	1,419.75
0+95.0	1,424.87
1+14.0	1,425.28
1+14.0	1,424.78
1+60.0	1,425.70
1+60.0	1,426.20
1+76.0	1,426.20

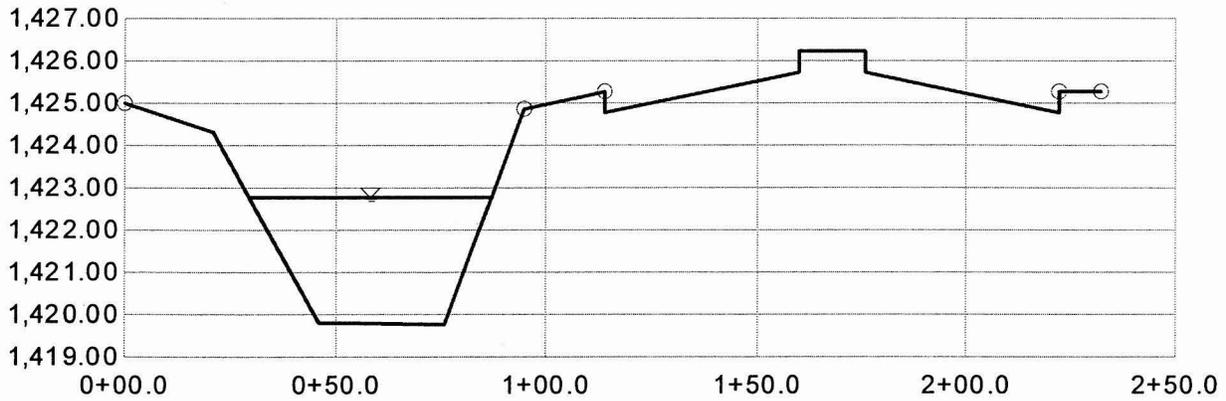
**Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 100Yr (Earth)**  
**Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
1+76.0	1,425.70
2+22.0	1,424.78
2+22.0	1,425.28
2+32.0	1,425.28

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 100Yr (Earth) Cross Section for Irregular Channel

Project Description	
Worksheet	Sdale Road Section from Tbird to Confluence with Airport Det. Outfall Channel, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.030
Slope	0.010000 ft/ft
Water Surface Elevation	1,422.78 ft
Elevation Range	1,419.75 to 1,426.20
Discharge	1,123.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 10Yr (Earth)

## Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect E, Tbird to Airport Outfall, 10Yr, Earth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.010000 ft/ft
Discharge	576.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.030
Water Surface Elevation	1,421.86 ft
Elevation Range	1,419.75 to 1,426.20
Flow Area	82.8 ft <sup>2</sup>
Wetted Perimeter	49.80 ft
Top Width	49.34 ft
Actual Depth	2.11 ft
Critical Elevation	1,421.80 ft
Critical Slope	0.011276 ft/ft
Velocity	6.95 ft/s
Velocity Head	0.75 ft
Specific Energy	1,422.62 ft
Froude Number	0.95
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+95.0	0.030
0+95.0	1+14.0	0.025
1+14.0	2+22.0	0.016
2+22.0	2+32.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	1,424.97
0+21.0	1,424.29
0+46.0	1,419.80
0+76.0	1,419.75
0+95.0	1,424.87
1+14.0	1,425.28
1+14.0	1,424.78
1+60.0	1,425.70
1+60.0	1,426.20
1+76.0	1,426.20

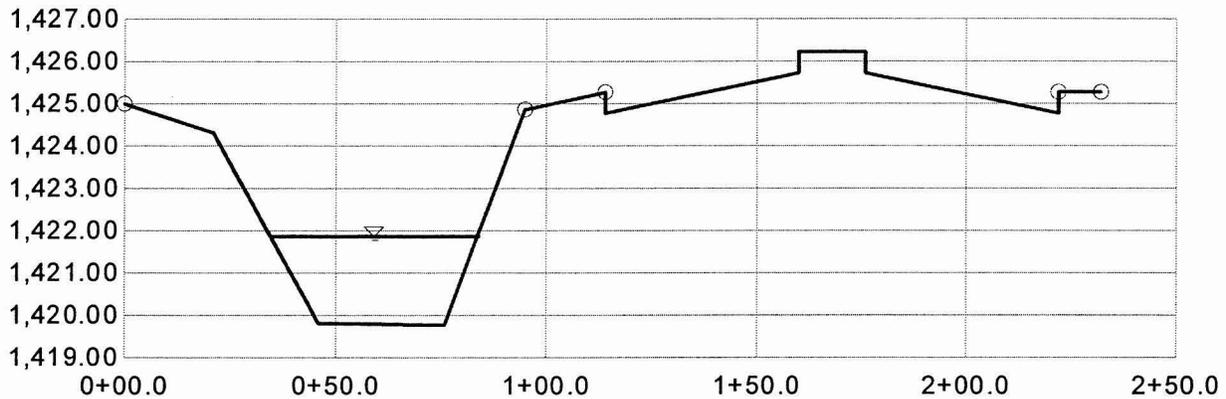
**Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 10Yr (Earth)  
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
1+76.0	1,425.70
2+22.0	1,424.78
2+22.0	1,425.28
2+32.0	1,425.28

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall Channel, 10Yr (Earth) Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect E, Tbird to Airport Outfall, 10Yr, Earth
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.030
Slope	0.010000 ft/ft
Water Surface Elevation	1,421.86 ft
Elevation Range	1,419.75 to 1,426.20
Discharge	576.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, Earth, Chnl Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	Sdale Road Section from Tbird to Confluence with Airport Det Outfall Chnl, Channel Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.010000 ft/ft
Water Surface Elevation	1,424.87 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.028
Elevation Range	1,419.75 to 1,426.20
Discharge	2,846.00 cfs
Flow Area	277.7 ft <sup>2</sup>
Wetted Perimeter	102.18 ft
Top Width	100.91 ft
Actual Depth	5.12 ft
Critical Elevation	1,425.45 ft
Critical Slope	0.009557 ft/ft
Velocity	10.25 ft/s
Velocity Head	1.63 ft
Specific Energy	1,426.50 ft
Froude Number	1.09
Flow Type	Supercritical

Calculation Messages:  
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+95.0	0.030
0+95.0	1+14.0	0.025
1+14.0	2+22.0	0.016
2+22.0	2+32.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	1,424.97
0+21.0	1,424.29
0+46.0	1,419.80
0+76.0	1,419.75
0+95.0	1,424.87
1+14.0	1,425.28
1+14.0	1,424.78

**Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, Earth, Chnl Capacity  
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
1+60.0	1,425.70
1+60.0	1,426.20
1+76.0	1,426.20
1+76.0	1,425.70
2+22.0	1,424.78
2+22.0	1,425.28
2+32.0	1,425.28

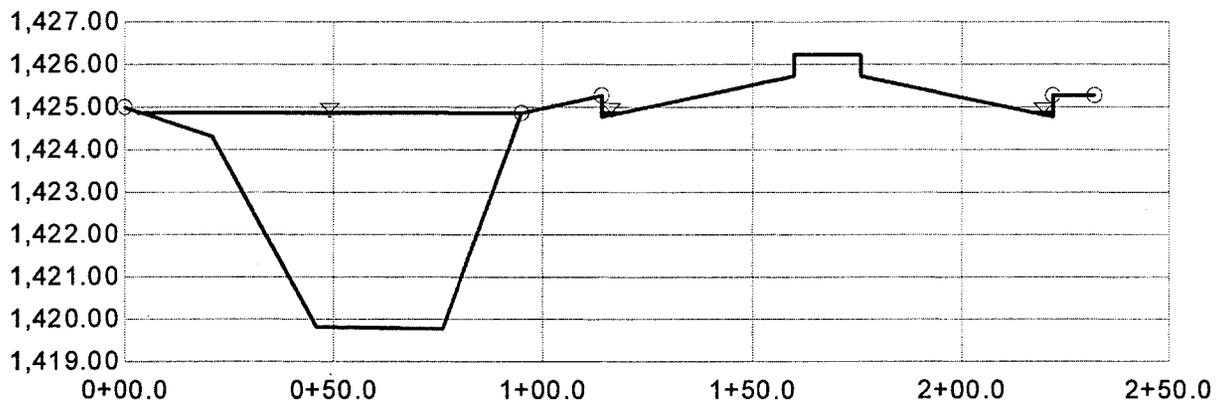
# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, Chnl Capacity, Earth Cross Section for Irregular Channel

## Project Description

Worksheet	Sdale Road Section from Tbird to Confluence with Airport Det Outfall Chnl, Channel Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

## Section Data

Mannings Coefficient	0.028
Slope	0.010000 ft/ft
Water Surface Elevation	1,424.87 ft
Elevation Range	1,419.75 to 1,426.20
Discharge	2,846.00 cfs



V:10.0  
H:1  
NTS

## Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, 100Yr, Lined Worksheet for Irregular Channel

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### Project Description

Worksheet	Sdale Road Section, South of Tbird for Approximately 200 ft, Next to Fire Station, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

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### Input Data

Slope	0.005100 ft/ft
Discharge	1,123.00 cfs

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### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

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### Results

Mannings Coefficient	0.018
Water Surface Elevation	1,424.34 ft
Elevation Range	1,419.28 to 1,426.20
Flow Area	91.7 ft <sup>2</sup>
Wetted Perimeter	30.63 ft
Top Width	28.24 ft
Actual Depth	5.06 ft
Critical Elevation	1,425.63 ft
Critical Slope	0.004517 ft/ft
Velocity	12.25 ft/s
Velocity Head	2.33 ft
Specific Energy	1,426.67 ft
Froude Number	1.20
Flow Type	Supercritical

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### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+77.0	1+09.0	0.018
1+09.0	1+14.0	0.025
1+14.0	2+22.0	0.016
2+22.0	2+32.0	0.025

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### Natural Channel Points

Station (ft)	Elevation (ft)
0+77.0	1,425.28
0+89.0	1,419.28
0+97.0	1,419.28
1+09.0	1,425.28
1+14.0	1,425.28
1+14.0	1,424.78
1+60.0	1,425.70
1+60.0	1,426.20
1+76.0	1,426.20
1+76.0	1,425.70

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**Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, 100Yr, Lined  
Worksheet for Irregular Channel**

**Natural Channel Points**

Station (ft)	Elevation (ft)
2+22.0	1,424.78
2+22.0	1,425.28
2+32.0	1,425.28

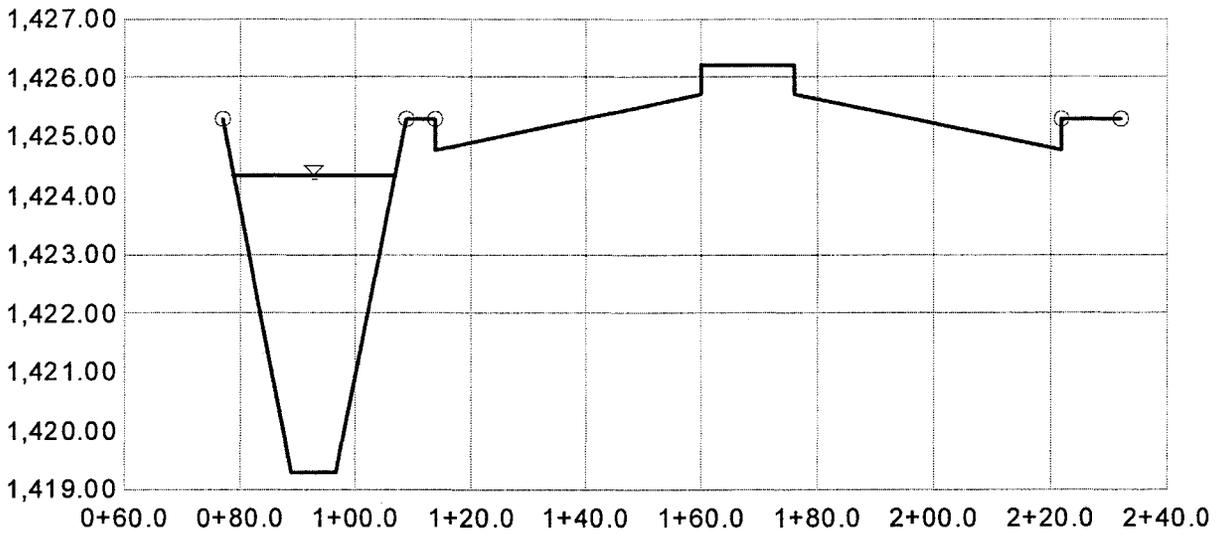
# Normal Depth Section E, Sdale Rd from Tbird to Airport Outfall, 100Yr, Lined Cross Section for Irregular Channel

## Project Description

Worksheet	Sdale Road Section, South of Tbird for Approximately 200 ft, Next to Fire Station, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.018
Slope	0.005100 ft/ft
Water Surface Elevation	1,424.34 ft
Elevation Range	1,419.28 to 1,426.20
Discharge	1,123.00 cfs



V:10.0  
H:1  
NTS

## Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, 10Yr, Lined Worksheet for Irregular Channel

Project Description	
Worksheet	Sdale Road Section, South of Tbird for Approximately 200 ft, Next to Fire Station, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005100 ft/ft
Discharge	576.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.018
Water Surface Elevation	1,422.94 ft
Elevation Range	1,419.28 to 1,426.20
Flow Area	56.1 ft <sup>2</sup>
Wetted Perimeter	24.37 ft
Top Width	22.64 ft
Actual Depth	3.66 ft
Critical Elevation	1,423.22 ft
Critical Slope	0.003780 ft/ft
Velocity	10.27 ft/s
Velocity Head	1.64 ft
Specific Energy	1,424.58 ft
Froude Number	1.15
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+77.0	1+09.0	0.018
1+09.0	1+14.0	0.025
1+14.0	2+22.0	0.016
2+22.0	2+32.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+77.0	1,425.28
0+89.0	1,419.28
0+97.0	1,419.28
1+09.0	1,425.28
1+14.0	1,425.28
1+14.0	1,424.78
1+60.0	1,425.70
1+60.0	1,426.20
1+76.0	1,426.20
1+76.0	1,425.70

**Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, 10Yr, Lined  
Worksheet for Irregular Channel**

---

Natural Channel Points

---

Station (ft)	Elevation (ft)
2+22.0	1,424.78
2+22.0	1,425.28
2+32.0	1,425.28

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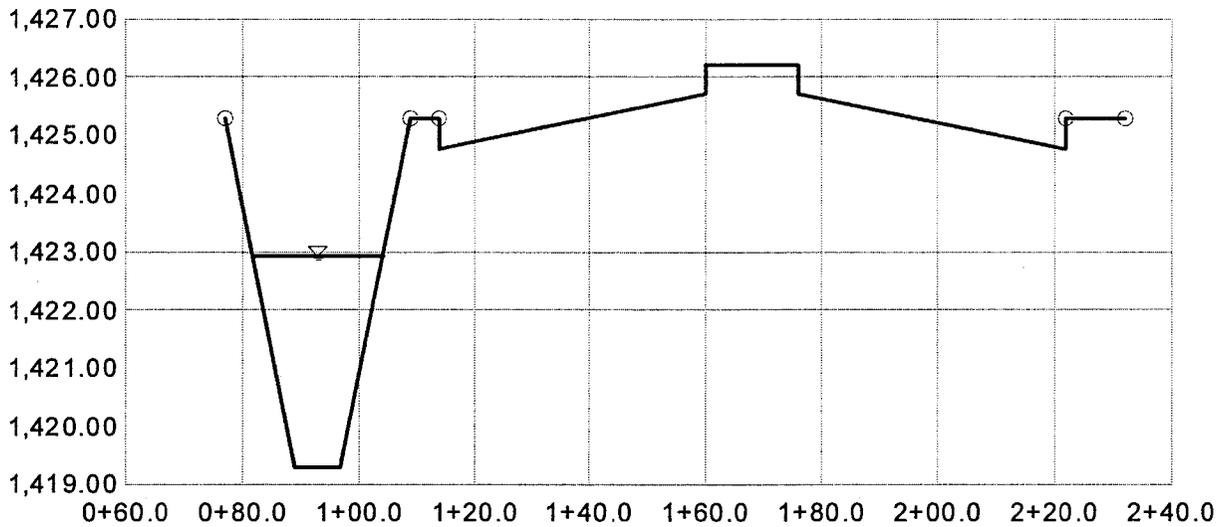
# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, 10Yr, Lined Cross Section for Irregular Channel

## Project Description

Worksheet	Sdale Road Section, South of TBird for Approximately 200 ft, Next to Fire Station, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.018
Slope	0.005100 ft/ft
Water Surface Elevation	1,422.94 ft
Elevation Range	1,419.28 to 1,426.20
Discharge	576.00 cfs



V:10.0  
H:1  
NTS

## Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, Chanl Capacity, Lined Worksheet for Irregular Channel

Project Description	
Worksheet	Sdale Road Section, South of Tbird for Approximately 200 ft, Next to Fire Station, Channel Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.005100 ft/ft
Water Surface Elevation	1,425.28 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.018
Elevation Range	1,419.28 to 1,425.28
Discharge	1,613.68 cfs
Flow Area	120.0 ft <sup>2</sup>
Wetted Perimeter	34.83 ft
Top Width	32.00 ft
Actual Depth	6.00 ft
Critical Elevation	1,425.82 ft
Critical Slope	0.003389 ft/ft
Velocity	13.45 ft/s
Velocity Head	2.81 ft
Specific Energy	1,428.09 ft
Froude Number	1.22
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+77.0	1+09.0	0.018

Natural Channel Points	
Station (ft)	Elevation (ft)
0+77.0	1,425.28
0+89.0	1,419.28
0+97.0	1,419.28
1+09.0	1,425.28

# Normal Depth Sect E, Sdale Rd from Tbird to Airport Outfall, Chanl Capacity, Lined Cross Section for Irregular Channel

---

**Project Description**

---

Worksheet	Sdale Road Section, South of TBird for Approximately 200 ft, Next to Fire Station, Channel Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

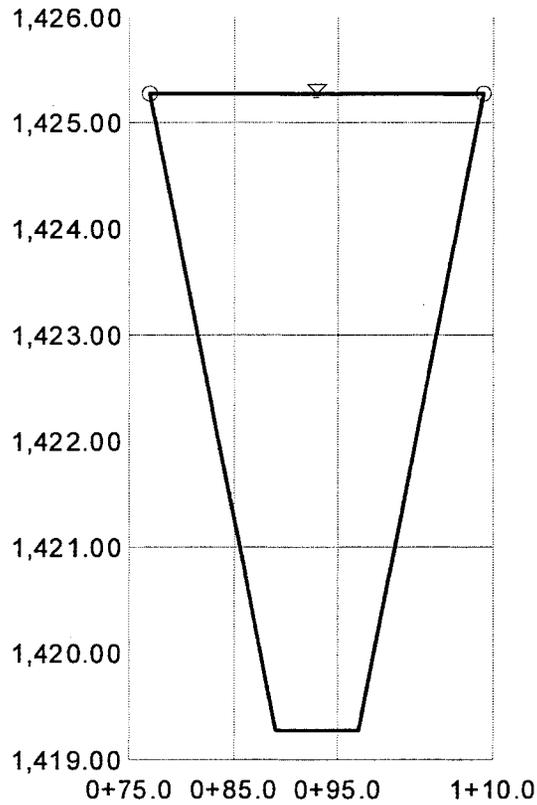
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**Section Data**

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Mannings Coefficient	0.018
Slope	0.005100 ft/ft
Water Surface Elevation	1,425.28 ft
Elevation Range	1,419.28 to 1,425.28
Discharge	1,613.68 cfs

---



V:10.0  
H:1  
NTS

## Normal Depth Sect F, Airport Outfall Chanl, 100Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, 100 yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.006200 ft/ft
Discharge	586.00 cfs $Q_{100}$ @ R2015C

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.018
Water Surface Elevation	103.38 ft
Elevation Range	100.00 to 104.00
Flow Area	53.2 ft <sup>2</sup>
Wetted Perimeter	24.10 ft
Top Width	22.51 ft
Actual Depth	3.38 ft
Critical Elevation	104.11 ft
Critical Slope	0.004014 ft/ft
Velocity	11.02 ft/s
Velocity Head	1.89 ft
Specific Energy	105.26 ft
Froude Number	1.26
Flow Type	Supercritical

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.00	0.025
0+05.00	0+30.00	0.018
0+30.00	0+35.00	0.025

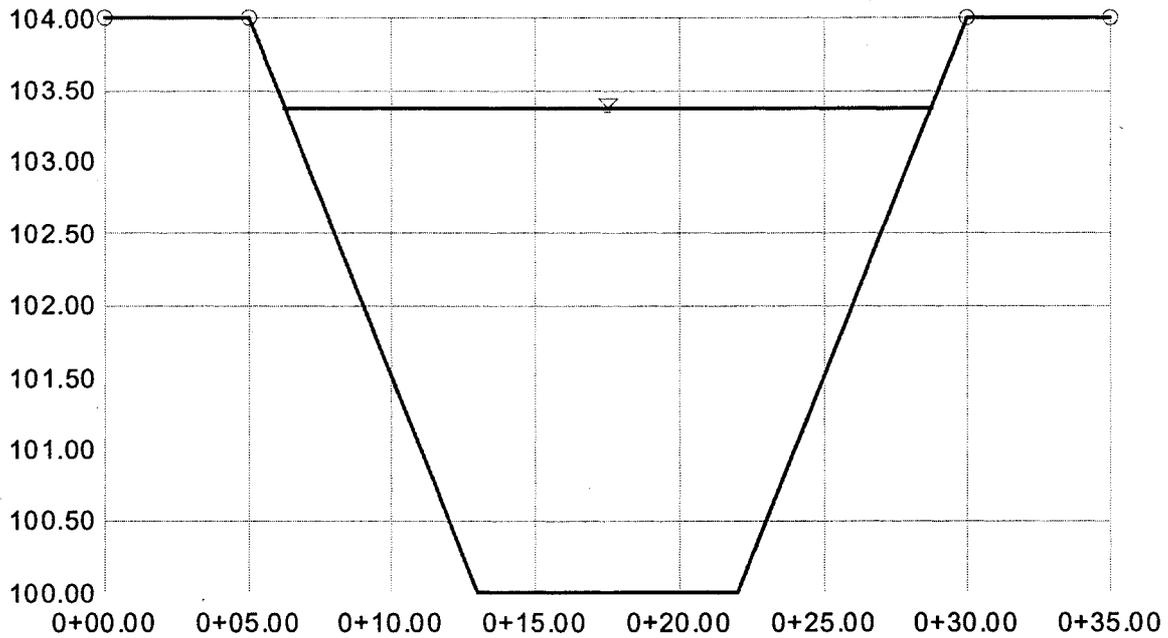
### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	104.00
0+05.00	104.00
0+13.00	100.00
0+18.00	100.00
0+22.00	100.00
0+30.00	104.00
0+35.00	104.00

# Normal Depth Sect F, Airport Outfall Channel, 100Yr, 6Hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, 100 yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.018
Slope	0.006200 ft/ft
Water Surface Elevation	103.38 ft
Elevation Range	100.00 to 104.00
Discharge	586.00 cfs



V:5.0  
H:1  
NTS

## Normal Depth Sect F, Airport Outfall Channel, 10Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, 10 yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.006200 ft/ft
Discharge	332.00 cfs <i>Q<sub>10</sub> @ RR015C</i>

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.018
Water Surface Elevation	102.51 ft
Elevation Range	100.00 to 104.00
Flow Area	35.3 ft <sup>2</sup>
Wetted Perimeter	20.24 ft
Top Width	19.06 ft
Actual Depth	2.51 ft
Critical Elevation	102.81 ft
Critical Slope	0.004058 ft/ft
Velocity	9.41 ft/s
Velocity Head	1.38 ft
Specific Energy	103.89 ft
Froude Number	1.22
Flow Type	Supercritical

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.00	0.025
0+05.00	0+30.00	0.018
0+30.00	0+35.00	0.025

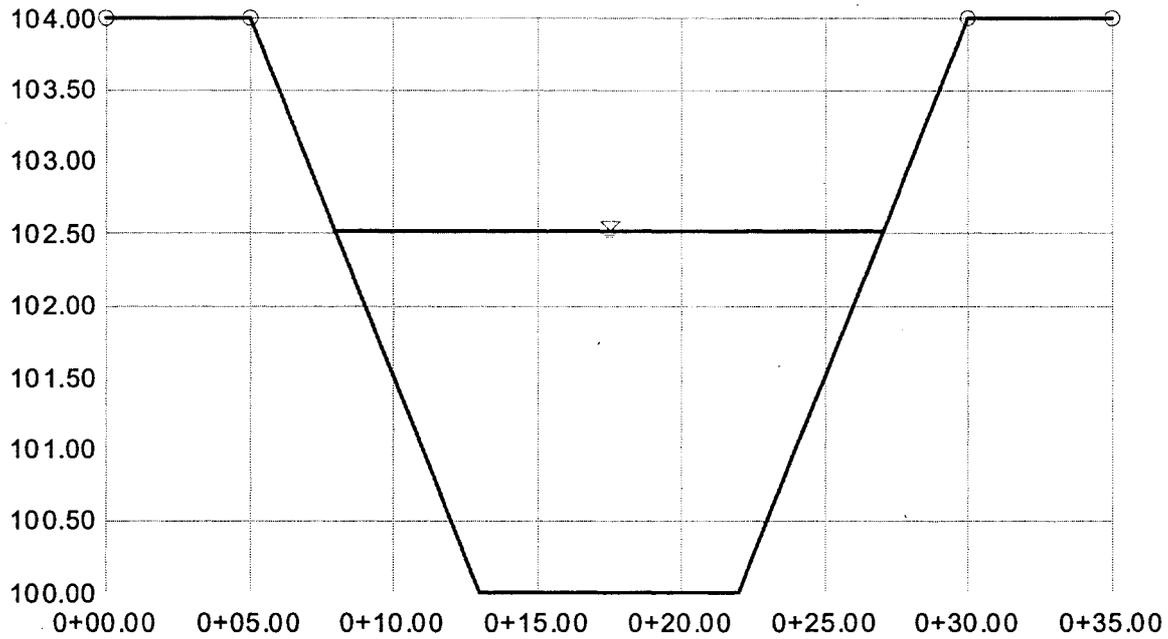
### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	104.00
0+05.00	104.00
0+13.00	100.00
0+18.00	100.00
0+22.00	100.00
0+30.00	104.00
0+35.00	104.00

# Normal Depth Sect F, Airport Outfall Channel, 10Yr, 6Hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, 10 yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.018
Slope	0.006200 ft/ft
Water Surface Elevation	102.51 ft
Elevation Range	100.00 to 104.00
Discharge	332.00 cfs



V:5.0  
H:1  
NTS

## Normal Depth Sect F, Airport Outfall Channel, Channel Capacity Worksheet for Irregular Channel

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### Project Description

---

Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



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### Input Data

---

Slope	0.006200 ft/ft
Water Surface Elevation	104.00 ft

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### Options

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Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



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### Results

---

Mannings Coefficient	0.018
Elevation Range	100.00 to 104.00
Discharge	820.46 cfs
Flow Area	68.0 ft <sup>2</sup>
Wetted Perimeter	26.89 ft
Top Width	25.00 ft
Actual Depth	4.00 ft
Critical Elevation	104.50 ft
Critical Slope	0.003699 ft/ft
Velocity	12.07 ft/s
Velocity Head	2.26 ft
Specific Energy	106.26 ft
Froude Number	1.29
Flow Type	Supercritical

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### Roughness Segments

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Start Station	End Station	Mannings Coefficient
0+05.00	0+30.00	0.018

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### Natural Channel Points

---

Station (ft)	Elevation (ft)
0+05.00	104.00
0+13.00	100.00
0+18.00	100.00
0+22.00	100.00
0+30.00	104.00

---

# Normal Depth Sect F, Airport Outfall Channel, Channel Capacity Cross Section for Irregular Channel

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**Project Description**

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Worksheet	Normal Depth Sect F, Sdale Airport Storage Outfall Channel, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

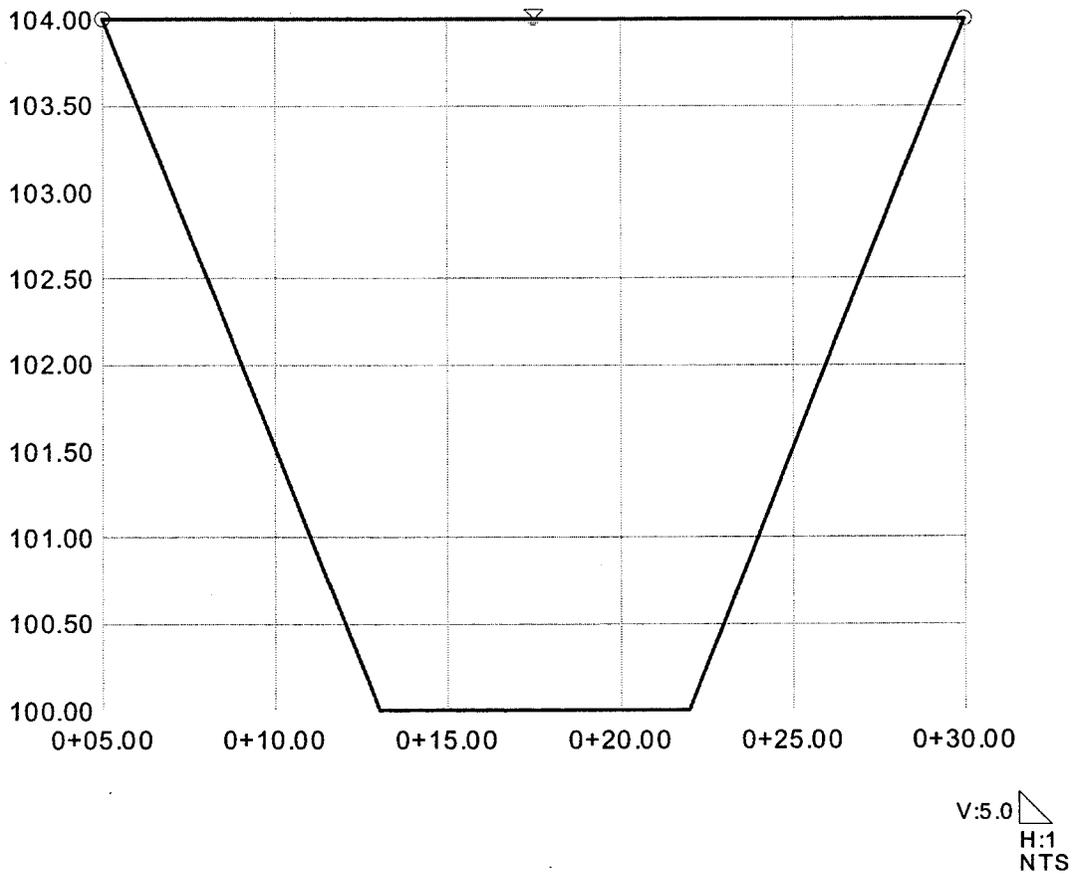
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**Section Data**

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Mannings Coefficient	0.018
Slope	0.006200 ft/ft
Water Surface Elevation	104.00 ft
Elevation Range	100.00 to 104.00
Discharge	820.46 cfs

---



# Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, 100Yr, 6Hr Worksheet for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect G, Sdale Rd. from Confluence to Sutton, 100-yr, 6-hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Input Data

Slope	0.010000 ft/ft
Discharge	1,317.00 cfs <i>Q<sub>100</sub> @ RR020A</i>

## Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

## Results

Mannings Coefficient	0.030
Water Surface Elevation	104.34 ft
Elevation Range	100.00 to 110.50
Flow Area	167.1 ft <sup>2</sup>
Wetted Perimeter	83.20 ft
Top Width	82.73 ft
Actual Depth	4.34 ft
Critical Elevation	104.31 ft
Critical Slope	0.010485 ft/ft
Velocity	7.88 ft/s
Velocity Head	0.97 ft
Specific Energy	105.31 ft
Froude Number	0.98
Flow Type	Subcritical

## Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+07.00	0.030
1+07.00	2+25.00	0.016

## Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	110.50
0+00.05	105.50
0+43.00	101.50
0+54.00	100.00
0+61.00	101.00
1+07.00	105.50
1+12.50	105.50
1+12.55	105.00
1+59.00	105.92
1+59.00	106.42
1+75.00	106.42
1+75.00	105.92

Title: untitled

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10/22/02 02:23:39 PM

Stanley Consultants Inc

Project Engineer: Stanley Consultants Inc.

FlowMaster v6.1 [614n]

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Page 1 of 2

Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, 100Yr, 6Hr  
Worksheet for Irregular Channel

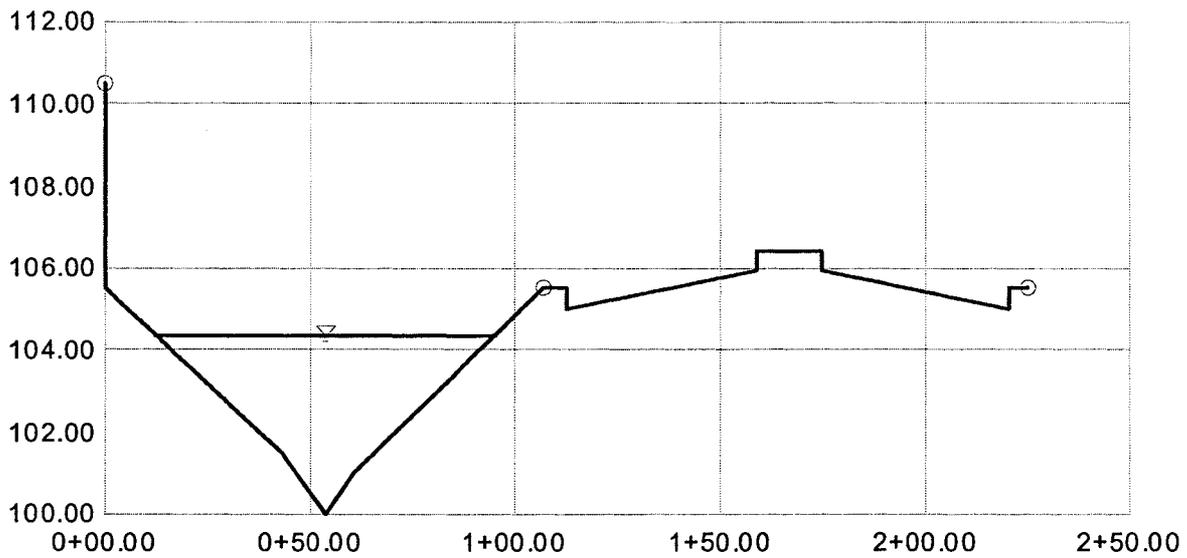
Natural Channel Points

Station (ft)	Elevation (ft)
2+20.60	105.00
2+20.60	105.50
2+25.00	105.50

# Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, 100Yr, 6Hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect G, Sdale Rd. from Confluence to Sutton, 100-yr, 6-hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.030
Slope	0.010000 ft/ft
Water Surface Elevation	104.34 ft
Elevation Range	100.00 to 110.50
Discharge	1,317.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, 10Yr, 6Hr Worksheet for Irregular Channel

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### Project Description

Worksheet	Normal Depth Sect G, Sdale Rd. from Confluence to Sutton, 10-yr, 6-hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

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### Input Data

Slope	0.010000 ft/ft
Discharge	722.00 cfs <i>Q10 @ RR020A</i>

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---

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



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### Results

Mannings Coefficient	0.030
Water Surface Elevation	103.52 ft
Elevation Range	100.00 to 110.50
Flow Area	106.1 ft <sup>2</sup>
Wetted Perimeter	65.88 ft
Top Width	65.49 ft
Actual Depth	3.52 ft
Critical Elevation	103.45 ft
Critical Slope	0.011342 ft/ft
Velocity	6.81 ft/s
Velocity Head	0.72 ft
Specific Energy	104.24 ft
Froude Number	0.94
Flow Type	Subcritical

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### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	1+07.00	0.030
1+07.00	2+25.00	0.016

---



---

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	110.50
0+00.05	105.50
0+43.00	101.50
0+54.00	100.00
0+61.00	101.00
1+07.00	105.50
1+12.50	105.50
1+12.55	105.00
1+59.00	105.92
1+59.00	106.42
1+75.00	106.42
1+75.00	105.92

---

**Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, 10Yr, 6Hr  
Worksheet for Irregular Channel**

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Natural Channel Points

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Station (ft)	Elevation (ft)
2+20.60	105.00
2+20.60	105.50
2+25.00	105.50

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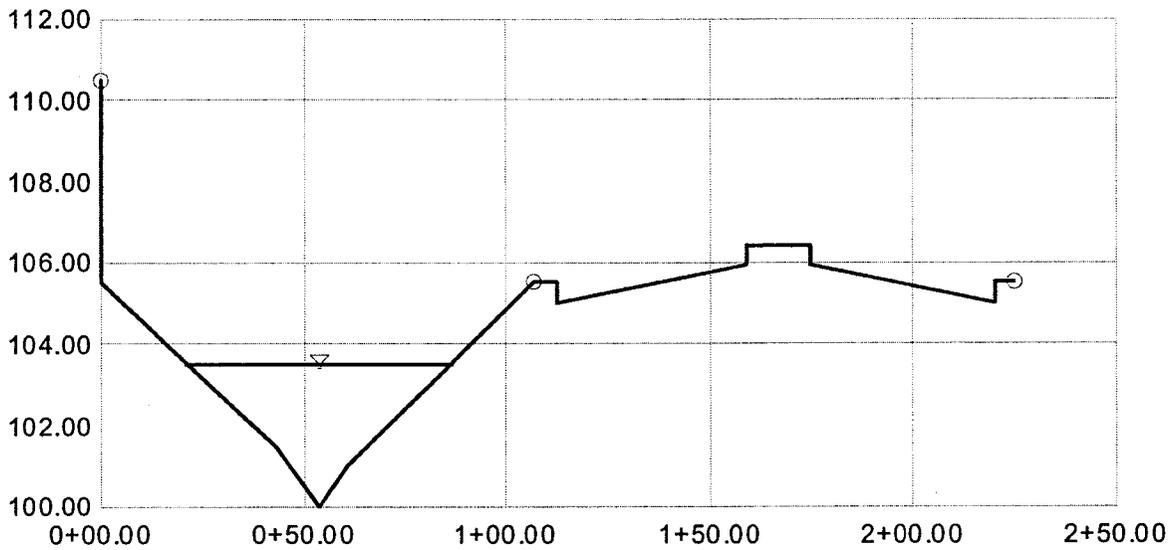
# Normal Depth Sect G, Sdale Rd. from Airport Outfall to Sutton, 10-yr, 6-hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect G, Sdale Rd. from Confluence to Sutton, 10-yr, 6-hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.030
Slope	0.010000 ft/ft
Water Surface Elevation	103.52 ft
Elevation Range	100.00 to 110.50
Discharge	722.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, Channel Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect G, Sdale Rd. Open Channel from Confluence to Suttc
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.010000 ft/ft
Water Surface Elevation	105.50 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results	
Mannings Coefficient	0.030
Elevation Range	100.00 to 110.50
Discharge	2,572.82 cfs
Flow Area	276.7 ft <sup>2</sup>
Wetted Perimeter	107.53 ft
Top Width	106.95 ft
Actual Depth	5.50 ft
Critical Elevation	105.53 ft
Critical Slope	0.009590 ft/ft
Velocity	9.30 ft/s
Velocity Head	1.34 ft
Specific Energy	106.84 ft
Froude Number	1.02
Flow Type	Supercritical

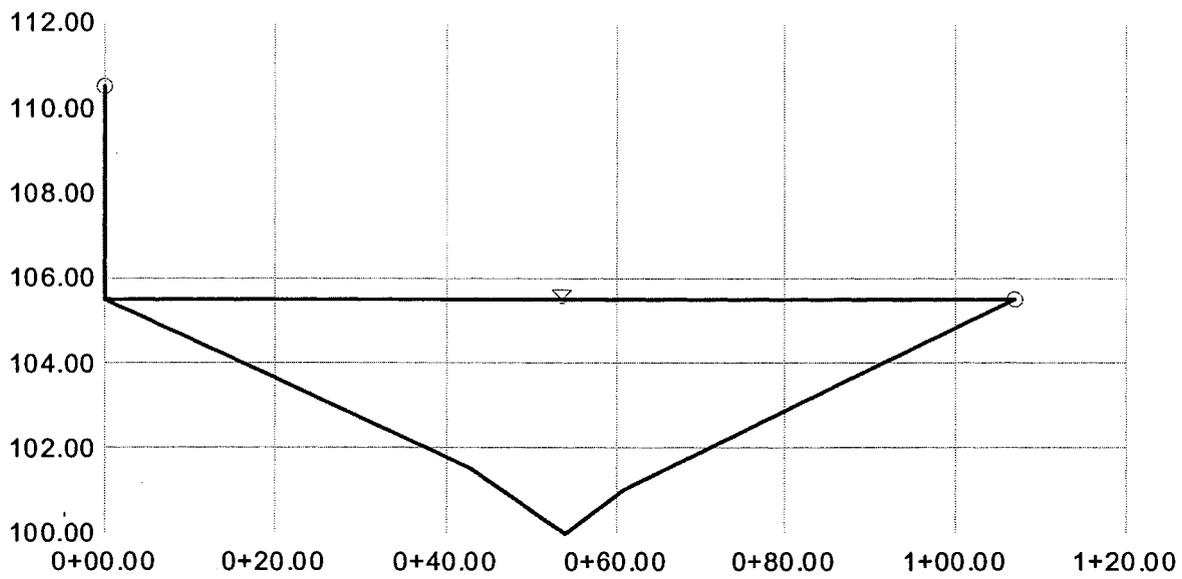
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	1+07.00	0.030

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	110.50
0+00.05	105.50
0+43.00	101.50
0+54.00	100.00
0+61.00	101.00
1+07.00	105.50

# Normal Depth Sect G, Sdale Rd from Airport Outfall to Sutton, Channel Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect G, Sdale Rd. Open Channel from Confluence to Suttc
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.030
Slope	0.010000 ft/ft
Water Surface Elevation	105.50 ft
Elevation Range	100.00 to 110.50
Discharge	2,572.82 cfs



V:5.0  
H:1  
NTS

CURRENT DATE: 10-22-2002  
 CURRENT TIME: 14:30:43

FILE DATE: 10-22-2002  
 FILE NAME: SUTTON

CULVERT AT SCOTTSDALE & SUTTON

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.0

C U L V E R T N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1411.62	1411.57	55.00	4 RCB	8.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs)

FILE: SUTTON

DATE: 10-22-2002

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1411.62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1413.18	131.7	131.7	0.0	0.0	0.0	0.0	0.0	0.00	1
1414.02	263.4	263.4	0.0	0.0	0.0	0.0	0.0	0.00	1
1414.70	395.1	395.1	0.0	0.0	0.0	0.0	0.0	0.00	1
1415.38	526.8	526.8	0.0	0.0	0.0	0.0	0.0	0.00	1
1415.85	658.5	658.5	0.0	0.0	0.0	0.0	0.0	0.00	1
1416.23	722.0	722.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1417.18	921.9	753.0	0.0	0.0	0.0	0.0	0.0	168.06	3
1417.48	1053.6	758.0	0.0	0.0	0.0	0.0	0.0	294.42	4
1418.07	1185.3	598.5	0.0	0.0	0.0	0.0	0.0	597.05	11
1418.17	1317.0	652.1	0.0	0.0	0.0	0.0	0.0	652.50	24
1416.50	722.0	722.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: SUTTON

DATE: 10-22-2002

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1411.62	0.000	0.00	0.00	0.00
1413.18	0.000	131.70	0.00	0.00
1414.02	0.000	263.40	0.00	0.00
1414.70	0.000	395.10	0.00	0.00
1415.38	0.000	526.80	0.00	0.00
1415.85	0.000	658.50	0.00	0.00
1416.23	0.000	722.00	0.00	0.00
1417.18	-0.001	921.90	0.90	0.10
1417.48	-0.001	1053.60	1.13	0.11
1418.07	0.002	1185.30	-10.27	-0.87
1418.17	-0.001	1317.00	12.43	0.94

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 10-22-2002  
CURRENT TIME: 14:30:43

FILE DATE: 10-22-2002  
FILE NAME: SUTTON

PERFORMANCE CURVE FOR CULVERT 1 - 4( 8.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1411.62	0.00	-0.05	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
131.70	1413.18	1.39	1.56	3-M1t	1.24	0.81	1.36	1.36	3.03	4.58
263.40	1414.02	2.17	2.40	3-M1t	1.98	1.28	2.01	2.01	4.10	5.72
395.10	1414.70	2.84	3.08	3-M2t	2.64	1.68	2.51	2.51	4.91	6.47
526.80	1415.38	3.50	3.76	3-M2t	3.00	2.04	2.94	2.94	5.60	7.05
658.50	1415.85	4.23	3.26	3-M2t	3.00	2.37	2.94	3.31	7.00	7.52
722.00	1416.23	4.61	3.43	3-M2t	3.00	2.52	2.94	3.48	7.68	7.72
752.95	1416.43	4.81	3.90	3-M2t	3.00	2.59	2.94	3.95	8.01	8.28
758.04	1416.47	4.85	4.19	3-M2t	3.00	2.60	2.94	4.24	8.06	8.60
598.52	1416.07	3.88	4.45	3-M2t	3.00	2.22	2.94	4.50	8.06	8.89
652.07	1416.32	4.19	4.70	3-M2t	3.00	2.35	2.94	4.75	8.06	9.15

El. inlet face invert 1411.62 ft El. outlet invert 1411.57 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION 0.00 ft  
INLET ELEVATION 1411.62 ft  
OUTLET STATION 55.00 ft  
OUTLET ELEVATION 1411.57 ft  
NUMBER OF BARRELS 4  
SLOPE (V/H) 0.0009  
CULVERT LENGTH ALONG SLOPE 55.00 ft

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE BOX  
BARREL SPAN 8.00 ft  
BARREL RISE 3.00 ft  
BARREL MATERIAL CONCRETE  
BARREL MANNING'S n 0.013  
INLET TYPE CONVENTIONAL  
INLET EDGE AND WALL SQUARE EDGE (90-45 DEG.)  
INLET DEPRESSION NONE

CURRENT DATE: 10-22-2002  
CURRENT TIME: 14:30:43

FILE DATE: 10-22-2002  
FILE NAME: SUTTON

---

TAILWATER

---

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*

BOTTOM WIDTH 17.50 ft  
SIDE SLOPE H/V (X:1) 2.7  
CHANNEL SLOPE V/H (ft/ft) 0.005  
MANNING'S n (.01-0.1) 0.025  
CHANNEL INVERT ELEVATION 1411.57 ft  
CULVERT NO.1 OUTLET INVERT ELEVATION 1411.57 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	1411.57	0.000	0.00	0.00	0.00
131.70	1412.93	0.692	1.36	4.58	0.42
263.40	1413.58	0.710	2.01	5.72	0.63
395.10	1414.08	0.719	2.51	6.47	0.78
526.80	1414.51	0.725	2.94	7.05	0.92
658.50	1414.88	0.729	3.31	7.52	1.03
722.00	1415.05	0.730	3.48	7.72	1.09
921.90	1415.52	0.734	3.95	8.28	1.23
1053.60	1415.81	0.736	4.24	8.60	1.32
1185.30	1416.07	0.738	4.50	8.89	1.40
1317.00	1416.32	0.740	4.75	9.15	1.48

---

ROADWAY OVERTOPPING DATA

---

ROADWAY SURFACE PAVED  
EMBANKMENT TOP WIDTH 49.00 ft  
CREST LENGTH 100.00 ft  
OVERTOPPING CREST ELEVATION 1416.50 ft

---

## Normal Depth Sect H, Sdale Rd from Sutton to Sweetwater, 100Yr, 6Hr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect H, Sutton to Sweetwater, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	1,307.00 cfs <i>Q<sub>100</sub> @ RR020B</i>

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.019
Water Surface Elevation	104.35 ft
Elevation Range	100.00 to 108.50
Flow Area	190.4 ft <sup>2</sup>
Wetted Perimeter	136.85 ft
Top Width	132.96 ft
Actual Depth	4.35 ft
Critical Elevation	104.36 ft
Critical Slope	0.004878 ft/ft
Velocity	6.86 ft/s
Velocity Head	0.73 ft
Specific Energy	105.08 ft
Froude Number	1.01
Flow Type	Supercritical

Calculation Messages:  
Water elevation exceeds lowest end station by 0.84811087 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+42.00	0.025
0+42.00	1+28.05	0.016
1+28.05	1+33.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	108.50
0+00.05	103.50
0+14.00	103.00
0+18.00	100.00
0+27.50	100.50
0+35.50	100.50
0+39.00	103.50
0+42.00	103.50

Normal Depth Sect H, Sdale Rd from Sutton to Sweetwater, 100Yr, 6Hr  
Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+42.05	103.00
0+85.00	103.86
1+28.00	103.00
1+28.05	103.50
1+33.00	103.50

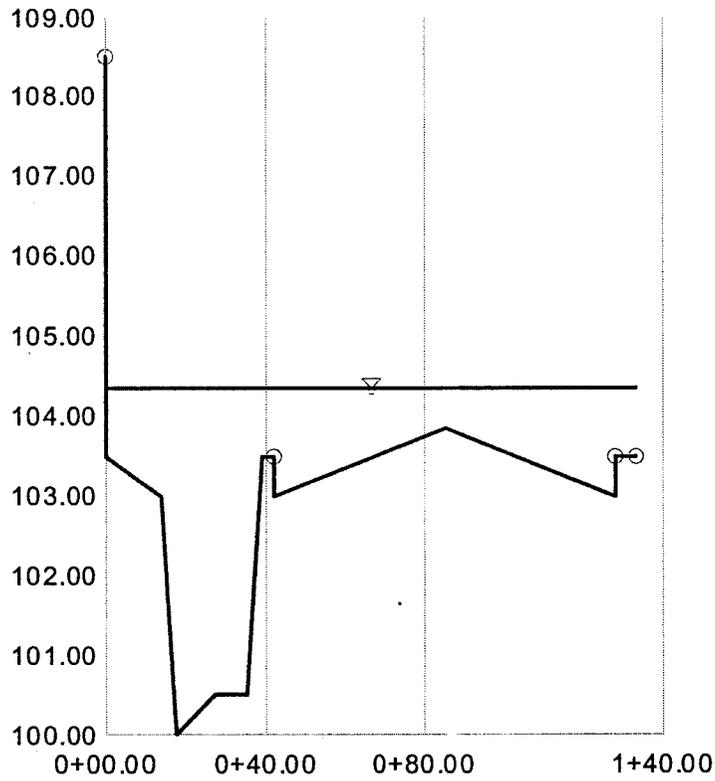
# Normal Depth Sect H, Sdale Rd from Sutton to Sweetwater, 100Yr, 6Hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect H, Sutton to Sweetwater, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.019
Slope	0.005000 ft/ft
Water Surface Elevation	104.35 ft
Elevation Range	100.00 to 108.50
Discharge	1,307.00 cfs



V:20.0  
H:1  
NTS

## Normal Depth Sect H, Sdale Rd. from Sutton to Sweetwater, 10yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect H, Sutton to Sweetwater, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.005000 ft/ft
Discharge	717.00 cfs <i>Q10 @ RR020B</i>

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.018
Water Surface Elevation	103.87 ft
Elevation Range	100.00 to 108.50
Flow Area	126.4 ft <sup>2</sup>
Wetted Perimeter	136.37 ft
Top Width	132.95 ft
Actual Depth	3.87 ft
Critical Elevation	103.88 ft
Critical Slope	0.004726 ft/ft
Velocity	5.67 ft/s
Velocity Head	0.50 ft
Specific Energy	104.37 ft
Froude Number	1.03
Flow Type	Supercritical

Calculation Messages:  
Water elevation exceeds lowest end station by 0.36654727 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+42.00	0.025
0+42.00	1+28.05	0.016
1+28.05	1+33.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	108.50
0+00.05	103.50
0+14.00	103.00
0+18.00	100.00
0+27.50	100.50
0+35.50	100.50
0+39.00	103.50
0+42.00	103.50

**Normal Depth Sect H, Sdale Rd. from Sutton to Sweetwater, 10yr, 6hr  
Worksheet for Irregular Channel**

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Natural Channel Points

---

Station (ft)	Elevation (ft)
0+42.05	103.00
0+85.00	103.86
1+28.00	103.00
1+28.05	103.50
1+33.00	103.50

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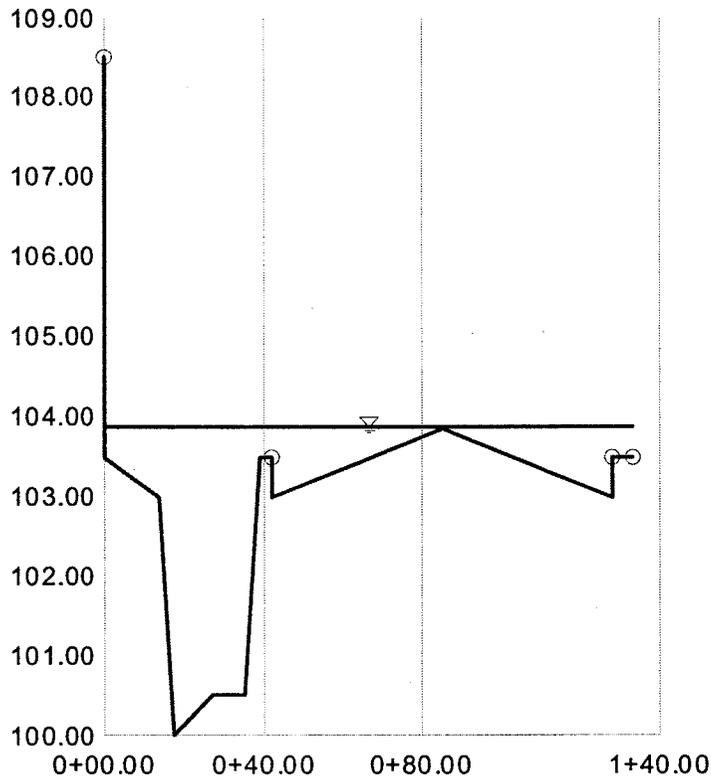
## Normal Depth Sect H, Sdale Rd. from Sutton to Sweetwater, 10yr, 6hr Cross Section for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect H, Sutton to Sweetwater, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Section Data

Mannings Coefficient	0.018
Slope	0.005000 ft/ft
Water Surface Elevation	103.87 ft
Elevation Range	100.00 to 108.50
Discharge	717.00 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sect H, Sdale Rd from Sutton to Sweetwater, Chnl Capacity Worksheet for Irregular Channel

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## Project Description

---

Worksheet	Normal Depth Sect H, Open Channel- Sutton to Sweetwater
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



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## Input Data

---

Slope	0.005000 ft/ft
Water Surface Elevation	103.50 ft

---



---

## Options

---

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



---

## Results

---

Mannings Coefficient	0.025
Elevation Range	100.00 to 108.50
Discharge	435.93 cfs
Flow Area	71.6 ft <sup>2</sup>
Wetted Perimeter	41.08 ft
Top Width	38.95 ft
Actual Depth	3.50 ft
Critical Elevation	102.85 ft
Critical Slope	0.007759 ft/ft
Velocity	6.09 ft/s
Velocity Head	0.58 ft
Specific Energy	104.08 ft
Froude Number	0.79
Flow Type	Subcritical

---



---

## Roughness Segments

---

Start Station	End Station	Mannings Coefficient
0+00.00	0+39.00	0.025

---



---

## Natural Channel Points

---

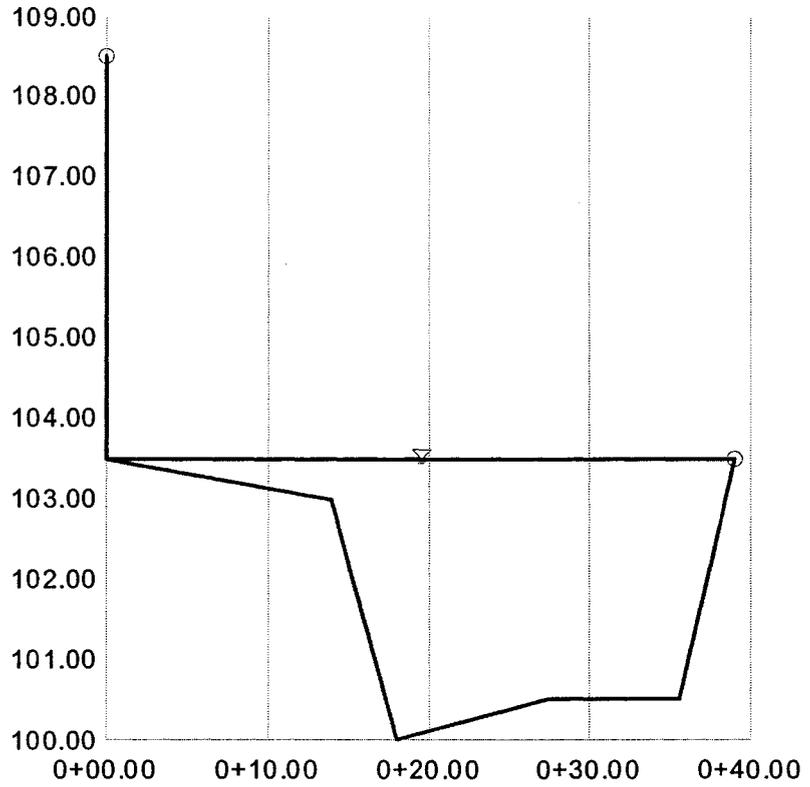
Station (ft)	Elevation (ft)
0+00.00	108.50
0+00.05	103.50
0+14.00	103.00
0+18.00	100.00
0+27.50	100.50
0+35.50	100.50
0+39.00	103.50

---

# Normal Depth Sect H, Sdale Rd from Sutton to Sweetwater, Channel Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect H, Open Channel- Sutton to Sweetwater
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.025
Slope	0.005000 ft/ft
Water Surface Elevation	103.50 ft
Elevation Range	100.00 to 108.50
Discharge	435.93 cfs



V:5.0  
H:1  
NTS

# Normal Depth Sect H, Sdale Rd. Street Section from Sutton to Sweetwater Worksheet for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect H, Sdale Rd. Street Section, Sutton to Sweetwater
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

## Input Data

Slope	0.005000 ft/ft
Water Surface Elevation	103.50 ft

## Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

## Results

Mannings Coefficient	0.016
Elevation Range	103.00 to 103.86
Discharge	32.23 cfs
Flow Area	12.5 ft <sup>2</sup>
Wetted Perimeter	50.99 ft
Top Width	50.07 ft
Actual Depth	0.50 ft
Critical Elevation	103.48 ft
Critical Slope	0.006145 ft/ft
Velocity	2.57 ft/s
Velocity Head	0.10 ft
Specific Energy	103.60 ft
Froude Number	0.91
Flow Type	Subcritical

Calculation Messages:  
Flow is divided.

## Roughness Segments

Start Station	End Station	Mannings Coefficient
0+42.00	1+28.05	0.016

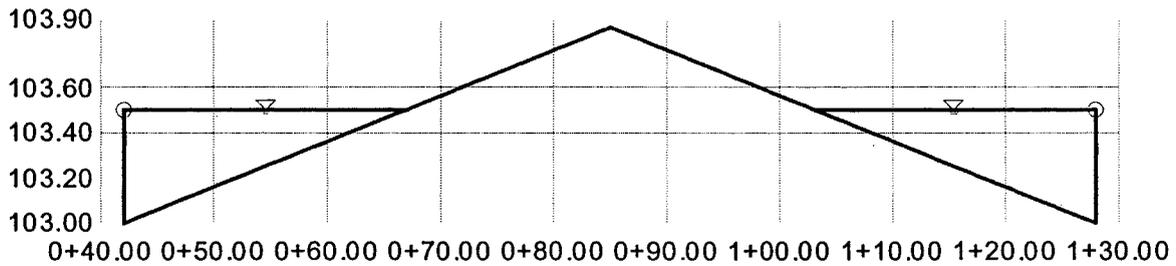
## Natural Channel Points

Station (ft)	Elevation (ft)
0+42.00	103.50
0+42.05	103.00
0+85.00	103.86
1+28.00	103.00
1+28.05	103.50

# Normal Depth Sect H, Sdale Rd. Street Section from Sutton to Sweetwater Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect H, Sdale Rd. Street Section, Sutton to Sweetwater
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.016
Slope	0.005000 ft/ft
Water Surface Elevation	103.50 ft
Elevation Range	103.00 to 103.86
Discharge	32.23 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sec I, Sdale Rd from Sweetwater to Cactus Park, 100Yr, 6Hr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, 100 Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006500 ft/ft
Discharge	731.00 cfs

$Q_{100} @ R2020C = 1306 \text{ CFS}$   
 $90" \text{ } \phi \text{ SD } \alpha = 575 \text{ CFS (SEE ATTACHED)}$   
 $1306 - 575 = 731 \text{ CFS}$

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	1,426.26 ft
Elevation Range	1,424.78 to 1,426.20
Flow Area	114.5 ft <sup>2</sup>
Wetted Perimeter	131.98 ft
Top Width	128.00 ft
Actual Depth	1.48 ft
Critical Elevation	1,426.37 ft
Critical Slope	0.004427 ft/ft
Velocity	6.38 ft/s
Velocity Head	0.63 ft
Specific Energy	1,426.89 ft
Froude Number	1.19
Flow Type	Supercritical

Calculation Messages:  
Water elevation exceeds lowest end station by 0.98087496 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
1+04.00	1+14.00	0.025
1+14.00	2+22.00	0.016
2+22.00	2+32.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
1+04.00	1,425.28
1+14.00	1,425.28
1+14.00	1,424.78
1+60.00	1,425.70
1+60.00	1,426.20
1+76.00	1,426.20
1+76.00	1,425.70
2+22.00	1,424.78

**Normal Depth Sec I, Sdale Rd from Sweetwater to Cactus Park, 100Yr, 6Hr  
Worksheet for Irregular Channel**

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Natural Channel Points

---

Station (ft)	Elevation (ft)
2+22.00	1,425.28
2+32.00	1,425.28

---

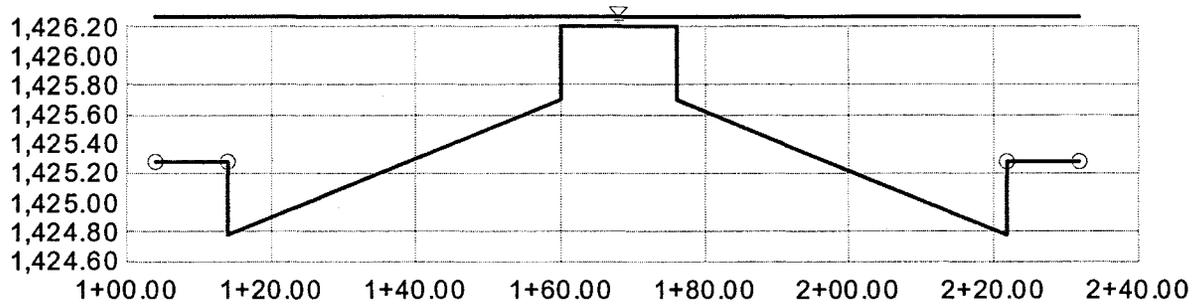
# Normal Depth Section I, Sdale Rd from Sweetwater to Cactus Park, 100Yr, 6Hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, 100 Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.017
Slope	0.006500 ft/ft
Water Surface Elevation	1,426.26 ft
Elevation Range	1,424.78 to 1,426.20
Discharge	731.00 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sect I, Sdale Road from Sweetwater to Cactus Park, 10Yr Worksheet for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, 10 Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006500 ft/ft
Discharge	139.00 cfs

$Q_{10} @ 220200 = 714 \text{ CFS}$   
 $90" \text{ } \phi \text{ SD } Q = 575 \text{ CFS (SEE ATTACHED)}$   
 $714 - 575 = 139 \text{ CFS}$

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	1,425.57 ft
Elevation Range	1,424.78 to 1,426.20
Flow Area	37.5 ft <sup>2</sup>
Wetted Perimeter	101.08 ft
Top Width	99.47 ft
Actual Depth	0.79 ft
Critical Elevation	1,425.59 ft
Critical Slope	0.005671 ft/ft
Velocity	3.71 ft/s
Velocity Head	0.21 ft
Specific Energy	1,425.79 ft
Froude Number	1.07
Flow Type	Supercritical

Calculation Messages:  
 Water elevation exceeds lowest end station by 0.29474379 ft.  
 Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
1+04.00	1+14.00	0.025
1+14.00	2+22.00	0.016
2+22.00	2+32.00	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
1+04.00	1,425.28
1+14.00	1,425.28
1+14.00	1,424.78
1+60.00	1,425.70
1+60.00	1,426.20
1+76.00	1,426.20
1+76.00	1,425.70

Normal Depth Sect I, Sdale Road from Sweetwater to Cactus Park, 10Yr  
Worksheet for Irregular Channel

Natural Channel Points

Station (ft)	Elevation (ft)
2+22.00	1,424.78
2+22.00	1,425.28
2+32.00	1,425.28

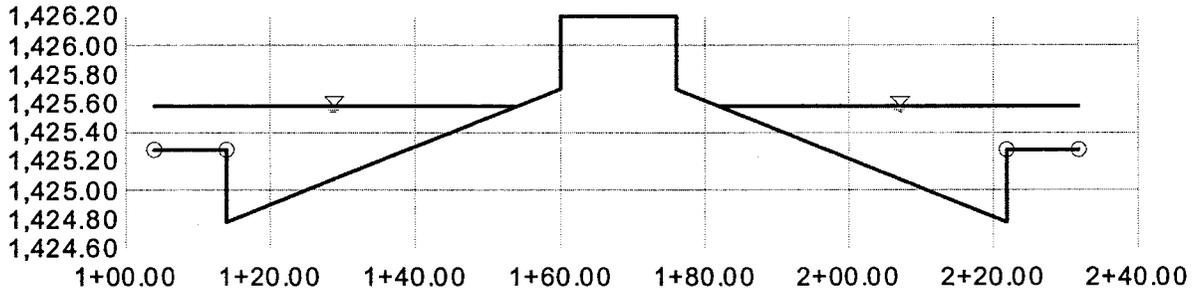
# Normal Depth Sect I, Sdale from Sweetwater to Cactus Park, 10Yr, 6Hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, 10 Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.017
Slope	0.006500 ft/ft
Water Surface Elevation	1,425.57 ft
Elevation Range	1,424.78 to 1,426.20
Discharge	139.00 cfs



V:20.0  
H:1  
NTS

# Normal Depth Sect I, Sdale Rd from Sweetwater to Cactus Park, Street Capacity Worksheet for Irregular Channel

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## Project Description

---

Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, Street Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



---

## Input Data

---

Slope	0.006500 ft/ft
Water Surface Elevation	1,425.28 ft

---



---

## Options

---

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



---

## Results

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Mannings Coefficient	0.016
Elevation Range	1,424.78 to 1,426.20
Discharge	36.65 cfs
Flow Area	12.5 ft <sup>2</sup>
Wetted Perimeter	51.01 ft
Top Width	50.00 ft
Actual Depth	0.50 ft
Critical Elevation	1,425.29 ft
Critical Slope	0.006055 ft/ft
Velocity	2.93 ft/s
Velocity Head	0.13 ft
Specific Energy	1,425.41 ft
Froude Number	1.03
Flow Type	Supercritical

---

Calculation Messages:  
Flow is divided.

---

## Roughness Segments

---

Start Station	End Station	Mannings Coefficient
1+14.00	2+22.00	0.016

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## Natural Channel Points

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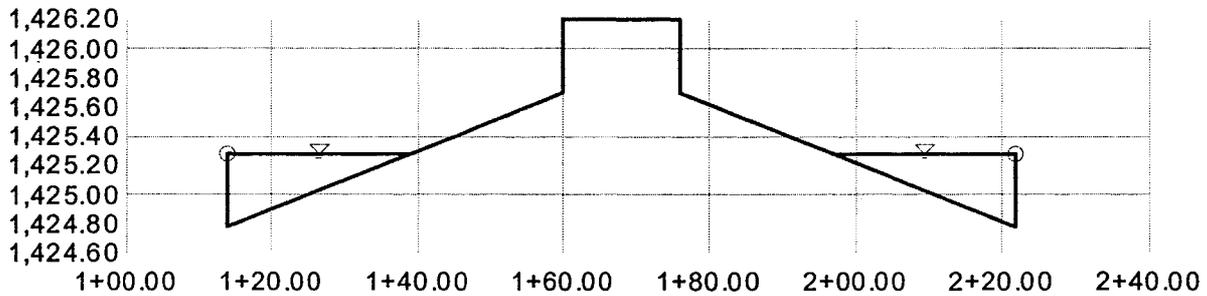
Station (ft)	Elevation (ft)
1+14.00	1,425.28
1+14.00	1,424.78
1+60.00	1,425.70
1+60.00	1,426.20
1+76.00	1,426.20
1+76.00	1,425.70
2+22.00	1,424.78
2+22.00	1,425.28

---

# Normal Depth Sect I, Sdale Rd from Sweetwater to Cactus Park, Street Capacity Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect I, Sdale Road Section from Sweetwater to Cactus, Street Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.016
Slope	0.006500 ft/ft
Water Surface Elevation	1,425.28 ft
Elevation Range	1,424.78 to 1,426.20
Discharge	36.65 cfs



V:20.0  
H:1  
NTS

**DV/DR20A1**  
**Worksheet for Circular Channel**

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**Project Description**

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Worksheet	DV20A1, 90" SD
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

---



---

**Input Data**

---

Mannings Coefficient	0.013
Slope	0.005600 ft/ft
Diameter	90 in

---



---

**Results**

---

Depth	7.50 ft	
Discharge	574.59 cfs	→ 90" d SD CAPACITY
Flow Area	44.2 ft <sup>2</sup>	
Wetted Perimeter	23.56 ft	
Top Width	0.00 ft	
Critical Depth	6.17 ft	
Percent Full	100.0 %	
Critical Slope	0.005564 ft/ft	
Velocity	13.01 ft/s	
Velocity Head	2.63 ft	
Specific Energy	0.00 ft	
Froude Number	0.00	
Maximum Discharg	618.09 cfs	
Discharge Full	574.59 cfs	
Slope Full	0.005600 ft/ft	
Flow Type		

---



Stanley Consultants inc

Project No. 15586

Page No. \_\_\_\_\_

Computed by B. SCHALK Date 12/26/01

Checked by \_\_\_\_\_ Date \_\_\_\_\_

Approved by \_\_\_\_\_ Date \_\_\_\_\_

Subject INLET CAPACITY OF 90" DIAM  
SD @ SWEETWATER - DISCHARGES  
INTO CACTUS PARK BASIN

Sheet No. \_\_\_\_\_ of \_\_\_\_\_

BASED ON SCALE DWG # 13/31, PROJECT # 8916

TOP-OF-HEADWALL EL = 1406.00 FT

INVERT EL = 1390.66

ASSUMED INLET CONTROL FOR CONCRETE PIPE CULVERTS

$$HW = 1406.00 - 1390.66 = 15.34 \text{ FT}$$

$$\frac{HW}{D} = \frac{15.34}{7.50} = 2.05$$

$Q = 700 \text{ CFS}$  (FIG 5.20, FCDMC HYDRAULICS MAN.)



90" DIAM SD @ SWEETWATER -  
DISCHARGES INTO CACTUS PARK BASIN

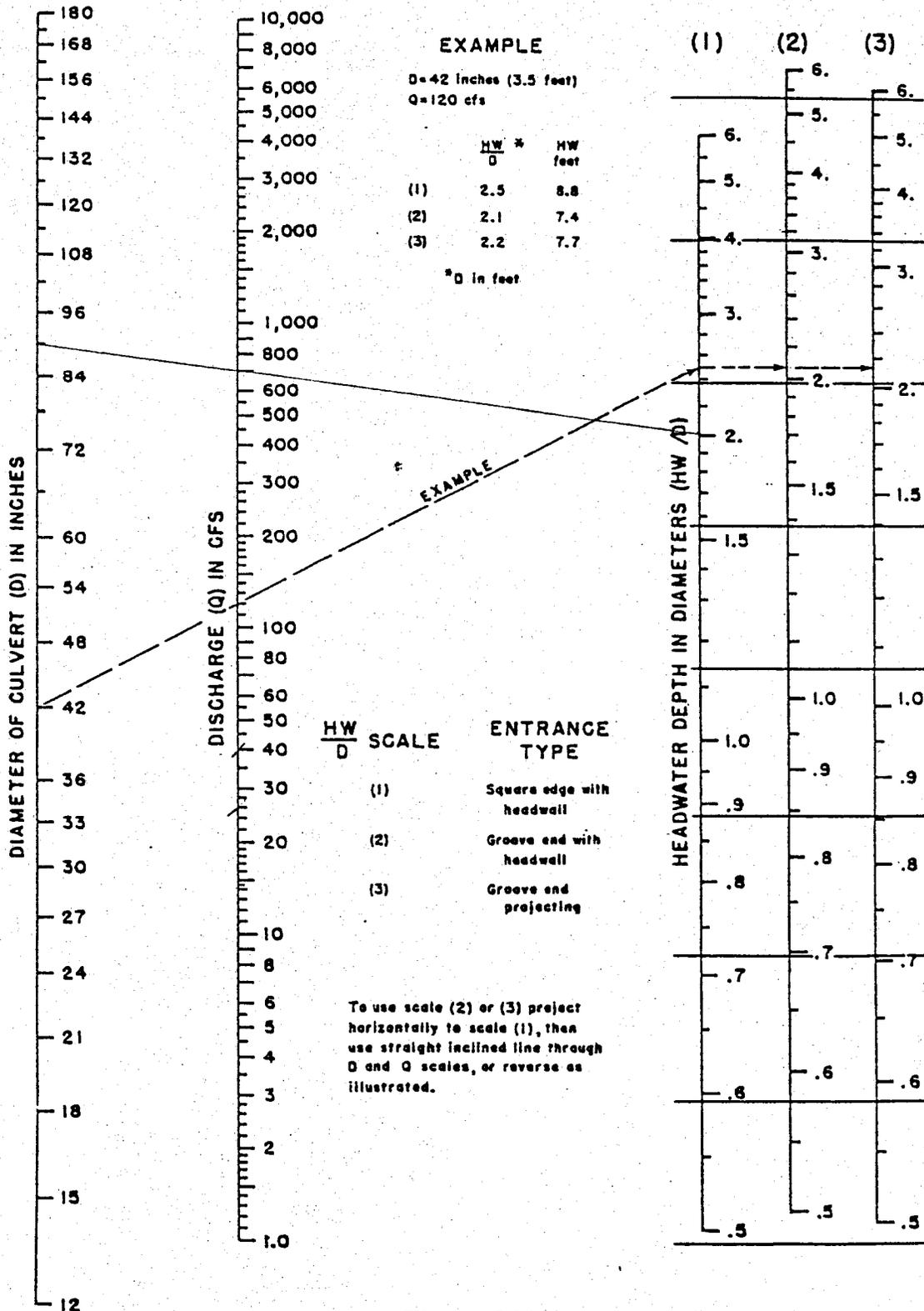


Figure 5.20  
Headwater Depth for Concrete Pipe Culverts with Inlet Control  
(USDOT, FHWA, HDS-5, 1985)

## Normal Depth Section J, Sdale Rd. south of Cactus, 100Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect J, Sdale Rd South of Cactus, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.006000 ft/ft
Discharge	737.00 cfs

$Q_{100} @ AD024C = 857 \text{ cfs}$   
 $48" \text{ d SD } Q = 120 \text{ cfs}$   
 $857 - 120 = 737 \text{ cfs}$

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.017
Water Surface Elevation	101.53 ft
Elevation Range	100.00 to 101.14
Flow Area	108.0 ft <sup>2</sup>
Wetted Perimeter	106.67 ft
Top Width	105.00 ft
Actual Depth	1.53 ft
Critical Elevation	101.65 ft
Critical Slope	0.004104 ft/ft
Velocity	6.82 ft/s
Velocity Head	0.72 ft
Specific Energy	102.25 ft
Froude Number	1.19
Flow Type	Supercritical

### Calculation Messages:

Water elevation exceeds lowest end station by 1.03043134 ft.

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+08.50	0.025
0+08.50	0+96.50	0.016
0+96.50	1+05.00	0.025

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	100.50
0+08.50	100.50
0+08.55	100.00
0+44.45	100.72
0+44.50	101.14
0+60.50	101.14
0+60.55	100.72
0+96.45	100.00

Title: untitled

q:\15586\haestad\sci 15586.fm2

10/22/02 02:51:31 PM

Stanley Consultants Inc

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Project Engineer: Stanley Consultants Inc.

FlowMaster v6.1 [614n]

(203) 755-1666

Page 1 of 2

**Normal Depth Section J, Sdale Rd. south of Cactus, 100Yr, 6Hr  
Worksheet for Irregular Channel**

Natural Channel Points	
Station (ft)	Elevation (ft)
0+96.50	100.50
1+05.00	100.50

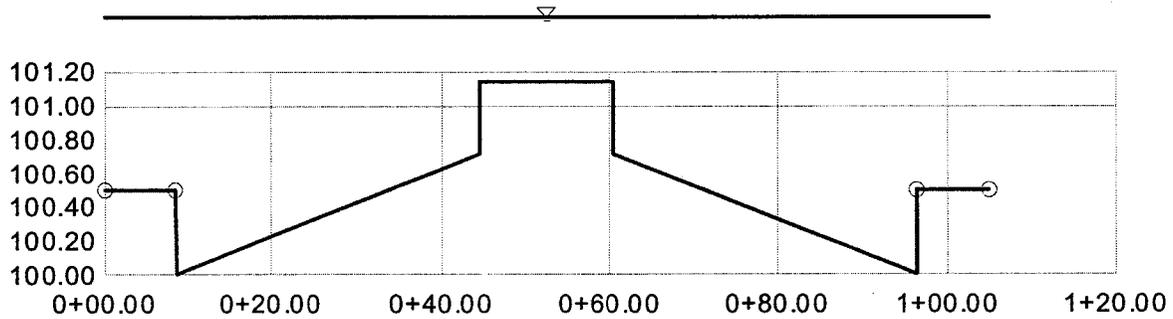
# Normal Depth Sect J, Sdale Rd. south of Cactus, 100yr, 6hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect J, Sdale Rd South of Cactus, 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.017
Slope	0.006000 ft/ft
Water Surface Elevation	101.53 ft
Elevation Range	100.00 to 101.14
Discharge	737.00 cfs



V:20.0  
H:1  
NTS

## Normal Depth Sect J, Sdale Rd. south of Cactus, 10yr, 6hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect J, Sdale Rd South of Cactus, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.006000 ft/ft
Discharge	51.00 cfs

$Q_{10} @ ADO24C = 171 \text{ CFS}$   
 $48" \text{ } \phi \text{ SD} = 120 \text{ CFS}$   
 $171 - 120 = 51 \text{ CFS}$

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.018
Water Surface Elevation	100.60 ft
Elevation Range	100.00 to 101.14
Flow Area	20.0 ft <sup>2</sup>
Wetted Perimeter	78.22 ft
Top Width	77.30 ft
Actual Depth	0.60 ft
Critical Elevation	100.58 ft
Critical Slope	0.007808 ft/ft
Velocity	2.55 ft/s
Velocity Head	0.10 ft
Specific Energy	100.71 ft
Froude Number	0.89
Flow Type	Subcritical

### Calculation Messages:

Water elevation exceeds lowest end station by 0.10371096 ft.  
 Flow is divided.

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+08.50	0.025
0+08.50	0+96.50	0.016
0+96.50	1+05.00	0.025

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	100.50
0+08.50	100.50
0+08.55	100.00
0+44.45	100.72
0+44.50	101.14
0+60.50	101.14
0+60.55	100.72

Normal Depth Sect J, Sdale Rd. south of Cactus, 10yr, 6hr  
Worksheet for Irregular Channel

---

Natural Channel Points

---

Station (ft)	Elevation (ft)
0+96.45	100.00
0+96.50	100.50
1+05.00	100.50

---

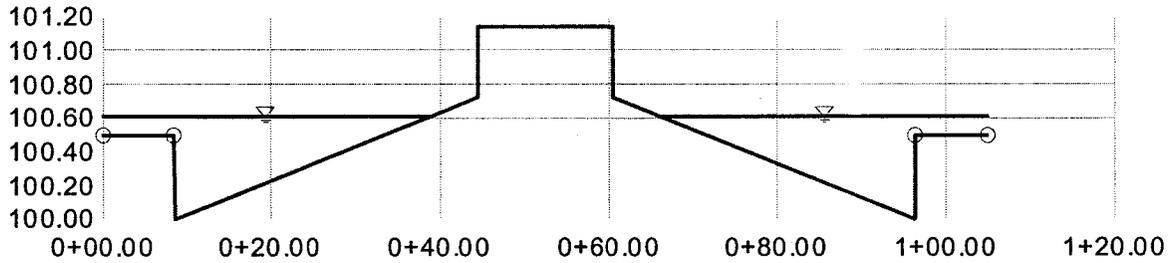
# Normal Depth Sect J, Sdale Rd. south of Cactus, 10yr, 6hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect J, Sdale Rd South of Cactus, 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.018
Slope	0.006000 ft/ft
Water Surface Elevation	100.60 ft
Elevation Range	100.00 to 101.14
Discharge	51.00 cfs



V:20.0  
H:1  
NTS

## Normal Depth Sect J, Sdale Rd. south of Cactus, Capacity Worksheet for Irregular Channel

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### Project Description

---

Worksheet	Normal Depth Sect J, Sdale Rd Street Section South of Cactus
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



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### Input Data

---

Slope	0.006000 ft/ft
Water Surface Elevation	100.50 ft

---



---

### Options

---

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



---

### Results

---

Mannings Coefficient	0.016
Elevation Range	100.00 to 101.14
Discharge	35.23 cfs
Flow Area	12.5 ft <sup>2</sup>
Wetted Perimeter	50.88 ft
Top Width	49.96 ft
Actual Depth	0.50 ft
Critical Elevation	100.50 ft
Critical Slope	0.006071 ft/ft
Velocity	2.82 ft/s
Velocity Head	0.12 ft
Specific Energy	100.62 ft
Froude Number	0.99
Flow Type	Subcritical

---

Calculation Messages:  
Flow is divided.

---

### Roughness Segments

---

Start Station	End Station	Mannings Coefficient
0+08.50	0+96.50	0.016

---



---

### Natural Channel Points

---

Station (ft)	Elevation (ft)
0+08.50	100.50
0+08.55	100.00
0+44.45	100.72
0+44.50	101.14
0+60.50	101.14
0+60.55	100.72
0+96.45	100.00
0+96.50	100.50

---

# Normal Depth Sect J, Sdale Rd. south of Cactus, Capacity Cross Section for Irregular Channel

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## Project Description

---

Worksheet	Normal Depth Sect J, Sdale Rd Street Section South of Cactus
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

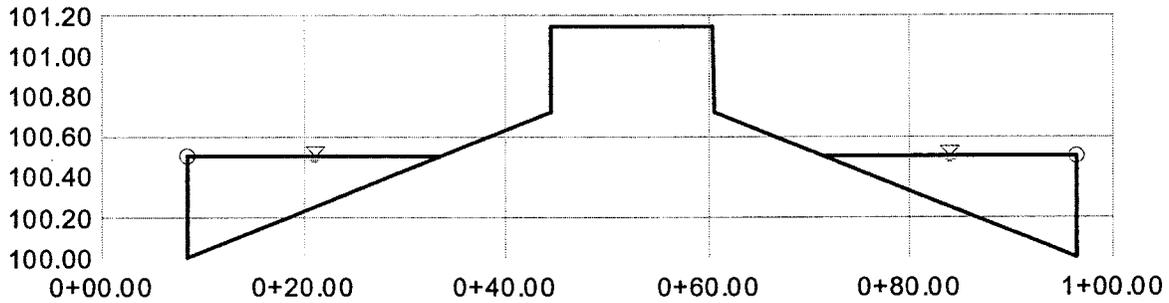
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## Section Data

---

Mannings Coefficient	0.016
Slope	0.006000 ft/ft
Water Surface Elevation	100.50 ft
Elevation Range	100.00 to 101.14
Discharge	35.23 cfs

---



V:20.0  
H:1  
NTS

## Normal Depth Sect K, Continental Plaza Channel, 100Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect K, Continental Plaza Channel, 100Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.004000 ft/ft
Discharge	729.00 cfs <i>Q<sub>100</sub> @ 22024E</i>

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.025
Water Surface Elevation	105.57 ft
Elevation Range	100.00 to 107.00
Flow Area	97.7 ft <sup>2</sup>
Wetted Perimeter	35.23 ft
Top Width	28.00 ft
Actual Depth	5.57 ft
Critical Elevation	104.84 ft
Critical Slope	0.008237 ft/ft
Velocity	7.46 ft/s
Velocity Head	0.87 ft
Specific Energy	106.43 ft
Froude Number	0.70
Flow Type	Subcritical

### Calculation Messages:

Water elevation exceeds lowest end station by 2.56884123 ft.

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+15.00	0.018
0+15.00	0+28.00	0.035
0+28.00	0+28.00	0.018

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	103.00
0+15.00	103.00
0+19.00	100.50
0+21.50	100.00
0+24.00	100.50
0+28.00	102.00
0+28.00	107.00

# Normal Depth Sect K, Continental Plaza Channel, 100Yr, 6Hr Cross Section for Irregular Channel

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**Project Description**

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Worksheet	Normal Depth Sect K, Continental Plaza Channel, 100Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

---



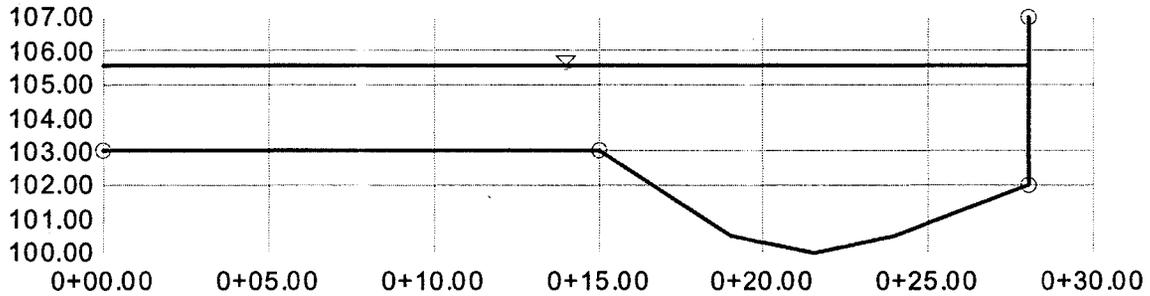
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**Section Data**

---

Mannings Coefficient	0.025
Slope	0.004000 ft/ft
Water Surface Elevation	105.57 ft
Elevation Range	100.00 to 107.00
Discharge	729.00 cfs

---



V:1  
H:1  
NTS

## Normal Depth Sect K, Continental Plaza Channel, 10Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect K, Continental Plaza Channel, 10Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.004000 ft/ft
Discharge	52.00 cfs <i>Q<sub>10</sub> @ RECYCLE</i>

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.035
Water Surface Elevation	102.24 ft
Elevation Range	100.00 to 107.00
Flow Area	16.4 ft <sup>2</sup>
Wetted Perimeter	12.91 ft
Top Width	11.79 ft
Actual Depth	2.24 ft
Critical Elevation	101.60 ft
Critical Slope	0.019306 ft/ft
Velocity	3.17 ft/s
Velocity Head	0.16 ft
Specific Energy	102.40 ft
Froude Number	0.47
Flow Type	Subcritical

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+15.00	0.018
0+15.00	0+28.00	0.035
0+28.00	0+28.00	0.018

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	103.00
0+15.00	103.00
0+19.00	100.50
0+21.50	100.00
0+24.00	100.50
0+28.00	102.00
0+28.00	107.00

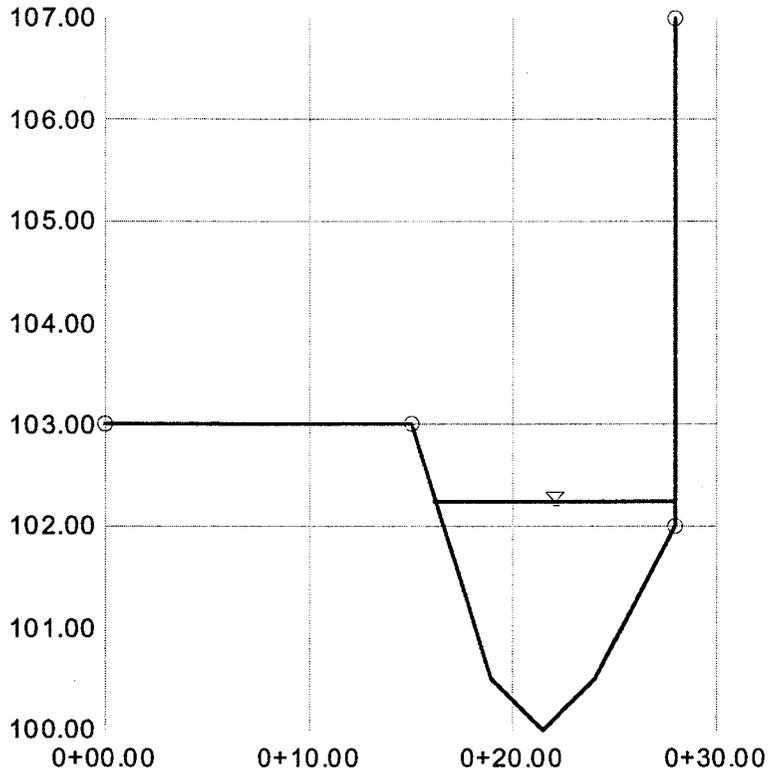
# Normal Depth Sect K, Continental Plaza Channel 10Yr, 6Hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect K, Continental Plaza Channel, 10Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.035
Slope	0.004000 ft/ft
Water Surface Elevation	102.24 ft
Elevation Range	100.00 to 107.00
Discharge	52.00 cfs



V:5.0  
H:1  
NTS

## Normal Depth Sect K, Continental Plaza Channel, Capacity Worksheet for Irregular Channel

---

### Project Description

Worksheet	Normal Depth Sect K, Continental Plaza Channel, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



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### Input Data

Slope	0.004000 ft/ft
Water Surface Elevation	103.00 ft

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### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

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---

### Results

Mannings Coefficient	0.034
Elevation Range	100.00 to 107.00
Discharge	101.59 cfs
Flow Area	25.8 ft <sup>2</sup>
Wetted Perimeter	15.09 ft
Top Width	13.00 ft
Actual Depth	3.00 ft
Critical Elevation	102.17 ft
Critical Slope	0.017147 ft/ft
Velocity	3.95 ft/s
Velocity Head	0.24 ft
Specific Energy	103.24 ft
Froude Number	0.49
Flow Type	Subcritical

---



---

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+15.00	0+28.00	0.035
0+28.00	0+28.00	0.018

---



---

### Natural Channel Points

Station (ft)	Elevation (ft)
0+15.00	103.00
0+19.00	100.50
0+21.50	100.00
0+24.00	100.50
0+28.00	102.00
0+28.00	107.00

---

# Normal Depth Sect K, Continental Plaza Channel, Capacity Cross Section for Irregular Channel

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**Project Description**

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Worksheet	Normal Depth Sect K, Continental Plaza Channel, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

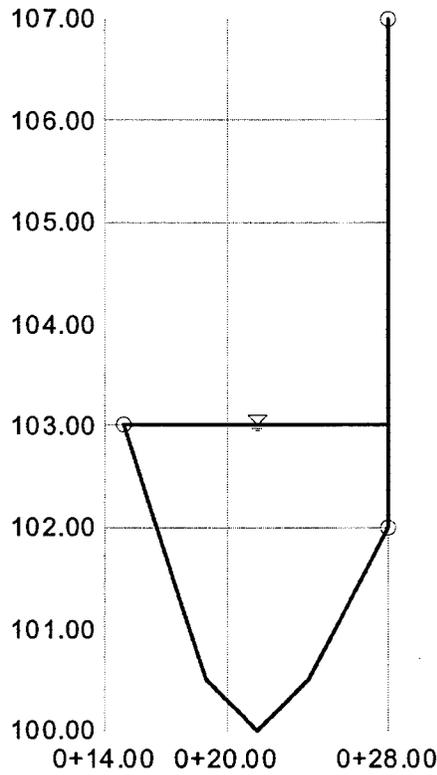
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**Section Data**

---

Mannings Coefficient	0.034
Slope	0.004000 ft/ft
Water Surface Elevation	103.00 ft
Elevation Range	100.00 to 107.00
Discharge	101.59 cfs

---



V:5.0  
H:1  
NTS

# Normal Depth Sect L, 73rd Street from Cactus Park to Sunnyside Dr, 100Yr, 6Hr Worksheet for Irregular Channel

---

### Project Description

---

Worksheet	Normal Depth Sect L, 73rd Street, 100-year
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

---



---

### Input Data

---

Slope	0.003000 ft/ft	
Discharge	698.00 cfs	<i>Q<sub>100</sub> @ RR024B</i>

---



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### Options

---

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



---

### Results

---

Mannings Coefficient	0.018
Water Surface Elevation	102.22 ft
Elevation Range	100.00 to 105.00
Flow Area	102.6 ft <sup>2</sup>
Wetted Perimeter	55.18 ft
Top Width	50.98 ft
Actual Depth	2.22 ft
Critical Elevation	102.01 ft
Critical Slope	0.004310 ft/ft
Velocity	6.80 ft/s
Velocity Head	0.72 ft
Specific Energy	102.94 ft
Froude Number	0.85
Flow Type	Subcritical

---



---

### Roughness Segments

---

Start Station	End Station	Mannings Coefficient
0+00.00	0+10.00	0.025
0+10.00	0+41.00	0.016
0+41.00	0+51.10	0.025

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### Natural Channel Points

---

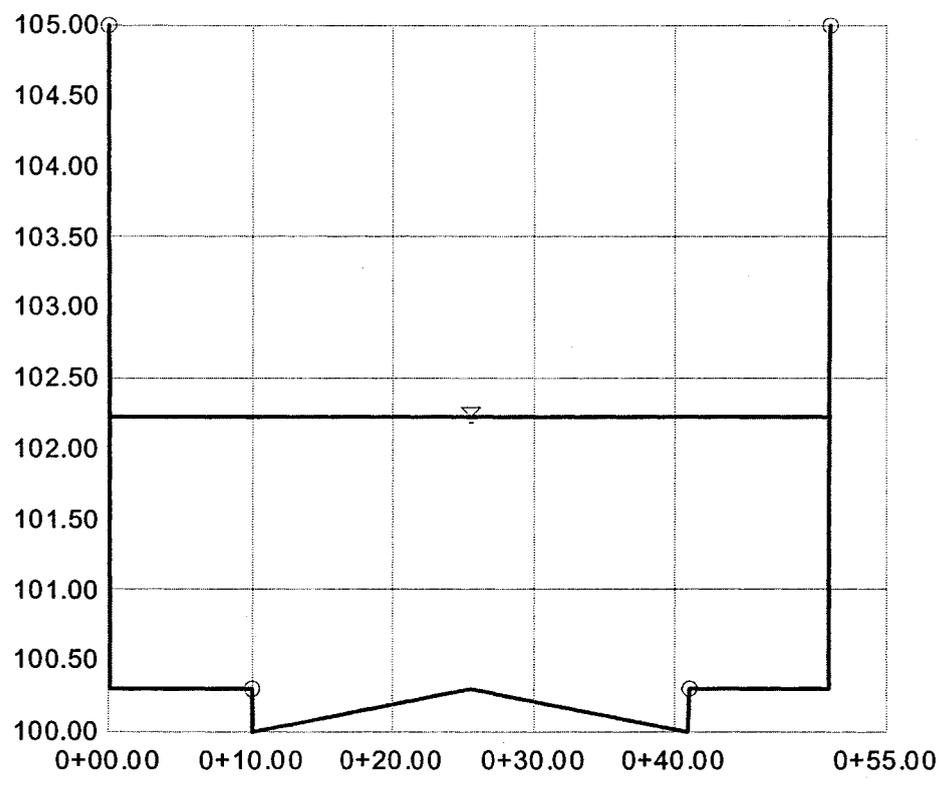
Station (ft)	Elevation (ft)
0+00.00	105.00
0+00.10	100.30
0+10.00	100.30
0+10.10	100.00
0+25.50	100.30
0+40.90	100.00
0+41.00	100.30
0+51.00	100.30
0+51.10	105.00

---

# Normal Depth Sect L, 73rd Street from Cactus Park to Sunnyside Dr, 100Yr, 6Hr Cross Section for Irregular Channel

Project Description	
Worksheet	Normal Depth Sect L, 73rd Street, 100-year
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.018
Slope	0.003000 ft/ft
Water Surface Elevation	102.22 ft
Elevation Range	100.00 to 105.00
Discharge	698.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect L, 73rd Street from Cactus Park to Sunnyside Drive, Capacity Worksheet for Irregular Channel

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## Project Description

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Worksheet	Normal Depth Sect L, 73rd Street Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

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## Input Data

---

Slope	0.003000 ft/ft
Water Surface Elevation	100.30 ft

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## Options

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Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



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## Results

---

Mannings Coefficient	0.016
Elevation Range	100.00 to 100.30
Discharge	6.62 cfs
Flow Area	4.7 ft <sup>2</sup>
Wetted Perimeter	31.44 ft
Top Width	31.00 ft
Actual Depth	0.30 ft
Critical Elevation	100.25 ft
Critical Slope	0.007581 ft/ft
Velocity	1.42 ft/s
Velocity Head	0.03 ft
Specific Energy	100.33 ft
Froude Number	0.65
Flow Type	Subcritical

---



---

## Roughness Segments

---

Start Station	End Station	Mannings Coefficient
0+10.00	0+41.00	0.016

---



---

## Natural Channel Points

---

Station (ft)	Elevation (ft)
0+10.00	100.30
0+10.10	100.00
0+25.50	100.30
0+40.90	100.00
0+41.00	100.30

---

# Normal Depth Sect L, 73rd Street from Cactus Park to Sunnyside Dr, Capacity Cross Section for Irregular Channel

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**Project Description**

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Worksheet	Normal Depth Sect L, 73rd Street Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

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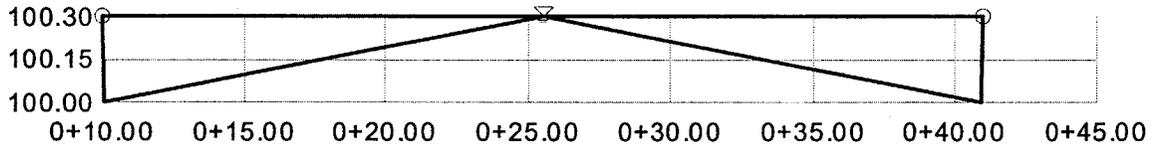
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**Section Data**

---

Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elevation	100.30 ft
Elevation Range	100.00 to 100.30
Discharge	6.62 cfs

---



V:10.0  
H:1  
NTS

# Normal Depth Sect M, Sunnyside Dr from 73rd St to Sdale Rd, 100-Yr, 6Hr Worksheet for Irregular Channel

### Project Description

Worksheet	Normal Depth Sect M, Sunnyside Dr from 73rd Street to Sdale Road, 100-Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.003000 ft/ft
Discharge	692.00 cfs <i>Q100 @ RR024C</i>

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.017
Water Surface Elevation	102.43 ft
Elevation Range	100.00 to 100.55
Flow Area	90.1 ft <sup>2</sup>
Wetted Perimeter	45.69 ft
Top Width	41.00 ft
Actual Depth	2.43 ft
Critical Elevation	102.30 ft
Critical Slope	0.003644 ft/ft
Velocity	7.68 ft/s
Velocity Head	0.92 ft
Specific Energy	103.35 ft
Froude Number	0.91
Flow Type	Subcritical

### Calculation Messages:

Water elevation exceeds lowest end station by 1.98383788 ft.

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.00	0+05.00	0.025
0+05.00	0+36.00	0.016
0+36.00	0+41.00	0.025

### Natural Channel Points

Station (ft)	Elevation (ft)
0+00.00	100.45
0+05.00	100.50
0+05.10	100.00
0+20.50	100.30
0+35.90	100.00
0+36.00	100.50
0+41.00	100.55

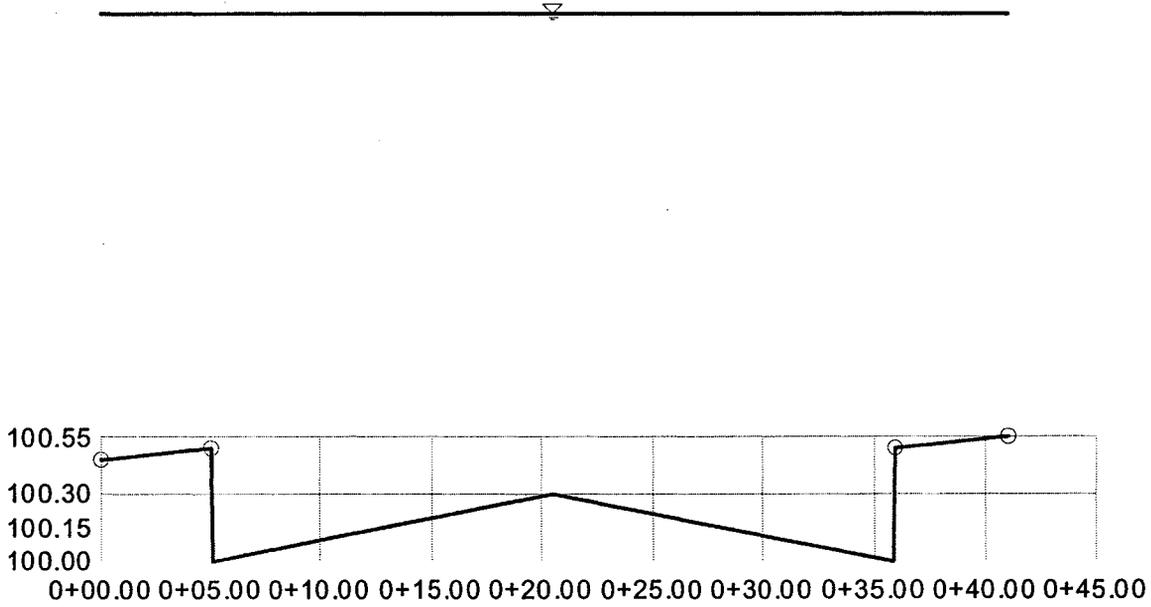
# Normal Depth Sect M, Sunnyside Dr from 73rd St to Sdale Rd, 100-Yr, 6Hr Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect M, Sunnyside Dr from 73rd Street to Sdale Road, 100-Yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.017
Slope	0.003000 ft/ft
Water Surface Elevation	102.43 ft
Elevation Range	100.00 to 100.55
Discharge	692.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect M, Sunnyside Dr from 73rd St to Sdale Rd, Capacity at Top-of-Curb Worksheet for Irregular Channel

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## Project Description

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Worksheet	Normal Depth Sect M, Sunnyside Dr from 73rd Street to Sdale Road, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

---



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## Input Data

---

Slope	0.003000 ft/ft
Water Surface Elevation	100.50 ft

---



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## Options

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Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

---



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## Results

---

Mannings Coefficient	0.016
Elevation Range	100.00 to 100.55
Discharge	26.85 cfs
Flow Area	10.8 ft <sup>2</sup>
Wetted Perimeter	31.83 ft
Top Width	31.00 ft
Actual Depth	0.50 ft
Critical Elevation	100.44 ft
Critical Slope	0.005839 ft/ft
Velocity	2.48 ft/s
Velocity Head	0.10 ft
Specific Energy	100.60 ft
Froude Number	0.74
Flow Type	Subcritical

---



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## Roughness Segments

---

Start Station	End Station	Mannings Coefficient
0+05.00	0+36.00	0.016
0+36.00	0+41.00	0.025

---



---

## Natural Channel Points

---

Station (ft)	Elevation (ft)
0+05.00	100.50
0+05.10	100.00
0+20.50	100.30
0+35.90	100.00
0+36.00	100.50
0+41.00	100.55

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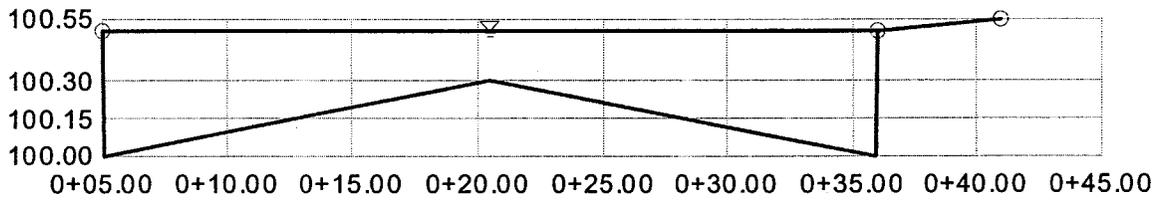
# Normal Depth Sect M, Sunnyside Dr from 73rd St to Sdale Rd, Capacity at Top-of-Curb Cross Section for Irregular Channel

## Project Description

Worksheet	Normal Depth Sect M, Sunnyside Dr from 73rd Street to Sdale Road, Capacity
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

## Section Data

Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elevation	100.50 ft
Elevation Range	100.00 to 100.55
Discharge	26.85 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect N, 76th St, 100yr, 6hr

## Worksheet for Irregular Channel

TBIRD RD. TO SWEETWATER AVE

### Project Description

Worksheet	RR022, 76th St., 100yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.009000 ft/ft
Discharge	303.00 cfs

$Q @ RR022 = 310 \text{ CFS}$   
 $18" \phi \text{ SD} = 7 \text{ CFS}$   
 $310 - 7 = 303 \text{ CFS}$

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.021
Water Surface Elevation	103.05 ft
Elevation Range	101.50 to 103.52
Flow Area	52.3 ft <sup>2</sup>
Wetted Perimeter	67.21 ft
Top Width	66.01 ft
Actual Depth	1.55 ft
Critical Elevation	103.13 ft
Critical Slope	0.006635 ft/ft
Velocity	5.80 ft/s
Velocity Head	0.52 ft
Specific Energy	103.58 ft
Froude Number	1.15
Flow Type	Supercritical

### Calculation Messages:

Water elevation exceeds lowest end station by 1.05462613 ft.

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+19.0	0.030
0+19.0	0+66.0	0.016
0+66.0	0+71.0	0.030

### Natural Channel Points

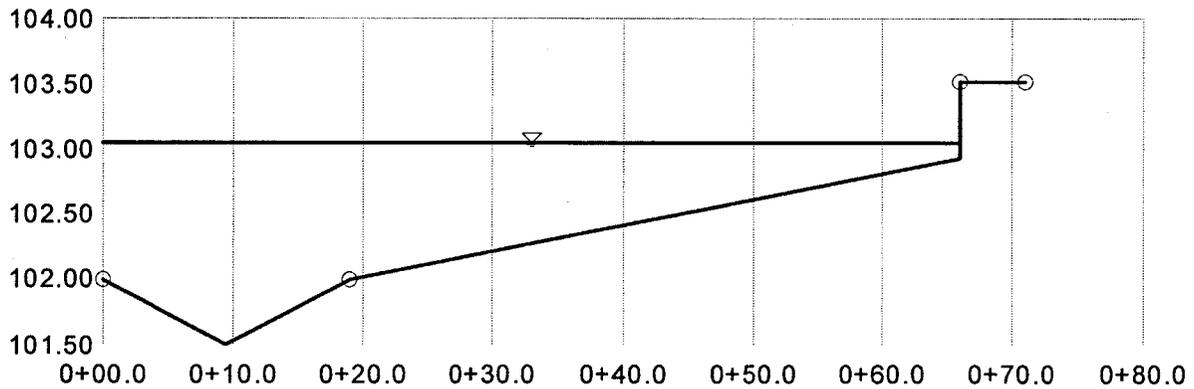
Station (ft)	Elevation (ft)
0+00.0	102.00
0+09.5	101.50
0+19.0	102.00
0+66.0	102.94
0+66.0	103.52
0+71.0	103.52

**Normal Depth Sect N, 76th St, 100yr, 6hr  
Cross Section for Irregular Channel**

TBIRD RD TO SWEETWATER AVE

Project Description	
Worksheet	RR022, 76th St., 100yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.021
Slope	0.009000 ft/ft
Water Surface Elevation	103.05 ft
Elevation Range	101.50 to 103.52
Discharge	303.00 cfs



V:10.0  
H:1  
NTS

**Normal Depth Sect N, 76th St, 10yr, 6hr  
Worksheet for Irregular Channel**

TBIRD RD TO SWEETWATER AVE

Project Description	
Worksheet	RR022, 76th St., 10yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.009000 ft/ft
Discharge	122.00 cfs

*Q @ RR022 = 129 CFS*  
*18"  $\phi$  SD = 7 CFS*  
*129 - 7 = 122 CFS*

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.022
Water Surface Elevation	102.67 ft
Elevation Range	101.50 to 103.52
Flow Area	28.5 ft <sup>2</sup>
Wetted Perimeter	52.96 ft
Top Width	52.26 ft
Actual Depth	1.17 ft
Critical Elevation	102.68 ft
Critical Slope	0.008549 ft/ft
Velocity	4.29 ft/s
Velocity Head	0.29 ft
Specific Energy	102.95 ft
Froude Number	1.02
Flow Type	Supercritical

Calculation Messages:  
Water elevation exceeds lowest end station by 0.66523873 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+19.0	0.030
0+19.0	0+66.0	0.016
0+66.0	0+71.0	0.030

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	102.00
0+09.5	101.50
0+19.0	102.00
0+66.0	102.94
0+66.0	103.52
0+71.0	103.52

# Normal Depth Sect N, 76th St, 10yr, 6hr Cross Section for Irregular Channel

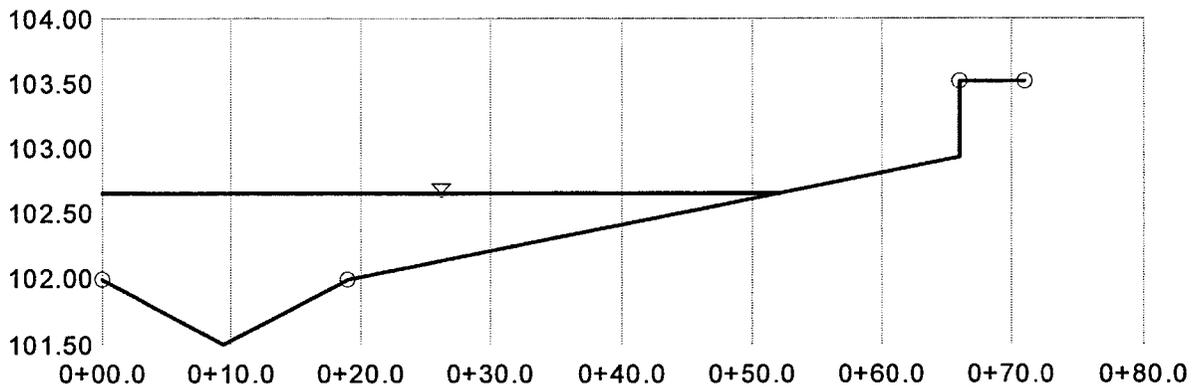
*TBIRD RD TO SWEETWATER AVE*

## Project Description

Worksheet	RR022, 76th St., 10yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.022
Slope	0.009000 ft/ft
Water Surface Elevation	102.67 ft
Elevation Range	101.50 to 103.52
Discharge	122.00 cfs



V:10.0  
H:1  
NTS

CURRENT DATE: 03-12-2002  
 CURRENT TIME: 15:26:19

FILE DATE: 03-12-2002  
 FILE NAME: 76THCULV

CULVERT @ 76<sup>TH</sup> ST & SWEETWATER AVE

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 6.0

C U L V E R T N O.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	100.20	100.00	40.00	1 RCB	8.00	3.00	.013	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs)

FILE: 76THCULV

DATE: 03-12-2002

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
100.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
101.92	30.3	30.3	0.0	0.0	0.0	0.0	0.0	0.00	1
102.27	60.6	60.6	0.0	0.0	0.0	0.0	0.0	0.00	1
102.88	90.9	90.9	0.0	0.0	0.0	0.0	0.0	0.00	1
103.48	121.2	121.2	0.0	0.0	0.0	0.0	0.0	0.00	1
103.50	122.0	122.0	0.0	0.0	0.0	0.0	0.0	0.00	1
104.28	181.8	158.7	0.0	0.0	0.0	0.0	0.0	22.63	4
104.44	212.1	165.6	0.0	0.0	0.0	0.0	0.0	44.76	3
104.59	242.4	171.8	0.0	0.0	0.0	0.0	0.0	69.11	3
104.73	272.7	177.4	0.0	0.0	0.0	0.0	0.0	94.24	3
104.86	303.0	182.3	0.0	0.0	0.0	0.0	0.0	119.79	3
104.00	145.9	145.9	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: 76THCULV

DATE: 03-12-2002

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
100.20	0.000	0.00	0.00	0.00
101.92	0.000	30.30	0.00	0.00
102.27	0.000	60.60	0.00	0.00
102.88	0.000	90.90	0.00	0.00
103.48	0.000	121.20	0.00	0.00
103.50	0.000	122.00	0.00	0.00
104.28	-0.003	181.80	0.48	0.26
104.44	-0.007	212.10	1.73	0.82
104.59	-0.005	242.40	1.46	0.60
104.73	-0.004	272.70	1.12	0.41
104.86	-0.003	303.00	0.90	0.30

<1> TOLERANCE (ft) = 0.010

<2> TOLERANCE (%) = 1.000



CURRENT DATE: 03-12-2002  
 CURRENT TIME: 15:26:19

FILE DATE: 03-12-2002  
 FILE NAME: 76THCULV

CULVERT @ 76<sup>TH</sup> ST & SWEETWATER

TAILWATER

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*

BOTTOM WIDTH	10.00 ft
SIDE SLOPE H/V (X:1)	3.0
CHANNEL SLOPE V/H (ft/ft)	0.005
MANNING'S n (.01-0.1)	0.030
CHANNEL INVERT ELEVATION	100.00 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	100.00 ft

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	100.00	0.000	0.00	0.00	0.00
30.30	100.87	0.525	0.87	2.78	0.27
60.60	101.27	0.538	1.27	3.44	0.40
90.90	101.59	0.544	1.59	3.88	0.50
121.20	101.85	0.548	1.85	4.22	0.58
122.00	101.85	0.548	1.85	4.23	0.58
181.80	102.28	0.553	2.28	4.74	0.71
212.10	102.47	0.555	2.47	4.94	0.77
242.40	102.64	0.556	2.64	5.13	0.82
272.70	102.80	0.558	2.80	5.29	0.87
303.00	102.95	0.559	2.95	5.45	0.92

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	40.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	104.00 ft

## Normal Depth Sect O, Greenway Rd from 78th St to 76th St, 100yr, 6hr Worksheet for Irregular Channel

Project Description	
Worksheet	RR013A, Greenway Rd Routing, 100yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002000 ft/ft
Discharge	559.00 cfs

*Q @ AD13A = 577 CFS*  
*33" & SD = 18 CFS*  
*577 - 18 = 559 CFS*

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	102.42 ft
Elevation Range	100.00 to 101.50
Flow Area	94.6 ft <sup>2</sup>
Wetted Perimeter	52.83 ft
Top Width	52.00 ft
Actual Depth	2.42 ft
Critical Elevation	102.13 ft
Critical Slope	0.003547 ft/ft
Velocity	5.91 ft/s
Velocity Head	0.54 ft
Specific Energy	102.96 ft
Froude Number	0.77
Flow Type	Subcritical

Calculation Messages:  
 Water elevation exceeds lowest end station by 1.91574969 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.025
0+05.0	0+47.0	0.016
0+47.0	0+52.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	100.50
0+05.0	100.50
0+05.1	100.00
0+26.0	100.50
0+46.9	101.00
0+47.0	101.50
0+52.0	101.50

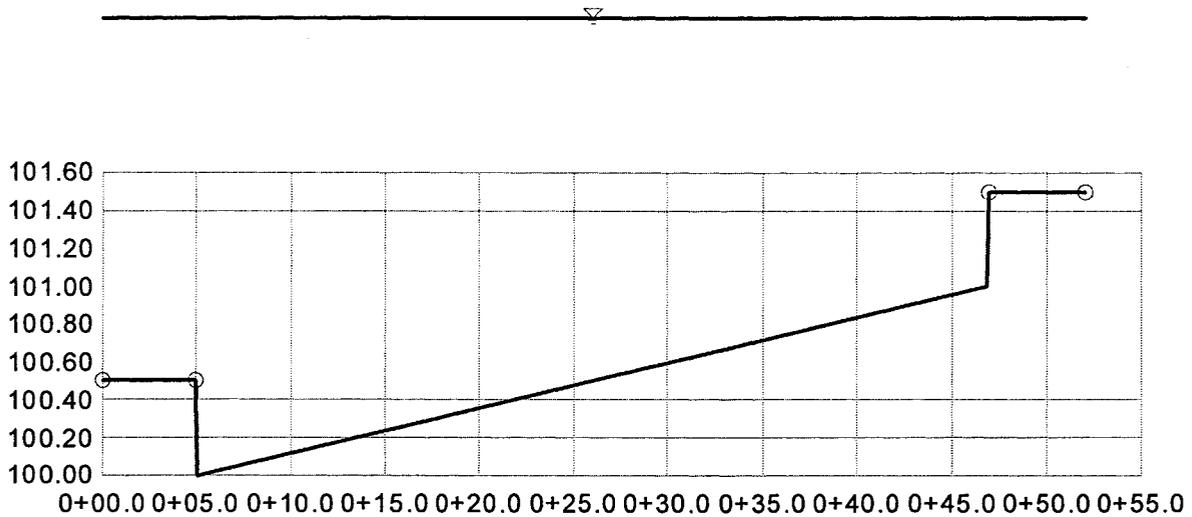
# Normal Depth Sect O, Greenway Rd from 78th St to 76th St, 100yr, 6hr Cross Section for Irregular Channel

## Project Description

Worksheet	RR013A, Greenway Rd Routing, 100yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Section Data

Mannings Coefficient	0.017
Slope	0.002000 ft/ft
Water Surface Elevation	102.42 ft
Elevation Range	100.00 to 101.50
Discharge	559.00 cfs



V:10.0  
H:1  
NTS

## Normal Depth Sect O, Greenway Rd from 78th St to 76th St, 10yr, 6hr Worksheet for Irregular Channel

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### Project Description

Worksheet	RR013A, Greenway Rd Routing, 10yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

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### Input Data

Slope	0.002000 ft/ft
Discharge	272.00 cfs

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### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

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### Results

Mannings Coefficient	0.016
Water Surface Elevation	101.76 ft
Elevation Range	100.00 to 101.50
Flow Area	60.2 ft <sup>2</sup>
Wetted Perimeter	52.83 ft
Top Width	52.00 ft
Actual Depth	1.76 ft
Critical Elevation	101.54 ft
Critical Slope	0.003910 ft/ft
Velocity	4.52 ft/s
Velocity Head	0.32 ft
Specific Energy	102.07 ft
Froude Number	0.74
Flow Type	Subcritical

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### Calculation Messages:

Water elevation exceeds lowest end station by 1.25561484 ft.

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### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+05.0	0.025
0+05.0	0+47.0	0.016
0+47.0	0+52.0	0.025

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### Natural Channel Points

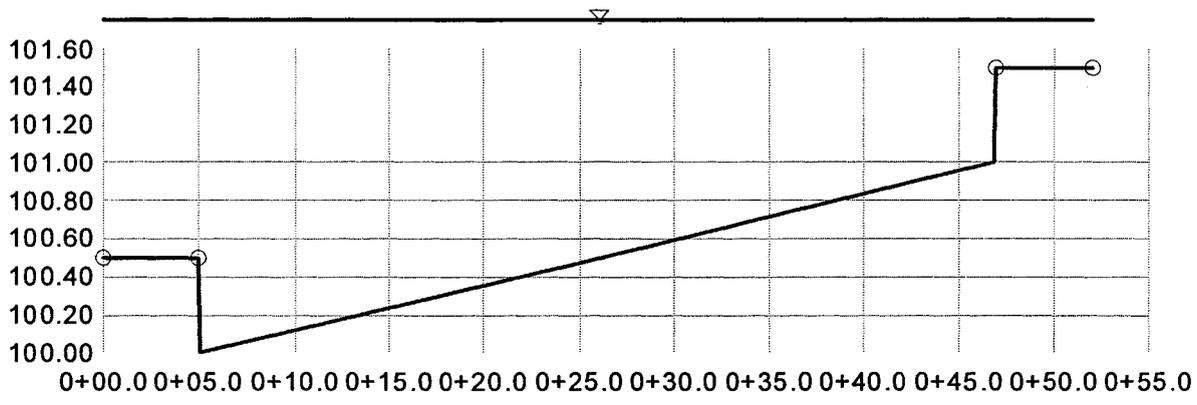
Station (ft)	Elevation (ft)
0+00.0	100.50
0+05.0	100.50
0+05.1	100.00
0+26.0	100.50
0+46.9	101.00
0+47.0	101.50
0+52.0	101.50

---

# Normal Depth Sect O, Greenway Rd from 78th St to 76th St, 10yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR013A, Greenway Rd Routing, 10yr, 6hr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.002000 ft/ft
Water Surface Elevation	101.76 ft
Elevation Range	100.00 to 101.50
Discharge	272.00 cfs



V:10.0  
H:1  
NTS

# Normal Depth Sect O, Greenway Rd from 78th St to 76th St, Road Capacity Worksheet for Irregular Channel

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## Project Description

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Worksheet	RR013A, Greenway Rd Routing, Road Capac
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

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## Input Data

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Slope	0.002000 ft/ft
Water Surface Elevation	100.50 ft

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## Options

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Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

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## Results

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Mannings Coefficient	0.016
Elevation Range	100.00 to 101.50
Discharge	8.54 cfs
Flow Area	5.2 ft <sup>2</sup>
Wetted Perimeter	21.42 ft
Top Width	21.00 ft
Actual Depth	0.50 ft
Critical Elevation	100.40 ft
Critical Slope	0.006546 ft/ft
Velocity	1.63 ft/s
Velocity Head	0.04 ft
Specific Energy	100.54 ft
Froude Number	0.57
Flow Type	Subcritical

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## Roughness Segments

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Start Station	End Station	Mannings Coefficient
0+05.0	0+47.0	0.016
0+47.0	0+52.0	0.025

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## Natural Channel Points

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Station (ft)	Elevation (ft)
0+05.0	100.50
0+05.1	100.00
0+26.0	100.50
0+46.9	101.00
0+47.0	101.50
0+52.0	101.50

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# Normal Depth Sect O, Greenway Rd from 78th St to 76th St, Road Capacity Cross Section for Irregular Channel

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**Project Description**

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Worksheet	RR013A, Greenway Rd Routing, Road Capac
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

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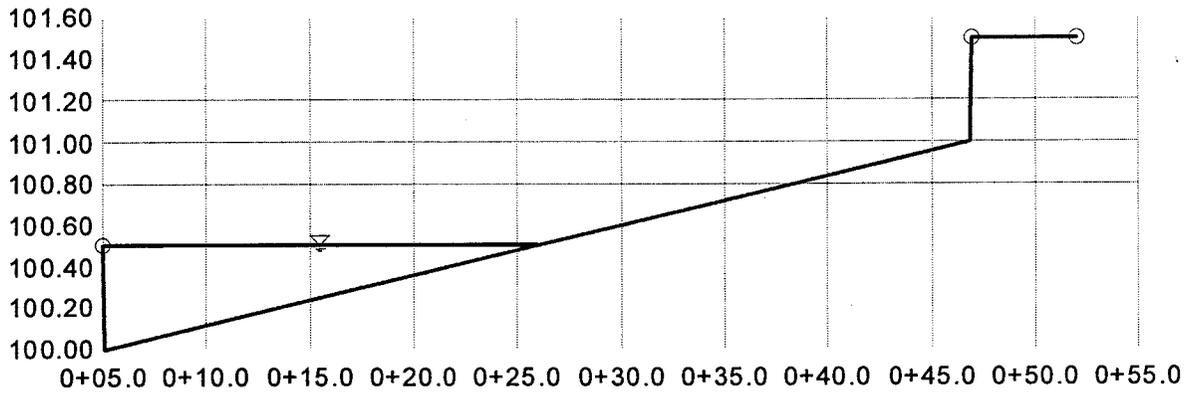
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**Section Data**

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Mannings Coefficient	0.016
Slope	0.002000 ft/ft
Water Surface Elevation	100.50 ft
Elevation Range	100.00 to 101.50
Discharge	8.54 cfs

---



V:10.0  
H:1  
NTS

73<sup>rd</sup> St

# Normal Depth Sect P, Greenway Rd from 76th St to ~~G-H Loop~~; 100yr, 6hr Worksheet for Irregular Channel

## Project Description

Worksheet	RR014, Greenway Rd Routing, 100yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

## Input Data

Slope	0.002000 ft/ft	<i>Q @ 122 CFS</i>
Discharge	104.00 cfs	<i>33" &amp; SD = 18 CFS</i>
		<i>122 - 18 = 104 CFS</i>

## Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

## Results

Mannings Coefficient	0.017
Water Surface Elevation	101.25 ft
Elevation Range	100.00 to 102.00
Flow Area	32.9 ft <sup>2</sup>
Wetted Perimeter	46.17 ft
Top Width	45.47 ft
Actual Depth	1.25 ft
Critical Elevation	101.07 ft
Critical Slope	0.005080 ft/ft
Velocity	3.16 ft/s
Velocity Head	0.16 ft
Specific Energy	101.41 ft
Froude Number	0.65
Flow Type	Subcritical

## Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+07.0	0.025
0+07.0	0+49.0	0.016
0+49.0	0+54.0	0.025

## Natural Channel Points

Station (ft)	Elevation (ft)
0+00.0	102.00
0+07.0	100.50
0+07.1	100.00
0+28.0	100.50
0+48.9	101.00
0+49.0	101.50
0+54.0	101.50

73<sup>rd</sup> St

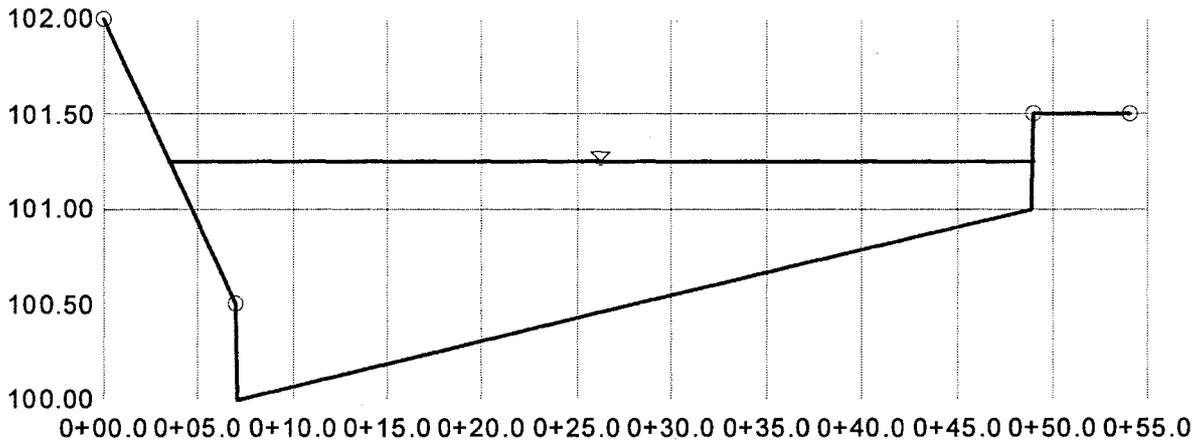
# Normal Depth Sect P, Greenway Rd from 76th St to ~~G-H Loop~~, 100yr, 6hr Cross Section for Irregular Channel

**Project Description**

Worksheet	RR014, Greenway Rd Routing, 100yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

**Section Data**

Mannings Coefficient	0.017
Slope	0.002000 ft/ft
Water Surface Elevation	101.25 ft
Elevation Range	100.00 to 102.00
Discharge	104.00 cfs



V:10.0  
H:1  
NTS

73<sup>rd</sup> St

## Normal Depth Sect P, Greenway Rd from 76th St to G-H Loop, 10yr, 6hr Worksheet for Irregular Channel

### Project Description

Worksheet	RR014, Greenway Rd Routing, 10yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

### Input Data

Slope	0.002000 ft/ft
Discharge	42.00 cfs

Q @ 60 CFS  
 33" @ SD = 18 CFS  
 60 - 18 = 42 CFS

### Options

Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

### Results

Mannings Coefficient	0.016
Water Surface Elevation	100.92 ft
Elevation Range	100.00 to 102.00
Flow Area	18.0 ft <sup>2</sup>
Wetted Perimeter	40.77 ft
Top Width	40.31 ft
Actual Depth	0.92 ft
Critical Elevation	100.76 ft
Critical Slope	0.005621 ft/ft
Velocity	2.34 ft/s
Velocity Head	0.08 ft
Specific Energy	101.00 ft
Froude Number	0.62
Flow Type	Subcritical

### Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+07.0	0.025
0+07.0	0+49.0	0.016
0+49.0	0+54.0	0.025

### Natural Channel Points

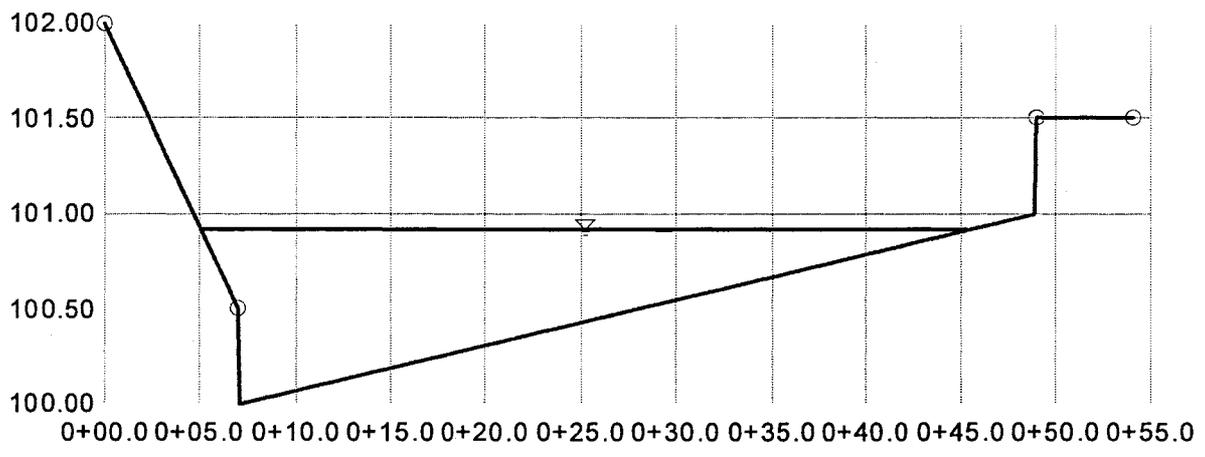
Station (ft)	Elevation (ft)
0+00.0	102.00
0+07.0	100.50
0+07.1	100.00
0+28.0	100.50
0+48.9	101.00
0+49.0	101.50
0+54.0	101.50

73<sup>rd</sup> St

# Normal Depth Sect P, Greenway Rd from 76th St to G-H Loop, 10yr, 6hr Cross Section for Irregular Channel

Project Description	
Worksheet	RR014, Greenway Rd Routing, 10yr, 6h
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.002000 ft/ft
Water Surface Elevation	100.92 ft
Elevation Range	100.00 to 102.00
Discharge	42.00 cfs



V:10.0  
H:1  
NTS

73<sup>rd</sup> St

# Normal Depth Sect P, Greenway Rd from 76th St to G-H Loop, Section Capacity Worksheet for Irregular Channel

Project Description	
Worksheet	RR014, Greenway Rd Routing, Capaci
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.002000 ft/ft
Water Surface Elevation	102.00 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Elevation Range	100.00 to 102.00
Discharge	324.12 cfs
Flow Area	70.7 ft <sup>2</sup>
Wetted Perimeter	54.99 ft
Top Width	54.00 ft
Actual Depth	2.00 ft
Critical Elevation	101.72 ft
Critical Slope	0.004306 ft/ft
Velocity	4.58 ft/s
Velocity Head	0.33 ft
Specific Energy	102.33 ft
Froude Number	0.71
Flow Type	Subcritical

Calculation Messages:  
Water elevation exceeds lowest end station by 0.5 ft.

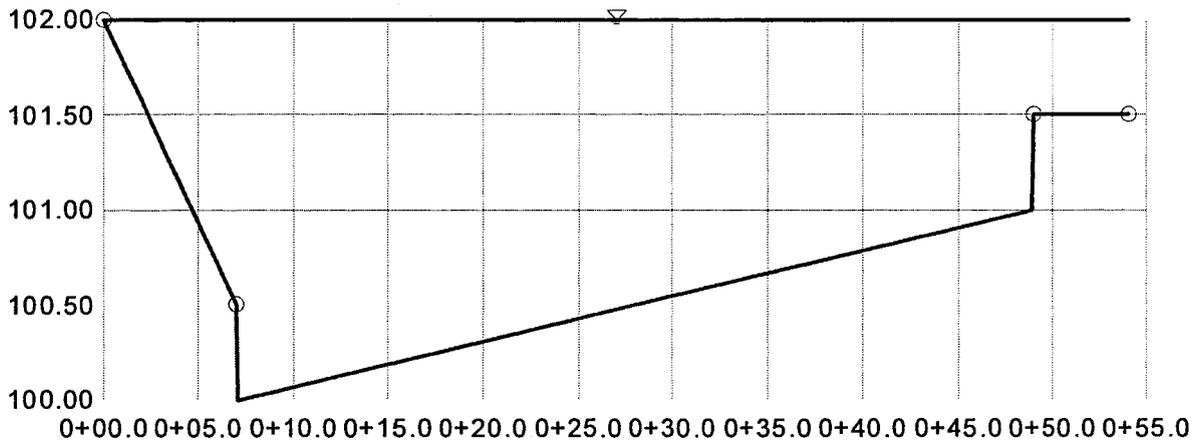
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.0	0+07.0	0.025
0+07.0	0+49.0	0.016
0+49.0	0+54.0	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.0	102.00
0+07.0	100.50
0+07.1	100.00
0+28.0	100.50
0+48.9	101.00
0+49.0	101.50
0+54.0	101.50

73<sup>rd</sup> St  
**Normal Depth Sect P, Greenway Rd from 76th St to ~~G-H Loop~~, Section Capacity**  
**Cross Section for Irregular Channel**

Project Description	
Worksheet	RR014, Greenway Rd Routing, Capac
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.017
Slope	0.002000 ft/ft
Water Surface Elevation	102.00 ft
Elevation Range	100.00 to 102.00
Discharge	324.12 cfs



V:10.0  
H:1  
NTS



## APPENDIX D

SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN  
"WITH RECOMMENDED ALTERNATIVE" HEC-RAS  
OUTPUT FILES, CROSS-SECTION PLOTS  
AND SUPPORTING HYDRAULIC CALCULATIONS/MODELS

"WITH RECOMMENDED ALTERNATIVE" HEC-RAS OUTPUT TABLES

"WITH RECOMMENDED ALTERNATIVE" HEC-RAS CROSS-SECTIONS

"WITH RECOMMENDED ALTERNATIVE" HEC-RAS  
HYDRAULICS REPORT & CULVERT TABLE

"WITH RECOMMENDED ALTERNATIVE" STORMCAD  
AND HEC-RAS PROFILES

71<sup>ST</sup> STREET CHANNEL PROPOSED STORM DRAIN INLET CALCULATIONS

"WITH RECOMMENDED ALTERNATIVE" HEC-RAS OUTPUT TABLES

REVISIONS  
 HEL-RAS OUTPUT  
 SLIP #15586

Plan: preferredalt 71 St. Channel Lower Reach RS: 37941 Profile: PF 1

E.G. Elev (ft)	1384.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1383.89	Reach Len. (ft)	133.00	133.00	133.00
Crit W.S. (ft)	1383.89	Flow Area (sq ft)	17.80	48.10	17.80
E.G. Slope (ft/ft)	0.002280	Area (sq ft)	17.80	48.10	17.80
Q Total (cfs)	498.00	Flow (cfs)	63.08	371.84	63.08
Top Width (ft)	50.30	Top Width (ft)	20.00	10.30	20.00
Vel Total (ft/s)	5.95	Avg. Vel. (ft/s)	3.54	7.73	3.54
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	0.89	4.67	0.89
Conv. Total (cfs)	10428.9	Conv. (cfs)	1321.0	7786.9	1321.0
Length Wtd. (ft)	133.00	Wetted Per. (ft)	20.89	17.52	20.89
Min Ch El (ft)	1379.10	Shear (lb/sq ft)	0.12	0.39	0.12
Alpha	1.35	Stream Power (lb/ft s)	0.43	3.02	0.43
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.09	16.23	0.04
C & E Loss (ft)	0.11	Cum SA (acres)	0.19	5.49	0.16

Plan: preferredalt 71 St. Channel Lower Reach RS: 37941 Profile: PF 2

E.G. Elev (ft)	1386.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.24	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1385.00	Reach Len. (ft)	133.00	133.00	133.00
Crit W.S. (ft)	1385.00	Flow Area (sq ft)	39.94	59.50	39.94
E.G. Slope (ft/ft)	0.003136	Area (sq ft)	39.94	59.50	39.94
Q Total (cfs)	1171.00	Flow (cfs)	274.74	621.52	274.74
Top Width (ft)	50.30	Top Width (ft)	20.00	10.30	20.00
Vel Total (ft/s)	8.40	Avg. Vel. (ft/s)	6.88	10.45	6.88
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)	2.00	5.78	2.00
Conv. Total (cfs)	20912.1	Conv. (cfs)	4906.4	11099.2	4906.4
Length Wtd. (ft)	133.00	Wetted Per. (ft)	22.00	17.52	22.00
Min Ch El (ft)	1379.10	Shear (lb/sq ft)	0.36	0.66	0.36
Alpha	1.13	Stream Power (lb/ft s)	2.45	6.95	2.44
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	5.57	33.01	5.38
C & E Loss (ft)	0.09	Cum SA (acres)	3.69	6.48	3.92

Plan: preferredalt 71 St. Channel Lower Reach RS: 37808 Profile: PF 1

E.G. Elev (ft)	1384.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.		0.018	0.050
W.S. Elev (ft)	1383.74	Reach Len. (ft)	108.00	108.00	108.00
Crit W.S. (ft)	1381.88	Flow Area (sq ft)		99.97	0.01
E.G. Slope (ft/ft)	0.000725	Area (sq ft)		99.97	0.01
Q Total (cfs)	498.00	Flow (cfs)		498.00	0.00
Top Width (ft)	26.49	Top Width (ft)		26.23	0.26
Vel Total (ft/s)	4.98	Avg. Vel. (ft/s)		4.98	0.06
Max Chl Dpth (ft)	5.04	Hydr. Depth (ft)		3.81	0.02
Conv. Total (cfs)	18489.4	Conv. (cfs)		18489.3	0.0
Length Wtd. (ft)	108.00	Wetted Per. (ft)		29.81	0.26
Min Ch El (ft)	1378.70	Shear (lb/sq ft)		0.15	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.76	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.06	16.01	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.16	5.44	0.13

Plan: preferredalt 71 St. Channel Lower Reach RS: 37808 Profile: PF 2

E.G. Elev (ft)	1385.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.95	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1384.82	Reach Len. (ft)	108.00	108.00	108.00
Crit W.S. (ft)	1384.22	Flow Area (sq ft)	76.83	128.35	4.15
E.G. Slope (ft/ft)	0.001423	Area (sq ft)	76.83	128.35	4.15
Q Total (cfs)	1171.00	Flow (cfs)	112.25	1055.62	3.13
Top Width (ft)	83.71	Top Width (ft)	50.00	26.30	7.41
Vel Total (ft/s)	5.59	Avg. Vel. (ft/s)	1.46	8.22	0.76
Max Chl Dpth (ft)	6.12	Hydr. Depth (ft)	1.54	4.88	0.56
Conv. Total (cfs)	31044.1	Conv. (cfs)	2975.9	27985.2	83.0
Length Wtd. (ft)	108.00	Wetted Per. (ft)	51.63	29.90	7.50
Min Ch EI (ft)	1378.70	Shear (lb/sq ft)	0.13	0.38	0.05
Alpha	1.96	Stream Power (lb/ft s)	0.19	3.14	0.04
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	5.39	32.73	5.31
C & E Loss (ft)	0.01	Cum SA (acres)	3.58	6.42	3.88

Plan: preferredalt 71 St. Channel Lower Reach RS: 37700 Profile: PF 1

E.G. Elev (ft)	1384.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.33	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1383.71	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)	1381.20	Flow Area (sq ft)	5.24	107.21	0.24
E.G. Slope (ft/ft)	0.000601	Area (sq ft)	5.24	107.21	0.24
Q Total (cfs)	498.00	Flow (cfs)	0.85	497.15	0.01
Top Width (ft)	121.20	Top Width (ft)	50.00	21.20	50.00
Vel Total (ft/s)	4.42	Avg. Vel. (ft/s)	0.16	4.64	0.02
Max Chl Dpth (ft)	5.10	Hydr. Depth (ft)	0.10	5.06	0.00
Conv. Total (cfs)	20315.8	Conv. (cfs)	34.6	20281.0	0.2
Length Wtd. (ft)	85.00	Wetted Per. (ft)	50.10	30.91	50.00
Min Ch EI (ft)	1378.60	Shear (lb/sq ft)	0.00	0.13	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.60	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.06	15.75	0.01
C & E Loss (ft)		Cum SA (acres)	0.10	5.38	0.06

Plan: preferredalt 71 St. Channel Lower Reach RS: 37700 Profile: PF 2

E.G. Elev (ft)	1385.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.	0.050	0.018	0.050
W.S. Elev (ft)	1384.58	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)	1383.19	Flow Area (sq ft)	48.97	125.75	43.97
E.G. Slope (ft/ft)	0.001624	Area (sq ft)	48.97	125.75	43.97
Q Total (cfs)	1171.00	Flow (cfs)	57.09	1066.14	47.77
Top Width (ft)	121.20	Top Width (ft)	50.00	21.20	50.00
Vel Total (ft/s)	5.35	Avg. Vel. (ft/s)	1.17	8.48	1.09
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)	0.98	5.93	0.88
Conv. Total (cfs)	29059.2	Conv. (cfs)	1416.7	26456.9	1185.6
Length Wtd. (ft)	85.00	Wetted Per. (ft)	50.98	30.91	50.88
Min Ch EI (ft)	1378.60	Shear (lb/sq ft)	0.10	0.41	0.09
Alpha	2.29	Stream Power (lb/ft s)	0.11	3.50	0.10
Frctn Loss (ft)		Cum Volume (acre-ft)	5.24	32.41	5.25
C & E Loss (ft)		Cum SA (acres)	3.46	6.37	3.80

Plan: preferredalt 71 St. Channel Lower Reach RS: 37615 Profile: PF 1

E.G. Elev (ft)	1383.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.		0.018	
W.S. Elev (ft)	1382.62	Reach Len. (ft)	272.00	272.00	272.00
Crit W.S. (ft)	1381.11	Flow Area (sq ft)		86.70	
E.G. Slope (ft/ft)	0.001132	Area (sq ft)		86.70	
Q Total (cfs)	498.00	Flow (cfs)		498.00	
Top Width (ft)	21.37	Top Width (ft)		21.37	
Vel Total (ft/s)	5.74	Avg. Vel. (ft/s)		5.74	
Max Chl Dpth (ft)	4.12	Hydr. Depth (ft)		4.06	
Conv. Total (cfs)	14804.2	Conv. (cfs)		14804.2	
Length Wtd. (ft)	272.00	Wetted Per. (ft)		29.14	
Min Ch EI (ft)	1378.50	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		1.21	
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)	0.05	15.56	0.01
C & E Loss (ft)	0.07	Cum SA (acres)	0.05	5.34	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 37615 Profile: PF 2

E.G. Elev (ft)	1385.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.94	Wt. n-Val.	0.100	0.018	0.050
W.S. Elev (ft)	1384.50	Reach Len. (ft)	272.00	272.00	272.00
Crit W.S. (ft)	1383.64	Flow Area (sq ft)	8.01	127.03	80.10
E.G. Slope (ft/ft)	0.001431	Area (sq ft)	8.01	127.03	80.10
Q Total (cfs)	1171.00	Flow (cfs)	5.12	1045.13	120.74
Top Width (ft)	76.40	Top Width (ft)	5.00	21.40	50.00
Vel Total (ft/s)	5.44	Avg. Vel. (ft/s)	0.64	8.23	1.51
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)	1.60	5.94	1.60
Conv. Total (cfs)	30951.6	Conv. (cfs)	135.4	27624.8	3191.5
Length Wtd. (ft)	272.00	Wetted Per. (ft)	6.60	29.71	51.60
Min Ch EI (ft)	1378.50	Shear (lb/sq ft)	0.11	0.38	0.14
Alpha	2.05	Stream Power (lb/ft s)	0.07	3.14	0.21
Frctn Loss (ft)	0.49	Cum Volume (acre-ft)	5.18	32.16	5.13
C & E Loss (ft)	0.05	Cum SA (acres)	3.41	6.32	3.71

Plan: preferredalt 71 St. Channel Lower Reach RS: 37343 Profile: PF 1

E.G. Elev (ft)	1382.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	Wt. n-Val.		0.018	
W.S. Elev (ft)	1381.28	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1381.28	Flow Area (sq ft)		55.53	
E.G. Slope (ft/ft)	0.004004	Area (sq ft)		55.53	
Q Total (cfs)	498.00	Flow (cfs)		498.00	
Top Width (ft)	22.48	Top Width (ft)		22.48	
Vel Total (ft/s)	8.97	Avg. Vel. (ft/s)		8.97	
Max Chl Dpth (ft)	3.08	Hydr. Depth (ft)		2.47	
Conv. Total (cfs)	7870.5	Conv. (cfs)		7870.5	
Length Wtd. (ft)	295.00	Wetted Per. (ft)		24.68	
Min Ch EI (ft)	1378.20	Shear (lb/sq ft)		0.56	
Alpha	1.00	Stream Power (lb/ft s)		5.04	
Frctn Loss (ft)	1.20	Cum Volume (acre-ft)	0.05	15.12	0.01
C & E Loss (ft)	0.34	Cum SA (acres)	0.05	5.20	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 37343 Profile: PF 2

E.G. Elev (ft)	1384.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.	0.100	0.018	0.050
W.S. Elev (ft)	1383.50	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1383.50	Flow Area (sq ft)	5.48	109.57	55.15
E.G. Slope (ft/ft)	0.002350	Area (sq ft)	5.48	109.57	55.15
Q Total (cfs)	1171.00	Flow (cfs)	3.68	1084.05	83.27
Top Width (ft)	80.40	Top Width (ft)	5.00	25.10	50.30
Vel Total (ft/s)	6.88	Avg. Vel. (ft/s)	0.67	9.89	1.51
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)	1.10	4.37	1.10
Conv. Total (cfs)	24154.2	Conv. (cfs)	75.9	22360.6	1717.7
Length Wtd. (ft)	295.00	Wetted Per. (ft)	6.10	28.19	51.41
Min Ch EI (ft)	1378.20	Shear (lb/sq ft)	0.13	0.57	0.16
Alpha	1.92	Stream Power (lb/ft s)	0.09	5.64	0.24
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	5.14	31.43	4.71
C & E Loss (ft)	0.20	Cum SA (acres)	3.38	6.18	3.39

Plan: preferredalt 71 St. Channel Lower Reach RS: 37048 Profile: PF 1

E.G. Elev (ft)	1377.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.018	
W.S. Elev (ft)	1377.58	Reach Len. (ft)	136.00	136.00	136.00
Crit W.S. (ft)	1377.58	Flow Area (sq ft)		4.54	
E.G. Slope (ft/ft)	0.007626	Area (sq ft)		4.54	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	18.06	Top Width (ft)		18.06	
Vel Total (ft/s)	2.86	Avg. Vel. (ft/s)		2.86	
Max Chl Dpth (ft)	0.28	Hydr. Depth (ft)		0.25	
Conv. Total (cfs)	148.9	Conv. (cfs)		148.9	
Length Wtd. (ft)	136.00	Wetted Per. (ft)		18.11	
Min Ch EI (ft)	1377.30	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.34	
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.05	14.91	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.05	5.06	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 37048 Profile: PF 2

E.G. Elev (ft)	1381.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.75	Wt. n-Val.	0.100	0.018	0.100
W.S. Elev (ft)	1380.98	Reach Len. (ft)	136.00	136.00	136.00
Crit W.S. (ft)		Flow Area (sq ft)	79.37	71.85	74.06
E.G. Slope (ft/ft)	0.001917	Area (sq ft)	79.37	71.85	74.06
Q Total (cfs)	686.00	Flow (cfs)	68.73	555.80	61.48
Top Width (ft)	120.00	Top Width (ft)	50.10	20.00	49.90
Vel Total (ft/s)	3.04	Avg. Vel. (ft/s)	0.87	7.74	0.83
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)	1.58	3.59	1.48
Conv. Total (cfs)	15669.5	Conv. (cfs)	1569.8	12695.3	1404.3
Length Wtd. (ft)	136.00	Wetted Per. (ft)	51.68	22.95	51.38
Min Ch EI (ft)	1377.30	Shear (lb/sq ft)	0.18	0.37	0.17
Alpha	5.24	Stream Power (lb/ft s)	0.16	2.90	0.14
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	4.85	30.81	4.27
C & E Loss (ft)	0.03	Cum SA (acres)	3.19	6.03	3.05

Plan: preferredalt 71 St. Channel Lower Reach RS: 36912 Profile: PF 1

E.G. Elev (ft)	1376.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.020	
W.S. Elev (ft)	1376.93	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1376.77	Flow Area (sq ft)		6.30	
E.G. Slope (ft/ft)	0.002521	Area (sq ft)		6.30	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	15.20	Top Width (ft)		15.20	
Vel Total (ft/s)	2.06	Avg. Vel. (ft/s)		2.06	
Max Chl Dpth (ft)	0.63	Hydr. Depth (ft)		0.41	
Conv. Total (cfs)	258.9	Conv. (cfs)		258.9	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		15.31	
Min Ch El (ft)	1376.30	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.13	
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)	0.05	14.90	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	5.01	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36912 Profile: PF 2

E.G. Elev (ft)	1381.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.06	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1380.32	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1380.32	Flow Area (sq ft)	46.04	73.44	31.05
E.G. Slope (ft/ft)	0.003103	Area (sq ft)	46.04	73.44	31.05
Q Total (cfs)	686.00	Flow (cfs)	35.64	631.81	18.55
Top Width (ft)	120.30	Top Width (ft)	50.00	20.30	50.00
Vel Total (ft/s)	4.56	Avg. Vel. (ft/s)	0.77	8.60	0.60
Max Chl Dpth (ft)	4.02	Hydr. Depth (ft)	0.92	3.62	0.62
Conv. Total (cfs)	12314.8	Conv. (cfs)	639.8	11341.9	333.1
Length Wtd. (ft)	200.00	Wetted Per. (ft)	50.92	24.51	50.62
Min Ch El (ft)	1376.30	Shear (lb/sq ft)	0.18	0.58	0.12
Alpha	3.28	Stream Power (lb/ft s)	0.14	4.99	0.07
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	4.66	30.58	4.11
C & E Loss (ft)	0.17	Cum SA (acres)	3.03	5.96	2.90

Plan: preferredalt 71 St. Channel Lower Reach RS: 36712 Profile: PF 1

E.G. Elev (ft)	1376.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1375.97	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)	1375.97	Flow Area (sq ft)		4.03	
E.G. Slope (ft/ft)	0.008565	Area (sq ft)		4.03	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	12.45	Top Width (ft)		12.45	
Vel Total (ft/s)	3.23	Avg. Vel. (ft/s)		3.23	
Max Chl Dpth (ft)	0.37	Hydr. Depth (ft)		0.32	
Conv. Total (cfs)	140.5	Conv. (cfs)		140.5	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		12.54	
Min Ch El (ft)	1375.60	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.55	
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.05	14.87	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.05	4.95	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36712 Profile: PF 2

E.G. Elev (ft)	1379.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1378.86	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)	128.05	48.30	123.05
E.G. Slope (ft/ft)	0.002312	Area (sq ft)	128.05	48.30	123.05
Q Total (cfs)	686.00	Flow (cfs)	165.64	365.15	155.20
Top Width (ft)	115.50	Top Width (ft)	50.00	15.50	50.00
Vel Total (ft/s)	2.29	Avg. Vel. (ft/s)	1.29	7.56	1.26
Max Chl Dpth (ft)	3.26	Hydr. Depth (ft)	2.56	3.12	2.46
Conv. Total (cfs)	14267.5	Conv. (cfs)	3445.0	7594.5	3227.9
Length Wtd. (ft)	48.00	Wetted Per. (ft)	52.56	15.69	52.46
Min Ch EI (ft)	1375.60	Shear (lb/sq ft)	0.35	0.44	0.34
Alpha	5.94	Stream Power (lb/ft s)	0.45	3.36	0.43
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	4.26	30.31	3.75
C & E Loss (ft)	0.05	Cum SA (acres)	2.80	5.88	2.67

Plan: preferredalt 71 St. Channel Lower Reach RS: 36664 Profile: PF 1

E.G. Elev (ft)	1375.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.020	
W.S. Elev (ft)	1375.64	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)		5.23	
E.G. Slope (ft/ft)	0.004334	Area (sq ft)		5.23	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	14.39	Top Width (ft)		14.39	
Vel Total (ft/s)	2.48	Avg. Vel. (ft/s)		2.48	
Max Chl Dpth (ft)	0.44	Hydr. Depth (ft)		0.36	
Conv. Total (cfs)	197.5	Conv. (cfs)		197.5	
Length Wtd. (ft)	85.00	Wetted Per. (ft)		14.46	
Min Ch EI (ft)	1375.20	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.24	
Frctn Loss (ft)	0.50	Cum Volume (acre-ft)	0.05	14.87	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	4.93	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36664 Profile: PF 2

E.G. Elev (ft)	1379.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.	0.100	0.020	0.100
W.S. Elev (ft)	1378.90	Reach Len. (ft)	85.00	85.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	154.79	57.83	154.79
E.G. Slope (ft/ft)	0.001253	Area (sq ft)	154.79	57.83	154.79
Q Total (cfs)	686.00	Flow (cfs)	166.14	353.72	166.14
Top Width (ft)	116.20	Top Width (ft)	50.00	16.20	50.00
Vel Total (ft/s)	1.87	Avg. Vel. (ft/s)	1.07	6.12	1.07
Max Chl Dpth (ft)	3.70	Hydr. Depth (ft)	3.10	3.57	3.10
Conv. Total (cfs)	19381.2	Conv. (cfs)	4693.9	9993.5	4693.9
Length Wtd. (ft)	85.00	Wetted Per. (ft)	53.10	16.31	53.10
Min Ch EI (ft)	1375.20	Shear (lb/sq ft)	0.23	0.28	0.23
Alpha	5.69	Stream Power (lb/ft s)	0.24	1.70	0.24
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	4.10	30.25	3.60
C & E Loss (ft)	0.09	Cum SA (acres)	2.75	5.86	2.61

Plan: preferredalt 71 St. Channel Lower Reach RS: 36579 Profile: PF 1

E.G. Elev (ft)	1375.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1375.07	Reach Len. (ft)	273.00	273.00	273.00
Crit W.S. (ft)	1375.06	Flow Area (sq ft)		4.00	
E.G. Slope (ft/ft)	0.008372	Area (sq ft)		4.00	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	11.98	Top Width (ft)		11.98	
Vel Total (ft/s)	3.25	Avg. Vel. (ft/s)		3.25	
Max Chl Dpth (ft)	0.37	Hydr. Depth (ft)		0.33	
Conv. Total (cfs)	142.1	Conv. (cfs)		142.1	
Length Wtd. (ft)	273.00	Wetted Per. (ft)		12.10	
Min Ch EI (ft)	1374.70	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.56	
Frctn Loss (ft)	1.84	Cum Volume (acre-ft)	0.05	14.86	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.91	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36579 Profile: PF 2

E.G. Elev (ft)	1378.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.17	Wt. n-Val.	0.100	0.020	0.035
W.S. Elev (ft)	1377.76	Reach Len. (ft)	273.00	273.00	273.00
Crit W.S. (ft)	1377.76	Flow Area (sq ft)	107.94	43.60	11.29
E.G. Slope (ft/ft)	0.004934	Area (sq ft)	107.94	43.60	11.29
Q Total (cfs)	686.00	Flow (cfs)	182.96	457.82	45.22
Top Width (ft)	70.00	Top Width (ft)	50.00	15.00	5.00
Vel Total (ft/s)	4.21	Avg. Vel. (ft/s)	1.70	10.50	4.00
Max Chl Dpth (ft)	3.06	Hydr. Depth (ft)	2.16	2.91	2.26
Conv. Total (cfs)	9766.1	Conv. (cfs)	2604.7	6517.6	643.8
Length Wtd. (ft)	273.00	Wetted Per. (ft)	52.16	15.27	7.26
Min Ch EI (ft)	1374.70	Shear (lb/sq ft)	0.64	0.88	0.48
Alpha	4.25	Stream Power (lb/ft s)	1.08	9.23	1.92
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	3.84	30.15	3.44
C & E Loss (ft)	0.17	Cum SA (acres)	2.65	5.83	2.56

Plan: preferredalt 71 St. Channel Lower Reach RS: 36306 Profile: PF 1

E.G. Elev (ft)	1373.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.016	
W.S. Elev (ft)	1373.23	Reach Len. (ft)	73.00	73.00	73.00
Crit W.S. (ft)	1373.23	Flow Area (sq ft)		3.97	
E.G. Slope (ft/ft)	0.005539	Area (sq ft)		3.97	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	12.09	Top Width (ft)		12.09	
Vel Total (ft/s)	3.27	Avg. Vel. (ft/s)		3.27	
Max Chl Dpth (ft)	0.38	Hydr. Depth (ft)		0.33	
Conv. Total (cfs)	174.7	Conv. (cfs)		174.7	
Length Wtd. (ft)	73.00	Wetted Per. (ft)		12.19	
Min Ch EI (ft)	1372.85	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.37	
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)	0.05	14.83	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.05	4.83	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36306 Profile: PF 2

E.G. Elev (ft)	1375.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1374.98	Reach Len. (ft)	73.00	73.00	73.00
Crit W.S. (ft)	1374.98	Flow Area (sq ft)	63.62	30.33	66.62
E.G. Slope (ft/ft)	0.003989	Area (sq ft)	63.62	30.33	66.62
Q Total (cfs)	686.00	Flow (cfs)	196.99	276.48	212.53
Top Width (ft)	115.44	Top Width (ft)	50.00	15.44	50.00
Vel Total (ft/s)	4.27	Avg. Vel. (ft/s)	3.10	9.11	3.19
Max Chl Dpth (ft)	2.13	Hydr. Depth (ft)	1.27	1.96	1.33
Conv. Total (cfs)	10862.0	Conv. (cfs)	3119.1	4377.7	3365.2
Length Wtd. (ft)	73.00	Wetted Per. (ft)	51.27	15.66	51.33
Min Ch El (ft)	1372.85	Shear (lb/sq ft)	0.31	0.48	0.32
Alpha	2.16	Stream Power (lb/ft s)	0.96	4.40	1.03
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	3.31	29.92	3.20
C & E Loss (ft)	0.01	Cum SA (acres)	2.34	5.74	2.39

Plan: preferredalt 71 St. Channel Lower Reach RS: 36233 Profile: PF 1

E.G. Elev (ft)	1372.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1372.29	Reach Len. (ft)	145.00	145.00	145.00
Crit W.S. (ft)	1372.29	Flow Area (sq ft)		5.41	
E.G. Slope (ft/ft)	0.006724	Area (sq ft)		5.41	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	30.40	Top Width (ft)		30.40	
Vel Total (ft/s)	2.40	Avg. Vel. (ft/s)		2.40	
Max Chl Dpth (ft)	0.24	Hydr. Depth (ft)		0.18	
Conv. Total (cfs)	158.5	Conv. (cfs)		158.5	
Length Wtd. (ft)	145.00	Wetted Per. (ft)		30.59	
Min Ch El (ft)	1372.05	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	0.05	14.83	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.80	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36233 Profile: PF 2

E.G. Elev (ft)	1374.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1373.77	Reach Len. (ft)	145.00	145.00	145.00
Crit W.S. (ft)	1373.77	Flow Area (sq ft)	53.12	50.67	56.62
E.G. Slope (ft/ft)	0.003644	Area (sq ft)	53.12	50.67	56.62
Q Total (cfs)	686.00	Flow (cfs)	139.76	390.96	155.28
Top Width (ft)	130.55	Top Width (ft)	50.00	30.55	50.00
Vel Total (ft/s)	4.28	Avg. Vel. (ft/s)	2.63	7.72	2.74
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)	1.06	1.66	1.13
Conv. Total (cfs)	11364.8	Conv. (cfs)	2315.3	6477.0	2572.6
Length Wtd. (ft)	145.00	Wetted Per. (ft)	51.06	31.37	51.13
Min Ch El (ft)	1372.05	Shear (lb/sq ft)	0.24	0.37	0.25
Alpha	2.03	Stream Power (lb/ft s)	0.62	2.83	0.69
Frctn Loss (ft)	0.50	Cum Volume (acre-ft)	3.21	29.85	3.09
C & E Loss (ft)	0.00	Cum SA (acres)	2.25	5.70	2.30

Plan: preferredalt 71 St. Channel Lower Reach RS: 36088 Profile: PF 1

E.G. Elev (ft)	1371.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.016	
W.S. Elev (ft)	1371.22	Reach Len. (ft)	243.00	243.00	243.00
Crit W.S. (ft)	1371.21	Flow Area (sq ft)		5.81	
E.G. Slope (ft/ft)	0.005490	Area (sq ft)		5.81	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	31.30	Top Width (ft)		31.30	
Vel Total (ft/s)	2.24	Avg. Vel. (ft/s)		2.24	
Max Chl Dpth (ft)	0.36	Hydr. Depth (ft)		0.19	
Conv. Total (cfs)	175.4	Conv. (cfs)		175.4	
Length Wtd. (ft)	243.00	Wetted Per. (ft)		31.33	
Min Ch EI (ft)	1370.86	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	1.51	Cum Volume (acre-ft)	0.05	14.81	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.69	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 36088 Profile: PF 2

E.G. Elev (ft)	1373.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1372.78	Reach Len. (ft)	243.00	243.00	243.00
Crit W.S. (ft)	1372.78	Flow Area (sq ft)	53.55	54.91	53.55
E.G. Slope (ft/ft)	0.003294	Area (sq ft)	53.55	54.91	53.55
Q Total (cfs)	686.00	Flow (cfs)	134.66	416.68	134.66
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	4.23	Avg. Vel. (ft/s)	2.51	7.59	2.51
Max Chl Dpth (ft)	1.92	Hydr. Depth (ft)	1.07	1.74	1.07
Conv. Total (cfs)	11952.2	Conv. (cfs)	2346.2	7259.8	2346.2
Length Wtd. (ft)	243.00	Wetted Per. (ft)	51.07	32.33	51.07
Min Ch EI (ft)	1370.86	Shear (lb/sq ft)	0.22	0.35	0.22
Alpha	2.09	Stream Power (lb/ft s)	0.54	2.65	0.54
Frctn Loss (ft)	0.84	Cum Volume (acre-ft)	3.03	29.67	2.91
C & E Loss (ft)	0.00	Cum SA (acres)	2.09	5.60	2.14

Plan: preferredalt 71 St. Channel Lower Reach RS: 35845 Profile: PF 1

E.G. Elev (ft)	1369.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1369.69	Reach Len. (ft)	352.00	352.00	352.00
Crit W.S. (ft)	1369.69	Flow Area (sq ft)		5.40	
E.G. Slope (ft/ft)	0.007080	Area (sq ft)		5.40	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	31.34	Top Width (ft)		31.34	
Vel Total (ft/s)	2.41	Avg. Vel. (ft/s)		2.41	
Max Chl Dpth (ft)	0.24	Hydr. Depth (ft)		0.17	
Conv. Total (cfs)	154.5	Conv. (cfs)		154.5	
Length Wtd. (ft)	352.00	Wetted Per. (ft)		31.51	
Min Ch EI (ft)	1369.45	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	0.05	14.78	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.52	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35845 Profile: PF 2

E.G. Elev (ft)	1371.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.57	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1371.18	Reach Len. (ft)	352.00	352.00	352.00
Crit W.S. (ft)	1371.18	Flow Area (sq ft)	54.28	52.09	54.28
E.G. Slope (ft/ft)	0.003590	Area (sq ft)	54.28	52.09	54.28
Q Total (cfs)	686.00	Flow (cfs)	143.79	398.43	143.79
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	4.27	Avg. Vel. (ft/s)	2.65	7.65	2.65
Max Chl Dpth (ft)	1.73	Hydr. Depth (ft)	1.09	1.65	1.09
Conv. Total (cfs)	11449.7	Conv. (cfs)	2399.9	6649.9	2399.9
Length Wtd. (ft)	352.00	Wetted Per. (ft)	51.09	32.32	51.09
Min Ch El (ft)	1369.45	Shear (lb/sq ft)	0.24	0.36	0.24
Alpha	2.02	Stream Power (lb/ft s)	0.63	2.76	0.63
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	2.73	29.37	2.61
C & E Loss (ft)	0.13	Cum SA (acres)	1.81	5.42	1.86

Plan: preferredalt 71 St. Channel Lower Reach RS: 35493 Profile: PF 1

E.G. Elev (ft)	1367.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.016	
W.S. Elev (ft)	1367.60	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)	1367.60	Flow Area (sq ft)		5.95	
E.G. Slope (ft/ft)	0.005086	Area (sq ft)		5.95	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	31.31	Top Width (ft)		31.31	
Vel Total (ft/s)	2.19	Avg. Vel. (ft/s)		2.19	
Max Chl Dpth (ft)	0.35	Hydr. Depth (ft)		0.19	
Conv. Total (cfs)	182.3	Conv. (cfs)		182.3	
Length Wtd. (ft)	82.00	Wetted Per. (ft)		31.36	
Min Ch El (ft)	1367.25	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.13	
Frctn Loss (ft)	0.48	Cum Volume (acre-ft)	0.05	14.73	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.27	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35493 Profile: PF 2

E.G. Elev (ft)	1370.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1370.18	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)		Flow Area (sq ft)	105.18	87.21	105.68
E.G. Slope (ft/ft)	0.000522	Area (sq ft)	105.18	87.21	105.68
Q Total (cfs)	686.00	Flow (cfs)	163.01	358.71	164.28
Top Width (ft)	131.50	Top Width (ft)	50.00	31.50	50.00
Vel Total (ft/s)	2.30	Avg. Vel. (ft/s)	1.55	4.11	1.55
Max Chl Dpth (ft)	2.93	Hydr. Depth (ft)	2.10	2.77	2.11
Conv. Total (cfs)	30016.5	Conv. (cfs)	7132.6	15695.5	7188.4
Length Wtd. (ft)	82.00	Wetted Per. (ft)	52.10	32.33	52.11
Min Ch El (ft)	1367.25	Shear (lb/sq ft)	0.07	0.09	0.07
Alpha	1.89	Stream Power (lb/ft s)	0.10	0.36	0.10
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	2.09	28.81	1.96
C & E Loss (ft)	0.02	Cum SA (acres)	1.40	5.17	1.45

Plan: preferredalt 71 St. Channel Lower Reach RS: 35411 Profile: PF 1

E.G. Elev (ft)	1367.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1367.10	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1367.10	Flow Area (sq ft)		5.45	
E.G. Slope (ft/ft)	0.006875	Area (sq ft)		5.45	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	31.43	Top Width (ft)		31.43	
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)		2.39	
Max Chl Dpth (ft)	0.27	Hydr. Depth (ft)		0.17	
Conv. Total (cfs)	156.8	Conv. (cfs)		156.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		31.56	
Min Ch EI (ft)	1366.83	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	0.05	14.72	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	4.21	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35411 Profile: PF 2

E.G. Elev (ft)	1370.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.	0.035	0.016	0.035
W.S. Elev (ft)	1370.20	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	134.16	103.44	133.65
E.G. Slope (ft/ft)	0.000267	Area (sq ft)	134.16	103.44	133.65
Q Total (cfs)	686.00	Flow (cfs)	173.49	340.07	172.44
Top Width (ft)	131.60	Top Width (ft)	50.00	31.60	50.00
Vel Total (ft/s)	1.85	Avg. Vel. (ft/s)	1.29	3.29	1.29
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)	2.68	3.27	2.67
Conv. Total (cfs)	41995.8	Conv. (cfs)	10620.9	20818.7	10556.2
Length Wtd. (ft)	100.00	Wetted Per. (ft)	52.68	32.42	52.67
Min Ch EI (ft)	1366.83	Shear (lb/sq ft)	0.04	0.05	0.04
Alpha	1.82	Stream Power (lb/ft s)	0.05	0.17	0.05
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.86	28.63	1.74
C & E Loss (ft)	0.02	Cum SA (acres)	1.31	5.11	1.36

Plan: preferredalt 71 St. Channel Lower Reach RS: 35311 Profile: PF 1

E.G. Elev (ft)	1366.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1366.37	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)	1366.37	Flow Area (sq ft)		5.47	
E.G. Slope (ft/ft)	0.006816	Area (sq ft)		5.47	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	31.64	Top Width (ft)		31.64	
Vel Total (ft/s)	2.38	Avg. Vel. (ft/s)		2.38	
Max Chl Dpth (ft)	0.37	Hydr. Depth (ft)		0.17	
Conv. Total (cfs)	157.5	Conv. (cfs)		157.5	
Length Wtd. (ft)	59.00	Wetted Per. (ft)		31.65	
Min Ch EI (ft)	1366.00	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.17	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.05	14.71	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	4.13	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35311 Profile: PF 2

E.G. Elev (ft)	1370.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.025	0.016	0.025
W.S. Elev (ft)	1370.24	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)	1367.70	Flow Area (sq ft)	156.92	276.29	156.42
E.G. Slope (ft/ft)	0.000046	Area (sq ft)	156.92	276.29	156.42
Q Total (cfs)	686.00	Flow (cfs)	130.33	426.03	129.65
Top Width (ft)	171.40	Top Width (ft)	50.00	71.40	50.00
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)	0.83	1.54	0.83
Max Chl Dpth (ft)	4.24	Hydr. Depth (ft)	3.14	3.87	3.13
Conv. Total (cfs)	101052.8	Conv. (cfs)	19197.9	62756.6	19098.3
Length Wtd. (ft)	59.00	Wetted Per. (ft)	53.14	72.23	53.13
Min Ch El (ft)	1366.00	Shear (lb/sq ft)	0.01	0.01	0.01
Alpha	1.28	Stream Power (lb/ft s)	0.01	0.02	0.01
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.53	28.20	1.40
C & E Loss (ft)	0.15	Cum SA (acres)	1.19	4.99	1.25

Plan: preferredalt 71 St. Channel Lower Reach RS: 35252 Profile: PF 1

E.G. Elev (ft)	1365.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.018	
W.S. Elev (ft)	1365.40	Reach Len. (ft)	229.00	229.00	229.00
Crit W.S. (ft)	1365.40	Flow Area (sq ft)		4.27	
E.G. Slope (ft/ft)	0.006681	Area (sq ft)		4.27	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	13.94	Top Width (ft)		13.94	
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)		3.05	
Max Chl Dpth (ft)	0.40	Hydr. Depth (ft)		0.31	
Conv. Total (cfs)	159.0	Conv. (cfs)		159.0	
Length Wtd. (ft)	229.00	Wetted Per. (ft)		14.07	
Min Ch El (ft)	1365.00	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.39	
Frctn Loss (ft)	1.22	Cum Volume (acre-ft)	0.05	14.70	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	4.10	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35252 Profile: PF 2

E.G. Elev (ft)	1370.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.52	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1368.59	Reach Len. (ft)	229.00	229.00	229.00
Crit W.S. (ft)	1368.59	Flow Area (sq ft)	1.78	68.46	1.39
E.G. Slope (ft/ft)	0.003378	Area (sq ft)	1.78	68.46	1.39
Q Total (cfs)	686.00	Flow (cfs)	3.27	680.35	2.38
Top Width (ft)	24.20	Top Width (ft)	1.00	22.20	1.00
Vel Total (ft/s)	9.58	Avg. Vel. (ft/s)	1.83	9.94	1.72
Max Chl Dpth (ft)	3.58	Hydr. Depth (ft)	1.78	3.08	1.39
Conv. Total (cfs)	11803.6	Conv. (cfs)	56.3	11706.4	40.9
Length Wtd. (ft)	229.00	Wetted Per. (ft)	2.78	22.96	2.39
Min Ch El (ft)	1365.00	Shear (lb/sq ft)	0.14	0.63	0.12
Alpha	1.07	Stream Power (lb/ft s)	0.25	6.25	0.21
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	1.42	27.96	1.30
C & E Loss (ft)	0.01	Cum SA (acres)	1.16	4.92	1.21

Plan: preferredalt 71 St. Channel Lower Reach RS: 35023 Profile: PF 1

E.G. Elev (ft)	1364.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.018	
W.S. Elev (ft)	1364.20	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1364.15	Flow Area (sq ft)		4.82	
E.G. Slope (ft/ft)	0.004362	Area (sq ft)		4.82	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	13.69	Top Width (ft)		13.69	
Vel Total (ft/s)	2.70	Avg. Vel. (ft/s)		2.70	
Max Chl Dpth (ft)	0.50	Hydr. Depth (ft)		0.35	
Conv. Total (cfs)	196.8	Conv. (cfs)		196.8	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		13.82	
Min Ch EI (ft)	1363.70	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.26	
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	0.05	14.68	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	4.03	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 35023 Profile: PF 2

E.G. Elev (ft)	1369.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.64	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1367.44	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1367.44	Flow Area (sq ft)	2.03	65.74	2.03
E.G. Slope (ft/ft)	0.003320	Area (sq ft)	2.03	65.74	2.03
Q Total (cfs)	686.00	Flow (cfs)	3.81	678.37	3.81
Top Width (ft)	22.00	Top Width (ft)	1.00	20.00	1.00
Vel Total (ft/s)	9.83	Avg. Vel. (ft/s)	1.87	10.32	1.87
Max Chl Dpth (ft)	3.73	Hydr. Depth (ft)	2.03	3.29	2.03
Conv. Total (cfs)	11906.1	Conv. (cfs)	66.2	11773.8	66.2
Length Wtd. (ft)	150.00	Wetted Per. (ft)	3.03	20.57	3.03
Min Ch EI (ft)	1363.70	Shear (lb/sq ft)	0.14	0.66	0.14
Alpha	1.09	Stream Power (lb/ft s)	0.26	6.83	0.26
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	1.41	27.61	1.29
C & E Loss (ft)	0.06	Cum SA (acres)	1.16	4.81	1.21

Plan: preferredalt 71 St. Channel Lower Reach RS: 34873 Profile: PF 1

E.G. Elev (ft)	1363.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.018	
W.S. Elev (ft)	1363.80	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1363.66	Flow Area (sq ft)		6.20	
E.G. Slope (ft/ft)	0.002013	Area (sq ft)		6.20	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	14.38	Top Width (ft)		14.38	
Vel Total (ft/s)	2.10	Avg. Vel. (ft/s)		2.10	
Max Chl Dpth (ft)	0.50	Hydr. Depth (ft)		0.43	
Conv. Total (cfs)	289.7	Conv. (cfs)		289.7	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		14.53	
Min Ch EI (ft)	1363.30	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.11	
Frctn Loss (ft)	0.69	Cum Volume (acre-ft)	0.05	14.66	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	3.98	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34873 Profile: PF 2

E.G. Elev (ft)	1368.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.43	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1367.04	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1366.89	Flow Area (sq ft)	2.24	70.34	2.04
E.G. Slope (ft/ft)	0.002796	Area (sq ft)	2.24	70.34	2.04
Q Total (cfs)	686.00	Flow (cfs)	3.94	678.54	3.52
Top Width (ft)	22.90	Top Width (ft)	1.00	20.90	1.00
Vel Total (ft/s)	9.19	Avg. Vel. (ft/s)	1.76	9.65	1.72
Max Chl Dpth (ft)	3.74	Hydr. Depth (ft)	2.24	3.37	2.04
Conv. Total (cfs)	12973.2	Conv. (cfs)	74.5	12832.2	66.5
Length Wtd. (ft)	200.00	Wetted Per. (ft)	3.24	21.41	3.04
Min Ch EI (ft)	1363.30	Shear (lb/sq ft)	0.12	0.57	0.12
Alpha	1.09	Stream Power (lb/ft s)	0.21	5.53	0.20
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	1.40	27.38	1.28
C & E Loss (ft)	0.02	Cum SA (acres)	1.15	4.74	1.20

Plan: preferredalt 71 St. Channel Lower Reach RS: 34673 Profile: PF 1

E.G. Elev (ft)	1363.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.018	
W.S. Elev (ft)	1363.02	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1363.02	Flow Area (sq ft)		4.19	
E.G. Slope (ft/ft)	0.007099	Area (sq ft)		4.19	
Q Total (cfs)	13.00	Flow (cfs)		13.00	
Top Width (ft)	13.92	Top Width (ft)		13.92	
Vel Total (ft/s)	3.10	Avg. Vel. (ft/s)		3.10	
Max Chl Dpth (ft)	0.32	Hydr. Depth (ft)		0.30	
Conv. Total (cfs)	154.3	Conv. (cfs)		154.3	
Length Wtd. (ft)	295.00	Wetted Per. (ft)		14.05	
Min Ch EI (ft)	1362.70	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.41	
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	0.05	14.63	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	3.92	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34673 Profile: PF 2

E.G. Elev (ft)	1367.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.59	Wt. n-Val.	0.035	0.018	0.035
W.S. Elev (ft)	1366.26	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1366.26	Flow Area (sq ft)	1.65	66.90	1.85
E.G. Slope (ft/ft)	0.003379	Area (sq ft)	1.65	66.90	1.85
Q Total (cfs)	686.00	Flow (cfs)	2.98	679.59	3.43
Top Width (ft)	23.00	Top Width (ft)	1.00	21.00	1.00
Vel Total (ft/s)	9.74	Avg. Vel. (ft/s)	1.80	10.16	1.85
Max Chl Dpth (ft)	3.55	Hydr. Depth (ft)	1.65	3.19	1.85
Conv. Total (cfs)	11801.2	Conv. (cfs)	51.3	11690.9	59.1
Length Wtd. (ft)	295.00	Wetted Per. (ft)	2.65	21.72	2.85
Min Ch EI (ft)	1362.70	Shear (lb/sq ft)	0.13	0.65	0.14
Alpha	1.08	Stream Power (lb/ft s)	0.24	6.60	0.25
Frctn Loss (ft)	0.27	Cum Volume (acre-ft)	1.39	27.06	1.27
C & E Loss (ft)	0.42	Cum SA (acres)	1.15	4.65	1.20

Plan: preferredalt 71 St. Channel Lower Reach RS: 34378 Profile: PF 1

E.G. Elev (ft)	1359.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.		0.030	
W.S. Elev (ft)	1359.77	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)		Flow Area (sq ft)		181.88	
E.G. Slope (ft/ft)	0.001084	Area (sq ft)		181.88	
Q Total (cfs)	659.00	Flow (cfs)		659.00	
Top Width (ft)	53.46	Top Width (ft)		53.46	
Vel Total (ft/s)	3.62	Avg. Vel. (ft/s)		3.62	
Max Chl Dpth (ft)	5.27	Hydr. Depth (ft)		3.40	
Conv. Total (cfs)	20019.1	Conv. (cfs)		20019.1	
Length Wtd. (ft)	40.00	Wetted Per. (ft)		54.90	
Min Ch El (ft)	1354.50	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.81	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.05	14.00	0.01
C & E Loss (ft)	0.03	Cum SA (acres)	0.05	3.69	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34378 Profile: PF 2

E.G. Elev (ft)	1363.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.		0.030	0.035
W.S. Elev (ft)	1362.87	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)		Flow Area (sq ft)		374.79	49.17
E.G. Slope (ft/ft)	0.000598	Area (sq ft)		374.79	49.17
Q Total (cfs)	1461.00	Flow (cfs)		1384.82	76.18
Top Width (ft)	93.30	Top Width (ft)		68.30	25.00
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.69	1.55
Max Chl Dpth (ft)	8.37	Hydr. Depth (ft)		5.49	1.97
Conv. Total (cfs)	59747.4	Conv. (cfs)		56632.1	3115.3
Length Wtd. (ft)	40.00	Wetted Per. (ft)		70.34	26.97
Min Ch El (ft)	1354.50	Shear (lb/sq ft)		0.20	0.07
Alpha	1.10	Stream Power (lb/ft s)		0.73	0.11
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.39	25.56	1.10
C & E Loss (ft)	0.02	Cum SA (acres)	1.14	4.34	1.11

Plan: preferredalt 71 St. Channel Lower Reach RS: 34338 Profile: PF 1

E.G. Elev (ft)	1359.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.		0.030	
W.S. Elev (ft)	1359.34	Reach Len. (ft)	31.00	31.00	31.00
Crit W.S. (ft)	1357.30	Flow Area (sq ft)		111.28	
E.G. Slope (ft/ft)	0.001646	Area (sq ft)		290.51	
Q Total (cfs)	659.00	Flow (cfs)		659.00	
Top Width (ft)	58.86	Top Width (ft)		58.86	
Vel Total (ft/s)	5.92	Avg. Vel. (ft/s)		5.92	
Max Chl Dpth (ft)	5.06	Hydr. Depth (ft)		5.06	
Conv. Total (cfs)	16242.2	Conv. (cfs)		16242.2	
Length Wtd. (ft)	31.00	Wetted Per. (ft)		22.00	
Min Ch El (ft)	1354.28	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		3.08	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	13.79	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	3.64	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34338 Profile: PF 2

E.G. Elev (ft)	1363.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (ft)	1362.91	Reach Len. (ft)	31.00	31.00	31.00
Crit W.S. (ft)	1359.42	Flow Area (sq ft)	1.56	503.37	38.88
E.G. Slope (ft/ft)	0.000239	Area (sq ft)	1.56	503.37	38.88
Q Total (cfs)	1461.00	Flow (cfs)	0.73	1427.35	32.92
Top Width (ft)	86.00	Top Width (ft)	1.00	60.00	25.00
Vel Total (ft/s)	2.69	Avg. Vel. (ft/s)	0.47	2.84	0.85
Max Chl Dpth (ft)	8.63	Hydr. Depth (ft)	1.56	8.39	1.56
Conv. Total (cfs)	94452.1	Conv. (cfs)	47.4	92276.5	2128.3
Length Wtd. (ft)	31.00	Wetted Per. (ft)	2.56	70.69	26.56
Min Ch El (ft)	1354.28	Shear (lb/sq ft)	0.01	0.11	0.02
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.30	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	1.39	25.16	1.06
C & E Loss (ft)		Cum SA (acres)	1.14	4.29	1.09

Plan: preferredalt 71 St. Channel Lower Reach RS: 34307 Profile: PF 1

E.G. Elev (ft)	1359.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.030	
W.S. Elev (ft)	1358.61	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1356.82	Flow Area (sq ft)		105.88	
E.G. Slope (ft/ft)	0.001943	Area (sq ft)		275.90	
Q Total (cfs)	659.00	Flow (cfs)		659.00	
Top Width (ft)	58.66	Top Width (ft)		58.66	
Vel Total (ft/s)	6.22	Avg. Vel. (ft/s)		6.22	
Max Chl Dpth (ft)	4.81	Hydr. Depth (ft)		4.81	
Conv. Total (cfs)	14948.6	Conv. (cfs)		14948.6	
Length Wtd. (ft)	62.00	Wetted Per. (ft)		22.00	
Min Ch El (ft)	1353.80	Shear (lb/sq ft)		0.58	
Alpha	1.00	Stream Power (lb/ft s)		3.63	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.05	13.59	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	3.60	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34307 Profile: PF 2

E.G. Elev (ft)	1361.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.035	0.030	0.020
W.S. Elev (ft)	1361.40	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1358.94	Flow Area (sq ft)	0.35	441.25	8.65
E.G. Slope (ft/ft)	0.000388	Area (sq ft)	0.35	441.25	8.65
Q Total (cfs)	1461.00	Flow (cfs)	0.12	1454.71	6.18
Top Width (ft)	86.00	Top Width (ft)	1.00	60.00	25.00
Vel Total (ft/s)	3.24	Avg. Vel. (ft/s)	0.34	3.30	0.71
Max Chl Dpth (ft)	7.60	Hydr. Depth (ft)	0.35	7.35	0.35
Conv. Total (cfs)	74167.6	Conv. (cfs)	5.9	73848.1	313.6
Length Wtd. (ft)	62.00	Wetted Per. (ft)	1.35	71.04	25.35
Min Ch El (ft)	1353.80	Shear (lb/sq ft)	0.01	0.15	0.01
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.50	0.01
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	1.39	24.83	1.04
C & E Loss (ft)	0.18	Cum SA (acres)	1.14	4.24	1.07

Plan: preferredalt 71 St. Channel Lower Reach RS: 34245 Profile: PF 1

E.G. Elev (ft)	1359.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.030	
W.S. Elev (ft)	1358.44	Reach Len. (ft)	413.00	413.00	413.00
Crit W.S. (ft)		Flow Area (sq ft)		114.15	
E.G. Slope (ft/ft)	0.004123	Area (sq ft)		114.15	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	40.06	Top Width (ft)		40.06	
Vel Total (ft/s)	6.24	Avg. Vel. (ft/s)		6.24	
Max Chl Dpth (ft)	4.94	Hydr. Depth (ft)		2.85	
Conv. Total (cfs)	11088.5	Conv. (cfs)		11088.5	
Length Wtd. (ft)	413.00	Wetted Per. (ft)		41.56	
Min Ch EI (ft)	1353.50	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		4.41	
Frctn Loss (ft)	1.61	Cum Volume (acre-ft)	0.05	13.31	0.01
C & E Loss (ft)	0.08	Cum SA (acres)	0.05	3.53	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 34245 Profile: PF 2

E.G. Elev (ft)	1361.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.035	0.030	0.020
W.S. Elev (ft)	1360.55	Reach Len. (ft)	413.00	413.00	413.00
Crit W.S. (ft)	1359.32	Flow Area (sq ft)	0.05	213.90	13.66
E.G. Slope (ft/ft)	0.003398	Area (sq ft)	0.05	213.90	13.66
Q Total (cfs)	1568.00	Flow (cfs)	0.01	1529.00	38.99
Top Width (ft)	78.90	Top Width (ft)	1.00	52.90	25.00
Vel Total (ft/s)	6.89	Avg. Vel. (ft/s)	0.31	7.15	2.85
Max Chl Dpth (ft)	7.05	Hydr. Depth (ft)	0.05	4.04	0.55
Conv. Total (cfs)	26899.4	Conv. (cfs)	0.2	26230.4	668.8
Length Wtd. (ft)	413.00	Wetted Per. (ft)	1.05	54.91	25.55
Min Ch EI (ft)	1353.50	Shear (lb/sq ft)	0.01	0.83	0.11
Alpha	1.05	Stream Power (lb/ft s)	0.00	5.91	0.32
Frctn Loss (ft)	1.24	Cum Volume (acre-ft)	1.39	24.36	1.03
C & E Loss (ft)	0.10	Cum SA (acres)	1.14	4.16	1.03

Plan: preferredalt 71 St. Channel Lower Reach RS: 33832 Profile: PF 1

E.G. Elev (ft)	1357.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.45	Wt. n-Val.		0.018	
W.S. Elev (ft)	1355.89	Reach Len. (ft)	386.00	386.00	386.00
Crit W.S. (ft)	1355.89	Flow Area (sq ft)		73.77	
E.G. Slope (ft/ft)	0.003694	Area (sq ft)		73.77	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	25.58	Top Width (ft)		25.58	
Vel Total (ft/s)	9.65	Avg. Vel. (ft/s)		9.65	
Max Chl Dpth (ft)	4.39	Hydr. Depth (ft)		2.88	
Conv. Total (cfs)	11715.0	Conv. (cfs)		11715.0	
Length Wtd. (ft)	386.00	Wetted Per. (ft)		27.65	
Min Ch EI (ft)	1351.50	Shear (lb/sq ft)		0.62	
Alpha	1.00	Stream Power (lb/ft s)		5.94	
Frctn Loss (ft)	1.42	Cum Volume (acre-ft)	0.05	12.42	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.05	3.21	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 33832 Profile: PF 2

E.G. Elev (ft)	1359.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.81	Wt. n-Val.	0.025	0.018	0.025
W.S. Elev (ft)	1358.17	Reach Len. (ft)	386.00	386.00	386.00
Crit W.S. (ft)	1358.17	Flow Area (sq ft)	6.72	141.50	5.38
E.G. Slope (ft/ft)	0.002684	Area (sq ft)	6.72	141.50	5.38
Q Total (cfs)	1568.00	Flow (cfs)	15.20	1540.77	12.03
Top Width (ft)	50.00	Top Width (ft)	10.00	32.00	8.00
Vel Total (ft/s)	10.21	Avg. Vel. (ft/s)	2.26	10.89	2.24
Max Chl Dpth (ft)	6.67	Hydr. Depth (ft)	0.67	4.42	0.67
Conv. Total (cfs)	30264.5	Conv. (cfs)	293.3	29738.9	232.2
Length Wtd. (ft)	386.00	Wetted Per. (ft)	10.67	34.83	8.67
Min Ch EI (ft)	1351.50	Shear (lb/sq ft)	0.11	0.68	0.10
Alpha	1.12	Stream Power (lb/ft s)	0.24	7.41	0.23
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	1.35	22.67	0.94
C & E Loss (ft)	0.22	Cum SA (acres)	1.09	3.76	0.88

Plan: preferredalt 71 St. Channel Lower Reach RS: 33446 Profile: PF 1

E.G. Elev (ft)	1355.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.53	Wt. n-Val.		0.018	
W.S. Elev (ft)	1354.13	Reach Len. (ft)	33.00	33.00	33.00
Crit W.S. (ft)	1354.13	Flow Area (sq ft)		79.86	
E.G. Slope (ft/ft)	0.003688	Area (sq ft)		79.86	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	26.51	Top Width (ft)		26.51	
Vel Total (ft/s)	9.92	Avg. Vel. (ft/s)		9.92	
Max Chl Dpth (ft)	4.63	Hydr. Depth (ft)		3.01	
Conv. Total (cfs)	13042.1	Conv. (cfs)		13042.1	
Length Wtd. (ft)	33.00	Wetted Per. (ft)		28.70	
Min Ch EI (ft)	1349.50	Shear (lb/sq ft)		0.64	
Alpha	1.00	Stream Power (lb/ft s)		6.35	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.05	11.74	0.01
C & E Loss (ft)	0.30	Cum SA (acres)	0.05	2.98	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 33446 Profile: PF 2

E.G. Elev (ft)	1358.69	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.07	Wt. n-Val.	0.025	0.018	0.250
W.S. Elev (ft)	1357.61	Reach Len. (ft)	33.00	33.00	33.00
Crit W.S. (ft)		Flow Area (sq ft)	17.14	190.70	10.97
E.G. Slope (ft/ft)	0.001156	Area (sq ft)	17.14	190.70	10.97
Q Total (cfs)	1655.00	Flow (cfs)	44.62	1607.67	2.71
Top Width (ft)	50.00	Top Width (ft)	10.00	33.60	6.40
Vel Total (ft/s)	7.56	Avg. Vel. (ft/s)	2.60	8.43	0.25
Max Chl Dpth (ft)	8.11	Hydr. Depth (ft)	1.71	5.68	1.71
Conv. Total (cfs)	48686.5	Conv. (cfs)	1312.6	47294.2	79.7
Length Wtd. (ft)	33.00	Wetted Per. (ft)	11.71	36.62	8.11
Min Ch EI (ft)	1349.50	Shear (lb/sq ft)	0.11	0.38	0.10
Alpha	1.21	Stream Power (lb/ft s)	0.27	3.17	0.02
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	1.25	21.20	0.86
C & E Loss (ft)	0.18	Cum SA (acres)	1.00	3.47	0.81

Plan: preferredalt 71 St. Channel Lower Reach RS: 33413 Profile: PF 1

E.G. Elev (ft)	1354.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.		0.030	
W.S. Elev (ft)	1354.14	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	1352.52	Flow Area (sq ft)		134.47	
E.G. Slope (ft/ft)	0.001999	Area (sq ft)		144.54	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	35.64	Top Width (ft)		35.64	
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)		5.89	
Max Chl Dpth (ft)	4.34	Hydr. Depth (ft)		4.34	
Conv. Total (cfs)	17716.0	Conv. (cfs)		17716.0	
Length Wtd. (ft)	61.00	Wetted Per. (ft)		31.00	
Min Ch El (ft)	1349.80	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		3.19	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	11.65	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	2.96	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 33413 Profile: PF 2

E.G. Elev (ft)	1358.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.030	0.100
W.S. Elev (ft)	1358.00	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	1354.24	Flow Area (sq ft)	7.20	287.24	45.97
E.G. Slope (ft/ft)	0.001080	Area (sq ft)	7.20	287.24	45.97
Q Total (cfs)	1655.00	Flow (cfs)	12.16	1606.48	36.36
Top Width (ft)	60.30	Top Width (ft)	3.00	37.30	20.00
Vel Total (ft/s)	4.86	Avg. Vel. (ft/s)	1.69	5.59	0.79
Max Chl Dpth (ft)	8.20	Hydr. Depth (ft)	2.40	7.70	2.30
Conv. Total (cfs)	50363.7	Conv. (cfs)	370.0	48887.3	1106.4
Length Wtd. (ft)	61.00	Wetted Per. (ft)	5.40	45.09	22.30
Min Ch El (ft)	1349.80	Shear (lb/sq ft)	0.09	0.43	0.14
Alpha	1.29	Stream Power (lb/ft s)	0.15	2.40	0.11
Frctn Loss (ft)		Cum Volume (acre-ft)	1.24	21.02	0.84
C & E Loss (ft)		Cum SA (acres)	1.00	3.44	0.80

Plan: preferredalt 71 St. Channel Lower Reach RS: 33352 Profile: PF 1

E.G. Elev (ft)	1353.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.37	Wt. n-Val.		0.030	
W.S. Elev (ft)	1352.02	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)	1352.02	Flow Area (sq ft)		84.23	
E.G. Slope (ft/ft)	0.009506	Area (sq ft)		88.18	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	33.91	Top Width (ft)		33.91	
Vel Total (ft/s)	9.40	Avg. Vel. (ft/s)		9.40	
Max Chl Dpth (ft)	2.72	Hydr. Depth (ft)		2.72	
Conv. Total (cfs)	8123.2	Conv. (cfs)		8123.2	
Length Wtd. (ft)		Wetted Per. (ft)		31.00	
Min Ch El (ft)	1349.30	Shear (lb/sq ft)		1.61	
Alpha	1.00	Stream Power (lb/ft s)		15.16	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	11.49	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	2.91	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 33352 Profile: PF 2

E.G. Elev (ft)	1357.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.59	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	1356.65	Reach Len. (ft)	62.00	62.00	62.00
Crit W.S. (ft)		Flow Area (sq ft)	38.75	255.59	36.25
E.G. Slope (ft/ft)	0.001579	Area (sq ft)	38.75	255.59	36.25
Q Total (cfs)	1655.00	Flow (cfs)	29.44	1599.15	26.41
Top Width (ft)	87.30	Top Width (ft)	25.00	37.30	25.00
Vel Total (ft/s)	5.01	Avg. Vel. (ft/s)	0.76	6.26	0.73
Max Chl Dpth (ft)	7.35	Hydr. Depth (ft)	1.55	6.85	1.45
Conv. Total (cfs)	41650.2	Conv. (cfs)	740.9	40244.7	664.7
Length Wtd. (ft)		Wetted Per. (ft)	26.55	45.09	26.45
Min Ch EI (ft)	1349.30	Shear (lb/sq ft)	0.14	0.56	0.14
Alpha	1.51	Stream Power (lb/ft s)	0.11	3.50	0.10
Frctn Loss (ft)		Cum Volume (acre-ft)	1.21	20.64	0.78
C & E Loss (ft)		Cum SA (acres)	0.98	3.39	0.77

Plan: preferredalt 71 St. Channel Lower Reach RS: 33290 Profile: PF 1

E.G. Elev (ft)	1354.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.39	Wt. n-Val.		0.030	
W.S. Elev (ft)	1353.02	Reach Len. (ft)	391.00	391.00	391.00
Crit W.S. (ft)	1353.02	Flow Area (sq ft)		83.77	
E.G. Slope (ft/ft)	0.010156	Area (sq ft)		83.77	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	30.50	Top Width (ft)		30.50	
Vel Total (ft/s)	9.45	Avg. Vel. (ft/s)		9.45	
Max Chl Dpth (ft)	3.91	Hydr. Depth (ft)		2.75	
Conv. Total (cfs)	7859.0	Conv. (cfs)		7859.0	
Length Wtd. (ft)		Wetted Per. (ft)		32.14	
Min Ch EI (ft)	1349.10	Shear (lb/sq ft)		1.65	
Alpha	1.00	Stream Power (lb/ft s)		15.62	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	11.37	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	2.87	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 33290 Profile: PF 2

E.G. Elev (ft)	1357.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.100	0.030	0.100
W.S. Elev (ft)	1356.34	Reach Len. (ft)	391.00	391.00	391.00
Crit W.S. (ft)		Flow Area (sq ft)	20.80	206.72	28.80
E.G. Slope (ft/ft)	0.003000	Area (sq ft)	20.80	206.72	28.80
Q Total (cfs)	1655.00	Flow (cfs)	16.80	1609.67	28.54
Top Width (ft)	80.00	Top Width (ft)	20.00	40.00	20.00
Vel Total (ft/s)	6.46	Avg. Vel. (ft/s)	0.81	7.79	0.99
Max Chl Dpth (ft)	7.24	Hydr. Depth (ft)	1.04	5.17	1.44
Conv. Total (cfs)	30214.5	Conv. (cfs)	306.7	29386.9	521.0
Length Wtd. (ft)		Wetted Per. (ft)	21.04	42.52	21.44
Min Ch EI (ft)	1349.10	Shear (lb/sq ft)	0.19	0.91	0.25
Alpha	1.42	Stream Power (lb/ft s)	0.15	7.09	0.25
Frctn Loss (ft)		Cum Volume (acre-ft)	1.16	20.31	0.74
C & E Loss (ft)		Cum SA (acres)	0.94	3.34	0.74

Plan: preferredalt 71 St. Channel Lower Reach RS: 32899 Profile: PF 1

E.G. Elev (ft)	1351.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.32	Wt. n-Val.		0.018	
W.S. Elev (ft)	1350.34	Reach Len. (ft)	357.00	357.00	357.00
Crit W.S. (ft)		Flow Area (sq ft)		85.93	
E.G. Slope (ft/ft)	0.001583	Area (sq ft)		89.30	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	11.51	Top Width (ft)		11.51	
Vel Total (ft/s)	9.22	Avg. Vel. (ft/s)		9.22	
Max Chl Dpth (ft)	8.34	Hydr. Depth (ft)		8.03	
Conv. Total (cfs)	19907.0	Conv. (cfs)		19907.0	
Length Wtd. (ft)	357.00	Wetted Per. (ft)		18.28	
Min Ch EI (ft)	1342.00	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		4.28	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	10.59	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	2.68	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 32899 Profile: PF 2

E.G. Elev (ft)	1356.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.20	Wt. n-Val.	0.100	0.018	0.100
W.S. Elev (ft)	1354.51	Reach Len. (ft)	357.00	357.00	357.00
Crit W.S. (ft)		Flow Area (sq ft)	2.20	138.99	2.20
E.G. Slope (ft/ft)	0.003282	Area (sq ft)	2.20	138.99	2.20
Q Total (cfs)	1655.00	Flow (cfs)	0.43	1654.14	0.43
Top Width (ft)	52.30	Top Width (ft)	20.00	12.30	20.00
Vel Total (ft/s)	11.54	Avg. Vel. (ft/s)	0.19	11.90	0.19
Max Chl Dpth (ft)	12.51	Hydr. Depth (ft)	0.11	11.30	0.11
Conv. Total (cfs)	28890.2	Conv. (cfs)	7.5	28875.3	7.5
Length Wtd. (ft)	357.00	Wetted Per. (ft)	20.11	34.82	20.11
Min Ch EI (ft)	1342.00	Shear (lb/sq ft)	0.02	0.82	0.02
Alpha	1.06	Stream Power (lb/ft s)	0.00	9.73	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	1.06	18.76	0.60
C & E Loss (ft)		Cum SA (acres)	0.76	3.10	0.56

Plan: preferredalt 71 St. Channel Lower Reach RS: 32542 Profile: PF 1

E.G. Elev (ft)	1348.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.018	
W.S. Elev (ft)	1347.12	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1345.92	Flow Area (sq ft)		77.56	
E.G. Slope (ft/ft)	0.001369	Area (sq ft)		120.42	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	25.26	Top Width (ft)		25.26	
Vel Total (ft/s)	10.60	Avg. Vel. (ft/s)		10.60	
Max Chl Dpth (ft)	6.46	Hydr. Depth (ft)		6.46	
Conv. Total (cfs)	22214.8	Conv. (cfs)		22214.8	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		12.00	
Min Ch EI (ft)	1340.66	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		5.86	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.05	9.73	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.05	2.53	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 32542 Profile: PF 2

E.G. Elev (ft)	1351.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.018	0.018	0.100
W.S. Elev (ft)	1351.26	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1349.22	Flow Area (sq ft)	37.25	240.14	21.25
E.G. Slope (ft/ft)	0.000562	Area (sq ft)	37.25	240.14	21.25
Q Total (cfs)	1713.00	Flow (cfs)	103.98	1601.49	7.53
Top Width (ft)	70.70	Top Width (ft)	20.00	30.70	20.00
Vel Total (ft/s)	5.74	Avg. Vel. (ft/s)	2.79	6.67	0.35
Max Chl Dpth (ft)	10.60	Hydr. Depth (ft)	1.86	7.82	1.06
Conv. Total (cfs)	72264.6	Conv. (cfs)	4386.4	67560.6	317.6
Length Wtd. (ft)	150.00	Wetted Per. (ft)	21.86	38.17	21.06
Min Ch El (ft)	1340.66	Shear (lb/sq ft)	0.06	0.22	0.04
Alpha	1.28	Stream Power (lb/ft s)	0.17	1.47	0.01
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.90	17.21	0.50
C & E Loss (ft)	0.35	Cum SA (acres)	0.60	2.92	0.40

Plan: preferredalt 71 St. Channel Lower Reach RS: 32392 Profile: PF 1

E.G. Elev (ft)	1348.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.018	
W.S. Elev (ft)	1346.81	Reach Len. (ft)	368.00	368.00	368.00
Crit W.S. (ft)	1346.81	Flow Area (sq ft)		77.76	
E.G. Slope (ft/ft)	0.003858	Area (sq ft)		77.76	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	22.53	Top Width (ft)		22.53	
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)		10.57	
Max Chl Dpth (ft)	6.61	Hydr. Depth (ft)		3.45	
Conv. Total (cfs)	13233.3	Conv. (cfs)		13233.3	
Length Wtd. (ft)	368.00	Wetted Per. (ft)		26.27	
Min Ch El (ft)	1340.20	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		7.54	
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	0.05	9.39	0.01
C & E Loss (ft)	0.39	Cum SA (acres)	0.05	2.44	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 32392 Profile: PF 2

E.G. Elev (ft)	1351.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.83	Wt. n-Val.	0.018	0.018	
W.S. Elev (ft)	1349.57	Reach Len. (ft)	368.00	368.00	368.00
Crit W.S. (ft)	1349.57	Flow Area (sq ft)	13.44	152.00	
E.G. Slope (ft/ft)	0.002549	Area (sq ft)	13.44	152.00	
Q Total (cfs)	1713.00	Flow (cfs)	42.04	1670.96	
Top Width (ft)	50.35	Top Width (ft)	20.00	30.35	
Vel Total (ft/s)	10.35	Avg. Vel. (ft/s)	3.13	10.99	
Max Chl Dpth (ft)	9.37	Hydr. Depth (ft)	0.67	5.01	
Conv. Total (cfs)	33926.0	Conv. (cfs)	832.7	33093.4	
Length Wtd. (ft)	368.00	Wetted Per. (ft)	20.67	35.49	
Min Ch El (ft)	1340.20	Shear (lb/sq ft)	0.10	0.68	
Alpha	1.10	Stream Power (lb/ft s)	0.32	7.49	
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	0.81	16.53	0.47
C & E Loss (ft)	0.26	Cum SA (acres)	0.53	2.82	0.36

Plan: preferredalt 71 St. Channel Lower Reach RS: 32024 Profile: PF 1

E.G. Elev (ft)	1345.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.018	
W.S. Elev (ft)	1344.76	Reach Len. (ft)	72.00	72.00	72.00
Crit W.S. (ft)	1340.45	Flow Area (sq ft)		154.53	
E.G. Slope (ft/ft)	0.000562	Area (sq ft)		154.53	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	19.31	Top Width (ft)		19.31	
Vel Total (ft/s)	5.32	Avg. Vel. (ft/s)		5.32	
Max Chl Dpth (ft)	8.38	Hydr. Depth (ft)		8.00	
Conv. Total (cfs)	34676.4	Conv. (cfs)		34676.4	
Length Wtd. (ft)	72.00	Wetted Per. (ft)		34.48	
Min Ch EI (ft)	1336.38	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.84	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.05	8.41	0.01
C & E Loss (ft)		Cum SA (acres)	0.05	2.27	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 32024 Profile: PF 2

E.G. Elev (ft)	1347.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.96	Wt. n-Val.	0.018	0.018	0.100
W.S. Elev (ft)	1346.81	Reach Len. (ft)	72.00	72.00	72.00
Crit W.S. (ft)	1343.01	Flow Area (sq ft)	32.28	194.43	32.28
E.G. Slope (ft/ft)	0.001003	Area (sq ft)	32.28	194.43	32.28
Q Total (cfs)	1713.00	Flow (cfs)	110.24	1582.92	19.84
Top Width (ft)	59.40	Top Width (ft)	20.00	19.40	20.00
Vel Total (ft/s)	6.61	Avg. Vel. (ft/s)	3.42	8.14	0.61
Max Chl Dpth (ft)	10.43	Hydr. Depth (ft)	1.61	10.02	1.61
Conv. Total (cfs)	54095.0	Conv. (cfs)	3481.3	49987.0	626.6
Length Wtd. (ft)	72.00	Wetted Per. (ft)	21.61	35.38	21.61
Min Ch EI (ft)	1336.38	Shear (lb/sq ft)	0.09	0.34	0.09
Alpha	1.42	Stream Power (lb/ft s)	0.32	2.80	0.06
Frctn Loss (ft)		Cum Volume (acre-ft)	0.62	15.07	0.33
C & E Loss (ft)		Cum SA (acres)	0.36	2.61	0.28

Plan: preferredalt 71 St. Channel Lower Reach RS: 31952 Profile: PF 1

E.G. Elev (ft)	1344.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.		0.018	
W.S. Elev (ft)	1343.50	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1340.17	Flow Area (sq ft)		141.13	
E.G. Slope (ft/ft)	0.000367	Area (sq ft)		147.91	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	21.89	Top Width (ft)		21.89	
Vel Total (ft/s)	5.82	Avg. Vel. (ft/s)		5.82	
Max Chl Dpth (ft)	7.07	Hydr. Depth (ft)		7.07	
Conv. Total (cfs)	42906.2	Conv. (cfs)		42906.2	
Length Wtd. (ft)	295.00	Wetted Per. (ft)		19.97	
Min Ch EI (ft)	1336.43	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.94	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.05	8.16	0.01
C & E Loss (ft)	0.27	Cum SA (acres)	0.05	2.23	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 31952 Profile: PF 2

E.G. Elev (ft)	1346.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1345.78	Reach Len. (ft)	295.00	295.00	295.00
Crit W.S. (ft)	1342.53	Flow Area (sq ft)	3.43	198.56	0.50
E.G. Slope (ft/ft)	0.001189	Area (sq ft)	3.43	198.56	0.50
Q Total (cfs)	1713.00	Flow (cfs)	4.17	1708.42	0.41
Top Width (ft)	28.44	Top Width (ft)	5.00	22.37	1.07
Vel Total (ft/s)	8.46	Avg. Vel. (ft/s)	1.22	8.60	0.82
Max Chl Dpth (ft)	9.35	Hydr. Depth (ft)	0.69	8.88	0.47
Conv. Total (cfs)	49688.4	Conv. (cfs)	121.1	49555.4	11.9
Length Wtd. (ft)	295.00	Wetted Per. (ft)	5.70	37.77	1.49
Min Ch EI (ft)	1336.43	Shear (lb/sq ft)	0.04	0.39	0.02
Alpha	1.03	Stream Power (lb/ft s)	0.05	3.36	0.02
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)	0.59	14.74	0.30
C & E Loss (ft)	0.30	Cum SA (acres)	0.34	2.57	0.26

Plan: preferredalt 71 St. Channel Lower Reach RS: 31657 Profile: PF 1

E.G. Elev (ft)	1343.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.44	Wt. n-Val.	0.018	0.018	
W.S. Elev (ft)	1342.06	Reach Len. (ft)	365.00	365.00	365.00
Crit W.S. (ft)	1342.06	Flow Area (sq ft)	5.57	81.70	
E.G. Slope (ft/ft)	0.003290	Area (sq ft)	5.57	81.70	
Q Total (cfs)	822.00	Flow (cfs)	24.77	797.23	
Top Width (ft)	30.52	Top Width (ft)	5.00	25.52	
Vel Total (ft/s)	9.42	Avg. Vel. (ft/s)	4.45	9.76	
Max Chl Dpth (ft)	5.56	Hydr. Depth (ft)	1.11	3.20	
Conv. Total (cfs)	14331.5	Conv. (cfs)	431.9	13899.6	
Length Wtd. (ft)	365.00	Wetted Per. (ft)	6.11	27.61	
Min Ch EI (ft)	1336.50	Shear (lb/sq ft)	0.19	0.61	
Alpha	1.05	Stream Power (lb/ft s)	0.83	5.93	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.03	7.38	0.01
C & E Loss (ft)	0.29	Cum SA (acres)	0.04	2.07	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 31657 Profile: PF 2

E.G. Elev (ft)	1346.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.	0.018	0.018	0.018
W.S. Elev (ft)	1343.98	Reach Len. (ft)	365.00	365.00	365.00
Crit W.S. (ft)	1343.98	Flow Area (sq ft)	15.16	133.55	2.89
E.G. Slope (ft/ft)	0.002925	Area (sq ft)	15.16	133.55	2.89
Q Total (cfs)	1713.00	Flow (cfs)	103.42	1601.24	8.34
Top Width (ft)	37.91	Top Width (ft)	5.01	27.90	5.00
Vel Total (ft/s)	11.30	Avg. Vel. (ft/s)	6.82	11.99	2.88
Max Chl Dpth (ft)	7.48	Hydr. Depth (ft)	3.03	4.79	0.58
Conv. Total (cfs)	31674.6	Conv. (cfs)	1912.3	29608.1	154.2
Length Wtd. (ft)	365.00	Wetted Per. (ft)	8.03	30.35	5.58
Min Ch EI (ft)	1336.50	Shear (lb/sq ft)	0.34	0.80	0.09
Alpha	1.07	Stream Power (lb/ft s)	2.35	9.63	0.27
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.53	13.62	0.29
C & E Loss (ft)	0.44	Cum SA (acres)	0.31	2.40	0.24

Plan: preferredalt 71 St. Channel Lower Reach RS: 31292 Profile: PF 1

E.G. Elev (ft)	1341.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.		0.018	
W.S. Elev (ft)	1340.97	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1338.69	Flow Area (sq ft)		146.51	
E.G. Slope (ft/ft)	0.000504	Area (sq ft)		155.59	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	31.22	Top Width (ft)		31.22	
Vel Total (ft/s)	5.61	Avg. Vel. (ft/s)		5.61	
Max Chl Dpth (ft)	5.38	Hydr. Depth (ft)		5.26	
Conv. Total (cfs)	36599.8	Conv. (cfs)		36599.8	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		27.83	
Min Ch El (ft)	1335.58	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.93	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	6.39	0.01
C & E Loss (ft)		Cum SA (acres)	0.01	1.84	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 31292 Profile: PF 2

E.G. Elev (ft)	1344.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.67	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1344.13	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1340.60	Flow Area (sq ft)	9.76	256.44	2.03
E.G. Slope (ft/ft)	0.000572	Area (sq ft)	9.76	256.44	2.03
Q Total (cfs)	1713.00	Flow (cfs)	14.52	1696.59	1.89
Top Width (ft)	38.20	Top Width (ft)	5.10	32.00	1.10
Vel Total (ft/s)	6.39	Avg. Vel. (ft/s)	1.49	6.62	0.93
Max Chl Dpth (ft)	8.55	Hydr. Depth (ft)	1.91	8.01	1.85
Conv. Total (cfs)	71626.2	Conv. (cfs)	607.2	70940.0	78.9
Length Wtd. (ft)	100.00	Wetted Per. (ft)	6.93	41.80	2.93
Min Ch El (ft)	1335.58	Shear (lb/sq ft)	0.05	0.22	0.02
Alpha	1.06	Stream Power (lb/ft s)	0.07	1.45	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	0.42	11.99	0.27
C & E Loss (ft)		Cum SA (acres)	0.27	2.15	0.21

Plan: preferredalt 71 St. Channel Lower Reach RS: 31192 Profile: PF 1

E.G. Elev (ft)	1340.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.		0.035	
W.S. Elev (ft)	1339.70	Reach Len. (ft)	126.00	126.00	126.00
Crit W.S. (ft)	1337.88	Flow Area (sq ft)		134.47	
E.G. Slope (ft/ft)	0.002559	Area (sq ft)		181.58	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	47.62	Top Width (ft)		47.62	
Vel Total (ft/s)	6.11	Avg. Vel. (ft/s)		6.11	
Max Chl Dpth (ft)	4.80	Hydr. Depth (ft)		4.80	
Conv. Total (cfs)	16250.4	Conv. (cfs)		16250.4	
Length Wtd. (ft)	126.00	Wetted Per. (ft)		28.00	
Min Ch El (ft)	1334.90	Shear (lb/sq ft)		0.77	
Alpha	1.00	Stream Power (lb/ft s)		4.69	
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	6.00	0.01
C & E Loss (ft)	0.06	Cum SA (acres)	0.01	1.74	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 31192 Profile: PF 2

E.G. Elev (ft)	1342.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.	0.035	0.035	0.000
W.S. Elev (ft)	1342.02	Reach Len. (ft)	126.00	126.00	126.00
Crit W.S. (ft)	1339.76	Flow Area (sq ft)	0.02	302.44	0.00
E.G. Slope (ft/ft)	0.001985	Area (sq ft)	0.02	302.44	0.00
Q Total (cfs)	1713.00	Flow (cfs)	0.00	1713.00	0.00
Top Width (ft)	55.05	Top Width (ft)	0.04	55.00	0.01
Vel Total (ft/s)	5.66	Avg. Vel. (ft/s)	0.15	5.66	0.06
Max Chl Dpth (ft)	7.12	Hydr. Depth (ft)	0.36	5.50	0.06
Conv. Total (cfs)	38447.0	Conv. (cfs)	0.1	38447.0	0.0
Length Wtd. (ft)	126.00	Wetted Per. (ft)	0.73	58.37	0.13
Min Ch El (ft)	1334.90	Shear (lb/sq ft)	0.00	0.64	
Alpha	1.00	Stream Power (lb/ft s)	0.00	3.64	
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.41	11.34	0.27
C & E Loss (ft)	0.06	Cum SA (acres)	0.26	2.05	0.21

Plan: preferredalt 71 St. Channel Lower Reach RS: 31066 Profile: PF 1

E.G. Elev (ft)	1339.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.79	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.89	Reach Len. (ft)	177.00	177.00	177.00
Crit W.S. (ft)		Flow Area (sq ft)		115.47	
E.G. Slope (ft/ft)	0.008856	Area (sq ft)		115.47	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	47.45	Top Width (ft)		47.45	
Vel Total (ft/s)	7.12	Avg. Vel. (ft/s)		7.12	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)		2.43	
Conv. Total (cfs)	8734.8	Conv. (cfs)		8734.8	
Length Wtd. (ft)	177.00	Wetted Per. (ft)		48.55	
Min Ch El (ft)	1335.00	Shear (lb/sq ft)		1.31	
Alpha	1.00	Stream Power (lb/ft s)		9.36	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)	0.01	5.57	0.01
C & E Loss (ft)	0.17	Cum SA (acres)	0.01	1.61	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 31066 Profile: PF 2

E.G. Elev (ft)	1342.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.70	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	1341.43	Reach Len. (ft)	177.00	177.00	177.00
Crit W.S. (ft)		Flow Area (sq ft)	0.01	255.90	
E.G. Slope (ft/ft)	0.003887	Area (sq ft)	0.01	255.90	
Q Total (cfs)	1713.00	Flow (cfs)	0.00	1713.00	
Top Width (ft)	61.84	Top Width (ft)	0.03	61.82	
Vel Total (ft/s)	6.69	Avg. Vel. (ft/s)	0.14	6.69	
Max Chl Dpth (ft)	6.43	Hydr. Depth (ft)	0.26	4.14	
Conv. Total (cfs)	27475.7	Conv. (cfs)	0.0	27475.7	
Length Wtd. (ft)	177.00	Wetted Per. (ft)	0.53	63.62	
Min Ch El (ft)	1335.00	Shear (lb/sq ft)	0.00	0.98	
Alpha	1.00	Stream Power (lb/ft s)	0.00	6.53	
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.41	10.54	0.27
C & E Loss (ft)	0.16	Cum SA (acres)	0.26	1.88	0.21

Plan: preferredalt 71 St. Channel Lower Reach RS: 30889 Profile: PF 1

E.G. Elev (ft)	1339.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.90	Reach Len. (ft)	45.00	45.00	45.00
Crit W.S. (ft)	1336.43	Flow Area (sq ft)		224.78	
E.G. Slope (ft/ft)	0.001000	Area (sq ft)		293.98	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	80.78	Top Width (ft)		80.78	
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)		3.66	
Max Chl Dpth (ft)	4.50	Hydr. Depth (ft)		4.50	
Conv. Total (cfs)	25994.3	Conv. (cfs)		25994.3	
Length Wtd. (ft)	45.00	Wetted Per. (ft)		50.00	
Min Ch EI (ft)	1334.40	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		1.03	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	4.74	0.01
C & E Loss (ft)		Cum SA (acres)	0.01	1.35	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30889 Profile: PF 2

E.G. Elev (ft)	1341.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.60	Reach Len. (ft)	45.00	45.00	45.00
Crit W.S. (ft)	1337.70	Flow Area (sq ft)	16.00	528.16	17.00
E.G. Slope (ft/ft)	0.000522	Area (sq ft)	16.00	528.16	17.00
Q Total (cfs)	1713.00	Flow (cfs)	19.24	1672.60	21.16
Top Width (ft)	108.00	Top Width (ft)	10.00	88.00	10.00
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)	1.20	3.17	1.24
Max Chl Dpth (ft)	7.20	Hydr. Depth (ft)	1.60	6.00	1.70
Conv. Total (cfs)	74943.1	Conv. (cfs)	841.8	73175.4	925.9
Length Wtd. (ft)	45.00	Wetted Per. (ft)	11.60	89.59	11.70
Min Ch EI (ft)	1334.40	Shear (lb/sq ft)	0.04	0.19	0.05
Alpha	1.05	Stream Power (lb/ft s)	0.05	0.61	0.06
Frctn Loss (ft)		Cum Volume (acre-ft)	0.38	8.94	0.23
C & E Loss (ft)		Cum SA (acres)	0.24	1.58	0.19

Plan: preferredalt 71 St. Channel Lower Reach RS: 30844 Profile: PF 1

E.G. Elev (ft)	1338.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.65	Reach Len. (ft)	345.00	345.00	345.00
Crit W.S. (ft)	1336.10	Flow Area (sq ft)		244.63	
E.G. Slope (ft/ft)	0.000856	Area (sq ft)		362.42	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	107.97	Top Width (ft)		107.97	
Vel Total (ft/s)	3.36	Avg. Vel. (ft/s)		3.36	
Max Chl Dpth (ft)	4.45	Hydr. Depth (ft)		4.45	
Conv. Total (cfs)	28088.2	Conv. (cfs)		28088.2	
Length Wtd. (ft)	345.00	Wetted Per. (ft)		55.00	
Min Ch EI (ft)	1334.20	Shear (lb/sq ft)		0.24	
Alpha	1.00	Stream Power (lb/ft s)		0.80	
Frctn Loss (ft)	0.43	Cum Volume (acre-ft)	0.01	4.40	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	1.25	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30844 Profile: PF 2

E.G. Elev (ft)	1341.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1341.19	Reach Len. (ft)	345.00	345.00	345.00
Crit W.S. (ft)	1337.30	Flow Area (sq ft)	27.80	662.90	29.80
E.G. Slope (ft/ft)	0.000362	Area (sq ft)	27.80	662.90	29.80
Q Total (cfs)	1713.00	Flow (cfs)	26.76	1656.29	29.95
Top Width (ft)	161.00	Top Width (ft)	20.00	121.00	20.00
Vel Total (ft/s)	2.38	Avg. Vel. (ft/s)	0.96	2.50	1.01
Max Chl Dpth (ft)	6.99	Hydr. Depth (ft)	1.39	5.48	1.49
Conv. Total (cfs)	89986.0	Conv. (cfs)	1405.6	87006.9	1573.4
Length Wtd. (ft)	345.00	Wetted Per. (ft)	21.39	121.95	21.49
Min Ch El (ft)	1334.20	Shear (lb/sq ft)	0.03	0.12	0.03
Alpha	1.07	Stream Power (lb/ft s)	0.03	0.31	0.03
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.36	8.33	0.21
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	1.47	0.18

Plan: preferredalt 71 St. Channel Lower Reach RS: 30499 Profile: PF 1

E.G. Elev (ft)	1338.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.		0.035	
W.S. Elev (ft)	1338.12	Reach Len. (ft)	369.00	369.00	369.00
Crit W.S. (ft)		Flow Area (sq ft)		199.13	
E.G. Slope (ft/ft)	0.001973	Area (sq ft)		199.13	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	60.15	Top Width (ft)		60.15	
Vel Total (ft/s)	4.13	Avg. Vel. (ft/s)		4.13	
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)		3.31	
Conv. Total (cfs)	18504.9	Conv. (cfs)		18504.9	
Length Wtd. (ft)	369.00	Wetted Per. (ft)		61.49	
Min Ch El (ft)	1333.40	Shear (lb/sq ft)		0.40	
Alpha	1.00	Stream Power (lb/ft s)		1.65	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	0.01	2.18	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.01	0.58	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30499 Profile: PF 2

E.G. Elev (ft)	1341.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1340.74	Reach Len. (ft)	369.00	369.00	369.00
Crit W.S. (ft)		Flow Area (sq ft)	9.37	378.93	4.37
E.G. Slope (ft/ft)	0.001293	Area (sq ft)	9.37	378.93	4.37
Q Total (cfs)	1713.00	Flow (cfs)	12.90	1696.37	3.73
Top Width (ft)	93.50	Top Width (ft)	10.00	73.50	10.00
Vel Total (ft/s)	4.36	Avg. Vel. (ft/s)	1.38	4.48	0.85
Max Chl Dpth (ft)	7.34	Hydr. Depth (ft)	0.94	5.16	0.44
Conv. Total (cfs)	47645.2	Conv. (cfs)	358.8	47182.6	103.8
Length Wtd. (ft)	369.00	Wetted Per. (ft)	10.94	75.44	10.44
Min Ch El (ft)	1333.40	Shear (lb/sq ft)	0.07	0.41	0.03
Alpha	1.04	Stream Power (lb/ft s)	0.10	1.81	0.03
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	0.21	4.20	0.07
C & E Loss (ft)	0.00	Cum SA (acres)	0.11	0.70	0.06

Plan: preferredalt 71 St. Channel Lower Reach RS: 30130 Profile: PF 1

E.G. Elev (ft)	1337.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.37	Wt. n-Val.		0.035	
W.S. Elev (ft)	1337.11	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)		168.28	
E.G. Slope (ft/ft)	0.003063	Area (sq ft)		168.28	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	54.99	Top Width (ft)		54.99	
Vel Total (ft/s)	4.88	Avg. Vel. (ft/s)		4.88	
Max Chl Dpth (ft)	4.71	Hydr. Depth (ft)		3.06	
Conv. Total (cfs)	14852.9	Conv. (cfs)		14852.9	
Length Wtd. (ft)	47.00	Wetted Per. (ft)		56.14	
Min Ch EI (ft)	1332.40	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)		2.80	
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	0.01	0.62	0.01
C & E Loss (ft)	0.07	Cum SA (acres)	0.01	0.10	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30130 Profile: PF 2

E.G. Elev (ft)	1340.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1340.27	Reach Len. (ft)	47.00	47.00	47.00
Crit W.S. (ft)		Flow Area (sq ft)	22.74	371.18	0.02
E.G. Slope (ft/ft)	0.001191	Area (sq ft)	22.74	371.18	0.02
Q Total (cfs)	1713.00	Flow (cfs)	50.25	1662.74	0.00
Top Width (ft)	77.94	Top Width (ft)	10.00	67.90	0.04
Vel Total (ft/s)	4.35	Avg. Vel. (ft/s)	2.21	4.48	0.10
Max Chl Dpth (ft)	7.87	Hydr. Depth (ft)	2.27	5.47	0.49
Conv. Total (cfs)	49645.9	Conv. (cfs)	1456.5	48189.4	0.1
Length Wtd. (ft)	47.00	Wetted Per. (ft)	12.27	69.41	0.97
Min Ch EI (ft)	1332.40	Shear (lb/sq ft)	0.14	0.40	0.00
Alpha	1.04	Stream Power (lb/ft s)	0.30	1.78	0.00
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.07	1.03	0.06
C & E Loss (ft)	0.09	Cum SA (acres)	0.02	0.10	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30083 Profile: PF 1

E.G. Elev (ft)	1337.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.		0.035	
W.S. Elev (ft)	1336.66	Reach Len. (ft)	83.00	83.00	83.00
Crit W.S. (ft)	1334.69	Flow Area (sq ft)		132.28	
E.G. Slope (ft/ft)	0.003626	Area (sq ft)	5.55	132.28	5.55
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	46.00	Top Width (ft)	10.00	26.00	10.00
Vel Total (ft/s)	6.21	Avg. Vel. (ft/s)		6.21	
Max Chl Dpth (ft)	5.26	Hydr. Depth (ft)		5.09	
Conv. Total (cfs)	13650.9	Conv. (cfs)		13650.9	
Length Wtd. (ft)	83.00	Wetted Per. (ft)		34.90	
Min Ch EI (ft)	1331.40	Shear (lb/sq ft)		0.86	
Alpha	1.00	Stream Power (lb/ft s)		5.33	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	0.46	0.01
C & E Loss (ft)		Cum SA (acres)	0.01	0.05	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30083 Profile: PF 2

E.G. Elev (ft)	1340.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1339.79	Reach Len. (ft)	83.00	83.00	83.00
Crit W.S. (ft)	1336.68	Flow Area (sq ft)	36.90	213.80	36.90
E.G. Slope (ft/ft)	0.002208	Area (sq ft)	36.90	213.80	36.90
Q Total (cfs)	1713.00	Flow (cfs)	142.60	1427.81	142.60
Top Width (ft)	46.00	Top Width (ft)	10.00	26.00	10.00
Vel Total (ft/s)	5.96	Avg. Vel. (ft/s)	3.86	6.68	3.86
Max Chl Dpth (ft)	8.39	Hydr. Depth (ft)	3.69	8.22	3.69
Conv. Total (cfs)	36455.3	Conv. (cfs)	3034.7	30386.0	3034.7
Length Wtd. (ft)	83.00	Wetted Per. (ft)	13.69	34.90	13.69
Min Ch El (ft)	1331.40	Shear (lb/sq ft)	0.37	0.84	0.37
Alpha	1.12	Stream Power (lb/ft s)	1.44	5.64	1.44
Frctn Loss (ft)		Cum Volume (acre-ft)	0.04	0.71	0.04
C & E Loss (ft)		Cum SA (acres)	0.01	0.05	0.01

Plan: preferredalt 71 St. Channel Lower Reach RS: 30000 Profile: PF 1

E.G. Elev (ft)	1335.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.02	Wt. n-Val.		0.035	
W.S. Elev (ft)	1334.72	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		101.25	
E.G. Slope (ft/ft)	0.009153	Area (sq ft)		101.25	
Q Total (cfs)	822.00	Flow (cfs)		822.00	
Top Width (ft)	28.80	Top Width (ft)		28.80	
Vel Total (ft/s)	8.12	Avg. Vel. (ft/s)		8.12	
Max Chl Dpth (ft)	3.52	Hydr. Depth (ft)		3.52	
Conv. Total (cfs)	8592.1	Conv. (cfs)		8592.1	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		35.83	
Min Ch El (ft)	1331.20	Shear (lb/sq ft)		1.61	
Alpha	1.00	Stream Power (lb/ft s)		13.11	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.23	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt 71 St. Channel Lower Reach RS: 30000 Profile: PF 2

E.G. Elev (ft)	1338.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.92	Wt. n-Val.		0.035	
W.S. Elev (ft)	1336.55	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)		154.15	
E.G. Slope (ft/ft)	0.011154	Area (sq ft)		154.15	
Q Total (cfs)	1713.00	Flow (cfs)		1713.00	
Top Width (ft)	28.80	Top Width (ft)		28.80	
Vel Total (ft/s)	11.11	Avg. Vel. (ft/s)		11.11	
Max Chl Dpth (ft)	5.35	Hydr. Depth (ft)		5.35	
Conv. Total (cfs)	16220.0	Conv. (cfs)		16220.0	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		39.50	
Min Ch El (ft)	1331.20	Shear (lb/sq ft)		2.72	
Alpha	1.00	Stream Power (lb/ft s)		30.19	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.00	0.36	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Upper East Reach RS: 18515 Profile: PF 1

E.G. Elev (ft)	1334.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.018	
W.S. Elev (ft)	1334.72	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)	1331.72	Flow Area (sq ft)		198.71	
E.G. Slope (ft/ft)	0.000026	Area (sq ft)		198.71	
Q Total (cfs)	176.00	Flow (cfs)		176.00	
Top Width (ft)	63.97	Top Width (ft)		63.97	
Vel Total (ft/s)	0.89	Avg. Vel. (ft/s)		0.89	
Max Chl Dpth (ft)	3.82	Hydr. Depth (ft)		3.11	
Conv. Total (cfs)	34493.1	Conv. (cfs)		34493.1	
Length Wtd. (ft)	320.00	Wetted Per. (ft)		65.17	
Min Ch EI (ft)	1330.90	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		3.24	
C & E Loss (ft)	0.00	Cum SA (acres)		0.82	

Plan: preferredalt Berneil Ditch Upper East Reach RS: 18515 Profile: PF 2

E.G. Elev (ft)	1336.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.025	0.018	
W.S. Elev (ft)	1336.83	Reach Len. (ft)	320.00	320.00	320.00
Crit W.S. (ft)	1331.84	Flow Area (sq ft)	22.26	344.20	
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	22.26	344.20	
Q Total (cfs)	215.00	Flow (cfs)	3.95	211.05	
Top Width (ft)	89.98	Top Width (ft)	17.20	72.78	
Vel Total (ft/s)	0.59	Avg. Vel. (ft/s)	0.18	0.61	
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)	1.29	4.73	
Conv. Total (cfs)	80341.3	Conv. (cfs)	1477.7	78863.6	
Length Wtd. (ft)	320.00	Wetted Per. (ft)	18.86	74.44	
Min Ch EI (ft)	1330.90	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.32	5.40	
C & E Loss (ft)	0.00	Cum SA (acres)	0.21	0.93	

Plan: preferredalt Berneil Ditch Upper East Reach RS: 18195 Profile: PF 1

E.G. Elev (ft)	1334.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.018	
W.S. Elev (ft)	1334.72	Reach Len. (ft)	235.00	235.00	235.00
Crit W.S. (ft)	1331.39	Flow Area (sq ft)		215.63	
E.G. Slope (ft/ft)	0.000020	Area (sq ft)		215.63	
Q Total (cfs)	176.00	Flow (cfs)		176.00	
Top Width (ft)	63.94	Top Width (ft)		63.94	
Vel Total (ft/s)	0.82	Avg. Vel. (ft/s)		0.82	
Max Chl Dpth (ft)	4.15	Hydr. Depth (ft)		3.37	
Conv. Total (cfs)	39455.6	Conv. (cfs)		39455.6	
Length Wtd. (ft)	235.00	Wetted Per. (ft)		65.34	
Min Ch EI (ft)	1330.57	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.71	
C & E Loss (ft)	0.00	Cum SA (acres)		0.35	

Plan: preferredalt Berneil Ditch Upper East Reach RS: 18195 Profile: PF 2

E.G. Elev (ft)	1336.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.025	0.018	
W.S. Elev (ft)	1336.82	Reach Len. (ft)	235.00	235.00	235.00
Crit W.S. (ft)	1331.51	Flow Area (sq ft)	29.08	359.93	
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	29.08	359.93	
Q Total (cfs)	215.00	Flow (cfs)	5.34	209.66	
Top Width (ft)	89.76	Top Width (ft)	18.00	71.76	
Vel Total (ft/s)	0.55	Avg. Vel. (ft/s)	0.18	0.58	
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)	1.62	5.02	
Conv. Total (cfs)	87755.1	Conv. (cfs)	2180.8	85574.2	
Length Wtd. (ft)	235.00	Wetted Per. (ft)	20.52	73.64	
Min Ch EI (ft)	1330.57	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.13	2.81	
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	0.40	

Plan: preferredalt Berneil Ditch Upper East Reach RS: 17960 Profile: PF 1

E.G. Elev (ft)	1334.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.018	
W.S. Elev (ft)	1334.72	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)		Flow Area (sq ft)		232.02	
E.G. Slope (ft/ft)	0.000016	Area (sq ft)		232.02	
Q Total (cfs)	176.00	Flow (cfs)		176.00	
Top Width (ft)	65.81	Top Width (ft)		65.81	
Vel Total (ft/s)	0.76	Avg. Vel. (ft/s)		0.76	
Max Chl Dpth (ft)	4.39	Hydr. Depth (ft)		3.53	
Conv. Total (cfs)	43729.1	Conv. (cfs)		43729.1	
Length Wtd. (ft)	82.00	Wetted Per. (ft)		67.26	
Min Ch EI (ft)	1330.33	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.51	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Upper East Reach RS: 17960 Profile: PF 2

E.G. Elev (ft)	1336.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.025	0.018	
W.S. Elev (ft)	1336.82	Reach Len. (ft)	82.00	82.00	82.00
Crit W.S. (ft)	1331.27	Flow Area (sq ft)	11.90	383.48	
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	11.90	383.48	
Q Total (cfs)	215.00	Flow (cfs)	1.63	213.37	
Top Width (ft)	87.42	Top Width (ft)	10.50	76.92	
Vel Total (ft/s)	0.54	Avg. Vel. (ft/s)	0.14	0.56	
Max Chl Dpth (ft)	6.49	Hydr. Depth (ft)	1.13	4.99	
Conv. Total (cfs)	91446.0	Conv. (cfs)	691.6	90754.3	
Length Wtd. (ft)	82.00	Wetted Per. (ft)	12.31	79.00	
Min Ch EI (ft)	1330.33	Shear (lb/sq ft)	0.00	0.00	
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.00	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.02	0.81	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17873 Profile: PF 1

E.G. Elev (ft)	1334.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.018	
W.S. Elev (ft)	1334.46	Reach Len. (ft)	168.00	168.00	168.00
Crit W.S. (ft)	1332.11	Flow Area (sq ft)		306.86	
E.G. Slope (ft/ft)	0.000274	Area (sq ft)		306.86	
Q Total (cfs)	1009.00	Flow (cfs)		1009.00	
Top Width (ft)	77.01	Top Width (ft)		77.01	
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.29	
Max Chl Dpth (ft)	4.22	Hydr. Depth (ft)		3.98	
Conv. Total (cfs)	60975.6	Conv. (cfs)		60975.6	
Length Wtd. (ft)	168.00	Wetted Per. (ft)		82.17	
Min Ch El (ft)	1330.24	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.21	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)		8.72	
C & E Loss (ft)	0.02	Cum SA (acres)		2.54	

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17873 Profile: PF 2

E.G. Elev (ft)	1336.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1336.54	Reach Len. (ft)	168.00	168.00	168.00
Crit W.S. (ft)	1333.19	Flow Area (sq ft)	8.03	471.87	
E.G. Slope (ft/ft)	0.000290	Area (sq ft)	8.03	471.87	
Q Total (cfs)	2027.00	Flow (cfs)	4.66	2022.34	
Top Width (ft)	93.89	Top Width (ft)	12.88	81.01	
Vel Total (ft/s)	4.22	Avg. Vel. (ft/s)	0.58	4.29	
Max Chl Dpth (ft)	6.30	Hydr. Depth (ft)	0.62	5.82	
Conv. Total (cfs)	118961.4	Conv. (cfs)	273.3	118688.1	
Length Wtd. (ft)	168.00	Wetted Per. (ft)	14.08	88.72	
Min Ch El (ft)	1330.24	Shear (lb/sq ft)	0.01	0.10	
Alpha	1.03	Stream Power (lb/ft s)	0.01	0.41	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.02	15.38	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.02	3.00	0.09

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17705 Profile: PF 1

E.G. Elev (ft)	1334.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.		0.018	
W.S. Elev (ft)	1334.18	Reach Len. (ft)	477.00	477.00	477.00
Crit W.S. (ft)	1332.61	Flow Area (sq ft)		211.00	
E.G. Slope (ft/ft)	0.000685	Area (sq ft)		211.00	
Q Total (cfs)	1009.00	Flow (cfs)		1009.00	
Top Width (ft)	62.66	Top Width (ft)		62.66	
Vel Total (ft/s)	4.78	Avg. Vel. (ft/s)		4.78	
Max Chl Dpth (ft)	4.11	Hydr. Depth (ft)		3.37	
Conv. Total (cfs)	38540.7	Conv. (cfs)		38540.7	
Length Wtd. (ft)	477.00	Wetted Per. (ft)		64.11	
Min Ch El (ft)	1330.07	Shear (lb/sq ft)		0.14	
Alpha	1.00	Stream Power (lb/ft s)		0.67	
Frctn Loss (ft)	0.47	Cum Volume (acre-ft)		7.72	
C & E Loss (ft)	0.03	Cum SA (acres)		2.27	

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17705 Profile: PF 2

E.G. Elev (ft)	1336.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.018	
W.S. Elev (ft)	1336.21	Reach Len. (ft)	477.00	477.00	477.00
Crit W.S. (ft)	1333.97	Flow Area (sq ft)		349.62	
E.G. Slope (ft/ft)	0.000645	Area (sq ft)		349.62	
Q Total (cfs)	2027.00	Flow (cfs)		2027.00	
Top Width (ft)	73.86	Top Width (ft)		73.86	
Vel Total (ft/s)	5.80	Avg. Vel. (ft/s)		5.80	
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)		4.73	
Conv. Total (cfs)	79821.0	Conv. (cfs)		79821.0	
Length Wtd. (ft)	477.00	Wetted Per. (ft)		76.02	
Min Ch EI (ft)	1330.07	Shear (lb/sq ft)		0.19	
Alpha	1.00	Stream Power (lb/ft s)		1.07	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)		13.80	0.00
C & E Loss (ft)	0.02	Cum SA (acres)		2.71	0.09

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17228 Profile: PF 1

E.G. Elev (ft)	1334.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.		0.018	
W.S. Elev (ft)	1333.43	Reach Len. (ft)	698.00	698.00	698.00
Crit W.S. (ft)	1332.47	Flow Area (sq ft)		160.64	
E.G. Slope (ft/ft)	0.001503	Area (sq ft)		160.64	
Q Total (cfs)	1009.00	Flow (cfs)		1009.00	
Top Width (ft)	56.75	Top Width (ft)		56.75	
Vel Total (ft/s)	6.28	Avg. Vel. (ft/s)		6.28	
Max Chl Dpth (ft)	3.85	Hydr. Depth (ft)		2.83	
Conv. Total (cfs)	26023.9	Conv. (cfs)		26023.9	
Length Wtd. (ft)	698.00	Wetted Per. (ft)		58.43	
Min Ch EI (ft)	1329.58	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		1.62	
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)		5.69	
C & E Loss (ft)	0.06	Cum SA (acres)		1.62	

Plan: preferredalt Berneil Ditch Lower East Reach RS: 17228 Profile: PF 2

E.G. Elev (ft)	1336.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.74	Wt. n-Val.		0.018	
W.S. Elev (ft)	1335.59	Reach Len. (ft)	698.00	698.00	698.00
Crit W.S. (ft)	1334.03	Flow Area (sq ft)		292.97	
E.G. Slope (ft/ft)	0.001017	Area (sq ft)		292.97	
Q Total (cfs)	2027.00	Flow (cfs)		2027.00	
Top Width (ft)	66.11	Top Width (ft)		66.11	
Vel Total (ft/s)	6.92	Avg. Vel. (ft/s)		6.92	
Max Chl Dpth (ft)	6.01	Hydr. Depth (ft)		4.43	
Conv. Total (cfs)	63573.8	Conv. (cfs)		63573.8	
Length Wtd. (ft)	698.00	Wetted Per. (ft)		68.74	
Min Ch EI (ft)	1329.58	Shear (lb/sq ft)		0.27	
Alpha	1.00	Stream Power (lb/ft s)		1.87	
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)		10.28	0.00
C & E Loss (ft)	0.07	Cum SA (acres)		1.94	0.09

Plan: preferredalt Berneil Ditch Lower East Reach RS: 16530 Profile: PF 1

E.G. Elev (ft)	1333.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.		0.018	
W.S. Elev (ft)	1332.83	Reach Len. (ft)	475.00	475.00	475.00
Crit W.S. (ft)	1331.42	Flow Area (sq ft)		198.56	
E.G. Slope (ft/ft)	0.000799	Area (sq ft)		198.56	
Q Total (cfs)	1009.00	Flow (cfs)		1009.00	
Top Width (ft)	60.32	Top Width (ft)		60.32	
Vel Total (ft/s)	5.08	Avg. Vel. (ft/s)		5.08	
Max Chl Dpth (ft)	3.96	Hydr. Depth (ft)		3.29	
Conv. Total (cfs)	35687.4	Conv. (cfs)		35687.4	
Length Wtd. (ft)	475.00	Wetted Per. (ft)		61.81	
Min Ch EI (ft)	1328.87	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.81	
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)		2.81	
C & E Loss (ft)	0.03	Cum SA (acres)		0.68	

Plan: preferredalt Berneil Ditch Lower East Reach RS: 16530 Profile: PF 2

E.G. Elev (ft)	1335.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.50	Wt. n-Val.		0.018	0.025
W.S. Elev (ft)	1335.23	Reach Len. (ft)	475.00	475.00	475.00
Crit W.S. (ft)	1332.80	Flow Area (sq ft)		358.10	0.19
E.G. Slope (ft/ft)	0.000584	Area (sq ft)		358.10	0.19
Q Total (cfs)	2027.00	Flow (cfs)		2026.97	0.03
Top Width (ft)	79.26	Top Width (ft)		72.56	6.70
Vel Total (ft/s)	5.66	Avg. Vel. (ft/s)		5.66	0.13
Max Chl Dpth (ft)	6.36	Hydr. Depth (ft)		4.94	0.03
Conv. Total (cfs)	83863.0	Conv. (cfs)		83861.9	1.1
Length Wtd. (ft)	475.00	Wetted Per. (ft)		74.94	6.73
Min Ch EI (ft)	1328.87	Shear (lb/sq ft)		0.17	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.99	0.00
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)		5.06	0.00
C & E Loss (ft)	0.03	Cum SA (acres)		0.83	0.04

Plan: preferredalt Berneil Ditch Lower East Reach RS: 16055 Profile: PF 1

E.G. Elev (ft)	1332.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.		0.018	
W.S. Elev (ft)	1332.58	Reach Len. (ft)	110.00	110.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		227.86	
E.G. Slope (ft/ft)	0.000557	Area (sq ft)		227.86	
Q Total (cfs)	1009.00	Flow (cfs)		1009.00	
Top Width (ft)	64.99	Top Width (ft)		64.99	
Vel Total (ft/s)	4.43	Avg. Vel. (ft/s)		4.43	
Max Chl Dpth (ft)	4.34	Hydr. Depth (ft)		3.51	
Conv. Total (cfs)	42767.7	Conv. (cfs)		42767.7	
Length Wtd. (ft)	110.00	Wetted Per. (ft)		66.46	
Min Ch EI (ft)	1328.24	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.53	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.49	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Lower East Reach RS: 16055 Profile: PF 2

E.G. Elev (ft)	1335.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.018	
W.S. Elev (ft)	1335.08	Reach Len. (ft)	110.00	110.00	110.00
Crit W.S. (ft)	1332.14	Flow Area (sq ft)		408.61	
E.G. Slope (ft/ft)	0.000422	Area (sq ft)		408.61	
Q Total (cfs)	2027.00	Flow (cfs)		2027.00	
Top Width (ft)	79.41	Top Width (ft)		79.41	
Vel Total (ft/s)	4.96	Avg. Vel. (ft/s)		4.96	
Max Chl Dpth (ft)	6.84	Hydr. Depth (ft)		5.15	
Conv. Total (cfs)	98630.8	Conv. (cfs)		98630.8	
Length Wtd. (ft)	110.00	Wetted Per. (ft)		81.72	
Min Ch EI (ft)	1328.24	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.65	
Frcn Loss (ft)		Cum Volume (acre-ft)		0.88	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22527 Profile: PF 1

E.G. Elev (ft)	1340.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.52	Wt. n-Val.		0.018	
W.S. Elev (ft)	1340.25	Reach Len. (ft)	245.00	245.00	245.00
Crit W.S. (ft)	1340.10	Flow Area (sq ft)		29.09	
E.G. Slope (ft/ft)	0.003328	Area (sq ft)		29.09	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	20.98	Top Width (ft)		20.98	
Vel Total (ft/s)	5.81	Avg. Vel. (ft/s)		5.81	
Max Chl Dpth (ft)	1.95	Hydr. Depth (ft)		1.39	
Conv. Total (cfs)	2929.3	Conv. (cfs)		2929.3	
Length Wtd. (ft)	245.00	Wetted Per. (ft)		21.59	
Min Ch EI (ft)	1338.30	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		1.63	
Frcn Loss (ft)	0.94	Cum Volume (acre-ft)		3.31	
C & E Loss (ft)	0.02	Cum SA (acres)		1.17	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22527 Profile: PF 2

E.G. Elev (ft)	1342.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1341.69	Reach Len. (ft)	245.00	245.00	245.00
Crit W.S. (ft)		Flow Area (sq ft)	4.82	66.83	
E.G. Slope (ft/ft)	0.001693	Area (sq ft)	4.82	66.83	
Q Total (cfs)	359.00	Flow (cfs)	0.98	358.02	
Top Width (ft)	57.75	Top Width (ft)	25.00	32.75	
Vel Total (ft/s)	5.01	Avg. Vel. (ft/s)	0.20	5.36	
Max Chl Dpth (ft)	3.39	Hydr. Depth (ft)	0.19	2.04	
Conv. Total (cfs)	8723.8	Conv. (cfs)	23.8	8700.0	
Length Wtd. (ft)	245.00	Wetted Per. (ft)	25.19	33.75	
Min Ch EI (ft)	1338.30	Shear (lb/sq ft)	0.02	0.21	
Alpha	1.14	Stream Power (lb/ft s)	0.00	1.12	
Frcn Loss (ft)	0.25	Cum Volume (acre-ft)	1.32	8.40	0.11
C & E Loss (ft)	0.05	Cum SA (acres)	1.22	1.62	0.05

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22282 Profile: PF 1

E.G. Elev (ft)	1339.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.		0.018	
W.S. Elev (ft)	1339.10	Reach Len. (ft)	95.00	95.00	95.00
Crit W.S. (ft)	1339.10	Flow Area (sq ft)		24.95	
E.G. Slope (ft/ft)	0.004514	Area (sq ft)		24.95	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	17.69	Top Width (ft)		17.69	
Vel Total (ft/s)	6.77	Avg. Vel. (ft/s)		6.77	
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	2515.5	Conv. (cfs)		2515.5	
Length Wtd. (ft)	95.00	Wetted Per. (ft)		18.49	
Min Ch EI (ft)	1337.30	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		2.58	
Frctn Loss (ft)	0.44	Cum Volume (acre-ft)		3.16	
C & E Loss (ft)	0.00	Cum SA (acres)		1.06	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22282 Profile: PF 2

E.G. Elev (ft)	1341.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1341.55	Reach Len. (ft)	95.00	95.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)	23.70	80.04	
E.G. Slope (ft/ft)	0.000688	Area (sq ft)	23.70	80.04	
Q Total (cfs)	359.00	Flow (cfs)	8.70	350.30	
Top Width (ft)	51.17	Top Width (ft)	25.00	26.17	
Vel Total (ft/s)	3.46	Avg. Vel. (ft/s)	0.37	4.38	
Max Chl Dpth (ft)	4.25	Hydr. Depth (ft)	0.95	3.06	
Conv. Total (cfs)	13690.2	Conv. (cfs)	331.6	13358.6	
Length Wtd. (ft)	95.00	Wetted Per. (ft)	25.95	27.84	
Min Ch EI (ft)	1337.30	Shear (lb/sq ft)	0.04	0.12	
Alpha	1.56	Stream Power (lb/ft s)	0.01	0.54	
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	1.24	7.99	0.11
C & E Loss (ft)	0.02	Cum SA (acres)	1.08	1.45	0.05

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22187 Profile: PF 1

E.G. Elev (ft)	1339.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.		0.018	
W.S. Elev (ft)	1338.52	Reach Len. (ft)	404.00	404.00	404.00
Crit W.S. (ft)	1338.52	Flow Area (sq ft)		24.92	
E.G. Slope (ft/ft)	0.004761	Area (sq ft)		24.92	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	17.63	Top Width (ft)		17.63	
Vel Total (ft/s)	6.78	Avg. Vel. (ft/s)		6.78	
Max Chl Dpth (ft)	1.62	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	2449.2	Conv. (cfs)		2449.2	
Length Wtd. (ft)	404.00	Wetted Per. (ft)		19.18	
Min Ch EI (ft)	1336.90	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		2.62	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)		3.10	
C & E Loss (ft)	0.14	Cum SA (acres)		1.03	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 22187 Profile: PF 2

E.G. Elev (ft)	1341.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.018	
W.S. Elev (ft)	1341.53	Reach Len. (ft)	404.00	404.00	404.00
Crit W.S. (ft)		Flow Area (sq ft)		92.69	
E.G. Slope (ft/ft)	0.000496	Area (sq ft)		92.69	
Q Total (cfs)	359.00	Flow (cfs)		359.00	
Top Width (ft)	26.28	Top Width (ft)		26.28	
Vel Total (ft/s)	3.87	Avg. Vel. (ft/s)		3.87	
Max Chl Dpth (ft)	4.63	Hydr. Depth (ft)		3.53	
Conv. Total (cfs)	16118.8	Conv. (cfs)		16118.8	
Length Wtd. (ft)	404.00	Wetted Per. (ft)		30.32	
Min Ch EI (ft)	1336.90	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.37	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	1.21	7.80	0.11
C & E Loss (ft)	0.05	Cum SA (acres)	1.05	1.40	0.05

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21783 Profile: PF 1

E.G. Elev (ft)	1338.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.86	Reach Len. (ft)	232.00	232.00	232.00
Crit W.S. (ft)		Flow Area (sq ft)		42.89	
E.G. Slope (ft/ft)	0.001010	Area (sq ft)		42.89	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	22.16	Top Width (ft)		22.16	
Vel Total (ft/s)	3.94	Avg. Vel. (ft/s)		3.94	
Max Chl Dpth (ft)	2.66	Hydr. Depth (ft)		1.94	
Conv. Total (cfs)	5317.2	Conv. (cfs)		5317.2	
Length Wtd. (ft)	232.00	Wetted Per. (ft)		23.30	
Min Ch EI (ft)	1335.20	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.46	
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)		2.79	
C & E Loss (ft)	0.04	Cum SA (acres)		0.84	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21783 Profile: PF 2

E.G. Elev (ft)	1341.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1341.58	Reach Len. (ft)	232.00	232.00	232.00
Crit W.S. (ft)		Flow Area (sq ft)	49.53	146.87	14.62
E.G. Slope (ft/ft)	0.000088	Area (sq ft)	49.53	146.87	14.62
Q Total (cfs)	359.00	Flow (cfs)	34.46	315.42	9.12
Top Width (ft)	62.00	Top Width (ft)	25.00	29.80	7.20
Vel Total (ft/s)	1.70	Avg. Vel. (ft/s)	0.70	2.15	0.62
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)	1.98	4.93	2.03
Conv. Total (cfs)	38320.7	Conv. (cfs)	3678.0	33669.2	973.5
Length Wtd. (ft)	232.00	Wetted Per. (ft)	26.98	31.74	9.39
Min Ch EI (ft)	1335.20	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	1.42	Stream Power (lb/ft s)	0.01	0.05	0.01
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.98	6.69	0.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.93	1.14	0.02

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21551 Profile: PF 1

E.G. Elev (ft)	1337.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.85	Reach Len. (ft)	162.00	162.00	162.00
Crit W.S. (ft)		Flow Area (sq ft)		65.60	
E.G. Slope (ft/ft)	0.000297	Area (sq ft)		65.60	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	23.77	Top Width (ft)		23.77	
Vel Total (ft/s)	2.58	Avg. Vel. (ft/s)		2.58	
Max Chl Dpth (ft)	3.55	Hydr. Depth (ft)		2.76	
Conv. Total (cfs)	9813.8	Conv. (cfs)		9813.8	
Length Wtd. (ft)	162.00	Wetted Per. (ft)		26.89	
Min Ch El (ft)	1334.30	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.12	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)		2.50	
C & E Loss (ft)	0.01	Cum SA (acres)		0.72	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21551 Profile: PF 2

E.G. Elev (ft)	1341.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	162.00	162.00	162.00
Crit W.S. (ft)		Flow Area (sq ft)	25.44	169.17	
E.G. Slope (ft/ft)	0.000081	Area (sq ft)	25.44	169.17	
Q Total (cfs)	359.00	Flow (cfs)	11.18	347.82	
Top Width (ft)	55.71	Top Width (ft)	25.00	30.71	
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	0.44	2.06	
Max Chl Dpth (ft)	7.27	Hydr. Depth (ft)	1.02	5.51	
Conv. Total (cfs)	39914.7	Conv. (cfs)	1242.9	38671.8	
Length Wtd. (ft)	162.00	Wetted Per. (ft)	25.97	36.71	
Min Ch El (ft)	1334.30	Shear (lb/sq ft)	0.00	0.02	
Alpha	1.21	Stream Power (lb/ft s)	0.00	0.05	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.78	5.85	
C & E Loss (ft)	0.00	Cum SA (acres)	0.80	0.98	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21389 Profile: PF 1

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.84	Reach Len. (ft)	34.00	34.00	34.00
Crit W.S. (ft)		Flow Area (sq ft)		77.46	
E.G. Slope (ft/ft)	0.000184	Area (sq ft)		77.46	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	24.90	Top Width (ft)		24.90	
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)		2.18	
Max Chl Dpth (ft)	4.04	Hydr. Depth (ft)		3.11	
Conv. Total (cfs)	12474.2	Conv. (cfs)		12474.2	
Length Wtd. (ft)	34.00	Wetted Per. (ft)		28.43	
Min Ch El (ft)	1333.80	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.07	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		2.23	
C & E Loss (ft)	0.00	Cum SA (acres)		0.63	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21389 Profile: PF 2

E.G. Elev (ft)	1341.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	34.00	34.00	34.00
Crit W.S. (ft)		Flow Area (sq ft)	37.93	184.59	
E.G. Slope (ft/ft)	0.000059	Area (sq ft)	37.93	184.59	
Q Total (cfs)	359.00	Flow (cfs)	18.38	340.62	
Top Width (ft)	55.99	Top Width (ft)	25.00	30.99	
Vel Total (ft/s)	1.61	Avg. Vel. (ft/s)	0.48	1.85	
Max Chl Dpth (ft)	7.77	Hydr. Depth (ft)	1.52	5.96	
Conv. Total (cfs)	46647.6	Conv. (cfs)	2388.0	44259.5	
Length Wtd. (ft)	34.00	Wetted Per. (ft)	26.47	37.29	
Min Ch El (ft)	1333.80	Shear (lb/sq ft)	0.01	0.02	
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.03	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.66	5.19	
C & E Loss (ft)	0.00	Cum SA (acres)	0.71	0.86	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21355 Profile: PF 1

E.G. Elev (ft)	1337.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.018	
W.S. Elev (ft)	1337.84	Reach Len. (ft)	828.00	828.00	828.00
Crit W.S. (ft)		Flow Area (sq ft)		79.89	
E.G. Slope (ft/ft)	0.000168	Area (sq ft)		79.89	
Q Total (cfs)	169.00	Flow (cfs)		169.00	
Top Width (ft)	25.12	Top Width (ft)		25.12	
Vel Total (ft/s)	2.12	Avg. Vel. (ft/s)		2.12	
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)		3.18	
Conv. Total (cfs)	13039.6	Conv. (cfs)		13039.6	
Length Wtd. (ft)	828.00	Wetted Per. (ft)		28.74	
Min Ch El (ft)	1333.70	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)		2.17	
C & E Loss (ft)	0.14	Cum SA (acres)		0.61	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 21355 Profile: PF 2

E.G. Elev (ft)	1341.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.030	0.018	
W.S. Elev (ft)	1341.57	Reach Len. (ft)	828.00	828.00	828.00
Crit W.S. (ft)		Flow Area (sq ft)	40.42	187.68	
E.G. Slope (ft/ft)	0.000056	Area (sq ft)	40.42	187.68	
Q Total (cfs)	359.00	Flow (cfs)	19.78	339.22	
Top Width (ft)	56.05	Top Width (ft)	25.00	31.05	
Vel Total (ft/s)	1.57	Avg. Vel. (ft/s)	0.49	1.81	
Max Chl Dpth (ft)	7.87	Hydr. Depth (ft)	1.62	6.04	
Conv. Total (cfs)	48057.0	Conv. (cfs)	2648.4	45408.6	
Length Wtd. (ft)	828.00	Wetted Per. (ft)	26.57	37.40	
Min Ch El (ft)	1333.70	Shear (lb/sq ft)	0.01	0.02	
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.03	
Frctn Loss (ft)	0.48	Cum Volume (acre-ft)	0.63	5.04	
C & E Loss (ft)	0.21	Cum SA (acres)	0.69	0.84	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 20527 Profile: PF 1

E.G. Elev (ft)	1336.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.42	Wt. n-Val.		0.018	
W.S. Elev (ft)	1335.55	Reach Len. (ft)	527.00	527.00	527.00
Crit W.S. (ft)	1335.55	Flow Area (sq ft)		47.66	
E.G. Slope (ft/ft)	0.004160	Area (sq ft)		47.66	
Q Total (cfs)	456.00	Flow (cfs)		456.00	
Top Width (ft)	16.98	Top Width (ft)		16.98	
Vel Total (ft/s)	9.57	Avg. Vel. (ft/s)		9.57	
Max Chl Dpth (ft)	4.15	Hydr. Depth (ft)		2.81	
Conv. Total (cfs)	7070.0	Conv. (cfs)		7070.0	
Length Wtd. (ft)	527.00	Wetted Per. (ft)		19.78	
Min Ch EI (ft)	1331.40	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		5.99	
Frctn Loss (ft)	2.17	Cum Volume (acre-ft)		0.96	
C & E Loss (ft)	0.01	Cum SA (acres)		0.21	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 20527 Profile: PF 2

E.G. Elev (ft)	1340.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1338.80	Reach Len. (ft)	527.00	527.00	527.00
Crit W.S. (ft)	1338.80	Flow Area (sq ft)	15.05	116.66	
E.G. Slope (ft/ft)	0.003239	Area (sq ft)	15.05	116.66	
Q Total (cfs)	1379.00	Flow (cfs)	8.94	1370.06	
Top Width (ft)	49.71	Top Width (ft)	25.00	24.71	
Vel Total (ft/s)	10.47	Avg. Vel. (ft/s)	0.59	11.74	
Max Chl Dpth (ft)	7.40	Hydr. Depth (ft)	0.60	4.72	
Conv. Total (cfs)	24229.4	Conv. (cfs)	157.0	24072.4	
Length Wtd. (ft)	527.00	Wetted Per. (ft)	25.60	29.52	
Min Ch EI (ft)	1331.40	Shear (lb/sq ft)	0.12	0.80	
Alpha	1.25	Stream Power (lb/ft s)	0.07	9.38	
Frctn Loss (ft)	1.77	Cum Volume (acre-ft)	0.11	2.15	
C & E Loss (ft)	0.01	Cum SA (acres)	0.21	0.31	

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 20000 Profile: PF 1

E.G. Elev (ft)	1334.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.38	Wt. n-Val.		0.018	
W.S. Elev (ft)	1333.21	Reach Len. (ft)	160.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		48.41	
E.G. Slope (ft/ft)	0.004059	Area (sq ft)		48.41	
Q Total (cfs)	456.00	Flow (cfs)		456.00	
Top Width (ft)	17.58	Top Width (ft)		17.58	
Vel Total (ft/s)	9.42	Avg. Vel. (ft/s)		9.42	
Max Chl Dpth (ft)	4.11	Hydr. Depth (ft)		2.75	
Conv. Total (cfs)	7157.5	Conv. (cfs)		7157.5	
Length Wtd. (ft)	160.00	Wetted Per. (ft)		20.20	
Min Ch EI (ft)	1329.10	Shear (lb/sq ft)		0.61	
Alpha	1.00	Stream Power (lb/ft s)		5.72	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.38	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Mtn. View Chnl RS: 20000 Profile: PF 2

E.G. Elev (ft)	1338.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.19	Wt. n-Val.	0.100	0.018	
W.S. Elev (ft)	1336.29	Reach Len. (ft)	160.00	160.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)	1.87	115.93	
E.G. Slope (ft/ft)	0.003501	Area (sq ft)	1.87	115.93	
Q Total (cfs)	1379.00	Flow (cfs)	0.53	1378.47	
Top Width (ft)	35.99	Top Width (ft)	10.00	25.99	
Vel Total (ft/s)	11.71	Avg. Vel. (ft/s)	0.28	11.89	
Max Chl Dpth (ft)	7.19	Hydr. Depth (ft)	0.19	4.46	
Conv. Total (cfs)	23307.6	Conv. (cfs)	9.0	23298.6	
Length Wtd. (ft)	160.00	Wetted Per. (ft)	10.19	30.52	
Min Ch EI (ft)	1329.10	Shear (lb/sq ft)	0.04	0.83	
Alpha	1.03	Stream Power (lb/ft s)	0.01	9.87	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.00	0.74	
C & E Loss (ft)		Cum SA (acres)			

Plan: preferredalt Berneil Ditch Lower Reach RS: 15922 Profile: PF 1

E.G. Elev (ft)	1332.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.		0.018	
W.S. Elev (ft)	1331.68	Reach Len. (ft)	380.00	380.00	380.00
Crit W.S. (ft)	1331.39	Flow Area (sq ft)		157.15	
E.G. Slope (ft/ft)	0.002587	Area (sq ft)		157.15	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	56.15	Top Width (ft)		56.15	
Vel Total (ft/s)	8.23	Avg. Vel. (ft/s)		8.23	
Max Chl Dpth (ft)	3.58	Hydr. Depth (ft)		2.80	
Conv. Total (cfs)	25442.8	Conv. (cfs)		25442.8	
Length Wtd. (ft)	380.00	Wetted Per. (ft)		57.21	
Min Ch EI (ft)	1328.10	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		3.65	
Frctn Loss (ft)	0.84	Cum Volume (acre-ft)		23.83	
C & E Loss (ft)	0.06	Cum SA (acres)		8.28	

Plan: preferredalt Berneil Ditch Lower Reach RS: 15922 Profile: PF 2

E.G. Elev (ft)	1335.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.68	Wt. n-Val.		0.018	
W.S. Elev (ft)	1333.79	Reach Len. (ft)	380.00	380.00	380.00
Crit W.S. (ft)		Flow Area (sq ft)		289.61	
E.G. Slope (ft/ft)	0.002458	Area (sq ft)		289.61	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	69.76	Top Width (ft)		69.76	
Vel Total (ft/s)	10.40	Avg. Vel. (ft/s)		10.40	
Max Chl Dpth (ft)	5.69	Hydr. Depth (ft)		4.15	
Conv. Total (cfs)	60771.9	Conv. (cfs)		60771.9	
Length Wtd. (ft)	380.00	Wetted Per. (ft)		71.46	
Min Ch EI (ft)	1328.10	Shear (lb/sq ft)		0.62	
Alpha	1.00	Stream Power (lb/ft s)		6.47	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	0.05	43.35	0.08
C & E Loss (ft)	0.09	Cum SA (acres)	0.09	9.95	0.15

Plan: preferredalt Berneil Ditch Lower Reach RS: 15242 Profile: PF 2

E.G. Elev (ft)	1334.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.29	Wt. n-Val.		0.018	
W.S. Elev (ft)	1332.73	Reach Len. (ft)	201.00	201.00	201.00
Crit W.S. (ft)		Flow Area (sq ft)		330.72	
E.G. Slope (ft/ft)	0.001679	Area (sq ft)		330.72	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	72.92	Top Width (ft)		72.92	
Vel Total (ft/s)	9.11	Avg. Vel. (ft/s)		9.11	
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)		4.54	
Conv. Total (cfs)	73529.4	Conv. (cfs)		73529.4	
Length Wtd. (ft)	201.00	Wetted Per. (ft)		74.83	
Min Ch El (ft)	1326.50	Shear (lb/sq ft)		0.46	
Alpha	1.00	Stream Power (lb/ft s)		4.22	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.05	38.45	0.07
C & E Loss (ft)	0.07	Cum SA (acres)	0.09	8.83	0.13

Plan: preferredalt Berneil Ditch Lower Reach RS: 15041 Profile: PF 1

E.G. Elev (ft)	1330.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.31	Wt. n-Val.		0.018	
W.S. Elev (ft)	1329.45	Reach Len. (ft)	515.00	515.00	515.00
Crit W.S. (ft)	1329.45	Flow Area (sq ft)		140.80	
E.G. Slope (ft/ft)	0.003568	Area (sq ft)		140.80	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	54.34	Top Width (ft)		54.34	
Vel Total (ft/s)	9.19	Avg. Vel. (ft/s)		9.19	
Max Chl Dpth (ft)	3.25	Hydr. Depth (ft)		2.59	
Conv. Total (cfs)	21662.7	Conv. (cfs)		21662.7	
Length Wtd. (ft)	515.00	Wetted Per. (ft)		55.34	
Min Ch El (ft)	1326.20	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)		5.21	
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)		20.39	
C & E Loss (ft)	0.18	Cum SA (acres)		7.12	

Plan: preferredalt Berneil Ditch Lower Reach RS: 15041 Profile: PF 2

E.G. Elev (ft)	1333.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.018	
W.S. Elev (ft)	1331.51	Reach Len. (ft)	515.00	515.00	515.00
Crit W.S. (ft)	1331.51	Flow Area (sq ft)		265.63	
E.G. Slope (ft/ft)	0.003125	Area (sq ft)		265.63	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	67.30	Top Width (ft)		67.30	
Vel Total (ft/s)	11.34	Avg. Vel. (ft/s)		11.34	
Max Chl Dpth (ft)	5.30	Hydr. Depth (ft)		3.95	
Conv. Total (cfs)	53897.4	Conv. (cfs)		53897.4	
Length Wtd. (ft)	515.00	Wetted Per. (ft)		68.93	
Min Ch El (ft)	1326.20	Shear (lb/sq ft)		0.75	
Alpha	1.00	Stream Power (lb/ft s)		8.53	
Frctn Loss (ft)	1.06	Cum Volume (acre-ft)	0.05	37.08	0.07
C & E Loss (ft)	0.25	Cum SA (acres)	0.09	8.51	0.13

Plan: preferredalt Berneil Ditch Lower Reach RS: 15542 Profile: PF 1

E.G. Elev (ft)	1331.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.98	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		174.87	
E.G. Slope (ft/ft)	0.001918	Area (sq ft)		174.87	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	58.53	Top Width (ft)		58.53	
Vel Total (ft/s)	7.40	Avg. Vel. (ft/s)		7.40	
Max Chl Dpth (ft)	3.78	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	29544.5	Conv. (cfs)		29544.5	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		59.72	
Min Ch EI (ft)	1327.20	Shear (lb/sq ft)		0.35	
Alpha	1.00	Stream Power (lb/ft s)		2.59	
Frctn Loss (ft)	0.52	Cum Volume (acre-ft)		22.39	
C & E Loss (ft)	0.03	Cum SA (acres)		7.78	

Plan: preferredalt Berneil Ditch Lower Reach RS: 15542 Profile: PF 2

E.G. Elev (ft)	1334.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.38	Wt. n-Val.		0.018	0.035
W.S. Elev (ft)	1333.20	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		319.73	0.81
E.G. Slope (ft/ft)	0.001829	Area (sq ft)		319.73	0.81
Q Total (cfs)	3013.00	Flow (cfs)		3012.45	0.55
Top Width (ft)	74.76	Top Width (ft)		71.46	3.30
Vel Total (ft/s)	9.40	Avg. Vel. (ft/s)		9.42	0.67
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)		4.47	0.25
Conv. Total (cfs)	70454.4	Conv. (cfs)		70441.6	12.8
Length Wtd. (ft)	300.00	Wetted Per. (ft)		73.33	3.60
Min Ch EI (ft)	1327.20	Shear (lb/sq ft)		0.50	0.03
Alpha	1.00	Stream Power (lb/ft s)		4.69	0.02
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.05	40.69	0.08
C & E Loss (ft)	0.03	Cum SA (acres)	0.09	9.33	0.14

Plan: preferredalt Berneil Ditch Lower Reach RS: 15242 Profile: PF 1

E.G. Elev (ft)	1331.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.76	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.53	Reach Len. (ft)	201.00	201.00	201.00
Crit W.S. (ft)		Flow Area (sq ft)		185.39	
E.G. Slope (ft/ft)	0.001592	Area (sq ft)		185.39	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	58.86	Top Width (ft)		58.86	
Vel Total (ft/s)	6.98	Avg. Vel. (ft/s)		6.98	
Max Chl Dpth (ft)	4.03	Hydr. Depth (ft)		3.15	
Conv. Total (cfs)	32432.5	Conv. (cfs)		32432.5	
Length Wtd. (ft)	201.00	Wetted Per. (ft)		60.10	
Min Ch EI (ft)	1326.50	Shear (lb/sq ft)		0.31	
Alpha	1.00	Stream Power (lb/ft s)		2.14	
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)		21.14	
C & E Loss (ft)	0.06	Cum SA (acres)		7.38	

Plan: preferredalt Berneil Ditch Lower Reach RS: 14526 Profile: PF 1

E.G. Elev (ft)	1329.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.72	Wt. n-Val.		0.018	
W.S. Elev (ft)	1328.60	Reach Len. (ft)	610.00	610.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)		190.12	
E.G. Slope (ft/ft)	0.001482	Area (sq ft)		190.12	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	59.33	Top Width (ft)		59.33	
Vel Total (ft/s)	6.81	Avg. Vel. (ft/s)		6.81	
Max Chl Dpth (ft)	4.40	Hydr. Depth (ft)		3.20	
Conv. Total (cfs)	33608.5	Conv. (cfs)		33608.5	
Length Wtd. (ft)	610.00	Wetted Per. (ft)		60.67	
Min Ch El (ft)	1324.20	Shear (lb/sq ft)		0.29	
Alpha	1.00	Stream Power (lb/ft s)		1.97	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)		18.44	
C & E Loss (ft)	0.02	Cum SA (acres)		6.44	

Plan: preferredalt Berneil Ditch Lower Reach RS: 14526 Profile: PF 2

E.G. Elev (ft)	1332.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.18	Wt. n-Val.		0.018	
W.S. Elev (ft)	1330.95	Reach Len. (ft)	610.00	610.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)		345.99	
E.G. Slope (ft/ft)	0.001461	Area (sq ft)		345.99	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	73.32	Top Width (ft)		73.32	
Vel Total (ft/s)	8.71	Avg. Vel. (ft/s)		8.71	
Max Chl Dpth (ft)	6.75	Hydr. Depth (ft)		4.72	
Conv. Total (cfs)	78839.0	Conv. (cfs)		78839.0	
Length Wtd. (ft)	610.00	Wetted Per. (ft)		75.45	
Min Ch El (ft)	1324.20	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		3.64	
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.05	33.46	0.07
C & E Loss (ft)	0.03	Cum SA (acres)	0.09	7.68	0.13

Plan: preferredalt Berneil Ditch Lower Reach RS: 13916 Profile: PF 1

E.G. Elev (ft)	1328.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.84	Reach Len. (ft)	176.00	176.00	176.00
Crit W.S. (ft)		Flow Area (sq ft)		200.47	
E.G. Slope (ft/ft)	0.001179	Area (sq ft)		200.47	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	56.57	Top Width (ft)		56.57	
Vel Total (ft/s)	6.45	Avg. Vel. (ft/s)		6.45	
Max Chl Dpth (ft)	4.74	Hydr. Depth (ft)		3.54	
Conv. Total (cfs)	37679.3	Conv. (cfs)		37679.3	
Length Wtd. (ft)	176.00	Wetted Per. (ft)		58.35	
Min Ch El (ft)	1323.10	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		1.63	
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)		15.70	
C & E Loss (ft)	0.01	Cum SA (acres)		5.63	

Plan: preferredalt Berneil Ditch Lower Reach RS: 13916 Profile: PF 2

E.G. Elev (ft)	1331.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.46	Wt. n-Val.		0.018	
W.S. Elev (ft)	1329.64	Reach Len. (ft)	176.00	176.00	176.00
Crit W.S. (ft)	1328.81	Flow Area (sq ft)		310.24	
E.G. Slope (ft/ft)	0.001825	Area (sq ft)		310.24	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	65.39	Top Width (ft)		65.39	
Vel Total (ft/s)	9.71	Avg. Vel. (ft/s)		9.71	
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)		4.74	
Conv. Total (cfs)	70521.2	Conv. (cfs)		70521.2	
Length Wtd. (ft)	176.00	Wetted Per. (ft)		67.90	
Min Ch EI (ft)	1323.10	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		5.06	
Frctn Loss (ft)	0.38	Cum Volume (acre-ft)	0.05	28.87	0.07
C & E Loss (ft)	0.03	Cum SA (acres)	0.09	6.71	0.13

Plan: preferredalt Berneil Ditch Lower Reach RS: 13740 Profile: PF 1

E.G. Elev (ft)	1328.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.54	Reach Len. (ft)	1505.00	1505.00	1505.00
Crit W.S. (ft)	1326.71	Flow Area (sq ft)		191.57	
E.G. Slope (ft/ft)	0.001514	Area (sq ft)		191.57	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	61.47	Top Width (ft)		61.47	
Vel Total (ft/s)	6.75	Avg. Vel. (ft/s)		6.75	
Max Chl Dpth (ft)	3.94	Hydr. Depth (ft)		3.12	
Conv. Total (cfs)	33252.9	Conv. (cfs)		33252.9	
Length Wtd. (ft)	1505.00	Wetted Per. (ft)		62.83	
Min Ch EI (ft)	1323.60	Shear (lb/sq ft)		0.29	
Alpha	1.00	Stream Power (lb/ft s)		1.95	
Frctn Loss (ft)	3.34	Cum Volume (acre-ft)		14.91	
C & E Loss (ft)	0.06	Cum SA (acres)		5.39	

Plan: preferredalt Berneil Ditch Lower Reach RS: 13740 Profile: PF 2

E.G. Elev (ft)	1330.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.72	Wt. n-Val.		0.018	
W.S. Elev (ft)	1328.99	Reach Len. (ft)	1505.00	1505.00	1505.00
Crit W.S. (ft)	1328.71	Flow Area (sq ft)		286.60	
E.G. Slope (ft/ft)	0.002547	Area (sq ft)		286.60	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	69.62	Top Width (ft)		69.62	
Vel Total (ft/s)	10.51	Avg. Vel. (ft/s)		10.51	
Max Chl Dpth (ft)	5.39	Hydr. Depth (ft)		4.12	
Conv. Total (cfs)	59703.0	Conv. (cfs)		59703.0	
Length Wtd. (ft)	1505.00	Wetted Per. (ft)		71.50	
Min Ch EI (ft)	1323.60	Shear (lb/sq ft)		0.64	
Alpha	1.00	Stream Power (lb/ft s)		6.70	
Frctn Loss (ft)	2.17	Cum Volume (acre-ft)	0.05	27.66	0.07
C & E Loss (ft)	0.26	Cum SA (acres)	0.09	6.43	0.13

Plan: preferredalt Berneil Ditch Lower Reach RS: 12235 Profile: PF 1

E.G. Elev (ft)	1324.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.31	Wt. n-Val.		0.018	
W.S. Elev (ft)	1323.54	Reach Len. (ft)	27.00	27.00	27.00
Crit W.S. (ft)	1323.54	Flow Area (sq ft)		140.90	
E.G. Slope (ft/ft)	0.003564	Area (sq ft)		140.90	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	54.46	Top Width (ft)		54.46	
Vel Total (ft/s)	9.18	Avg. Vel. (ft/s)		9.18	
Max Chl Dpth (ft)	3.34	Hydr. Depth (ft)		2.59	
Conv. Total (cfs)	21675.4	Conv. (cfs)		21675.4	
Length Wtd. (ft)	27.00	Wetted Per. (ft)		55.39	
Min Ch El (ft)	1320.20	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)		5.20	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		9.17	
C & E Loss (ft)	0.45	Cum SA (acres)		3.39	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12235 Profile: PF 2

E.G. Elev (ft)	1328.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.86	Wt. n-Val.	0.030	0.018	0.030
W.S. Elev (ft)	1327.42	Reach Len. (ft)	27.00	27.00	27.00
Crit W.S. (ft)		Flow Area (sq ft)	3.10	403.39	4.11
E.G. Slope (ft/ft)	0.000929	Area (sq ft)	3.10	403.39	4.11
Q Total (cfs)	3013.00	Flow (cfs)	3.15	3005.81	4.04
Top Width (ft)	89.50	Top Width (ft)	5.00	77.30	7.20
Vel Total (ft/s)	7.34	Avg. Vel. (ft/s)	1.02	7.45	0.98
Max Chl Dpth (ft)	7.22	Hydr. Depth (ft)	0.62	5.22	0.57
Conv. Total (cfs)	98833.1	Conv. (cfs)	103.4	98597.3	132.4
Length Wtd. (ft)	27.00	Wetted Per. (ft)	5.62	79.18	7.82
Min Ch El (ft)	1320.20	Shear (lb/sq ft)	0.03	0.30	0.03
Alpha	1.03	Stream Power (lb/ft s)	0.03	2.20	0.03
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.00	15.74	0.00
C & E Loss (ft)	0.16	Cum SA (acres)	0.00	3.90	0.00

Plan: preferredalt Berneil Ditch Lower Reach RS: 12208 Profile: PF 1

E.G. Elev (ft)	1324.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.41	Wt. n-Val.		0.018	
W.S. Elev (ft)	1323.66	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1322.09	Flow Area (sq ft)		252.90	
E.G. Slope (ft/ft)	0.000636	Area (sq ft)		253.11	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	65.71	Top Width (ft)		65.71	
Vel Total (ft/s)	5.12	Avg. Vel. (ft/s)		5.12	
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		3.86	
Conv. Total (cfs)	51330.5	Conv. (cfs)		51330.5	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		65.60	
Min Ch El (ft)	1319.80	Shear (lb/sq ft)		0.15	
Alpha	1.00	Stream Power (lb/ft s)		0.78	
Frctn Loss (ft)		Cum Volume (acre-ft)		9.04	
C & E Loss (ft)		Cum SA (acres)		3.35	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12208 Profile: PF 2

E.G. Elev (ft)	1328.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.		0.018	
W.S. Elev (ft)	1327.56	Reach Len. (ft)	50.00	50.00	50.00
Crit W.S. (ft)	1323.82	Flow Area (sq ft)		509.76	
E.G. Slope (ft/ft)	0.000442	Area (sq ft)		509.76	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	65.80	Top Width (ft)		65.80	
Vel Total (ft/s)	5.91	Avg. Vel. (ft/s)		5.91	
Max Chl Dpth (ft)	7.76	Hydr. Depth (ft)		7.75	
Conv. Total (cfs)	143304.4	Conv. (cfs)		143304.4	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		81.12	
Min Ch EI (ft)	1319.80	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		1.03	
Frcn Loss (ft)		Cum Volume (acre-ft)		15.46	
C & E Loss (ft)		Cum SA (acres)		3.85	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12158 Profile: PF 1

E.G. Elev (ft)	1321.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.		0.018	
W.S. Elev (ft)	1320.79	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1320.79	Flow Area (sq ft)		150.13	
E.G. Slope (ft/ft)	0.003615	Area (sq ft)		150.19	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	65.66	Top Width (ft)		65.66	
Vel Total (ft/s)	8.62	Avg. Vel. (ft/s)		8.62	
Max Chl Dpth (ft)	2.29	Hydr. Depth (ft)		2.29	
Conv. Total (cfs)	21522.9	Conv. (cfs)		21522.9	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		65.60	
Min Ch EI (ft)	1318.50	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		4.45	
Frcn Loss (ft)	0.28	Cum Volume (acre-ft)		8.81	
C & E Loss (ft)	0.12	Cum SA (acres)		3.28	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12158 Profile: PF 2

E.G. Elev (ft)	1324.55	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.00	Wt. n-Val.		0.018	
W.S. Elev (ft)	1322.54	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1322.54	Flow Area (sq ft)		265.22	
E.G. Slope (ft/ft)	0.002940	Area (sq ft)		265.42	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	65.70	Top Width (ft)		65.70	
Vel Total (ft/s)	11.36	Avg. Vel. (ft/s)		11.36	
Max Chl Dpth (ft)	4.04	Hydr. Depth (ft)		4.04	
Conv. Total (cfs)	55564.0	Conv. (cfs)		55564.0	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		65.60	
Min Ch EI (ft)	1318.50	Shear (lb/sq ft)		0.74	
Alpha	1.00	Stream Power (lb/ft s)		8.43	
Frcn Loss (ft)	0.25	Cum Volume (acre-ft)		15.01	
C & E Loss (ft)	0.26	Cum SA (acres)		3.78	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12058 Profile: PF 1

E.G. Elev (ft)	1320.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.		0.018	
W.S. Elev (ft)	1319.22	Reach Len. (ft)	650.00	650.00	650.00
Crit W.S. (ft)	1318.82	Flow Area (sq ft)		168.15	
E.G. Slope (ft/ft)	0.002285	Area (sq ft)		168.15	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	60.53	Top Width (ft)		60.53	
Vel Total (ft/s)	7.70	Avg. Vel. (ft/s)		7.70	
Max Chl Dpth (ft)	3.22	Hydr. Depth (ft)		2.78	
Conv. Total (cfs)	27071.6	Conv. (cfs)		27071.6	
Length Wtd. (ft)	650.00	Wetted Per. (ft)		61.74	
Min Ch EI (ft)	1316.00	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		2.99	
Frctn Loss (ft)	1.72	Cum Volume (acre-ft)		8.45	
C & E Loss (ft)	0.07	Cum SA (acres)		3.13	

Plan: preferredalt Berneil Ditch Lower Reach RS: 12058 Profile: PF 2

E.G. Elev (ft)	1322.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.49	Wt. n-Val.		0.018	
W.S. Elev (ft)	1321.34	Reach Len. (ft)	650.00	650.00	650.00
Crit W.S. (ft)	1320.76	Flow Area (sq ft)		307.68	
E.G. Slope (ft/ft)	0.002084	Area (sq ft)		307.68	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	71.45	Top Width (ft)		71.45	
Vel Total (ft/s)	9.79	Avg. Vel. (ft/s)		9.79	
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		4.31	
Conv. Total (cfs)	66004.6	Conv. (cfs)		66004.6	
Length Wtd. (ft)	650.00	Wetted Per. (ft)		73.45	
Min Ch EI (ft)	1316.00	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		5.34	
Frctn Loss (ft)	1.63	Cum Volume (acre-ft)		14.36	
C & E Loss (ft)	0.15	Cum SA (acres)		3.62	

Plan: preferredalt Berneil Ditch Lower Reach RS: 11408 Profile: PF 1

E.G. Elev (ft)	1318.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.		0.018	
W.S. Elev (ft)	1317.21	Reach Len. (ft)	600.00	600.00	600.00
Crit W.S. (ft)		Flow Area (sq ft)		150.68	
E.G. Slope (ft/ft)	0.003086	Area (sq ft)		150.68	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	57.64	Top Width (ft)		57.64	
Vel Total (ft/s)	8.59	Avg. Vel. (ft/s)		8.59	
Max Chl Dpth (ft)	3.21	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	23294.8	Conv. (cfs)		23294.8	
Length Wtd. (ft)	600.00	Wetted Per. (ft)		58.79	
Min Ch EI (ft)	1314.00	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.24	
Frctn Loss (ft)	1.14	Cum Volume (acre-ft)		6.07	
C & E Loss (ft)	0.16	Cum SA (acres)		2.25	

Plan: preferredalt Berneil Ditch Lower Reach RS: 11408 Profile: PF 2

E.G. Elev (ft)	1321.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.		0.018	
W.S. Elev (ft)	1319.08	Reach Len. (ft)	600.00	600.00	600.00
Crit W.S. (ft)	1319.05	Flow Area (sq ft)		267.13	
E.G. Slope (ft/ft)	0.003067	Area (sq ft)		267.13	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	67.06	Top Width (ft)		67.06	
Vel Total (ft/s)	11.28	Avg. Vel. (ft/s)		11.28	
Max Chl Dpth (ft)	5.08	Hydr. Depth (ft)		3.98	
Conv. Total (cfs)	54406.5	Conv. (cfs)		54406.5	
Length Wtd. (ft)	600.00	Wetted Per. (ft)		68.93	
Min Ch EI (ft)	1314.00	Shear (lb/sq ft)		0.74	
Alpha	1.00	Stream Power (lb/ft s)		8.37	
Frctn Loss (ft)	1.40	Cum Volume (acre-ft)		10.07	
C & E Loss (ft)	0.19	Cum SA (acres)		2.58	

Plan: preferredalt Berneil Ditch Lower Reach RS: 10808 Profile: PF 1

E.G. Elev (ft)	1317.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.		0.018	
W.S. Elev (ft)	1316.43	Reach Len. (ft)	808.00	808.00	808.00
Crit W.S. (ft)	1315.49	Flow Area (sq ft)		206.62	
E.G. Slope (ft/ft)	0.001288	Area (sq ft)		206.62	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	65.81	Top Width (ft)		65.81	
Vel Total (ft/s)	6.26	Avg. Vel. (ft/s)		6.26	
Max Chl Dpth (ft)	3.63	Hydr. Depth (ft)		3.14	
Conv. Total (cfs)	36053.5	Conv. (cfs)		36053.5	
Length Wtd. (ft)	808.00	Wetted Per. (ft)		67.23	
Min Ch EI (ft)	1312.80	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		1.55	
Frctn Loss (ft)	1.46	Cum Volume (acre-ft)		3.61	
C & E Loss (ft)	0.02	Cum SA (acres)		1.40	

Plan: preferredalt Berneil Ditch Lower Reach RS: 10808 Profile: PF 2

E.G. Elev (ft)	1319.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.		0.018	
W.S. Elev (ft)	1318.11	Reach Len. (ft)	808.00	808.00	808.00
Crit W.S. (ft)	1317.37	Flow Area (sq ft)		323.83	
E.G. Slope (ft/ft)	0.001844	Area (sq ft)		323.83	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	74.07	Top Width (ft)		74.07	
Vel Total (ft/s)	9.30	Avg. Vel. (ft/s)		9.30	
Max Chl Dpth (ft)	5.31	Hydr. Depth (ft)		4.37	
Conv. Total (cfs)	70170.4	Conv. (cfs)		70170.4	
Length Wtd. (ft)	808.00	Wetted Per. (ft)		76.15	
Min Ch EI (ft)	1312.80	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.55	
Frctn Loss (ft)	1.79	Cum Volume (acre-ft)		6.00	
C & E Loss (ft)	0.00	Cum SA (acres)		1.61	

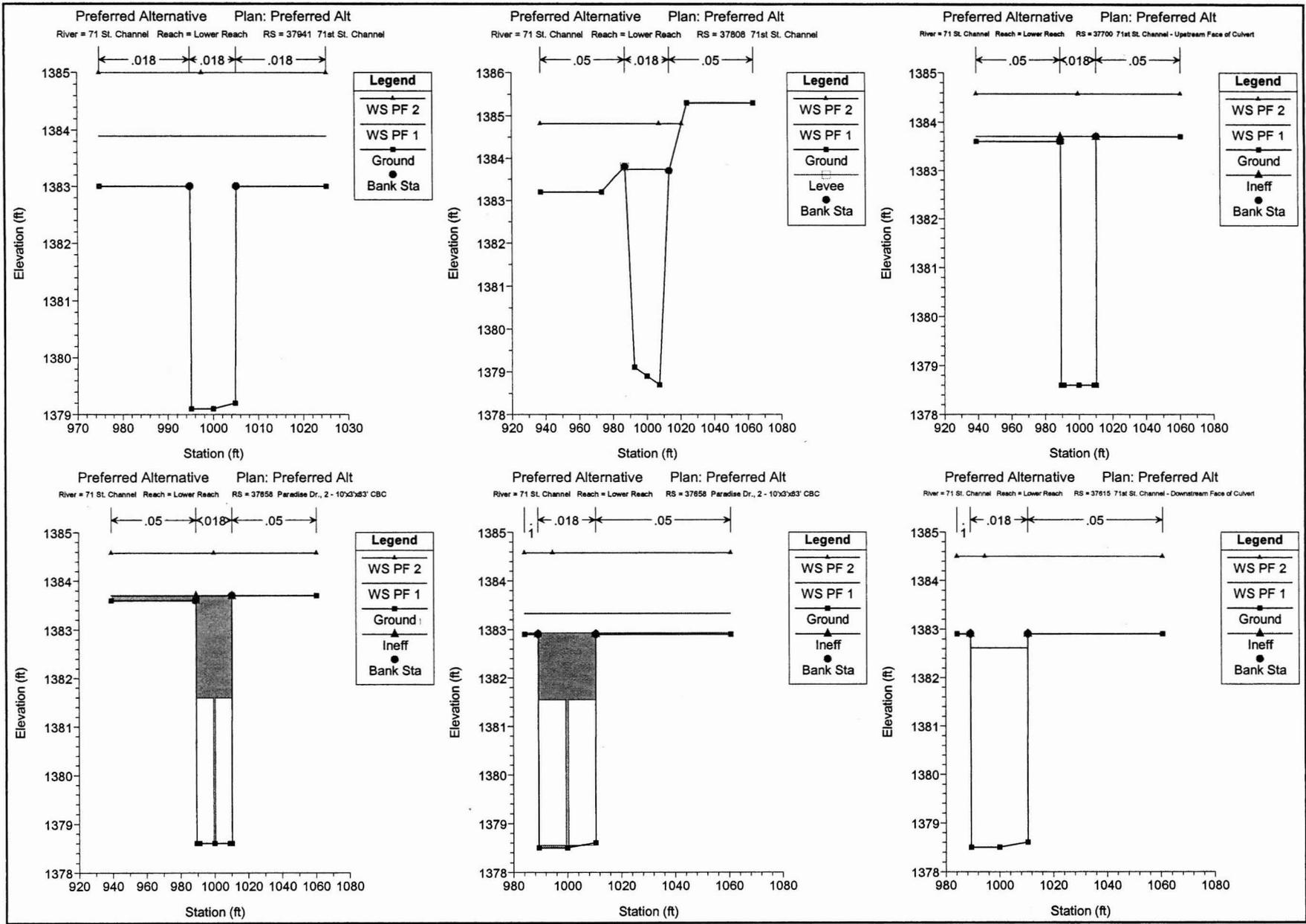
Plan: preferredalt Berneil Ditch Lower Reach RS: 10000 Profile: PF 1

E.G. Elev (ft)	1315.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.		0.018	
W.S. Elev (ft)	1314.79	Reach Len. (ft)			
Crit W.S. (ft)	1314.55	Flow Area (sq ft)		182.34	
E.G. Slope (ft/ft)	0.002704	Area (sq ft)		182.34	
Q Total (cfs)	1294.00	Flow (cfs)		1294.00	
Top Width (ft)	85.27	Top Width (ft)		85.27	
Vel Total (ft/s)	7.10	Avg. Vel. (ft/s)		7.10	
Max Chl Dpth (ft)	2.49	Hydr. Depth (ft)		2.14	
Conv. Total (cfs)	24885.2	Conv. (cfs)		24885.2	
Length Wtd. (ft)		Wetted Per. (ft)		85.78	
Min Ch EI (ft)	1312.30	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		2.55	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

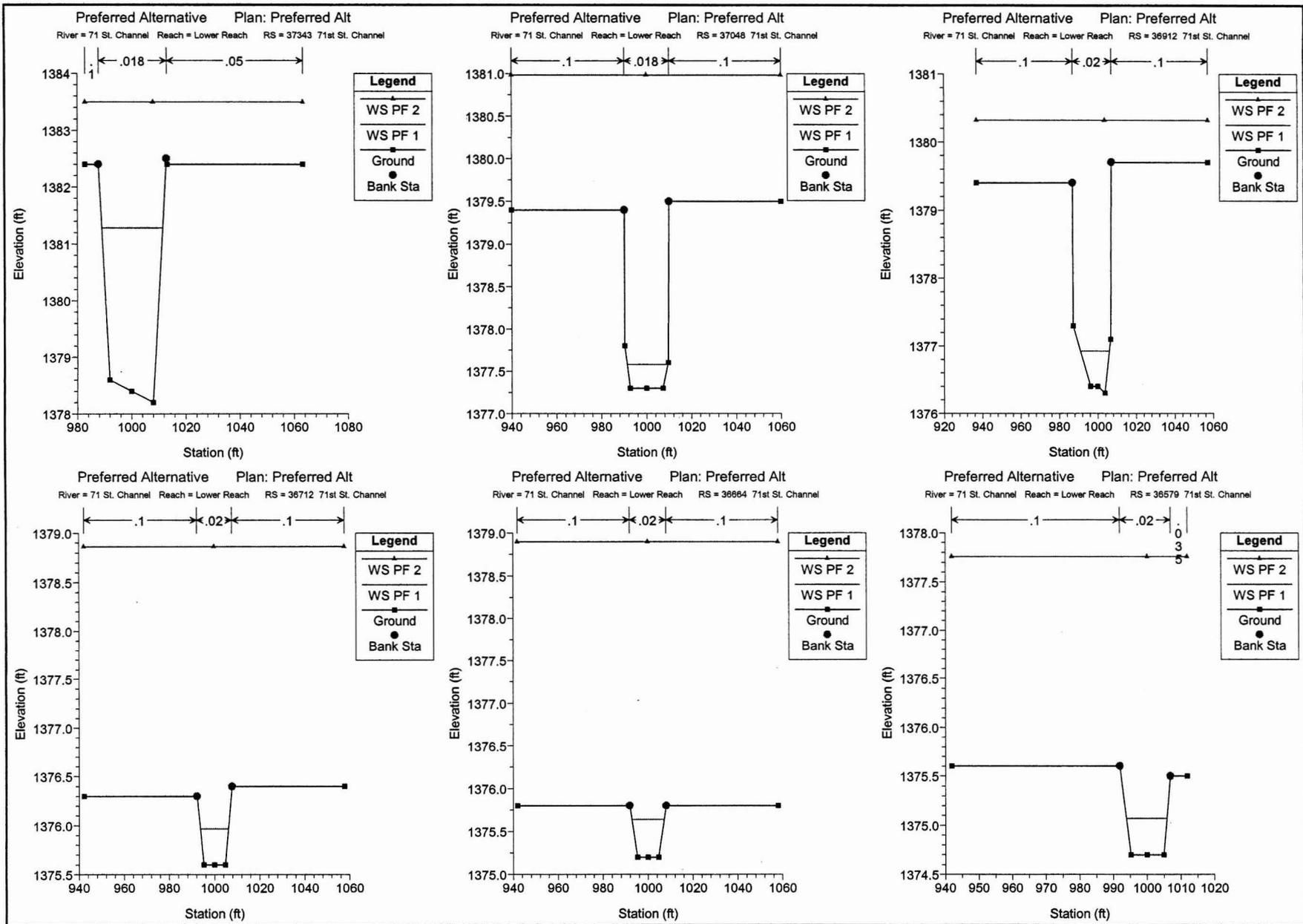
Plan: preferredalt Berneil Ditch Lower Reach RS: 10000 Profile: PF 2

E.G. Elev (ft)	1317.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.35	Wt. n-Val.		0.018	
W.S. Elev (ft)	1316.30	Reach Len. (ft)			
Crit W.S. (ft)	1316.09	Flow Area (sq ft)		322.83	
E.G. Slope (ft/ft)	0.002703	Area (sq ft)		322.83	
Q Total (cfs)	3013.00	Flow (cfs)		3013.00	
Top Width (ft)	99.84	Top Width (ft)		99.84	
Vel Total (ft/s)	9.33	Avg. Vel. (ft/s)		9.33	
Max Chl Dpth (ft)	4.00	Hydr. Depth (ft)		3.23	
Conv. Total (cfs)	57953.7	Conv. (cfs)		57953.7	
Length Wtd. (ft)		Wetted Per. (ft)		100.67	
Min Ch EI (ft)	1312.30	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		5.05	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

"WITH RECOMMENDED ALTERNATIVE" HEC-RAS CROSS-SECTIONS

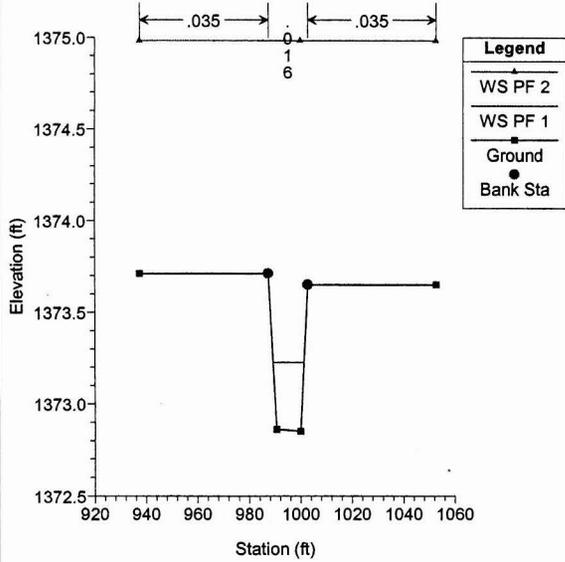


RECOMMENDED ALTERNATIVE  
 HEC-RAS CROSS-SECTIONS  
 SCF #15586



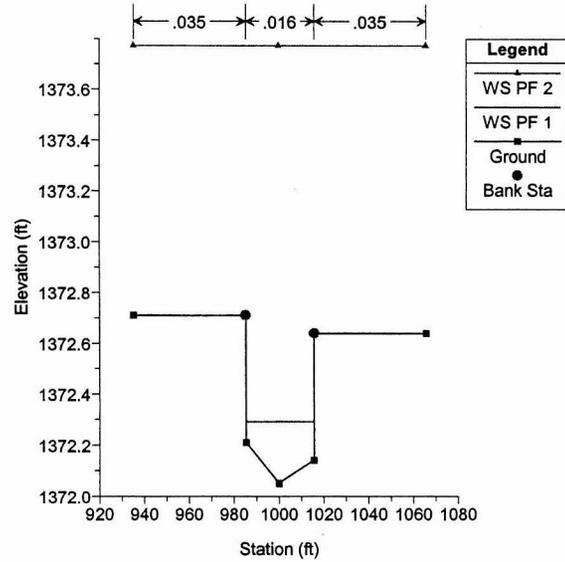
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 36306 71st St. Channel



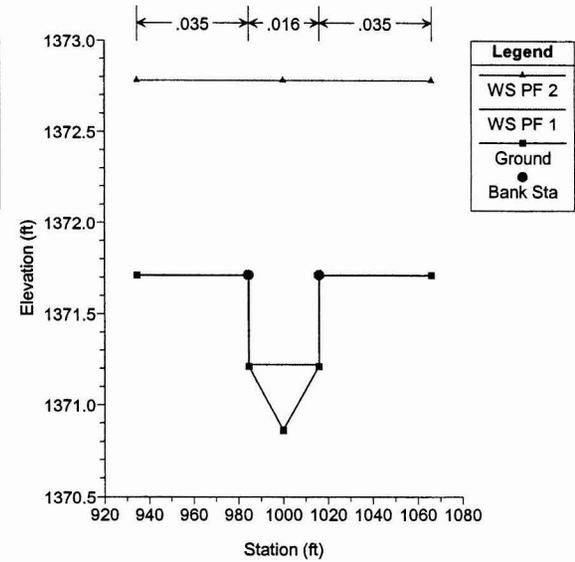
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 36233 71st St. Channel



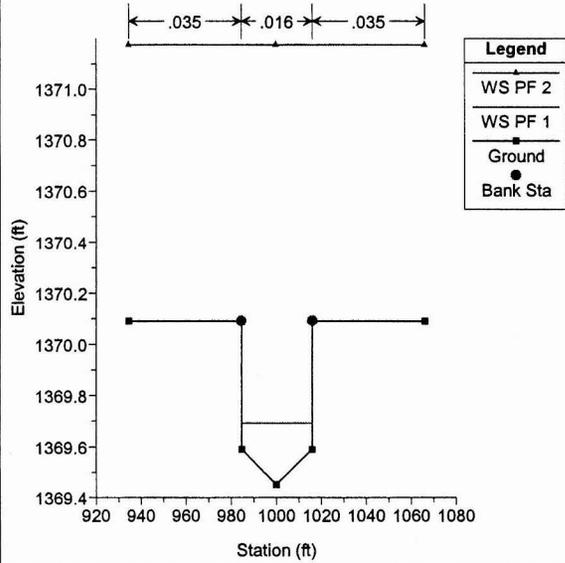
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 36088 71st St. Channel



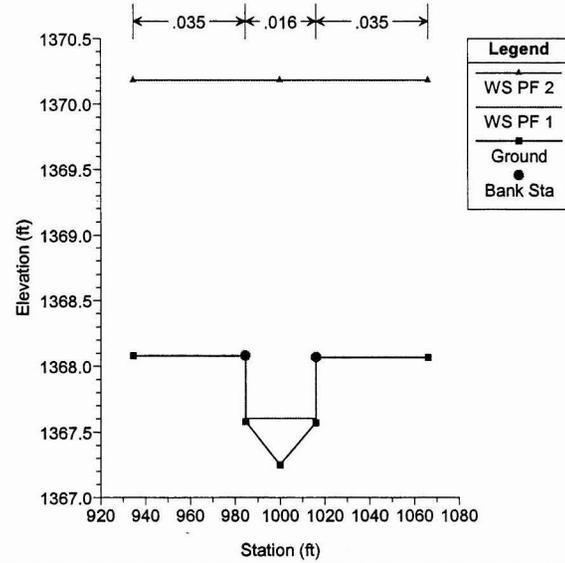
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 35845 71st St. Channel



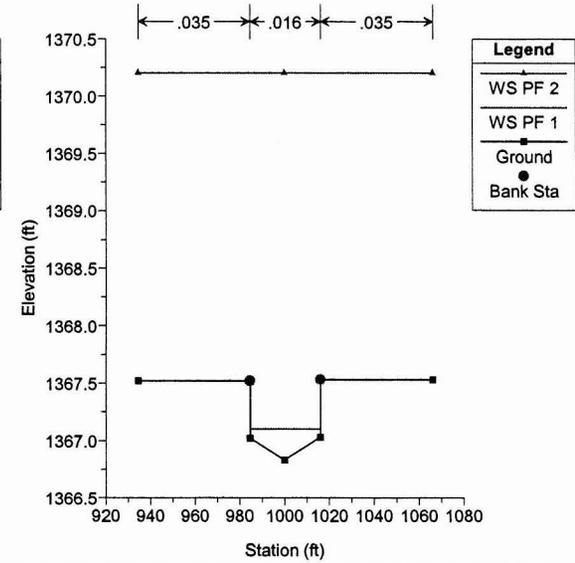
Preferred Alternative Plan: Preferred Alt

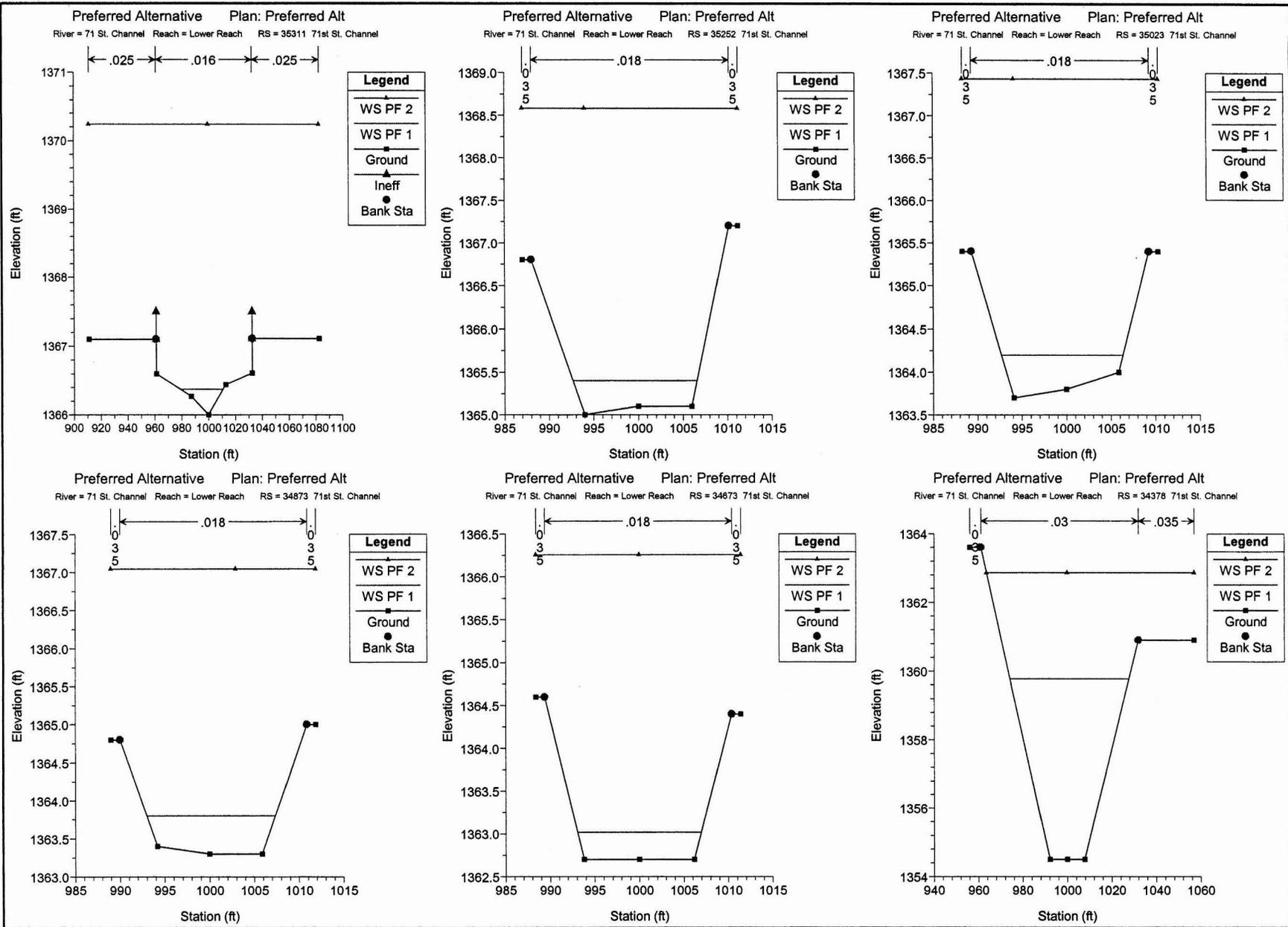
River = 71 St. Channel Reach = Lower Reach RS = 35493 71st St. Channel



Preferred Alternative Plan: Preferred Alt

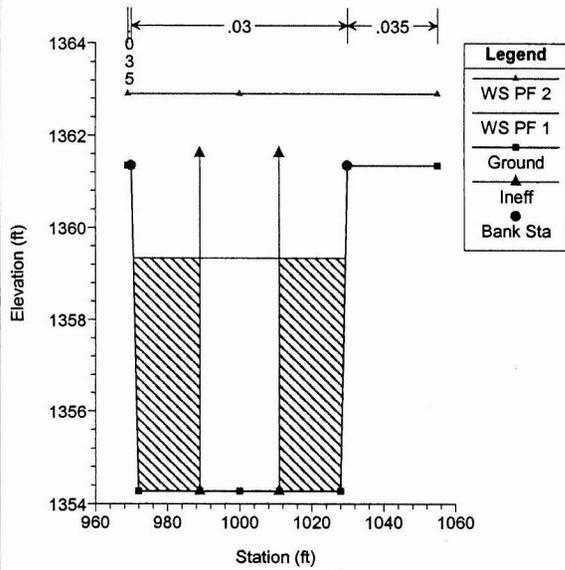
River = 71 St. Channel Reach = Lower Reach RS = 35411 71st St. Channel





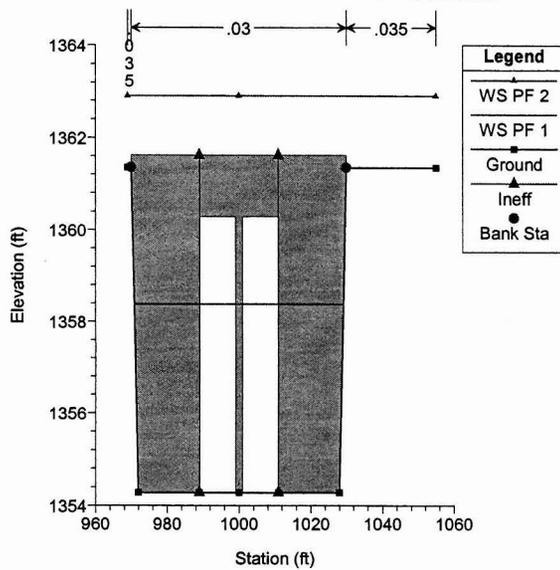
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 34336 71st St. Channel - Upstream Face of Culvert



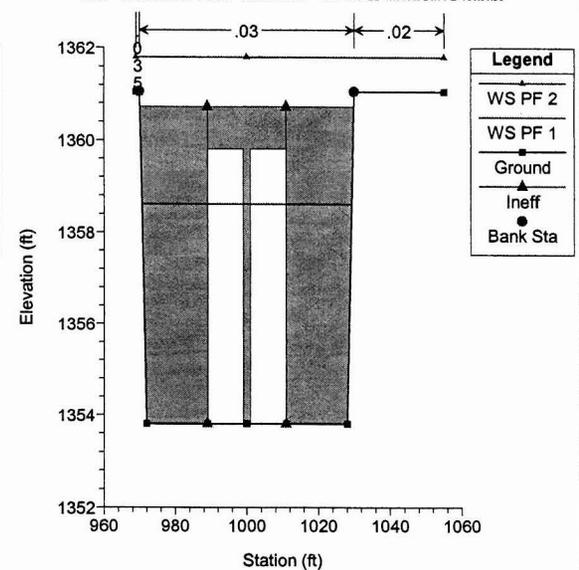
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 34322 Mesal Drive 2-10'x6'x30'



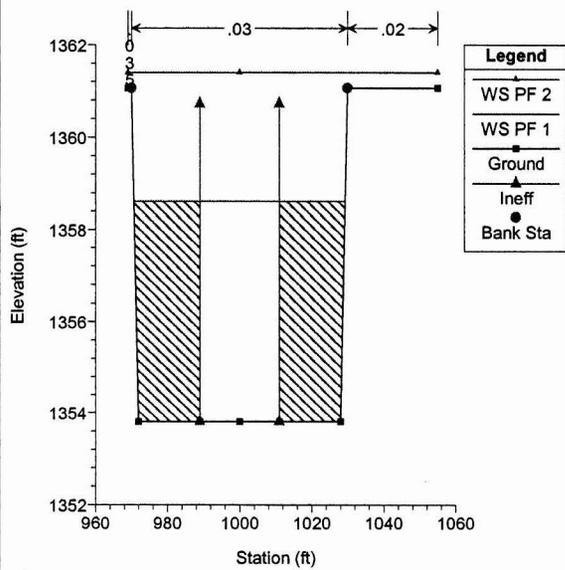
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 34322 Mesal Drive 2-10'x6'x30'



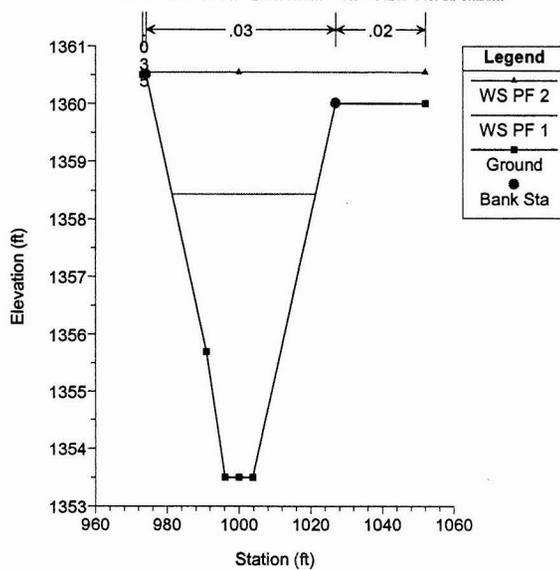
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 34307 71st St. Channel - Downstream Face of Culvert



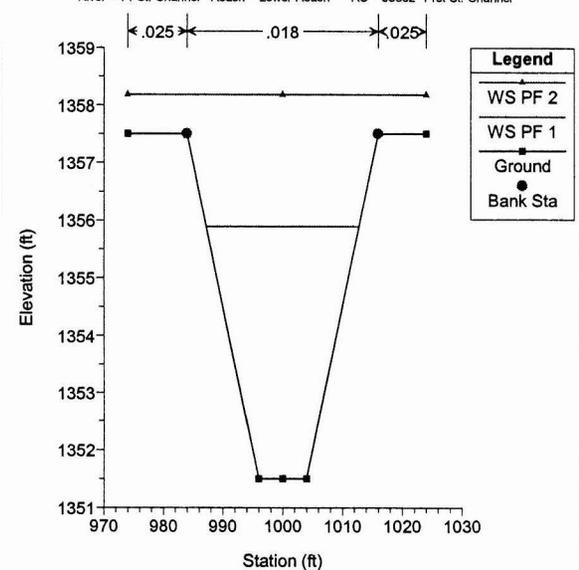
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 34245 71st St. Channel



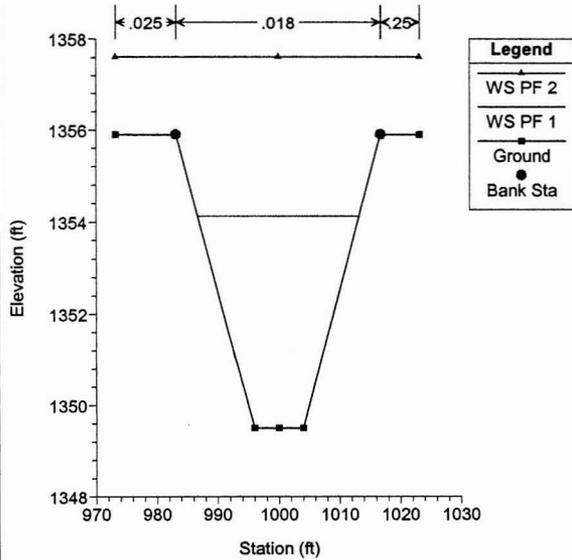
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33832 71st St. Channel



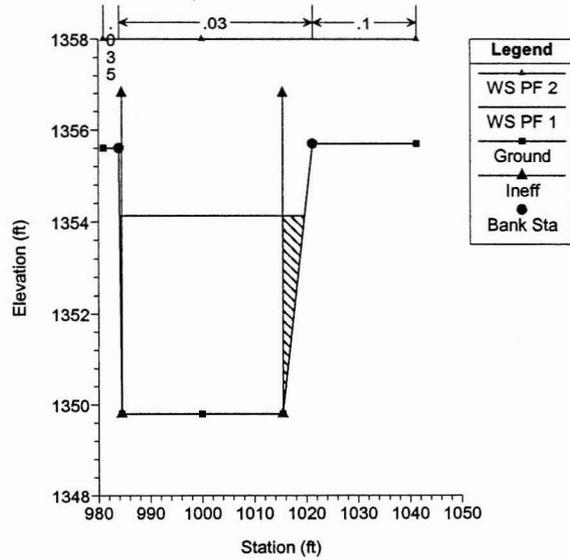
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33446 71st St. Channel



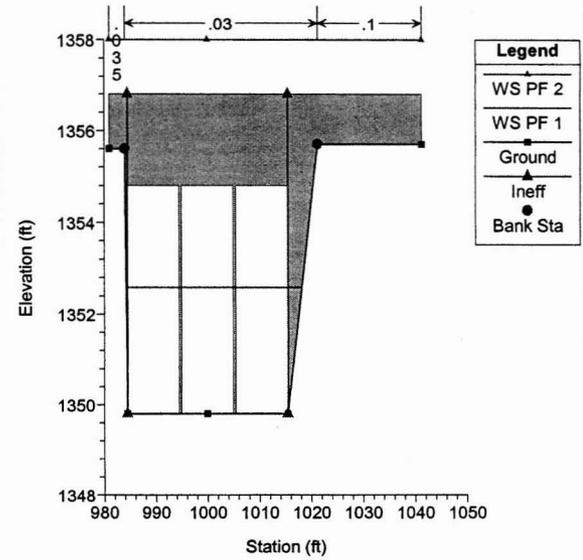
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33413 71st St. Channel - Upstream Face of Culvert



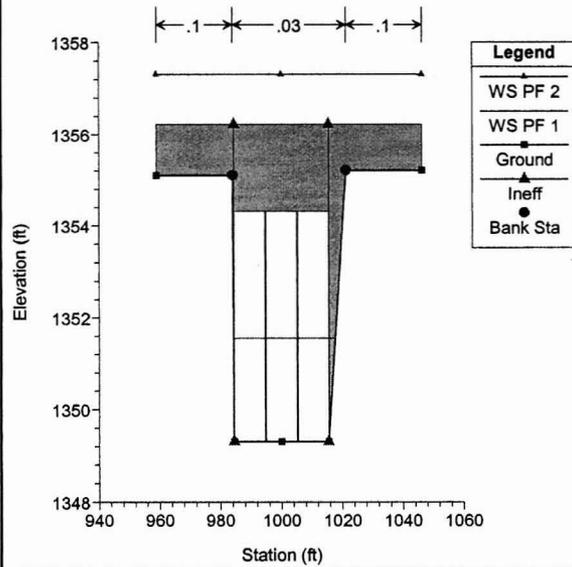
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33382 Sahuaro Drive 3-10x5x60'



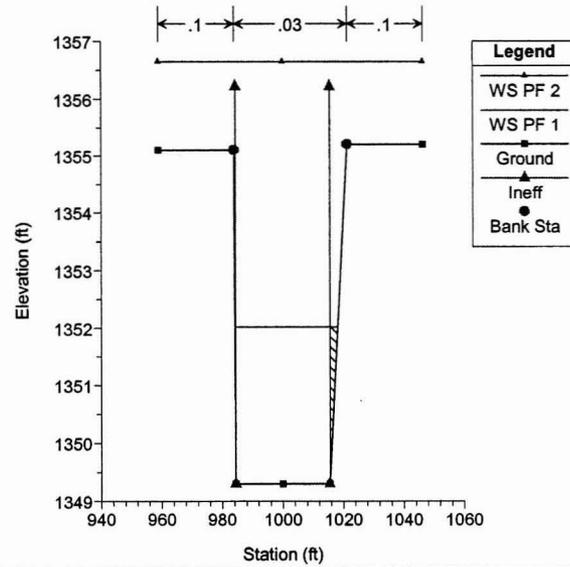
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33382 Sahuaro Drive 3-10x5x60'



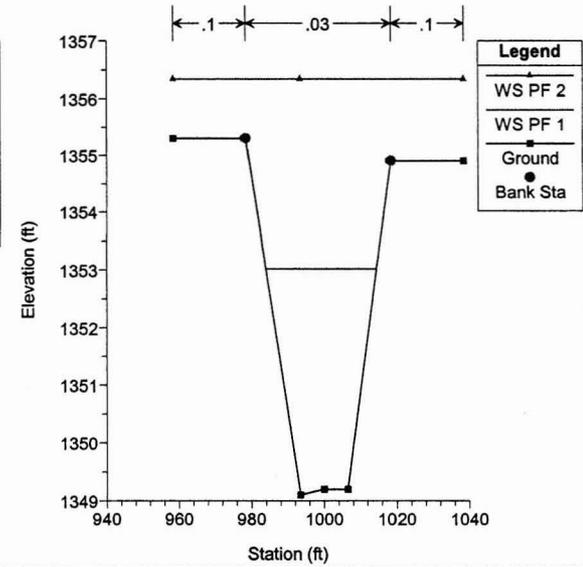
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33352 71st St. Channel - Downstream Face of Culvert



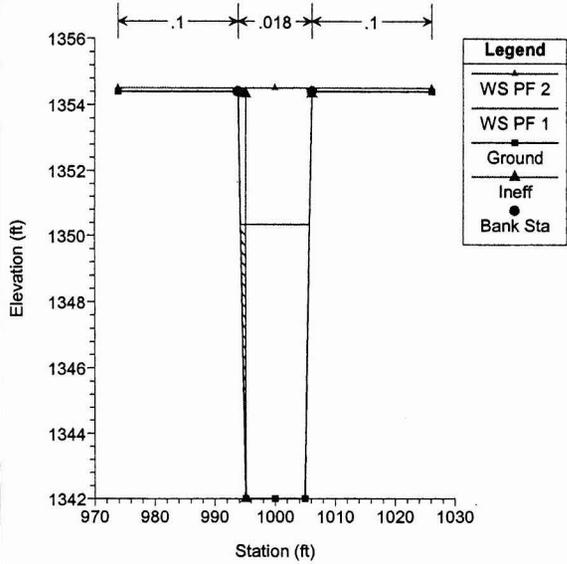
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 33290 71st St. Channel



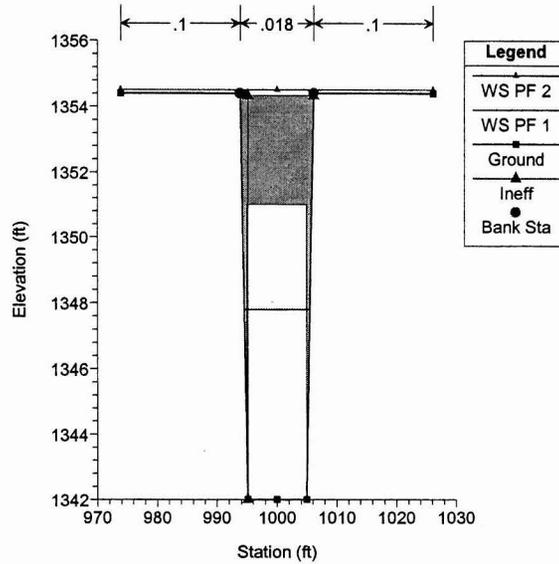
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32899 71st St. Channel - Upstream Face of Culvert



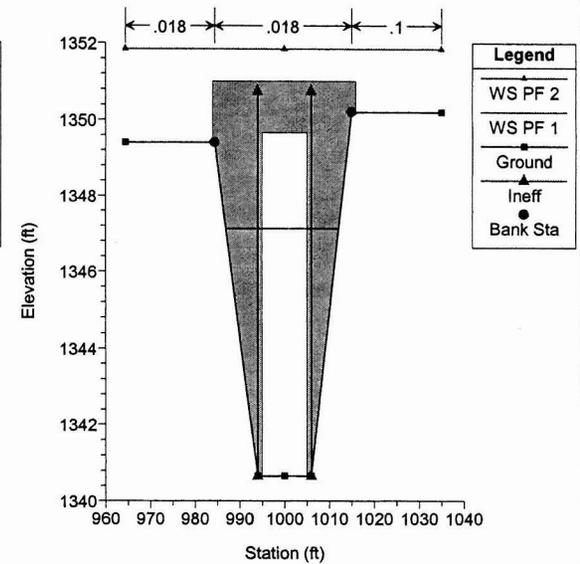
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32713 Shea Boulevard 1-10'S9'341"



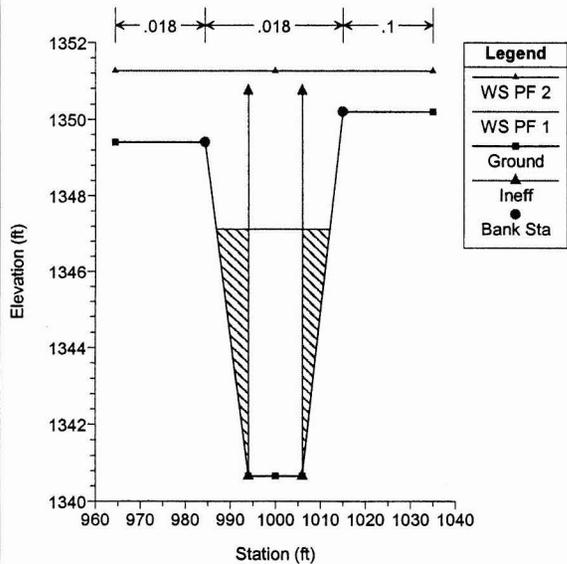
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32713 Shea Boulevard 1-10'S9'341"



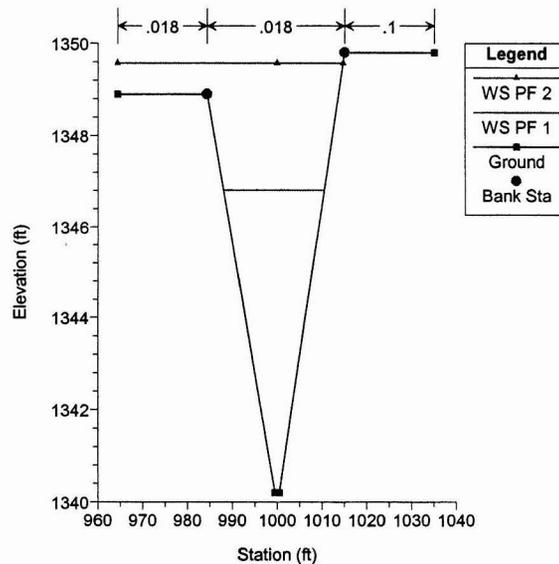
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32542 71st St. Channel - Downstream Face of Culvert



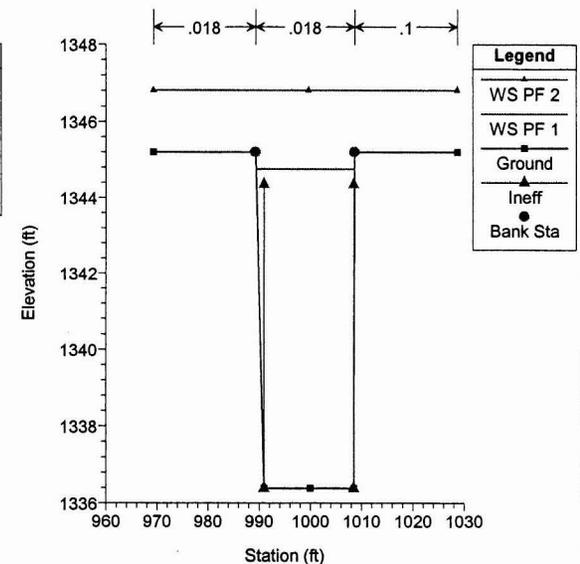
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32392 71st St. Channel



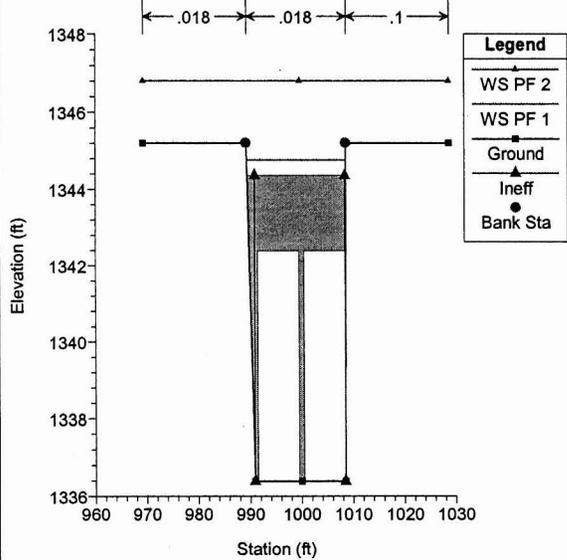
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 32024 71st St. Channel - Upstream Face of Culvert



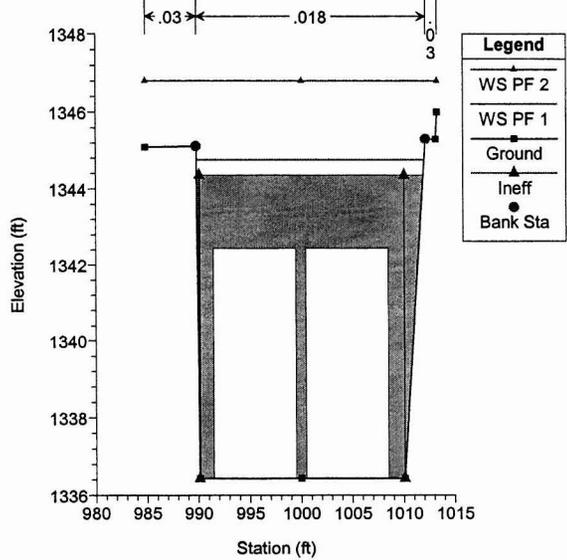
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31988 Cochise Road 2-8'x6'x70'



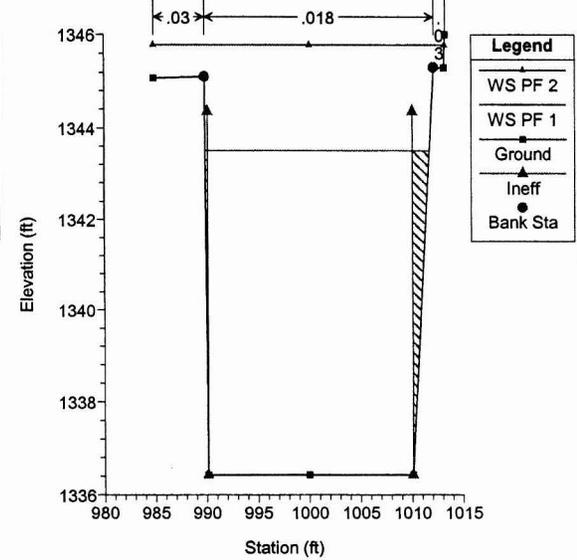
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31988 Cochise Road 2-8'x6'x70'



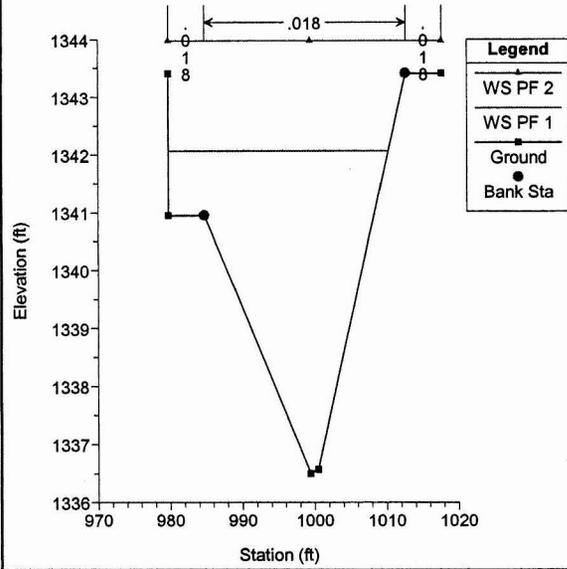
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31952 71st St. Channel - Downstream Face of Culvert



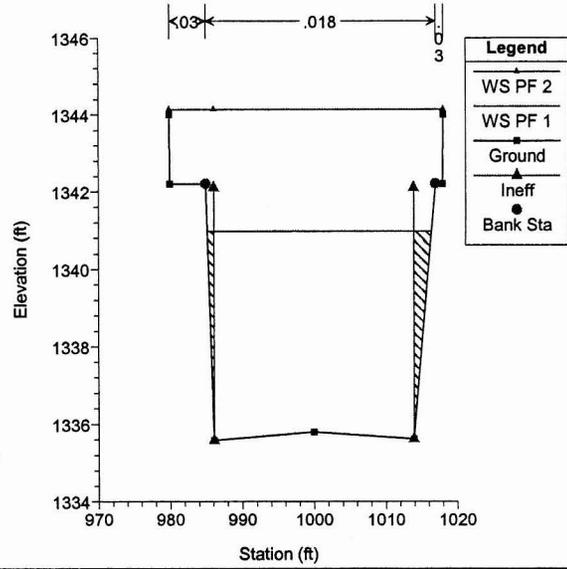
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31657 71st St. Channel



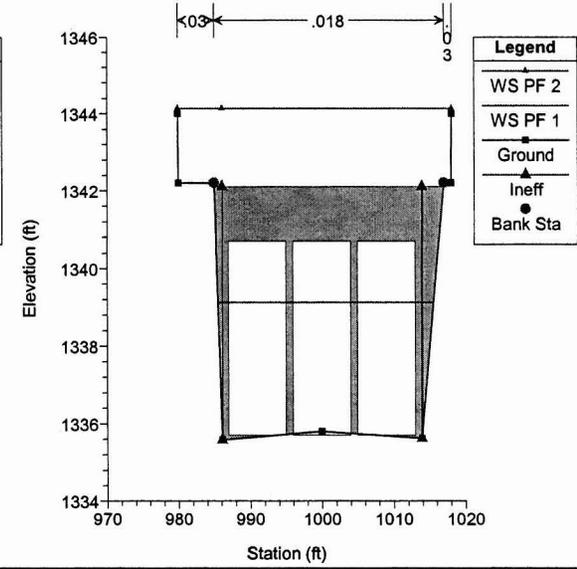
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31292 71st St. Channel - Upstream Face of Culvert



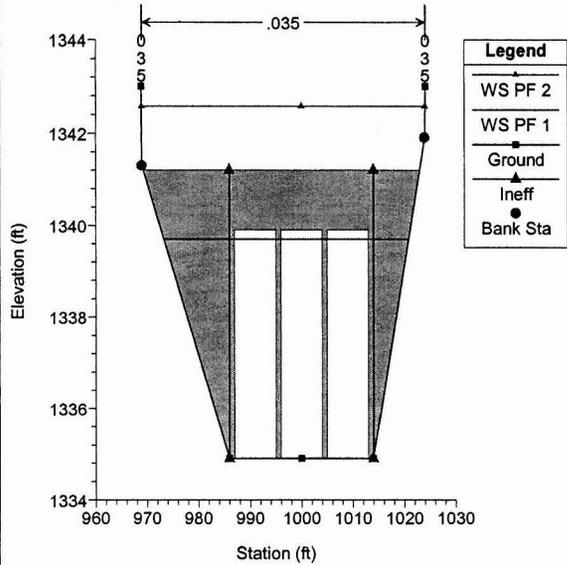
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31242 3 - 8' x 5' RCBC @ Gold Dust



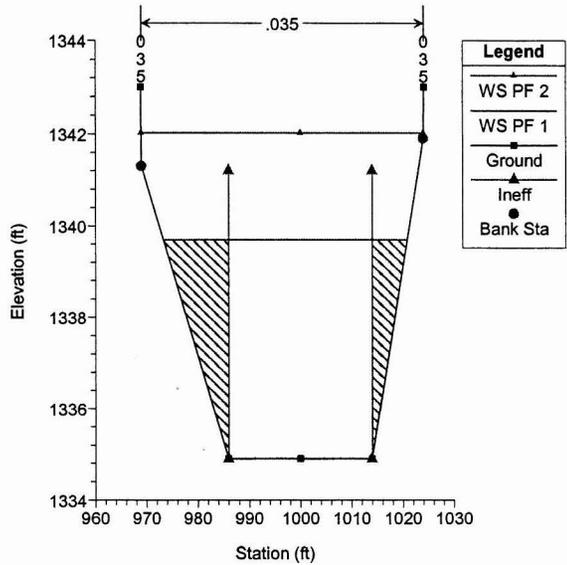
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31242 3 - 8' x 5' RCBC @ Gold Dust



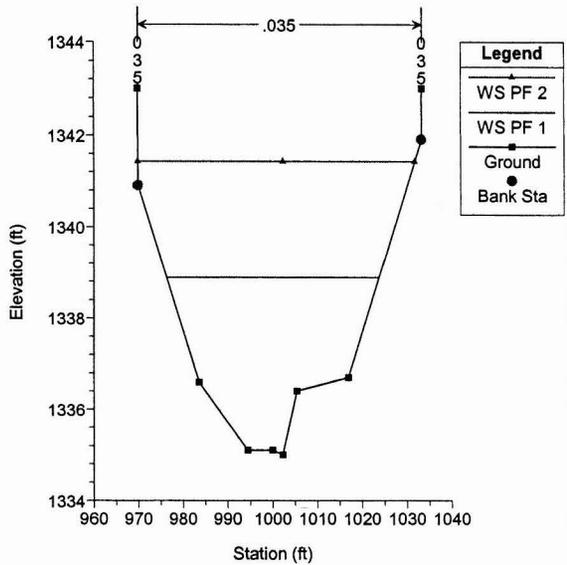
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31192 71st St. Channel - Downstream Face of Culvert



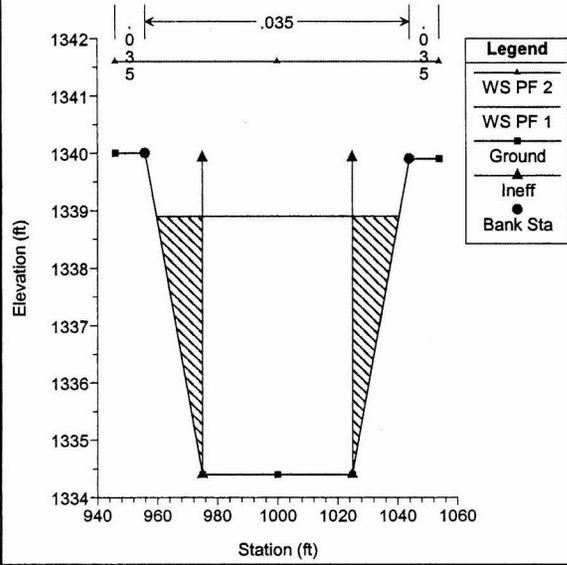
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 31066 71st St. Channel



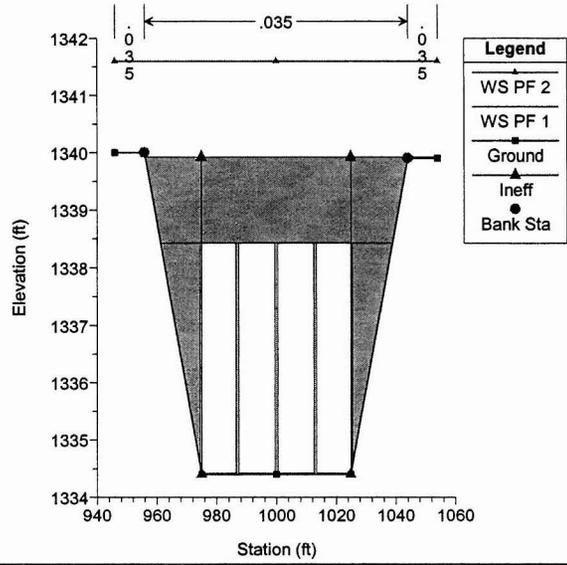
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 30869 71st St. Channel - Upstream Face of Culvert



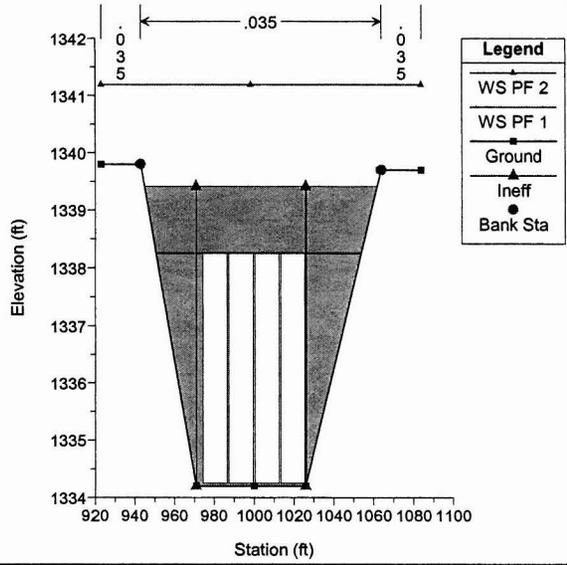
Preferred Alternative Plan: Preferred Alt

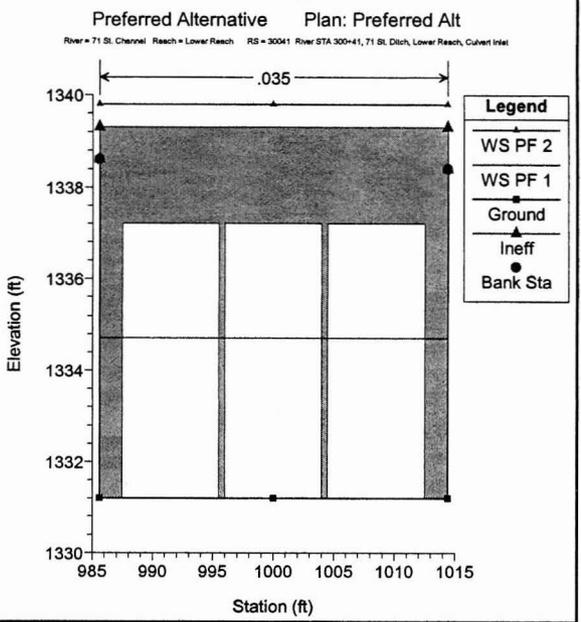
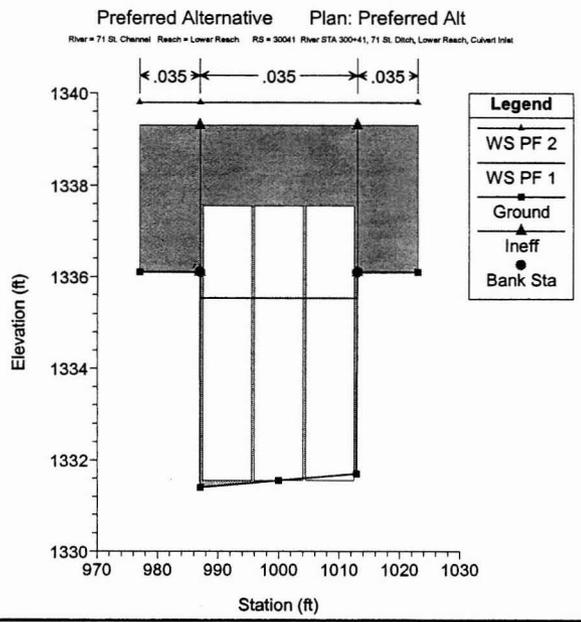
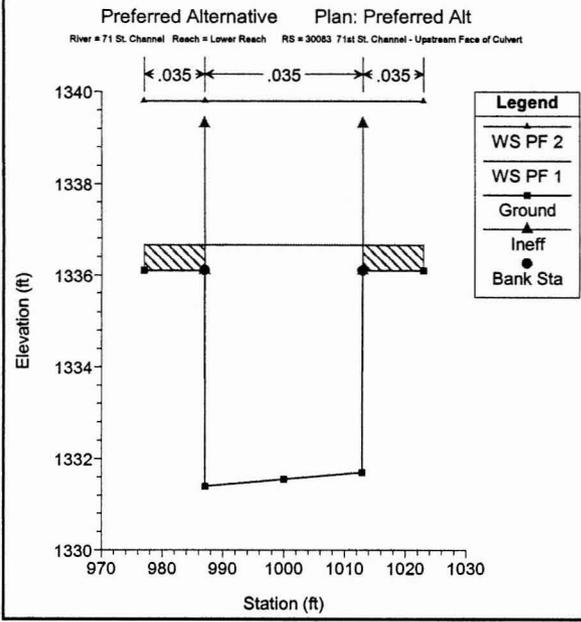
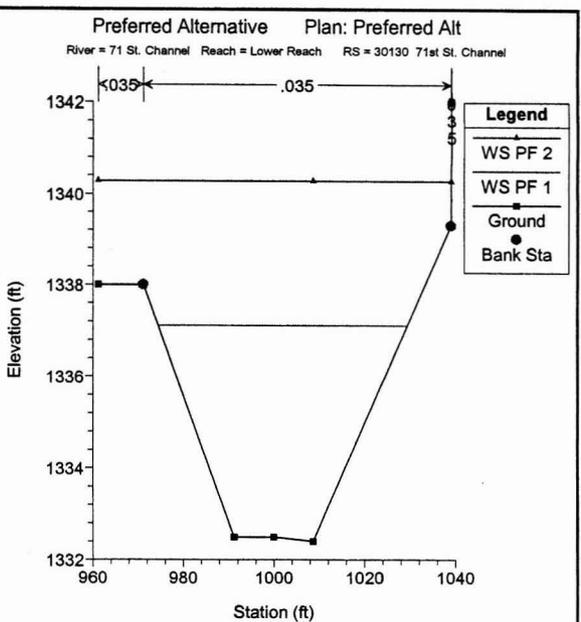
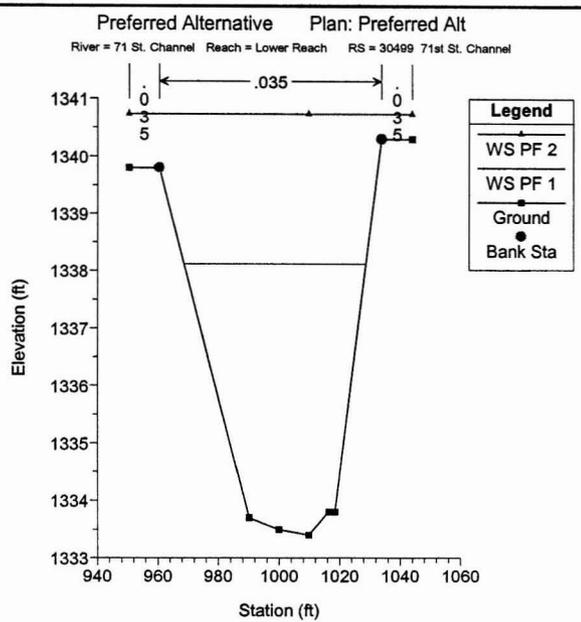
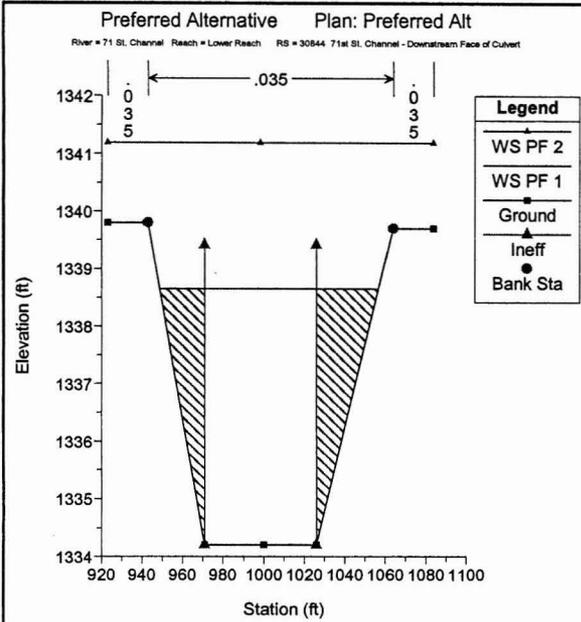
River = 71 St. Channel Reach = Lower Reach RS = 30866



Preferred Alternative Plan: Preferred Alt

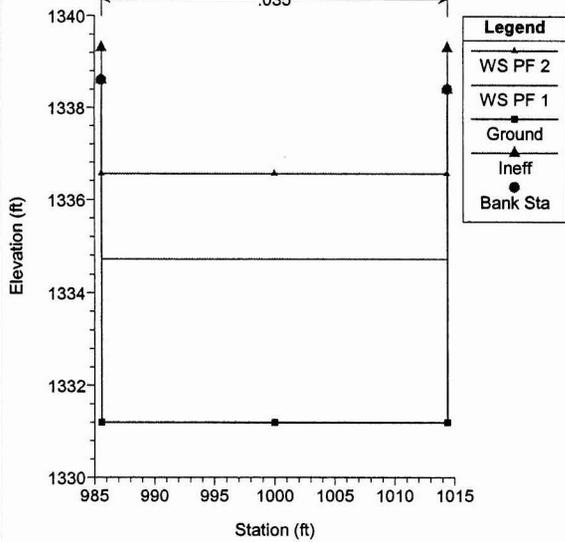
River = 71 St. Channel Reach = Lower Reach RS = 30866





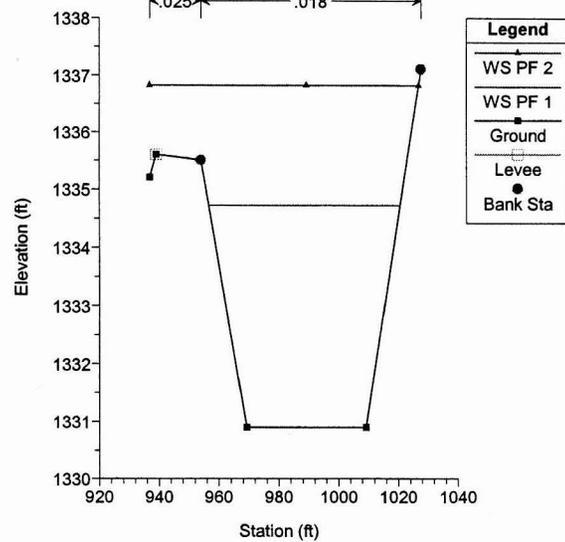
Preferred Alternative Plan: Preferred Alt

River = 71 St. Channel Reach = Lower Reach RS = 30000 71st St. Channel - Downstream Face of Culvert



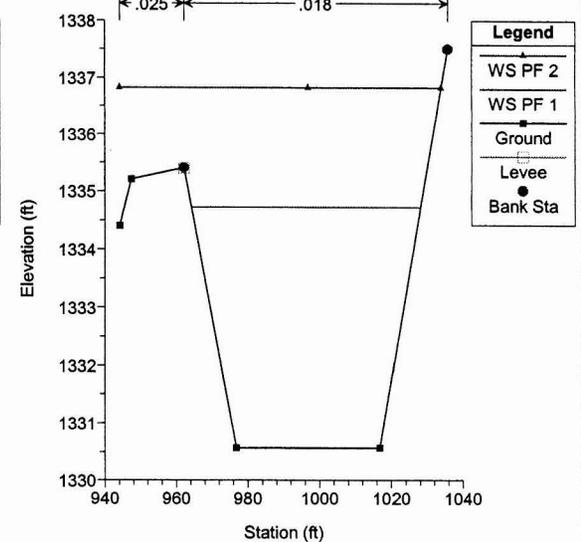
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Upper East Reach RS = 18515 Bernell Ditch



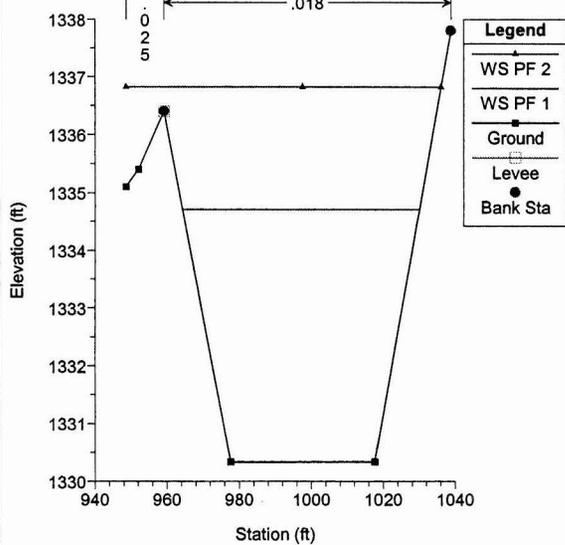
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Upper East Reach RS = 18195 Bernell Ditch



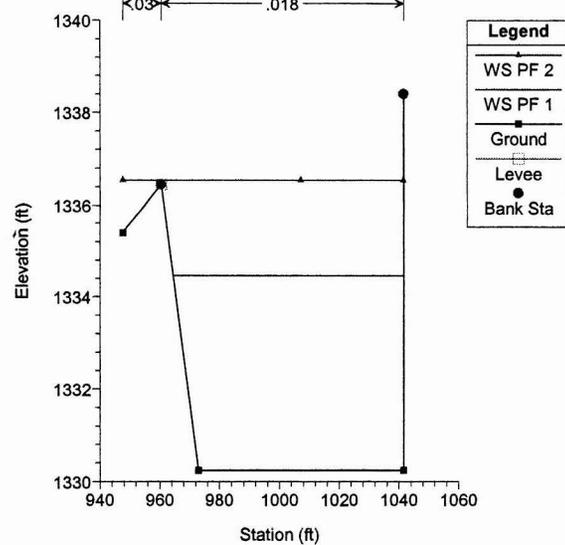
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Upper East Reach RS = 17960 Bernell Ditch



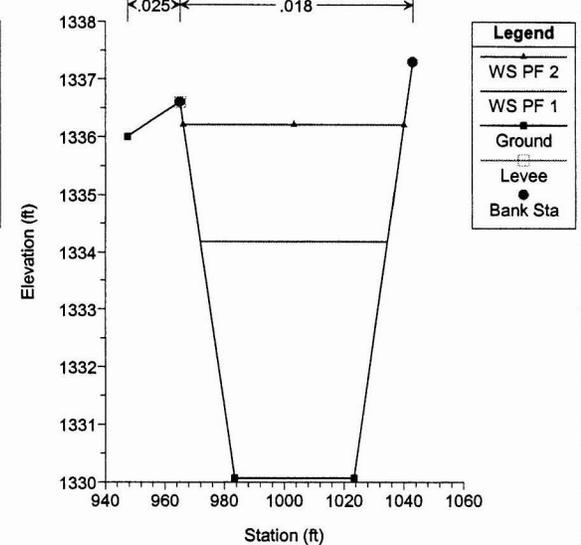
Preferred Alternative Plan: Preferred Alt

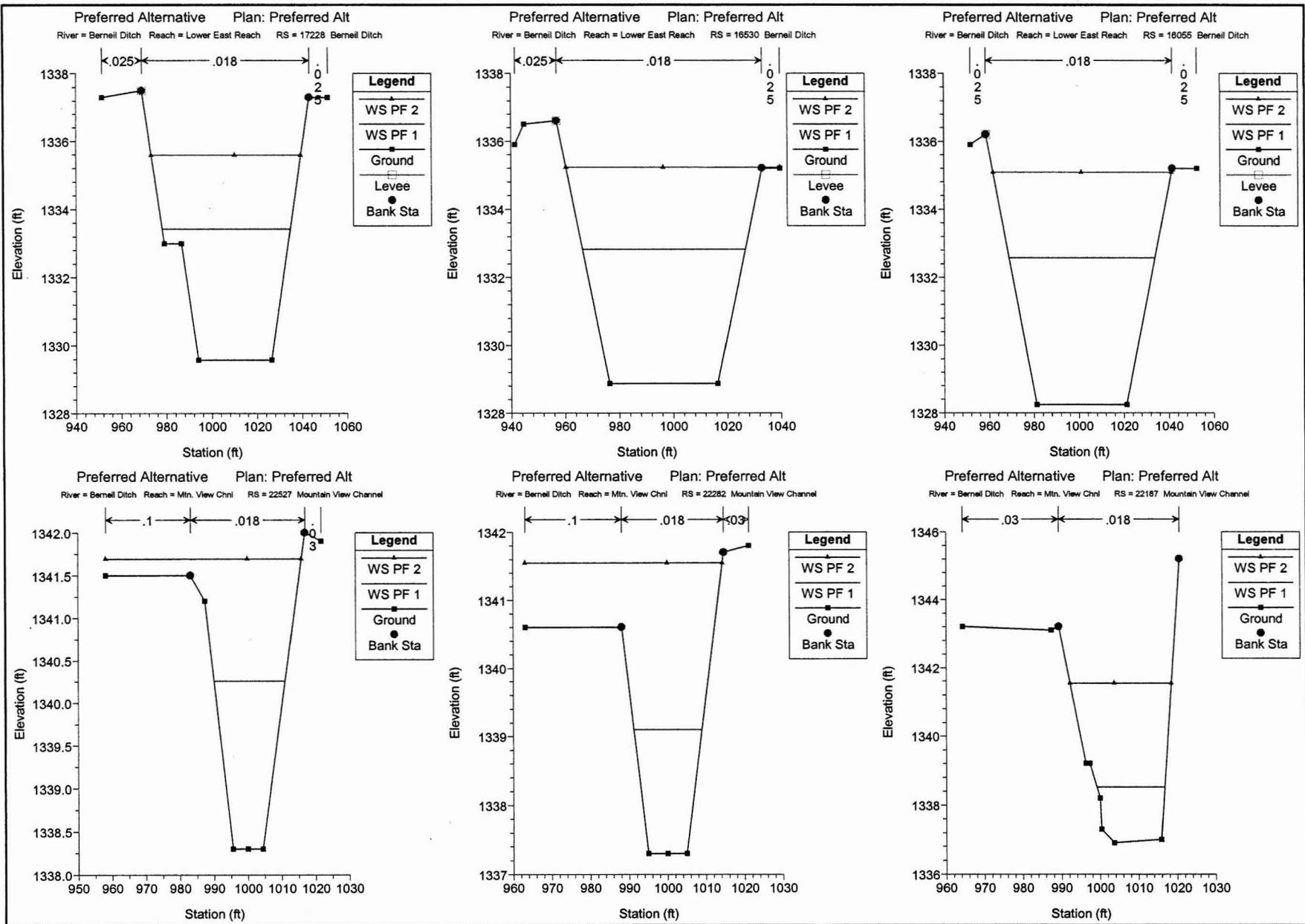
River = Bernell Ditch Reach = Lower East Reach RS = 17873 Bernell Ditch

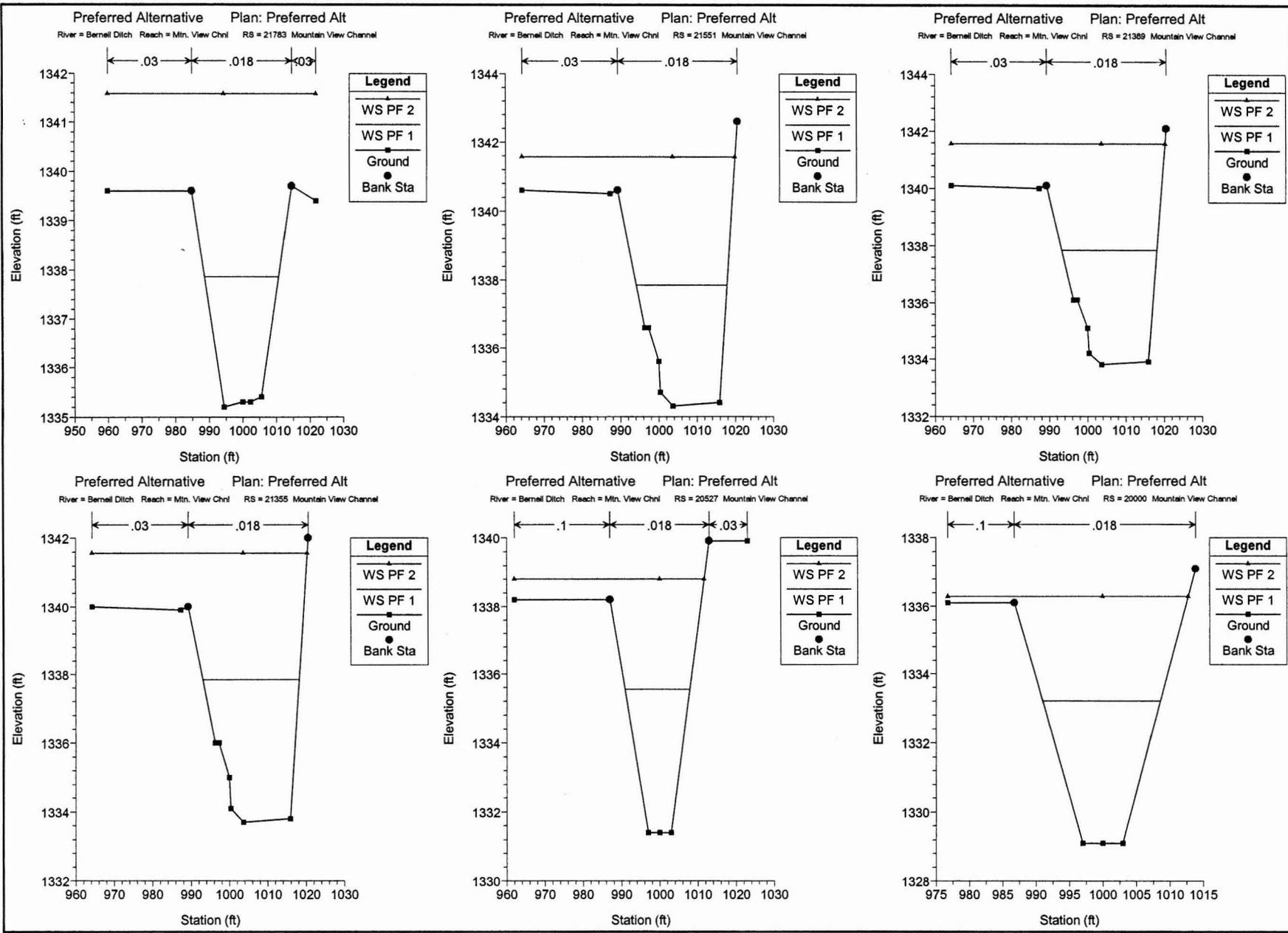


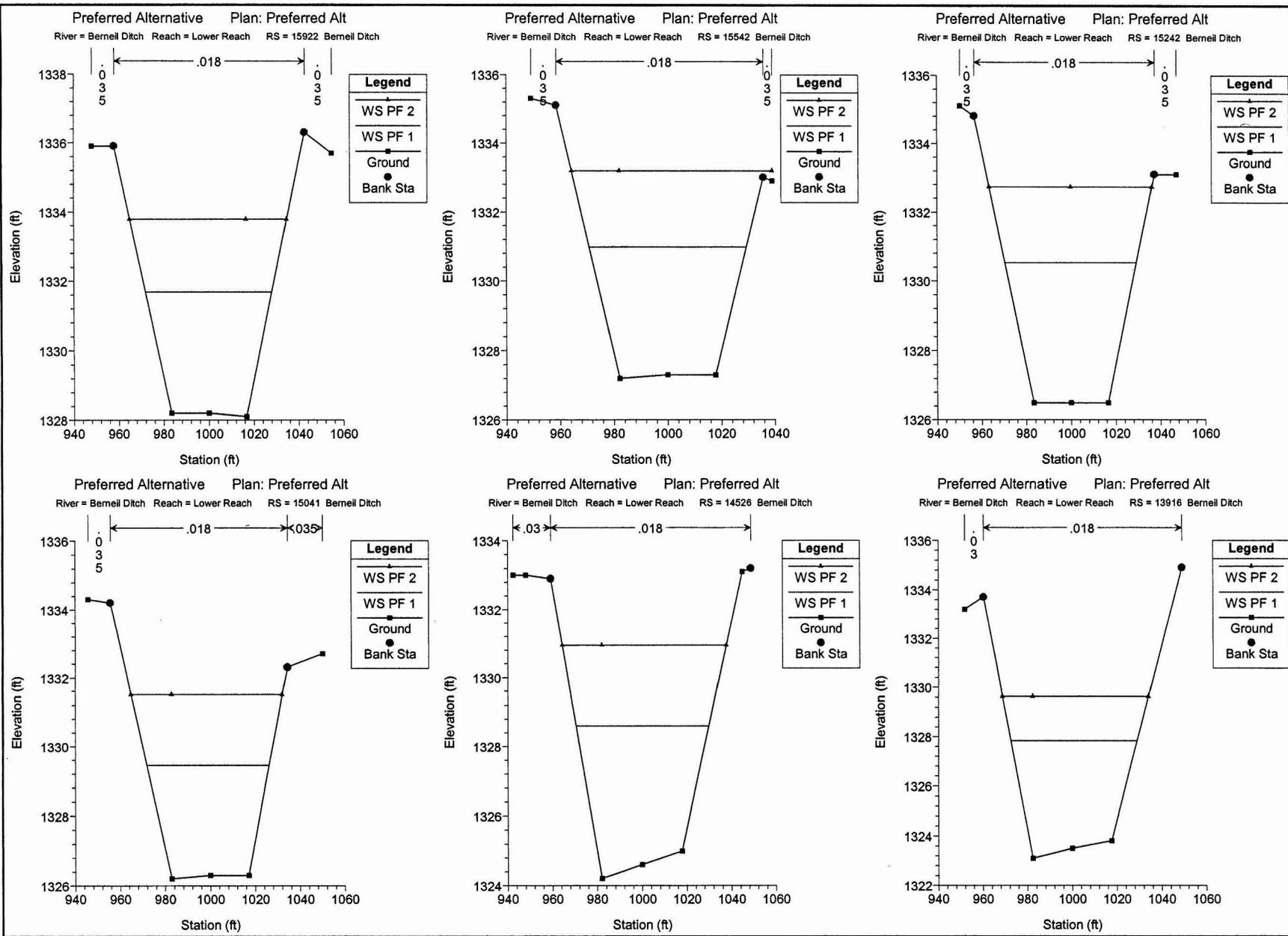
Preferred Alternative Plan: Preferred Alt

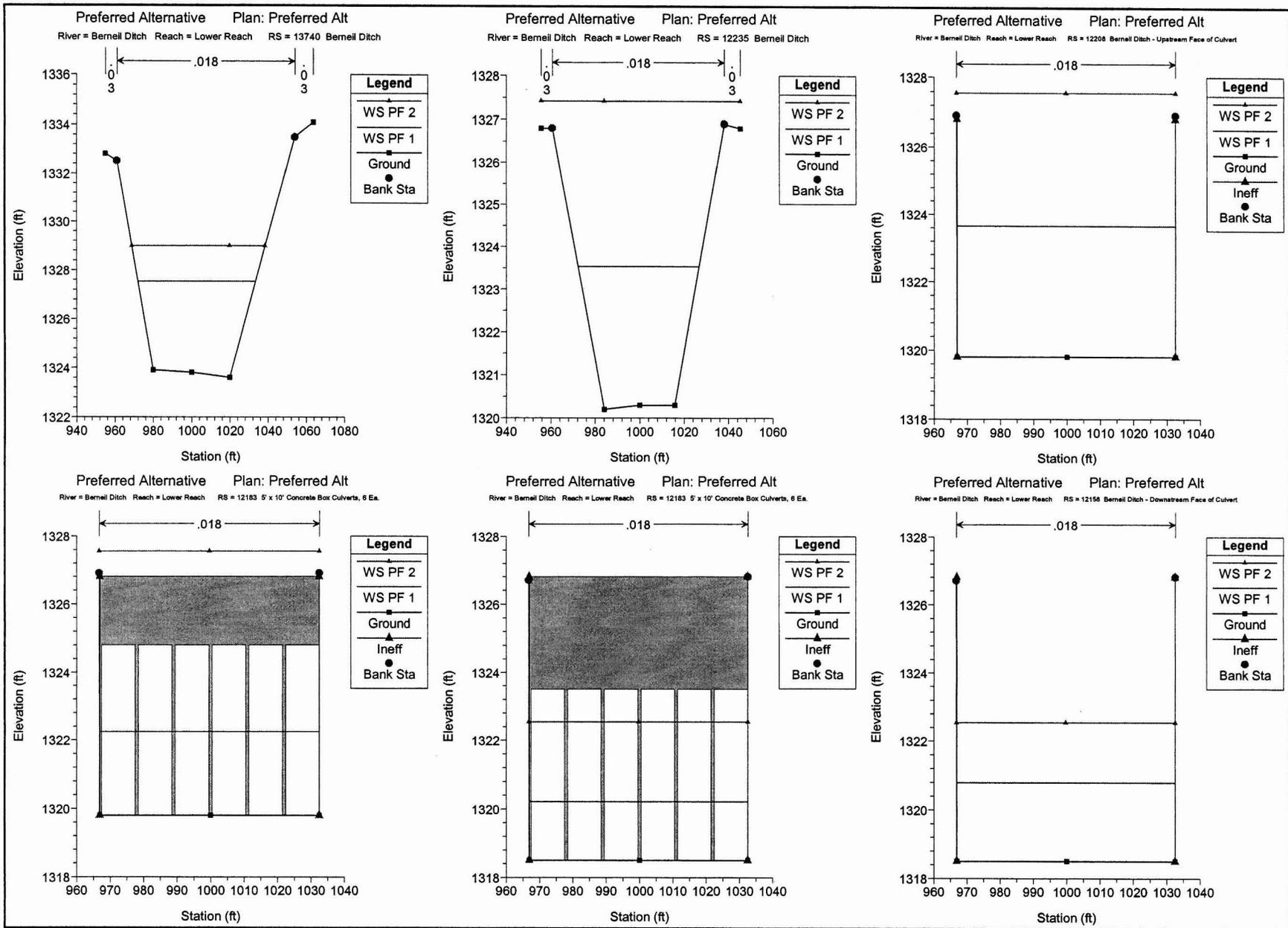
River = Bernell Ditch Reach = Lower East Reach RS = 17705 Bernell Ditch





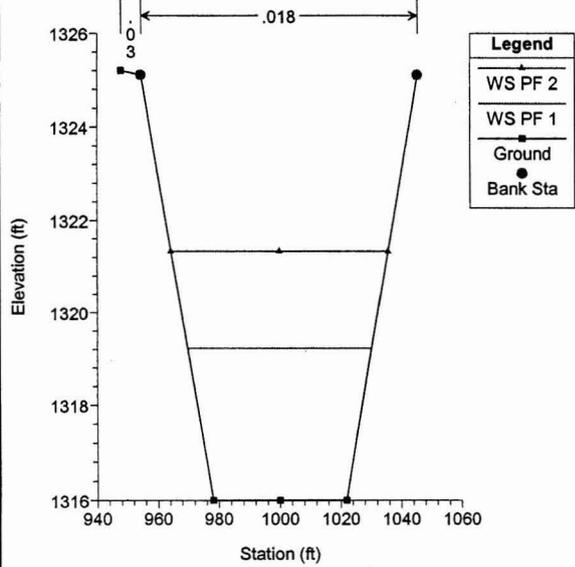






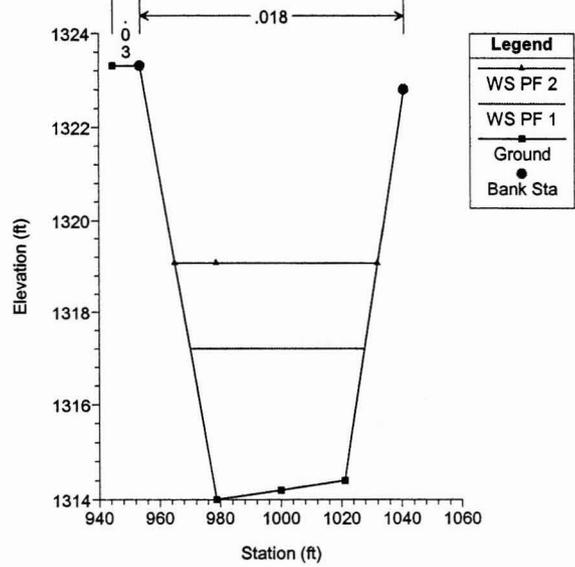
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Lower Reach RS = 12058 Bernell Ditch



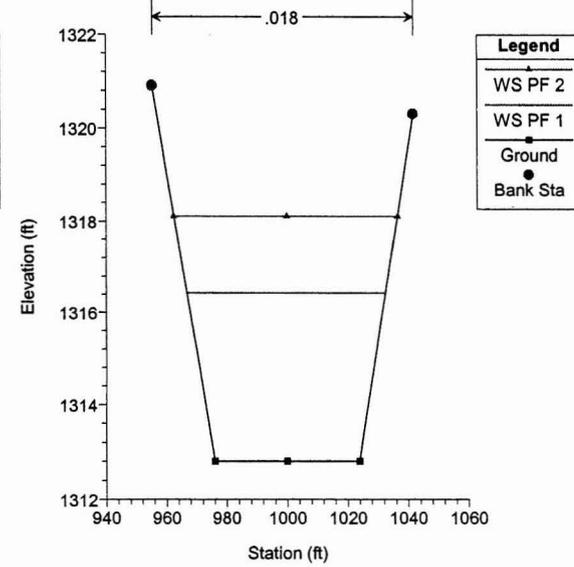
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Lower Reach RS = 11408 Bernell Ditch



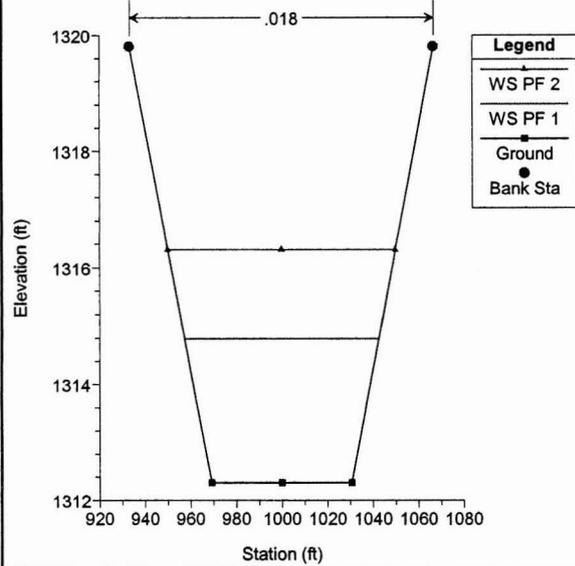
Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Lower Reach RS = 10808 Bernell Ditch



Preferred Alternative Plan: Preferred Alt

River = Bernell Ditch Reach = Lower Reach RS = 10000 Bernell Ditch



**"WITH RECOMMENDED ALTERNATIVE" HEC-RAS  
HYDRAULICS REPORT & CULVERT TABLE**

RECOMMENDED  
 ALTERNATIVE  
 SCI #15586

```

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   X
XXXXXXXX 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   X   XXXXXX   XXXX   X   X   X   X   XXXXX
  
```

**PROJECT DATA**

Project Title: Preferred Alternative  
 Project File : PrefAltrev01.prj  
 Run Date and Time: 10/18/02 9:20:46 AM

Project in English units

**Project Description:**

Scottsdale Rd Corridor Master Drainage  
 Berneil Ditch, Mountain View Ditch and  
 71st Street Channel  
 Existing Conditions/Preferred Alt  
 Profile No. 1: 10-yr  
 6-hr  
 Profile No. 2: 100-yr 6-hr  
 Flow Rates Based on 15586B.DAT and  
 15586B10.DAT Existing Conditions HEC-1 Models

**PLAN DATA**

Plan Title: Preferred Alt  
 Plan File : q:\15586\Final\Models\HEC-RAS\PrefAltrev01.p06

Geometry Title: Preferred Alternative, 40 foot bottom wi  
 Geometry File : q:\15586\Final\Models\HEC-RAS\PrefAltrev01.g07

Flow Title : Upper 71 St Chanl Flow Reduction  
 Flow File : q:\15586\Final\Models\HEC-RAS\PrefAltrev01.f01

**Plan Summary Information:**

Number of: Cross Sections = 76    Multiple Openings = 0  
 Culverts = 9    Inline Weirs = 0  
 Bridges = 0

**Computational Information**

Water surface calculation tolerance = 0.01  
 Critical depth calculation tolerance = 0.01  
 Maximum number of iterations = 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: Upper 71 St Chanl Flow Reduction  
 Flow File : q:\15586\Final\Models\HEC-RAS\PrefAltrev01.f01

**Flow Data (cfs)**

River	Reach	RS	PF 1	PF 2
71 St. Channel	Lower Reach	37941	498	1171
71 St. Channel	Lower Reach	37048	13	686
71 St. Channel	Lower Reach	34378	659	1461
71 St. Channel	Lower Reach	34245	712	1568
71 St. Channel	Lower Reach	33446	792	1655
71 St. Channel	Lower Reach	32542	822	1713
Berneil Ditch	Upper East Reach	18515	176	215
Berneil Ditch	Lower East Reach	17873	1009	2027
Berneil Ditch	Mtn. View Chnl	22527	169	359
Berneil Ditch	Mtn. View Chnl	20527	456	1379
Berneil Ditch	Lower Reach	15922	1294	3013

**Boundary Conditions**

River	Reach	Profile	Upstream	Downstream
Berneil Ditch	Lower Reach	PF 1		Normal S = .0027
Berneil Ditch	Lower Reach	PF 2		Normal S = .0027

Changes in WS and EG

River	Reach	RS	Profile	Type	Value
71 St. Channel	Lower Reach	33352	PF 2	Known WS	1356.65
71 St. Channel	Lower Reach	33352	PF 1	Known WS	1350.34
71 St. Channel	Lower Reach	33290	PF 2	Known WS	1356.34
71 St. Channel	Lower Reach	33290	PF 1	Known WS	1350.34
71 St. Channel	Lower Reach	32899	PF 2	Known WS	1354.51
71 St. Channel	Lower Reach	32899	PF 1	Known WS	1350.34

GEOMETRY DATA

Geometry Title: Preferred Alternative, 40 foot bottom wi  
 Geometry File : q:\15586\Final\Models\HEC-RAS\PrefAltrev01.g07

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
71 St. Channel	Lower Reach		Bern/71 Jct
Berneil Ditch	Upper East Reach		Bern/71 Jct
Berneil Ditch	Lower East Reach	Bern/71 Jct	Berneil Jct
Berneil Ditch	Mtn. View Chnl		Berneil Jct
Berneil Ditch	Lower Reach	Berneil Jct	

JUNCTION INFORMATION

Name: Berneil Jct  
 Description: West Reach/Lower East Reach/Lower Reach  
 Momentum computation Method  
 Add Friction  
 Do Not Add Weight

Length across Junction		Tributary		Length	Angle
River	Reach	River	Reach		
Berneil Ditch	Lower East Reach	to Berneil Ditch	Lower Reach	110	45
Berneil Ditch	Mtn. View Chnl	to Berneil Ditch	Lower Reach	160	10

Name: Bern/71 Jct  
 Description: 71 st ditch/Berneil Lower East Reach/Berneil East Reach  
 Momentum computation Method  
 Add Friction  
 Do Not Add Weight

Length across Junction		Tributary		Length	Angle
River	Reach	River	Reach		
Berneil Ditch	Upper East Reach	to Berneil Ditch	Lower East Reach	82	0
71 St. Channel	Lower Reach	to Berneil Ditch	Lower East Reach	50	45

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37941

INPUT

Description: 71st St. Channel  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
974.9	1383	994.9	1383	995.1	1379.1	1000	1379.1	1004.9	1379.2
1005.2	1383	1025.2	1383						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
974.9	.018	994.9	.018	1005.2	.018

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 994.9 1005.2 133 133 133 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37808

INPUT

Description: 71st St. Channel  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
937.2	1383.2	973.5	1383.2	987.2	1383.8	992.5	1379.1	1000	1378.9
1007.5	1378.7	1013.5	1383.7	1024.1	1385.3	1063.5	1385.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
937.2	.05	987.2	.018	1013.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 987.2 1013.5 108 108 108 .1 .3  
 Left Levee Station= 987.2 Elevation=

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 37700

INPUT

Description: 71st St. Channel - Upstream Face of Culvert  
 Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
939.3	1383.6	989.3	1383.6	989.5	1378.6	991	1378.6	1000	1378.6
1009	1378.6	1010.3	1378.6	1010.5	1383.7	1060.5	1383.7		

Manning's n Values num= 3

Sta n Val Sta n Val Sta n Val  
939.3 .05 989.3 .018 1010.5 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
989.3 1010.5 85 85 85 .1 .3

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent

888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 37658

INPUT

Description: Paradise Dr., 2 - 10'x3'x83' CBC

Distance from Upstream XS = 1

Deck/Roadway Width = 82

Weir Coefficient = 3

Upstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
940 1383.69 1060 1383.69

Upstream Bridge Cross Section Data

Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
939.3 1383.6 989.3 1383.6 989.5 1378.6 991 1378.6 1000 1378.6  
1009 1378.6 1010.3 1378.6 1010.5 1383.7 1060.5 1383.7

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
939.3 .05 989.3 .018 1010.5 .05

Bank Sta: Left Right Coeff Contr. Expan.  
989.3 1010.5 .1 .3

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent

888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
940 1382.93 1060 1382.93

Downstream Bridge Cross Section Data

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
984.3 1382.9 989.3 1382.9 989.5 1378.5 1000 1378.5 1010.5 1378.6  
1010.7 1382.9 1060.7 1382.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
984.3 .1 989.3 .018 1010.7 .05

Bank Sta: Left Right Coeff Contr. Expan.  
989.3 1010.7 .1 .3

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent

888 F  
888 F

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 = 1383.69  
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  
Paradise Dr. Box 3 10  
FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG  
Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
1 83 .013 .5 1

Number of Barrels = 2

Upstream Elevation = 1378.59

Centerline Stations

Sta. Sta.  
994.5 1005.5

Downstream Elevation = 1378.55

Centerline Stations

Sta. Sta.  
994.5 1005.5

CULVERT OUTPUT Profile #PF 1

Culvert ID : Paradise Dr.

Culv Q (cfs) 423.43 Culv Ful Lngh (ft) 83.00  
# Barrels 2 Culv Vel US (ft/s) 7.06  
Q Barrel (cfs) 211.72 Culv Vel DS (ft/s) 7.06  
E.G. US. (ft) 1384.04 Culv Inv El Up (ft) 1378.59  
W.S. US. (ft) 1383.71 Culv Inv El Dn (ft) 1378.55  
E.G. DS (ft) 1383.13 Culv Frctn Ls (ft) 0.26  
W.S. DS (ft) 1382.62 Culv Ext Lss (ft) 0.26  
Delta EG (ft) 0.91 Culv Ent Lss (ft) 0.39



1003.8 1376.3 1006.8 1377.1 1007.3 1379.7 1057.3 1379.7

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
937 .1 987 .02 1007.3 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
987 1007.3 200 200 200 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36712

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
942.3 1376.3 992.3 1376.3 995.3 1375.6 1000 1375.6 1004.8 1375.6  
1007.8 1376.4 1057.8 1376.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
942.3 .1 992.3 .02 1007.8 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
992.3 1007.8 48 48 48 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36664

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
941.9 1375.8 991.9 1375.8 995.3 1375.2 1000 1375.2 1004.7 1375.2  
1008.1 1375.8 1058.1 1375.8

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
941.9 .1 991.9 .02 1008.1 .1

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
991.9 1008.1 85 85 85 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36579

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
941.9 1375.6 991.9 1375.6 995.2 1374.7 1000 1374.7 1004.9 1374.7  
1006.9 1375.5 1011.9 1375.5

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
941.9 .1 991.9 .02 1006.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
991.9 1006.9 273 273 273 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36306

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 6  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
937.46 1373.71 987.46 1373.71 990.64 1372.86 1000 1372.85 1002.9 1373.65  
1052.9 1373.65

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
937.46 .035 987.46 .016 1002.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
987.46 1002.9 73 73 73 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36233

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
935.3 1372.71 985.3 1372.71 985.4 1372.21 1000 1372.05 1015.75 1372.14  
1015.85 1372.64 1065.85 1372.64

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
935.3 .035 985.3 .016 1015.85 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
985.3 1015.85 145 145 145 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 36088

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
934.6	1371.71	984.6	1371.71	984.7	1371.21	1000	1370.86	1016	1371.21
1016.1	1371.71	1066.1	1371.71						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
934.6	.035	984.6	.016	1016.1	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

984.6	1016.1	243	243	243	.1	.3
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CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35845

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
934.6	1370.09	984.6	1370.09	984.7	1369.59	1000	1369.45	1016	1369.59
1016.1	1370.09	1066.1	1370.09						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
934.6	.035	984.6	.016	1016.1	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

984.6	1016.1	352	352	352	.1	.3
-------	--------	-----	-----	-----	----	----

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35493

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
934.6	1368.08	984.6	1368.08	984.7	1367.58	1000	1367.25	1016	1367.57
1016.1	1368.07	1066.1	1368.07						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
934.6	.035	984.6	.016	1016.1	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

984.6	1016.1	82	82	82	.1	.3
-------	--------	----	----	----	----	----

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35411

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
934.5	1367.52	984.5	1367.52	984.6	1367.02	1000	1366.83	1016	1367.03
1016.1	1367.53	1066.1	1367.53						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
934.5	.035	984.5	.016	1016.1	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

984.5	1016.1	100	100	100	.1	.3
-------	--------	-----	-----	-----	----	----

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35311

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
911.3	1367.1	961.3	1367.1	961.4	1366.6	987.2	1366.27	1000	1366
1012.8	1366.44	1032.6	1366.61	1032.7	1367.11	1082.7	1367.11		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
911.3	.025	961.3	.016	1032.7	.025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

961.3	1032.7	59	59	59	.1	.3
-------	--------	----	----	----	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35252

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
987	1366.8	988	1366.8	994	1365	1000	1365.1	1006	1365.1
1010.2	1367.2	1011.2	1367.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
987	.035	988	.018	1010.2	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

988	1010.2	229	229	229	.1	.3
-----	--------	-----	-----	-----	----	----

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 35023

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
988.3 1365.4 989.3 1365.4 994.1 1363.7 1000 1363.8 1005.9 1364  
1009.3 1365.4 1010.3 1365.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
988.3 .035 989.3 .018 1009.3 .035

Bank Sta: Left Right Lengths: Left Channel Right Channel Coeff Contr. Expan.  
989.3 1009.3 150 150 150 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34873

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
989 1364.8 990 1364.8 994.2 1363.4 1000 1363.3 1005.9 1363.3  
1010.9 1365 1011.9 1365

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
989 .035 990 .018 1010.9 .035

Bank Sta: Left Right Lengths: Left Channel Right Channel Coeff Contr. Expan.  
990 1010.9 200 200 200 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34673

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
988.4 1364.6 989.4 1364.6 993.8 1362.7 1000 1362.7 1006.2 1362.7  
1010.4 1364.4 1011.4 1364.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
988.4 .035 989.4 .018 1010.4 .035

Bank Sta: Left Right Lengths: Left Channel Right Channel Coeff Contr. Expan.  
989.4 1010.4 295 295 295 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34378

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
956.2 1363.6 961.2 1363.6 992.2 1354.5 1000 1354.5 1007.8 1354.5  
1032 1360.9 1057 1360.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
956.2 .035 961.2 .03 1032 .035

Bank Sta: Left Right Lengths: Left Channel Right Channel Coeff Contr. Expan.  
961.2 1032 40 40 40 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34338

INPUT

Description: 71st St. Channel -, Upstream Face of Culvert  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
969 1361.35 970 1361.35 972 1354.28 989 1354.28 1000 1354.28  
1011 1354.28 1028 1354.28 1030 1361.35 1055 1361.35

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
969 .035 970 .03 1030 .035

Bank Sta: Left Right Lengths: Left Channel Right Channel Coeff Contr. Expan.  
970 1030 31 31 31 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 34322

INPUT

Description: Mescal Drive 2-10'x6'x30'  
Distance from Upstream XS = 1  
Deck/Roadway Width = 25  
Weir Coefficient = 3  
Upstream Deck/Roadway Coordinates num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord

970 1361.61

1030 1361.61

Upstream Bridge Cross Section Data

Station Elevation Data		num= 9		Sta	Elev	Sta	Elev	Sta	Elev
969	1361.35	970	1361.35	972	1354.28	989	1354.28	1000	1354.28
1011	1354.28	1028	1354.28	1030	1361.35	1055	1361.35		

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
969	.035	970	.03	1030	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	970	1030		.3	.5

Ineffective Flow		num=	2
Sta L	Sta R	Elev	Permanent

888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2		Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
970	1360.72	1030	1360.72		

Downstream Bridge Cross Section Data

Station Elevation Data		num= 9		Sta	Elev	Sta	Elev	Sta	Elev
969	1361.05	970	1361.05	972	1353.8	989	1353.8	1000	1353.8
1011	1353.8	1028	1353.8	1030	1361.05	1055	1361.05		

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
969	.035	970	.03	1030	.02

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	970	1030		.3	.5

Ineffective Flow		num=	2
Sta L	Sta R	Elev	Permanent

888 F  
888 F

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 = 1361.61  
 Energy head used in spillway design =  
 Spillway height used in design =  
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert #1	Shape	Rise	Span
	Box	6	10

FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef	Exit Loss Coef
1	30	.013	.5	1

Number of Barrels = 2

Upstream Elevation = 1354.28

Centerline Stations

Sta.	Sta.
994	1006

Downstream Elevation = 1353.8

Centerline Stations

Sta.	Sta.
994	1006

CULVERT OUTPUT Profile #PF 1

Culvert ID : Culvert #1

Culv Q (cfs)	659.00	Culv Ful Lngh (ft)	
# Barrels	2	Culv Vel US (ft/s)	8.05
Q Barrel (cfs)	329.50	Culv Vel DS (ft/s)	6.85
E.G. US. (ft)	1359.88	Culv Inv El Up (ft)	1354.28
W.S. US. (ft)	1359.34	Culv Inv El Dn (ft)	1353.80
E.G. DS (ft)	1359.21	Culv Frctn Ls (ft)	0.04
W.S. DS (ft)	1358.61	Culv Ext Lss (ft)	0.13
Delta EG (ft)	0.67	Culv Ent Lss (ft)	0.50
Delta WS (ft)	0.73	Q Weir (cfs)	
E.G. IC (ft)	1359.43	Weir Sta Lft (ft)	
E.G. OC (ft)	1359.88	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1358.38	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1358.61	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.86	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	3.23	Min El Weir Flow (ft)	1361.62

CULVERT OUTPUT Profile #PF 2

Culvert ID : Culvert #1

Culv Q (cfs)	986.32	Culv Ful Lngh (ft)	30.00
# Barrels	2	Culv Vel US (ft/s)	8.22
Q Barrel (cfs)	493.16	Culv Vel DS (ft/s)	8.22
E.G. US. (ft)	1363.04	Culv Inv El Up (ft)	1354.28
W.S. US. (ft)	1362.91	Culv Inv El Dn (ft)	1353.80
E.G. DS (ft)	1361.56	Culv Frctn Ls (ft)	0.07
W.S. DS (ft)	1361.40	Culv Ext Lss (ft)	0.88
Delta EG (ft)	1.47	Culv Ent Lss (ft)	0.52

Delta WS (ft)	1.51	Q Weir (cfs)	474.68
E.G. IC (ft)	1362.63	Weir Sta Lft (ft)	969.00
E.G. OC (ft)	1363.04	Weir Sta Rgt (ft)	1055.00
Culvert Control	Outlet	Weir Submerg	0.01
Culv WS Inlet (ft)	1360.28	Weir Max Depth (ft)	1.68
Culv WS Outlet (ft)	1359.80	Weir Avg Depth (ft)	1.50
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	128.93
Culv Crt Depth (ft)	4.23	Min El Weir Flow (ft)	1361.62

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 34307

INPUT  
 Description: 71st St. Channel -, Downstream Face of Culvert

Station Elevation Data	num=	9							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
969 1361.05	970 1361.05	972 1353.8	989 1353.8	1000 1353.8					
1011 1353.8	1028 1353.8	1030 1361.05	1055 1361.05						

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
969 .035	970 .03	1030 .02			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
970	1030	62	62	62	.3	.5	

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
888 F			
888 F			

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 34245

INPUT  
 Description: 71st St. Channel

Station Elevation Data	num=	8							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
973.1 1360.5	974.1 1360.5	991 1355.7	996.2 1353.5	1000 1353.5					
1003.8 1353.5	1027 1360	1052 1360							

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
973.1 .035	974.1 .03	1027 .02			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
974.1	1027	413	413	413	.1	.3	

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33832

INPUT  
 Description: 71st St. Channel

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
974 1357.5	984 1357.5	996 1351.5	1000 1351.5	1004 1351.5					
1016 1357.5	1024 1357.5								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
974 .025	984 .018	1016 .025			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
984	1016	386	386	386	.1	.3	

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33446

INPUT  
 Description: 71st St. Channel

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
973.2 1355.9	983.2 1355.9	996 1349.5	1000 1349.5	1004 1349.5					
1016.8 1355.9	1023.2 1355.9								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
973.2 .025	983.2 .018	1016.8 .25			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
983.2	1016.8	33	33	33	.1	.3	

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 33413

INPUT  
 Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
981 1355.6	984 1355.6	984.5 1349.8	1000 1349.8	1015.5 1349.8					
1021.3 1355.7	1041.3 1355.7								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
981 .035	984 .03	1021.3 .1			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
984	1021.3	61	61	61	.3	.5	

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent

888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 33382

INPUT

Description: Sahuaro Drive 3-10'x5'x60'  
Distance from Upstream XS = 1  
Deck/Roadway Width = 40  
Weir Coefficient = 3

Upstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
978 1356.8 1042 1356.8

Upstream Bridge Cross Section Data

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
981 1355.6 984 1355.6 984.5 1349.8 1000 1349.8 1015.5 1349.8  
1021.3 1355.7 1041.3 1355.7

Manning's n Values

num= 3  
Sta n Val Sta n Val Sta n Val  
981 .035 984 .03 1021.3 .1

Bank Sta: Left Right Coeff Contr. Expan.

984 1021.3 .3 .5  
Ineffective Flow num= 2  
Sta L Sta R Elev Permanent

888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
950 1356.22 1050 1356.22

Downstream Bridge Cross Section Data

Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
959 1355.1 984 1355.1 984.5 1349.3 1000 1349.3 1015.5 1349.3  
1021.3 1355.2 1046.3 1355.2

Manning's n Values

num= 3  
Sta n Val Sta n Val Sta n Val  
959 .1 984 .03 1021.3 .1

Bank Sta: Left Right Coeff Contr. Expan.

984 1021.3 .3 .5  
Ineffective Flow num= 2  
Sta L Sta R Elev Permanent

888 F  
888 F

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 = 1357.38  
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 5 10

FHWA Chart # 8 - flared wingwalls  
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
1 60 .013 .5 1

Number of Barrels = 3

Upstream Elevation = 1349.8

Centerline Stations

Sta. Sta. Sta.  
989.5 1000 1010.5

Downstream Elevation = 1349.3

Centerline Stations

Sta. Sta. Sta.  
989.5 1000 1010.5

CULVERT OUTPUT Profile #PF 1

Culvert ID : Culvert #1

Culv Q (cfs)	792.00	Culv Ful Lngh (ft)	
# Barrels	3	Culv Vel US (ft/s)	9.47
Q Barrel (cfs)	264.00	Culv Vel DS (ft/s)	11.71
E.G. US. (ft)	1354.68	Culv Inv El Up (ft)	1349.80
W.S. US. (ft)	1354.14	Culv Inv El Dn (ft)	1349.30
E.G. DS (ft)	1353.39	Culv Frctn Ls (ft)	0.30
W.S. DS (ft)	1352.02	Culv Ext Lss (ft)	0.29
Delta EG (ft)	1.29	Culv Ent Lss (ft)	0.70
Delta WS (ft)	2.12	Q Weir (cfs)	
E.G. IC (ft)	1354.27	Weir Sta Lft (ft)	
E.G. OC (ft)	1354.68	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1352.59	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1351.56	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.99	Wr Flw Area (sq ft)	

Culv Crt Depth (ft) 2.79 Min El Weir Flow (ft) 1357.38

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #PF 2

Culvert ID : Culvert #1

Culv Q (cfs)	1264.50	Culv Ful Lngh (ft)	60.00
# Barrels	3	Culv Vel US (ft/s)	8.43
Q Barrel (cfs)	421.50	Culv Vel DS (ft/s)	8.43
E.G. US. (ft)	1358.47	Culv Inv El Up (ft)	1349.80
W.S. US. (ft)	1358.00	Culv Inv El Dn (ft)	1349.30
E.G. DS (ft)	1357.24	Culv Frctn Ls (ft)	0.17
W.S. DS (ft)	1356.65	Culv Ext Lss (ft)	0.52
Delta EG (ft)	1.23	Culv Ent Lss (ft)	0.55
Delta WS (ft)	1.35	Q Weir (cfs)	390.50
E.G. IC (ft)	1357.63	Weir Sta Lft (ft)	981.00
E.G. OC (ft)	1358.47	Weir Sta Rgt (ft)	1041.30
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1354.80	Weir Max Depth (ft)	1.67
Culv WS Outlet (ft)	1354.30	Weir Avg Depth (ft)	1.67
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	100.72
Culv Crt Depth (ft)	3.81	Min El Weir Flow (ft)	1357.38

CROSS SECTION RIVER: 71 St. Channel

REACH: Lower Reach RS: 33352

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
959 1355.1	984 1355.1	984.5 1349.3	1000 1349.3	1015.5 1349.3					
1021.3 1355.2	1046.3 1355.2								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
959 .1	984 .03	1021.3 .1			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
984	1021.3	62	62	62	.3	.5	

Ineffective Flow	num=	2	
Sta L Sta R Elev	Permanent		
888 F			
888 F			

CROSS SECTION RIVER: 71 St. Channel

REACH: Lower Reach RS: 33290

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
958.5 1355.3	978.5 1355.3	993.5 1349.1	1000 1349.2	1006.5 1349.2					
1018.5 1354.9	1038.5 1354.9								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
958.5 .1	978.5 .03	1018.5 .1			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
978.5	1018.5	391	391	391	.1	.3	

Ineffective Flow	num=	2	
Sta L Sta R Elev	Permanent		
888 F			
888 F			

CROSS SECTION RIVER: 71 St. Channel

REACH: Lower Reach RS: 32899

INPUT

Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
973.9 1354.4	993.9 1354.4	995.1 1342	1000 1342	1005 1342					
1006.2 1354.4	1026.2 1354.4								

Manning's n Values	num=	3			
Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val	Sta n Val
973.9 .1	993.9 .018	1006.2 .1			

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
993.9	1006.2	357	357	357	.3	.5	

Ineffective Flow	num=	2	
Sta L Sta R Elev	Permanent		
888 F			
888 F			

CULVERT RIVER: 71 St. Channel

REACH: Lower Reach RS: 32713

INPUT

Description: Shea Boulevard 1-10'x9'x341'

Distance from Upstream XS	=	15
Deck/Roadway Width	=	340
Weir Coefficient	=	3
Upstream Deck/Roadway Coordinates		
num=	2	
Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord	
984 1354.33	1016 1354.33	

Upstream Bridge Cross Section Data

Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
973.9	1354.4	993.9	1354.4	995.1	1342	1000	1342	1005	1342
1006.2	1354.4	1026.2	1354.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
973.9	.1	993.9	.018	1006.2	.1

Bank Sta: Left Right Coeff Contr. Expan.  
 993.9 1006.2 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

Downstream Deck/Roadway Coordinates num= 2

Sta Hi	Cord	Lo Cord	Sta Hi	Cord	Lo Cord
984	1351		1016	1351	

Downstream Bridge Cross Section Data num= 7

Station	Elevation	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
964.4	1349.4	984.4	1349.4	994	1340.66	1000	1340.66	1006	1340.66
1015.1	1350.2	1035.1	1350.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
964.4	.018	984.4	.018	1015.1	.1

Bank Sta: Left Right Coeff Contr. Expan.  
 984.4 1015.1 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
888	F		
888	F		

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 9 10  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 15 341 .013 .5 1  
 Upstream Elevation = 1342  
 Centerline Station = 1000  
 Downstream Elevation = 1340.66  
 Centerline Station = 1000

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #1

Culv Q (cfs)	792.00	Culv Ful Lngh (ft)	
# Barrels	1	Culv Vel US (ft/s)	13.66
Q Barrel (cfs)	792.00	Culv Vel DS (ft/s)	12.25
E.G. US. (ft)	1352.15	Culv Inv El Up (ft)	1342.00
W.S. US. (ft)	1350.34	Culv Inv El Dn (ft)	1340.66
E.G. DS (ft)	1348.87	Culv Frctn Ls (ft)	1.24
W.S. DS (ft)	1347.12	Culv Ext Lss (ft)	0.59
Delta EG (ft)	3.28	Culv Ent Lss (ft)	1.45
Delta WS (ft)	3.22	Q Weir (cfs)	
E.G. IC (ft)	1351.36	Weir Sta Lft (ft)	
E.G. OC (ft)	1352.15	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1347.80	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1347.12	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	5.74	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	5.80	Min El Weir Flow (ft)	1354.34

Note: The user has entered known energy, a known water surface, or a change in water surface. Therefore, no hydraulic properties were computed through the culvert.  
 Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.  
 Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #1

Culv Q (cfs)	1163.16	Culv Ful Lngh (ft)	341.00
# Barrels	1	Culv Vel US (ft/s)	12.92
Q Barrel (cfs)	1163.16	Culv Vel DS (ft/s)	12.92
E.G. US. (ft)	1356.53	Culv Inv El Up (ft)	1342.00
W.S. US. (ft)	1354.51	Culv Inv El Dn (ft)	1340.66
E.G. DS (ft)	1351.92	Culv Frctn Ls (ft)	1.38
W.S. DS (ft)	1351.26	Culv Ext Lss (ft)	1.94
Delta EG (ft)	4.62	Culv Ent Lss (ft)	1.30
Delta WS (ft)	3.25	Q Weir (cfs)	491.84
E.G. IC (ft)	1356.29	Weir Sta Lft (ft)	973.90
E.G. OC (ft)	1356.53	Weir Sta Rgt (ft)	1026.20

Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1351.00	Weir Max Depth (ft)	2.19
Culv WS Outlet (ft)	1349.66	Weir Avg Depth (ft)	2.14
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	112.02
Culv Crt Depth (ft)	7.49	Min El Weir Flow (ft)	1354.34

Note: The user has entered known energy, a known water surface, or a change in water surface. Therefore, no hydraulic properties were computed through the culvert.

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 32542

INPUT  
 Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
964.4 1349.4 984.4 1349.4 994 1340.66 1000 1340.66 1006 1340.66									
1015.1 1350.2 1035.1 1350.2									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
964.4 .018 984.4 .018 1015.1 .1		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
984.4 1015.1 150 150 150	.3	.5

Ineffective Flow num=	2
Sta L Sta R Elev Permanent	
888 F	
888 F	

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 32392

INPUT  
 Description: 71st St. Channel

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
964.4 1348.9 984.4 1348.9 999.5 1340.2 1000 1340.2 1000.5 1340.2									
1015.1 1349.8 1035.1 1349.8									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
964.4 .018 984.4 .018 1015.1 .1		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
984.4 1015.1 368 368 368	.1	.3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 32024

INPUT  
 Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
969.3 1345.2 989.3 1345.2 990.91 1336.38 1000 1336.38 1008.5 1336.38									
1008.7 1345.2 1028.7 1345.2									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
969.3 .018 989.3 .018 1008.7 .1		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
989.3 1008.7 72 72 72	.3	.5

Ineffective Flow num=	2
Sta L Sta R Elev Permanent	
888 F	
888 F	

CULVERT RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31988

INPUT  
 Description: Cochise Road 2-8'x6'x70'

Distance from Upstream XS =	1
Deck/Roadway Width =	70
Weir Coefficient =	3
Upstream Deck/Roadway Coordinates	
num=	2
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord	
987 1344.35 1012 1344.35	

Upstream Bridge Cross Section Data									
Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
969.3 1345.2 989.3 1345.2 990.91 1336.38 1000 1336.38 1008.5 1336.38									
1008.7 1345.2 1028.7 1345.2									

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
969.3 .018 989.3 .018 1008.7 .1		

Bank Sta: Left Right	Coeff Contr.	Expan.
989.3 1008.7	.3	.5

Ineffective Flow num=	2
Sta L Sta R Elev Permanent	
888 F	
888 F	

Downstream Deck/Roadway Coordinates

num= 2  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 987 1344.35 1012 1344.35

Downstream Bridge Cross Section Data  
 Station Elevation Data num= 8  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 984.83 1345.08 989.83 1345.11 990.11 1336.43 1000 1336.43 1010.08 1336.43  
 1012.2 1345.3 1013.2 1345.3 1013.3 1346

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 984.83 .03 989.83 .018 1012.2 .03

Bank Sta: Left Right Coeff Contr. Expan.  
 989.83 1012.2 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 6 8  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 70 .013 .5 1

Number of Barrels = 2  
 Upstream Elevation = 1336.38  
 Centerline Stations  
 Sta. Sta.  
 995.5 1004.5  
 Downstream Elevation = 1336.43  
 Centerline Stations  
 Sta. Sta.  
 995.5 1004.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #1

Culv Q (cfs)	777.28	Culv Ful Lngh (ft)	70.00
# Barrels	2	Culv Vel US (ft/s)	8.10
Q Barrel (cfs)	388.64	Culv Vel DS (ft/s)	8.10
E.G. US. (ft)	1345.20	Culv Inv El Up (ft)	1336.38
W.S. US. (ft)	1344.76	Culv Inv El Dn (ft)	1336.43
E.G. DS (ft)	1344.02	Culv Frctn Ls (ft)	0.17
W.S. DS (ft)	1343.50	Culv Ext Lss (ft)	0.49
Delta EG (ft)	1.17	Culv Ent Lss (ft)	0.51
Delta WS (ft)	1.26	Q Weir (cfs)	44.72
E.G. IC (ft)	1343.44	Weir Sta Lft (ft)	989.30
E.G. OC (ft)	1345.20	Weir Sta Rgt (ft)	1008.70
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1342.38	Weir Max Depth (ft)	0.84
Culv WS Outlet (ft)	1342.43	Weir Avg Depth (ft)	0.84
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	16.26
Culv Crt Depth (ft)	4.18	Min El Weir Flow (ft)	1344.36

Warning: During the culvert inlet computations, the program could not balance the culvert/weir flow.  
 The reported inlet energy grade answer may not be valid.

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #1

Culv Q (cfs)	843.48	Culv Ful Lngh (ft)	70.00
# Barrels	2	Culv Vel US (ft/s)	8.79
Q Barrel (cfs)	421.74	Culv Vel DS (ft/s)	8.79
E.G. US. (ft)	1347.78	Culv Inv El Up (ft)	1336.38
W.S. US. (ft)	1346.81	Culv Inv El Dn (ft)	1336.43
E.G. DS (ft)	1346.93	Culv Frctn Ls (ft)	0.20
W.S. DS (ft)	1345.78	Culv Ext Lss (ft)	0.05
Delta EG (ft)	0.85	Culv Ent Lss (ft)	0.60
Delta WS (ft)	1.03	Q Weir (cfs)	869.52
E.G. IC (ft)	1346.97	Weir Sta Lft (ft)	969.30
E.G. OC (ft)	1347.78	Weir Sta Rgt (ft)	1028.70
Culvert Control	Outlet	Weir Submerg	0.31
Culv WS Inlet (ft)	1342.38	Weir Max Depth (ft)	3.44
Culv WS Outlet (ft)	1342.43	Weir Avg Depth (ft)	2.86
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	170.08
Culv Crt Depth (ft)	4.42	Min El Weir Flow (ft)	1344.36

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31952

INPUT  
 Description: 71st St. Channel - Downstream Face of Culvert  
 Station Elevation Data num= 8  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

984.83 1345.08 989.83 1345.11 990.11 1336.43 1000 1336.43 1010.08 1336.43  
1012.2 1345.3 1013.2 1345.3 1013.3 1346

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
984.83 .03 989.83 .018 1012.2 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
989.83 1012.2 295 295 295 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31657

INPUT

Description: 71st St. Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
979.77 1343.4 979.78 1340.95 984.78 1340.95 999.44 1336.5 1000.5 1336.57  
1012.68 1343.4 1017.68 1343.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
979.77 .018 984.78 .018 1012.68 .018

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.78 1012.68 365 365 365 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31292

INPUT

Description: 71st St. Channel - Upstream Face of Culvert  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
979.9 1344 980 1342.2 985 1342.2 986.1 1335.58 1000 1335.8  
1013.93 1335.62 1017 1342.2 1018 1342.2 1018.1 1344

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
979.9 .03 985 .018 1017 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
985 1017 100 100 100 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

CULVERT RIVER: 71 St. Channel  
REACH: Lower Reach RS: 31242

INPUT

Description: 3 - 8' x 5' RCBC @ Gold Dust  
Distance from Upstream XS = 1  
Deck/Roadway Width = 70  
Weir Coefficient = 3  
Upstream Deck/Roadway Coordinates  
num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
975 1342.1 1020 1342.1

Upstream Bridge Cross Section Data  
Station Elevation Data num= 9  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
979.9 1344 980 1342.2 985 1342.2 986.1 1335.58 1000 1335.8  
1013.93 1335.62 1017 1342.2 1018 1342.2 1018.1 1344

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
979.9 .03 985 .018 1017 .03

Bank Sta: Left Right Coeff Contr. Expan.  
985 1017 .3 .5

Ineffective Flow num= 2  
Sta L Sta R Elev Permanent  
888 F  
888 F

Downstream Deck/Roadway Coordinates

num= 2  
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
960 1341.2 1030 1341.2

Downstream Bridge Cross Section Data  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
968.9 1343 969 1341.3 986 1334.9 1000 1334.9 1014 1334.9  
1024 1341.9 1024.1 1343

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
968.9 .035 969 .035 1024 .035

Bank Sta: Left Right Coeff Contr. Expan.  
969 1024 .3 .5

Ineffective Flow num= 2

Sta L Sta R Elev Permanent  
 888 F  
 888 F

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  
 Gold Dust Box 5 8  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 3.5 93 .013 .5 1

Number of Barrels = 3  
 Upstream Elevation = 1335.7  
 Centerline Stations

Sta. Sta. Sta.  
 991 1000 1009

Downstream Elevation = 1334.9  
 Centerline Stations

Sta. Sta. Sta.  
 991 1000 1009

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Gold Dust

Culv Q (cfs)	822.00	Culv Ful Lngh (ft)	
# Barrels	3	Culv Vel US (ft/s)	9.99
Q Barrel (cfs)	274.00	Culv Vel DS (ft/s)	7.13
E.G. US. (ft)	1341.45	Culv Inv El Up (ft)	1335.70
W.S. US. (ft)	1340.97	Culv Inv El Dn (ft)	1334.90
E.G. DS (ft)	1340.28	Culv Frctn Ls (ft)	0.19
W.S. DS (ft)	1339.70	Culv Ext Lss (ft)	0.21
Delta EG (ft)	1.17	Culv Ent Lss (ft)	0.78
Delta WS (ft)	1.26	Q Weir (cfs)	
E.G. IC (ft)	1341.05	Weir Sta Lft (ft)	
E.G. OC (ft)	1341.45	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1339.13	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1339.70	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.44	Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	3.32	Min El Weir Flow (ft)	1342.11

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Gold Dust

Culv Q (cfs)	1211.09	Culv Ful Lngh (ft)	93.00
# Barrels	3	Culv Vel US (ft/s)	10.09
Q Barrel (cfs)	403.70	Culv Vel DS (ft/s)	10.09
E.G. US. (ft)	1344.81	Culv Inv El Up (ft)	1335.70
W.S. US. (ft)	1344.13	Culv Inv El Dn (ft)	1334.90
E.G. DS (ft)	1342.52	Culv Frctn Ls (ft)	0.41
W.S. DS (ft)	1342.02	Culv Ext Lss (ft)	1.08
Delta EG (ft)	2.28	Culv Ent Lss (ft)	0.79
Delta WS (ft)	2.11	Q Weir (cfs)	501.91
E.G. IC (ft)	1344.31	Weir Sta Lft (ft)	979.90
E.G. OC (ft)	1344.81	Weir Sta Rgt (ft)	1018.10
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1340.70	Weir Max Depth (ft)	2.70
Culv WS Outlet (ft)	1339.90	Weir Avg Depth (ft)	2.68
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	102.23
Culv Crt Depth (ft)	4.29	Min El Weir Flow (ft)	1342.11

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31192

INPUT  
 Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
968.9 1343 969 1341.3 986 1334.9 1000 1334.9 1014 1334.9		
1024 1341.9 1024.1 1343		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
968.9 .035 969 .035 1024 .035		

Bank Sta: Left Right Lengths: Left Channel Right	Coeff Contr.	Expan.
969 1024 126 126 126	.3	.5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent

888 F  
 888 F

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 31066

INPUT  
 Description: 71st St. Channel  
 Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
969.8	1343	969.9	1340.9	983.6	1336.6	994.4	1335.1	1000	1335.1
1002.3	1335	1005.4	1336.4	1016.9	1336.7	1033.2	1341.9	1033.3	1343

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 969.8 .035 969.9 .035 1033.2 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 969.9 1033.2 177 177 177 .1 .3

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30889

INPUT Description: 71st St. Channel - Upstream Face of Culvert

Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
946	1340	956	1340	975	1334.4	1000	1334.4	1025	1334.4
1044	1339.9	1054	1339.9						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 946 .035 956 .035 1044 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 956 1044 45 45 45 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CULVERT RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30866

INPUT Description:

Distance from Upstream XS = 1  
 Deck/Roadway Width = 40  
 Weir Coefficient = 3

Upstream Deck/Roadway Coordinates num= 2  

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
940	1339.92		1070	1339.92	

Upstream Bridge Cross Section Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
946	1340	956	1340	975	1334.4	1000	1334.4	1025	1334.4
1044	1339.9	1054	1339.9						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 946 .035 956 .035 1044 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 956 1044 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

Downstream Deck/Roadway Coordinates num= 2  

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
940	1339.41		1070	1339.41	

Downstream Bridge Cross Section Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
923	1339.8	943	1339.8	971	1334.2	1000	1334.2	1026	1334.2
1064	1339.7	1084	1339.7						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 923 .035 943 .035 1064 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 943 1064 .1 .3

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1339.92  
 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 #2 Box 4 12  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 1 - Wingwall flared 30 to 75 deg.  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef

1 42 .013 .5 1  
 Number of Barrels = 4  
 Upstream Elevation = 1334.42  
 Centerline Stations  
 Sta. Sta. Sta. Sta.  
 980.5 993.5 1006.5 1019.5  
 Downstream Elevation = 1334.25  
 Centerline Stations  
 Sta. Sta. Sta. Sta.  
 980.5 993.5 1006.5 1019.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Culvert #2

Culv Q (cfs)	822.00	Culv Ful Lngh (ft)	42.00
# Barrels	4	Culv Vel US (ft/s)	4.28
Q Barrel (cfs)	205.50	Culv Vel DS (ft/s)	4.28
E.G. US. (ft)	1339.11	Culv Inv El Up (ft)	1334.42
W.S. US. (ft)	1338.90	Culv Inv El Dn (ft)	1334.25
E.G. DS (ft)	1338.82	Culv Frctn Ls (ft)	0.03
W.S. DS (ft)	1338.65	Culv Ext Lss (ft)	0.11
Delta EG (ft)	0.29	Culv Ent Lss (ft)	0.14
Delta WS (ft)	0.25	Q Weir (cfs)	
E.G. IC (ft)	1337.77	Weir Sta Lft (ft)	
E.G. OC (ft)	1339.11	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1338.42	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1338.25	Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	
Culv Crt Depth (ft)	2.09	Min El Weir Flow (ft)	1339.93

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Culvert #2

Culv Q (cfs)	911.33	Culv Ful Lngh (ft)	42.00
# Barrels	4	Culv Vel US (ft/s)	4.75
Q Barrel (cfs)	227.83	Culv Vel DS (ft/s)	4.75
E.G. US. (ft)	1341.76	Culv Inv El Up (ft)	1334.42
W.S. US. (ft)	1341.60	Culv Inv El Dn (ft)	1334.25
E.G. DS (ft)	1341.28	Culv Frctn Ls (ft)	0.04
W.S. DS (ft)	1341.19	Culv Ext Lss (ft)	0.26
Delta EG (ft)	0.47	Culv Ent Lss (ft)	0.17
Delta WS (ft)	0.41	Q Weir (cfs)	801.67
E.G. IC (ft)	1340.61	Weir Sta Lft (ft)	946.00
E.G. OC (ft)	1341.76	Weir Sta Rgt (ft)	1054.00
Culvert Control	Outlet	Weir Submerg	0.69
Culv WS Inlet (ft)	1338.42	Weir Max Depth (ft)	1.84
Culv WS Outlet (ft)	1338.25	Weir Avg Depth (ft)	1.83
Culv Nml Depth (ft)		Wr Flw Area (sq ft)	197.56
Culv Crt Depth (ft)	2.24	Min El Weir Flow (ft)	1339.93

Warning: During the culvert inlet computations, the program could not balance the culvert/weir flow.  
 The reported inlet energy grade answer may not be valid.

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30844

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	7							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
923 1339.8 943 1339.8 971 1334.2 1000 1334.2 1026 1334.2									
1064 1339.7 1084 1339.7									

Manning's n Values	num=	3			
Sta n Val Sta n Val Sta n Val					
923 .035 943 .035 1064 .035					

Bank Sta: Left Right Lengths: Left Channel Right									
943 1064 345 345 345									
Coeff Contr. Expan.									
.1 .3									

Ineffective Flow	num=	2			
Sta L Sta R Elev Permanent					
888 F					
888 F					

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30499

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	9							
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev									
950.5 1339.8 960.5 1339.8 990.1 1333.7 1000 1333.5 1009.9 1333.4									
1016.5 1333.8 1018.5 1333.8 1034 1340.3 1044 1340.3									

Manning's n Values	num=	3			
Sta n Val Sta n Val Sta n Val					
950.5 .035 960.5 .035 1034 .035					

Bank Sta: Left Right Lengths: Left Channel Right									
960.5 1034 369 369 369									
Coeff Contr. Expan.									
.1 .3									

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30130

INPUT

Description: 71st St. Channel

Station Elevation Data	num=	7							
------------------------	------	---	--	--	--	--	--	--	--

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
961.2	1338	971.2	1338	991.3	1332.5	1000	1332.5	1008.7	1332.4
1039.1	1339.3	1039.2	1342						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 961.2 .035 971.2 .035 1039.1 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 971.2 1039.1 47 47 47 .3 .5

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30083

INPUT Description: 71st St. Channel - Upstream Face of Culvert  
 Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
977	1336.1	987	1336.1	987.1	1331.4	1000	1331.55	1012.9	1331.7
1013	1336.1	1023	1336.1						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 977 .035 987 .035 1013 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 987 1013 83 83 83 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CULVERT RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30041

INPUT Description: River STA 300+41, 71 St. Ditch, Lower Reach, Culvert Inlet  
 Distance from Upstream XS = 1

Deck/Roadway Width = 80  
 Weir Coefficient = 3  
 Upstream Deck/Roadway Coordinates num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
967	1339.3		1024	1339.3	

Upstream Bridge Cross Section Data  
 Station Elevation Data num= 7  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
977	1336.1	987	1336.1	987.1	1331.4	1000	1331.55	1012.9	1331.7
1013	1336.1	1023	1336.1						

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 977 .035 987 .035 1013 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 987 1013 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

Downstream Deck/Roadway Coordinates num= 2  

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
967	1339.3		1024	1339.3	

Downstream Bridge Cross Section Data  
 Station Elevation Data num= 5  

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
985.6	1338.6	985.6	1331.2	1000	1331.2	1014.4	1331.2	1014.4	1338.4

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 985.6 .035 985.6 .035 1014.4 .035

Bank Sta: Left Right Coeff Contr. Expan.  
 985.6 1014.4 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1339.3  
 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
Berneil	Box	6	8
FHWA Chart # 8 - flared wingwalls			
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.			
Solution Criteria = Highest U.S. EG			
Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef Exit Loss Coef
1	82	.02	.5 1

Number of Barrels = 3  
 Upstream Elevation = 1331.55  
 Centerline Stations  
 Sta. Sta. Sta.  
 991.5 1000 1008.5  
 Downstream Elevation = 1331.2  
 Centerline Stations  
 Sta. Sta. Sta.  
 991.5 1000 1008.5

CULVERT OUTPUT Profile #PF 1  
 Culvert ID : Berneil

Culv Q (cfs)	822.00	Culv Ful Lngh (ft)	
# Barrels	3	Culv Vel US (ft/s)	8.60
Q Barrel (cfs)	274.00	Culv Vel DS (ft/s)	9.74
E.G. US. (ft)	1337.26	Culv Inv El Up (ft)	1331.55
W.S. US. (ft)	1336.66	Culv Inv El Dn (ft)	1331.20
E.G. DS (ft)	1335.74	Culv Frctn Ls (ft)	0.49
W.S. DS (ft)	1334.72	Culv Ext Lss (ft)	0.45
Delta EG (ft)	1.52	Culv Ent Lss (ft)	0.57
Delta WS (ft)	1.94	Q Weir (cfs)	
E.G. IC (ft)	1336.87	Weir Sta Lft (ft)	
E.G. OC (ft)	1337.26	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1335.53	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1334.72	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	4.33	Wr FLW Area (sq ft)	
Culv Crt Depth (ft)	3.32	Min El Weir Flow (ft)	1339.31

CULVERT OUTPUT Profile #PF 2  
 Culvert ID : Berneil

Culv Q (cfs)	1553.24	Culv Ful Lngh (ft)	23.06
# Barrels	3	Culv Vel US (ft/s)	10.79
Q Barrel (cfs)	517.75	Culv Vel DS (ft/s)	12.09
E.G. US. (ft)	1340.40	Culv Inv El Up (ft)	1331.55
W.S. US. (ft)	1339.79	Culv Inv El Dn (ft)	1331.20
E.G. DS (ft)	1338.47	Culv Frctn Ls (ft)	0.67
W.S. DS (ft)	1336.55	Culv Ext Lss (ft)	0.35
Delta EG (ft)	1.93	Culv Ent Lss (ft)	0.90
Delta WS (ft)	3.24	Q Weir (cfs)	159.76
E.G. IC (ft)	1340.56	Weir Sta Lft (ft)	977.00
E.G. OC (ft)	1340.40	Weir Sta Rgt (ft)	1023.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	1337.55	Weir Max Depth (ft)	1.10
Culv WS Outlet (ft)	1336.55	Weir Avg Depth (ft)	1.10
Culv Nml Depth (ft)	6.00	Wr FLW Area (sq ft)	50.72
Culv Crt Depth (ft)	5.07	Min El Weir Flow (ft)	1339.31

- Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.  
 Note: During supercritical analysis, the culvert direct step method went to critical depth. The program then assumed critical depth at the outlet.  
 Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.  
 Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CROSS SECTION RIVER: 71 St. Channel  
 REACH: Lower Reach RS: 30000

INPUT

Description: 71st St. Channel - Downstream Face of Culvert

Station Elevation Data	num=	5
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
985.6 1338.6 985.6 1331.2 1000 1331.2 1014.4 1331.2 1014.4 1338.4		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
985.6 .035 985.6 .035 1014.4 .035		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
985.6 1014.4	0 0	.3	.5

Ineffective Flow	num=	2
Sta L Sta R Elev Permanent		
888 F		
888 F		

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Upper East Reach RS: 18515

INPUT

Description: Berneil Ditch

Station Elevation Data	num=	6
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
936.9 1335.2 939.1 1335.6 954.1 1335.5 969.3 1330.9 1009.3 1330.9 1027.7 1337.1		

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
936.9 .025 954.1 .018 1027.7 .018		

Bank Sta: Left Right	Lengths: Left Channel Right	Coeff Contr.	Expan.
954.1 1027.7	320 320	.1	.3
Left Levee Station=	939.1 Elevation=		

CROSS SECTION RIVER: Berneil Ditch

REACH: Upper East Reach RS: 18195

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 6		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
944.2	1334.4	947.5	1335.2	962.2	1335.4	976.9	1330.57	1016.9	1330.57
1035.8	1337.5								

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
944.2	.025	962.2	.018	1035.8	.018		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	962.2	1035.8		235	235		.1	.3
Left Levee		Station=	962.2	Elevation=				

CROSS SECTION RIVER: Berneil Ditch  
REACH: Upper East Reach RS: 17960

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 6		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
948.7	1335.1	952.1	1335.4	959.2	1336.4	977.65	1330.33	1017.65	1330.33
1038.9	1337.8								

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
948.7	.025	959.2	.018	1038.9	.018		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	959.2	1038.9		0	0		.1	.3
Left Levee		Station=	959.2	Elevation=				

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower East Reach RS: 17873

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 5		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
947.69	1335.39	960.57	1336.45	972.99	1330.24	1041.52	1330.24	1041.6	1338.4

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
947.69	.03	960.57	.018	1041.6	.018		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	960.57	1041.6		168	168		.1	.3
Left Levee		Station=	960.57	Elevation=				

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower East Reach RS: 17705

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 5		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
947.5	1336	965.2	1336.6	983.45	1330.07	1023.45	1330.07	1043.1	1337.3

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
947.5	.025	965.2	.018	1043.1	.018		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	965.2	1043.1		477	477		.1	.3
Left Levee		Station=	965.2	Elevation=				

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower East Reach RS: 17228

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 8		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
951.6	1337.3	969.3	1337.5	979.07	1333	986.57	1333	994	1329.58
1026.5	1329.58	1043.3	1337.3	1051.5	1337.3				

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
951.6	.025	969.3	.018	1043.3	.025		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	969.3	1043.3		698	698		.1	.3
Left Levee		Station=	969.3	Elevation=				

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower East Reach RS: 16530

INPUT

Description: Berneil Ditch

Station Elevation Data		num= 7		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
941.5	1335.9	944.9	1336.5	957	1336.6	976.4	1328.87	1016.4	1328.87
1033	1335.2	1039.7	1335.2						

Manning's n Values		num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
941.5	.025	957	.018	1033	.025		

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
957 1033 475 475 475 .1 .3  
Left Levee Station= 957 Elevation=

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower East Reach RS: 16055

INPUT

Description: Berneil Ditch  
Station Elevation Data num= 6  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
951.9 1335.9 958.8 1336.2 981.25 1328.24 1021.25 1328.24 1041.7 1335.2  
1052.6 1335.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
951.9 .025 958.8 .018 1041.7 .025

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
958.8 1041.7 0 0 0 .1 .3  
Left Levee Station= 958.8 Elevation=

CROSS SECTION RIVER: Berneil Ditch  
REACH: Mtn. View Chnl RS: 22527

INPUT

Description: Mountain View Channel  
Station Elevation Data num= 8  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
958.2 1341.5 983.2 1341.5 987.4 1341.2 995.6 1338.3 1000 1338.3  
1004.4 1338.3 1017 1342 1021.8 1341.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
958.2 .1 983.2 .018 1017 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
983.2 1017 245 245 245 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Mtn. View Chnl RS: 22282

INPUT

Description: Mountain View Channel  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
963.2 1340.6 988.2 1340.6 995 1337.3 1000 1337.3 1005 1337.3  
1014.7 1341.7 1021.2 1341.8

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
963.2 .1 988.2 .018 1014.7 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
988.2 1014.7 95 95 95 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Mtn. View Chnl RS: 22187

INPUT

Description: Mountain View Channel  
Station Elevation Data num= 10  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
964.3 1343.2 987.4 1343.1 989.3 1343.2 996.3 1339.2 997.3 1339.2  
1000 1338.2 1000.4 1337.3 1003.7 1336.9 1015.9 1337 1020.6 1345.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
964.3 .03 989.3 .018 1020.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
989.3 1020.6 404 404 404 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Mtn. View Chnl RS: 21783

INPUT

Description: Mountain View Channel  
Station Elevation Data num= 8  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
959.9 1339.6 984.9 1339.6 994.4 1335.2 1000 1335.3 1002.3 1335.3  
1005.6 1335.4 1014.7 1339.7 1021.9 1339.4

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
959.9 .03 984.9 .018 1014.7 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
984.9 1014.7 232 232 232 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Mtn. View Chnl RS: 21551

INPUT

Description: Mountain View Channel  
Station Elevation Data num= 10  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
964.3 1340.6 987.4 1340.5 989.3 1340.6 996.3 1336.6 997.3 1336.6  
1000 1335.6 1000.4 1334.7 1003.7 1334.3 1015.9 1334.4 1020.6 1342.6

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 964.3 .03 989.3 .018 1020.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 989.3 1020.6 162 162 162 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21389

INPUT

Description: Mountain View Channel

Station Elevation Data num= 10  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 964.3 1340.1 987.4 1340 989.3 1340.1 996.3 1336.1 997.3 1336.1  
 1000 1335.1 1000.4 1334.2 1003.7 1333.8 1015.9 1333.9 1020.6 1342.1

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 964.3 .03 989.3 .018 1020.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 989.3 1020.6 34 34 34 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 21355

INPUT

Description: Mountain View Channel

Station Elevation Data num= 10  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 964.3 1340 987.4 1339.9 989.3 1340 996.3 1336 997.3 1336  
 1000 1335 1000.4 1334.1 1003.7 1333.7 1015.9 1333.8 1020.6 1342

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 964.3 .03 989.3 .018 1020.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 989.3 1020.6 828 828 828 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 20527

INPUT

Description: Mountain View Channel

Station Elevation Data num= 7  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 962 1338.2 987 1338.2 997 1331.4 1000 1331.4 1003 1331.4  
 1013 1339.9 1023 1339.9

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 962 .1 987 .018 1013 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 987 1013 527 527 527 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Mtn. View Chnl RS: 20000

INPUT

Description: Mountain View Channel

Station Elevation Data num= 6  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 976.8 1336.1 986.8 1336.1 997 1329.1 1000 1329.1 1003 1329.1  
 1013.9 1337.1

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 976.8 .1 986.8 .018 1013.9 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 986.8 1013.9 0 0 0 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15922

INPUT

Description: Berneil Ditch

Station Elevation Data num= 7  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 948 1335.9 958 1335.9 983.4 1328.2 1000 1328.2 1016.7 1328.1  
 1042.7 1336.3 1054.9 1335.7

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 948 .035 958 .018 1042.7 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 958 1042.7 380 380 380 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 15542

INPUT

Description: Berneil Ditch

Station Elevation Data num= 7  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

949.3 1335.3 958.7 1335.1 982.1 1327.2 1000 1327.3 1017.9 1327.3  
1035.8 1333 1039.1 1332.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
949.3 .035 958.7 .018 1035.8 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
958.7 1035.8 300 300 300 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 15242

INPUT  
Description: Berneil Ditch  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
950.4 1335.1 956.8 1334.8 983.4 1326.5 1000 1326.5 1016.6 1326.5  
1037.5 1333.1 1047.2 1333.1

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
950.4 .035 956.8 .018 1037.5 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
956.8 1037.5 201 201 201 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 15041

INPUT  
Description: Berneil Ditch  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
945.8 1334.3 955.7 1334.2 983 1326.2 1000 1326.3 1017.1 1326.3  
1034.5 1332.3 1050.1 1332.7

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
945.8 .035 955.7 .018 1034.5 .035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
955.7 1034.5 515 515 515 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 14526

INPUT  
Description: Berneil Ditch  
Station Elevation Data num= 8  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
942.5 1333 948.1 1333 959.3 1332.9 982.1 1324.2 1000 1324.6  
1017.9 1325 1044.9 1333.1 1048.8 1333.2

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
942.5 .03 959.3 .018 1048.8 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
959.3 1048.8 610 610 610 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 13916

INPUT  
Description: Berneil Ditch  
Station Elevation Data num= 6  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
951.9 1333.2 960.4 1333.7 982.4 1323.1 1000 1323.5 1017.7 1323.8  
1049.1 1334.9

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
951.9 .03 960.4 .018 1049.1 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
960.4 1049.1 176 176 176 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 13740

INPUT  
Description: Berneil Ditch  
Station Elevation Data num= 7  
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
955.1 1332.8 961.3 1332.5 980 1323.9 1000 1323.8 1020 1323.6  
1054.1 1333.5 1063.7 1334.1

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
955.1 .03 961.3 .018 1054.1 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
961.3 1054.1 1505 1505 1505 .1 .3

CROSS SECTION RIVER: Berneil Ditch  
REACH: Lower Reach RS: 12235

INPUT  
Description: Berneil Ditch

Station Elevation Data num= 7  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 955.8 1326.8 960.8 1326.8 984.1 1320.2 1000 1320.3 1015.9 1320.3  
 1038.1 1326.9 1045.3 1326.8

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 955.8 .03 960.8 .018 1038.1 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 960.8 1038.1 27 27 27 .3 .5

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 12208

INPUT Description: Berneil Ditch - Upstream Face of Culvert

Station Elevation Data num= 5  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 966.8 1326.9 966.9 1319.8 1000 1319.8 1032.5 1319.8 1032.6 1326.9

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
 966.8 1032.6 50 50 50 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

CULVERT RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 12183

INPUT Description: 5' x 10' Concrete Box Culverts, 6 Ea.

Distance from Upstream XS = 1  
 Deck/Roadway Width = 48  
 Weir Coefficient = 3  
 Upstream Deck/Roadway Coordinates

num= 2  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 960 1326.8 1040 1326.8

Upstream Bridge Cross Section Data  
 Station Elevation Data num= 5  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 966.8 1326.9 966.9 1319.8 1000 1319.8 1032.5 1319.8 1032.6 1326.9

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Coeff Contr. Expan.  
 966.8 1032.6 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

Downstream Deck/Roadway Coordinates  
 num= 2  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 960 1326.8 1040 1326.8

Downstream Bridge Cross Section Data  
 Station Elevation Data num= 5  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 966.8 1326.7 966.9 1318.5 1000 1318.5 1032.5 1318.5 1032.6 1326.8

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 966.8 .03 966.8 .018 1032.6 .03

Bank Sta: Left Right Coeff Contr. Expan.  
 966.8 1032.6 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 888 F  
 888 F

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 = 1330  
 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 5 10  
 FHWA Chart # 8 - flared wingwalls  
 FHWA Scale # 3 - Wingwall flared 0 deg. (sides extended straight)  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 49 .02 .5 1  
 Number of Barrels = 6



1040.9 1322.8

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
944.6 .03	953.7 .018	1040.9 .03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
953.7	1040.9	600	600	600	.1	.3	

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 10808

INPUT

Description: Berneil Ditch

Station Elevation Data	num=	5
Sta Elev	Sta Elev	Sta Elev
955.4 1320.9	976.1 1312.8	1000 1312.8
1024 1312.8	1041.8 1320.3	

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
955.4 .03	955.4 .018	1041.8 .03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
955.4	1041.8	808	808	808	.1	.3	

CROSS SECTION RIVER: Berneil Ditch  
 REACH: Lower Reach RS: 10000

INPUT

Description: Berneil Ditch

Station Elevation Data	num=	5
Sta Elev	Sta Elev	Sta Elev
933.3 1319.8	969.3 1312.3	1000 1312.3
1030.7 1312.3	1066.7 1319.8	

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
933.3 .03	933.3 .018	1066.7 .03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
933.3	1066.7	0	0	0	.1	.3	

SUMMARY OF MANNING'S N VALUES

River:71 St. Channel

Reach	River Sta.	n1	n2	n3
Lower Reach	37941	.018	.018	.018
Lower Reach	37808	.05	.018	.05
Lower Reach	37700	.05	.018	.05
Lower Reach	37658			
Lower Reach	37615	Culvert	.018	.05
Lower Reach	37343	.1	.018	.05
Lower Reach	37048	.1	.018	.1
Lower Reach	36912	.1	.02	.1
Lower Reach	36712	.1	.02	.1
Lower Reach	36664	.1	.02	.1
Lower Reach	36579	.1	.02	.035
Lower Reach	36306	.035	.016	.035
Lower Reach	36233	.035	.016	.035
Lower Reach	36088	.035	.016	.035
Lower Reach	35845	.035	.016	.035
Lower Reach	35493	.035	.016	.035
Lower Reach	35411	.035	.016	.035
Lower Reach	35311	.025	.016	.025
Lower Reach	35252	.035	.018	.035
Lower Reach	35023	.035	.018	.035
Lower Reach	34873	.035	.018	.035
Lower Reach	34673	.035	.018	.035
Lower Reach	34378	.035	.03	.035
Lower Reach	34338	.035	.03	.035
Lower Reach	34322			
Lower Reach	34307	Culvert	.03	.02
Lower Reach	34245	.035	.03	.02
Lower Reach	33832	.025	.018	.025
Lower Reach	33446	.025	.018	.25
Lower Reach	33413	.035	.03	.1
Lower Reach	33382			
Lower Reach	33352	Culvert	.1	.1
Lower Reach	33290	.1	.03	.1
Lower Reach	32899	.1	.018	.1
Lower Reach	32713			
Lower Reach	32542	Culvert	.018	.1
Lower Reach	32392	.018	.018	.1
Lower Reach	32024	.018	.018	.1
Lower Reach	31988			
Lower Reach	31952	Culvert	.03	.03
Lower Reach	31657	.018	.018	.018
Lower Reach	31292	.03	.018	.03
Lower Reach	31242			
Lower Reach	31192	Culvert	.035	.035
Lower Reach	31066	.035	.035	.035
Lower Reach	30889	.035	.035	.035
Lower Reach	30866			
Lower Reach	30844	Culvert	.035	.035
Lower Reach	30499	.035	.035	.035
Lower Reach	30130	.035	.035	.035
Lower Reach	30083	.035	.035	.035

Lower Reach	30041	Culvert		
Lower Reach	30000	.035	.035	.035

River: Berneil Ditch

Reach	River Sta.	n1	n2	n3
Upper East Reach	18515	.025	.018	.018
Upper East Reach	18195	.025	.018	.018
Upper East Reach	17960	.025	.018	.018
Lower East Reach	17873	.03	.018	.018
Lower East Reach	17705	.025	.018	.018
Lower East Reach	17228	.025	.018	.025
Lower East Reach	16530	.025	.018	.025
Lower East Reach	16055	.025	.018	.025
Mtn. View Chnl	22527	.1	.018	.03
Mtn. View Chnl	22282	.1	.018	.03
Mtn. View Chnl	22187	.03	.018	.03
Mtn. View Chnl	21783	.03	.018	.03
Mtn. View Chnl	21551	.03	.018	.03
Mtn. View Chnl	21389	.03	.018	.03
Mtn. View Chnl	21355	.03	.018	.03
Mtn. View Chnl	20527	.1	.018	.03
Mtn. View Chnl	20000	.1	.018	.03
Lower Reach	15922	.035	.018	.035
Lower Reach	15542	.035	.018	.035
Lower Reach	15242	.035	.018	.035
Lower Reach	15041	.035	.018	.035
Lower Reach	14526	.03	.018	.03
Lower Reach	13916	.03	.018	.03
Lower Reach	13740	.03	.018	.03
Lower Reach	12235	.03	.018	.03
Lower Reach	12208	.03	.018	.03
Lower Reach	12183	Culvert		
Lower Reach	12158	.03	.018	.03
Lower Reach	12058	.03	.018	.03
Lower Reach	11408	.03	.018	.03
Lower Reach	10808	.03	.018	.03
Lower Reach	10000	.03	.018	.03

SUMMARY OF REACH LENGTHS

River: 71 St. Channel

Reach	River Sta.	Left	Channel	Right
Lower Reach	37941	133	133	133
Lower Reach	37808	108	108	108
Lower Reach	37700	85	85	85
Lower Reach	37658	Culvert		
Lower Reach	37615	272	272	272
Lower Reach	37343	295	295	295
Lower Reach	37048	136	136	136
Lower Reach	36912	200	200	200
Lower Reach	36712	48	48	48
Lower Reach	36664	85	85	85
Lower Reach	36579	273	273	273
Lower Reach	36306	73	73	73
Lower Reach	36233	145	145	145
Lower Reach	36088	243	243	243
Lower Reach	35845	352	352	352
Lower Reach	35493	82	82	82
Lower Reach	35411	100	100	100
Lower Reach	35311	59	59	59
Lower Reach	35252	229	229	229
Lower Reach	35023	150	150	150
Lower Reach	34873	200	200	200
Lower Reach	34673	295	295	295
Lower Reach	34378	40	40	40
Lower Reach	34338	31	31	31
Lower Reach	34322	Culvert		
Lower Reach	34307	62	62	62
Lower Reach	34245	413	413	413
Lower Reach	33832	386	386	386
Lower Reach	33446	33	33	33
Lower Reach	33413	61	61	61
Lower Reach	33382	Culvert		
Lower Reach	33352	62	62	62
Lower Reach	33290	391	391	391
Lower Reach	32899	357	357	357
Lower Reach	32713	Culvert		
Lower Reach	32542	150	150	150
Lower Reach	32392	368	368	368
Lower Reach	32024	72	72	72
Lower Reach	31988	Culvert		
Lower Reach	31952	295	295	295
Lower Reach	31657	365	365	365
Lower Reach	31292	100	100	100
Lower Reach	31242	Culvert		
Lower Reach	31192	126	126	126
Lower Reach	31066	177	177	177
Lower Reach	30889	45	45	45
Lower Reach	30866	Culvert		
Lower Reach	30844	345	345	345
Lower Reach	30499	369	369	369
Lower Reach	30130	47	47	47

Lower Reach	30083	83	83	83
Lower Reach	30041	Culvert		
Lower Reach	30000	0	0	0

River: Berneil Ditch

Reach	River Sta.	Left	Channel	Right
Upper East Reach	18515	320	320	320
Upper East Reach	18195	235	235	235
Upper East Reach	17960	0	0	0
Lower East Reach	17873	168	168	168
Lower East Reach	17705	477	477	477
Lower East Reach	17228	698	698	698
Lower East Reach	16530	475	475	475
Lower East Reach	16055	0	0	0
Mtn. View Chnl	22527	245	245	245
Mtn. View Chnl	22282	95	95	95
Mtn. View Chnl	22187	404	404	404
Mtn. View Chnl	21783	232	232	232
Mtn. View Chnl	21551	162	162	162
Mtn. View Chnl	21389	34	34	34
Mtn. View Chnl	21355	828	828	828
Mtn. View Chnl	20527	527	527	527
Mtn. View Chnl	20000	0	0	0
Lower Reach	15922	380	380	380
Lower Reach	15542	300	300	300
Lower Reach	15242	201	201	201
Lower Reach	15041	515	515	515
Lower Reach	14526	610	610	610
Lower Reach	13916	176	176	176
Lower Reach	13740	1505	1505	1505
Lower Reach	12235	27	27	27
Lower Reach	12208	50	50	50
Lower Reach	12183	Culvert		
Lower Reach	12158	100	100	100
Lower Reach	12058	650	650	650
Lower Reach	11408	600	600	600
Lower Reach	10808	808	808	808
Lower Reach	10000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS  
River: 71 St. Channel

Reach	River Sta.	Contr.	Expan.
Lower Reach	37941	.1	.3
Lower Reach	37808	.1	.3
Lower Reach	37700	.1	.3
Lower Reach	37658	Culvert	
Lower Reach	37615	.1	.3
Lower Reach	37343	.1	.3
Lower Reach	37048	.1	.3
Lower Reach	36912	.1	.3
Lower Reach	36712	.1	.3
Lower Reach	36664	.1	.3
Lower Reach	36579	.1	.3
Lower Reach	36306	.1	.3
Lower Reach	36233	.1	.3
Lower Reach	36088	.1	.3
Lower Reach	35845	.1	.3
Lower Reach	35493	.1	.3
Lower Reach	35411	.1	.3
Lower Reach	35311	.1	.3
Lower Reach	35252	.1	.3
Lower Reach	35023	.1	.3
Lower Reach	34873	.1	.3
Lower Reach	34673	.1	.3
Lower Reach	34378	.1	.3
Lower Reach	34338	.3	.5
Lower Reach	34322	Culvert	
Lower Reach	34307	.3	.5
Lower Reach	34245	.1	.3
Lower Reach	33832	.1	.3
Lower Reach	33446	.1	.3
Lower Reach	33413	.3	.5
Lower Reach	33382	Culvert	
Lower Reach	33352	.3	.5
Lower Reach	33290	.1	.3
Lower Reach	32899	.3	.5
Lower Reach	32713	Culvert	
Lower Reach	32542	.3	.5
Lower Reach	32392	.1	.3
Lower Reach	32024	.3	.5
Lower Reach	31988	Culvert	
Lower Reach	31952	.3	.5
Lower Reach	31657	.1	.3
Lower Reach	31292	.3	.5
Lower Reach	31242	Culvert	
Lower Reach	31192	.3	.5
Lower Reach	31066	.1	.3
Lower Reach	30889	.3	.5
Lower Reach	30866	Culvert	
Lower Reach	30844	.1	.3
Lower Reach	30499	.1	.3

Lower Reach	30130	.3	.5
Lower Reach	30083	.3	.5
Lower Reach	30041	Culvert	
Lower Reach	30000	.3	.5

River: Berneil Ditch

Reach	River Sta.	Contr.	Expan.
Upper East Reach	18515	.1	.3
Upper East Reach	18195	.1	.3
Upper East Reach	17960	.1	.3
Lower East Reach	17873	.1	.3
Lower East Reach	17705	.1	.3
Lower East Reach	17228	.1	.3
Lower East Reach	16530	.1	.3
Lower East Reach	16055	.1	.3
Mtn. View Chnl	22527	.1	.3
Mtn. View Chnl	22282	.1	.3
Mtn. View Chnl	22187	.1	.3
Mtn. View Chnl	21783	.1	.3
Mtn. View Chnl	21551	.1	.3
Mtn. View Chnl	21389	.1	.3
Mtn. View Chnl	21355	.1	.3
Mtn. View Chnl	20527	.1	.3
Mtn. View Chnl	20000	.1	.3
Lower Reach	15922	.1	.3
Lower Reach	15542	.1	.3
Lower Reach	15242	.1	.3
Lower Reach	15041	.1	.3
Lower Reach	14526	.1	.3
Lower Reach	13916	.1	.3
Lower Reach	13740	.1	.3
Lower Reach	12235	.3	.5
Lower Reach	12208	.3	.5
Lower Reach	12183	Culvert	
Lower Reach	12158	.3	.5
Lower Reach	12058	.3	.5
Lower Reach	11408	.1	.3
Lower Reach	10808	.1	.3
Lower Reach	10000	.1	.3

Profile Output Table - Standard Table 1

River	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. Elev (ft)	E.G. Elev (ft)	Slope (ft/ft)	Vel Chnl (ft/s)	Flow Ar (sq f)
Berneil Ditch	Upper East Reach	18515	176.00	1330.90	1334.72	1331.72	1334.73	0.000026	0.81	
Berneil Ditch	Upper East Reach	18515	215.00	1330.90	1336.83	1331.84	1336.83	0.000007	0.61	
Berneil Ditch	Upper East Reach	18195	176.00	1330.57	1334.72	1331.39	1334.73	0.000020	0.82	
Berneil Ditch	Upper East Reach	18195	215.00	1330.57	1336.82	1331.51	1336.83	0.000006	0.58	
Berneil Ditch	Upper East Reach	17960	176.00	1330.33	1334.72		1334.73	0.000016	0.76	
Berneil Ditch	Upper East Reach	17960	215.00	1330.33	1336.82	1331.27	1336.83	0.000006	0.56	
Berneil Ditch	Lower East Reach	17873	1009.00	1330.24	1334.46	1332.11	1334.63	0.000274	3.29	
Berneil Ditch	Lower East Reach	17873	2027.00	1330.24	1336.54	1333.19	1336.83	0.000290	4.29	
Berneil Ditch	Lower East Reach	17705	1009.00	1330.07	1334.18	1332.61	1334.54	0.000685	4.78	
Berneil Ditch	Lower East Reach	17705	2027.00	1330.07	1336.21	1333.97	1336.73	0.000645	5.80	
Berneil Ditch	Lower East Reach	17228	1009.00	1329.58	1333.43	1332.47	1334.04	0.001503	6.28	
Berneil Ditch	Lower East Reach	17228	2027.00	1329.58	1335.59	1334.03	1336.33	0.001017	6.92	
Berneil Ditch	Lower East Reach	16530	1009.00	1328.87	1332.83	1331.42	1333.23	0.000799	5.08	
Berneil Ditch	Lower East Reach	16530	2027.00	1328.87	1335.23	1332.80	1335.73	0.000584	5.66	
Berneil Ditch	Lower East Reach	16055	1009.00	1328.24	1332.58		1332.89	0.000557	4.43	
Berneil Ditch	Lower East Reach	16055	2027.00	1328.24	1335.08	1332.14	1335.47	0.000422	4.96	
Berneil Ditch	Mtn. View Chnl	22527	169.00	1338.30	1340.25	1340.10	1340.78	0.003328	5.81	
Berneil Ditch	Mtn. View Chnl	22527	359.00	1338.30	1341.69		1342.14	0.001693	5.36	
Berneil Ditch	Mtn. View Chnl	22282	169.00	1337.30	1339.10	1339.10	1339.82	0.004514	6.77	
Berneil Ditch	Mtn. View Chnl	22282	359.00	1337.30	1341.55		1341.84	0.000688	4.38	1
Berneil Ditch	Mtn. View Chnl	22187	169.00	1336.90	1338.52	1338.52	1339.23	0.004761	6.78	
Berneil Ditch	Mtn. View Chnl	22187	359.00	1336.90	1341.53		1341.77	0.000496	3.87	
Berneil Ditch	Mtn. View Chnl	21783	169.00	1335.20	1337.86		1338.10	0.001010	3.94	
Berneil Ditch	Mtn. View Chnl	21783	359.00	1335.20	1341.58		1341.65	0.000088	2.15	2
Berneil Ditch	Mtn. View Chnl	21551	169.00	1334.30	1337.85		1337.95	0.000297	2.58	
Berneil Ditch	Mtn. View Chnl	21551	359.00	1334.30	1341.57		1341.63	0.000081	2.06	1
Berneil Ditch	Mtn. View Chnl	21389	169.00	1333.80	1337.84		1337.91	0.000184	2.18	
Berneil Ditch	Mtn. View Chnl	21389	359.00	1333.80	1341.57		1341.62	0.000059	1.85	?
Berneil Ditch	Mtn. View Chnl	21355	169.00	1333.70	1337.84		1337.91	0.000168	2.12	
Berneil Ditch	Mtn. View Chnl	21355	359.00	1333.70	1341.57		1341.62	0.000056	1.81	2
Berneil Ditch	Mtn. View Chnl	20527	456.00	1331.40	1335.55	1335.55	1336.97	0.004160	9.57	
Berneil Ditch	Mtn. View Chnl	20527	1379.00	1331.40	1338.80	1338.80	1340.93	0.003239	11.74	1
Berneil Ditch	Mtn. View Chnl	20000	456.00	1329.10	1333.21		1334.58	0.004059	9.42	
Berneil Ditch	Mtn. View Chnl	20000	1379.00	1329.10	1336.29		1338.48	0.003501	11.89	1

Berneil Ditch	Lower Reach	15922	1294.00	1328.10	1331.68	1331.39	1332.74	0.002587	8.23	157
Berneil Ditch	Lower Reach	15922	3013.00	1328.10	1333.79		1335.47	0.002458	10.40	289
Berneil Ditch	Lower Reach	15542	1294.00	1327.20	1330.98		1331.83	0.001918	7.40	174
Berneil Ditch	Lower Reach	15542	3013.00	1327.20	1333.20		1334.57	0.001829	9.42	320
Berneil Ditch	Lower Reach	15242	1294.00	1326.50	1330.53		1331.28	0.001592	6.98	185
Berneil Ditch	Lower Reach	15242	3013.00	1326.50	1332.73		1334.02	0.001679	9.11	330
Berneil Ditch	Lower Reach	15041	1294.00	1326.20	1329.45	1329.45	1330.76	0.003568	9.19	140
Berneil Ditch	Lower Reach	15041	3013.00	1326.20	1331.51	1331.51	1333.50	0.003125	11.34	265
Berneil Ditch	Lower Reach	14526	1294.00	1324.20	1328.60		1329.32	0.001482	6.81	190
Berneil Ditch	Lower Reach	14526	3013.00	1324.20	1330.95		1332.13	0.001461	8.71	345
Berneil Ditch	Lower Reach	13916	1294.00	1323.10	1327.84		1328.49	0.001179	6.45	200
Berneil Ditch	Lower Reach	13916	3013.00	1323.10	1329.64	1328.81	1331.11	0.001825	9.71	310
Berneil Ditch	Lower Reach	13740	1294.00	1323.60	1327.54	1326.71	1328.25	0.001514	6.75	191
Berneil Ditch	Lower Reach	13740	3013.00	1323.60	1328.99	1328.71	1330.70	0.002547	10.51	286
Berneil Ditch	Lower Reach	12235	1294.00	1320.20	1323.54	1323.54	1324.85	0.003564	9.18	140
Berneil Ditch	Lower Reach	12235	3013.00	1320.20	1327.42		1328.28	0.000929	7.45	410
Berneil Ditch	Lower Reach	12208	1294.00	1319.80	1323.66	1322.09	1324.06	0.000636	5.12	252
Berneil Ditch	Lower Reach	12208	3013.00	1319.80	1327.56	1323.82	1328.10	0.000442	5.91	509
Berneil Ditch	Lower Reach	12183		Culvert						
Berneil Ditch	Lower Reach	12158	1294.00	1318.50	1320.79	1320.79	1321.94	0.003615	8.62	150
Berneil Ditch	Lower Reach	12158	3013.00	1318.50	1322.54	1322.54	1324.55	0.002940	11.36	265
Berneil Ditch	Lower Reach	12058	1294.00	1316.00	1319.22	1318.82	1320.14	0.002285	7.70	168
Berneil Ditch	Lower Reach	12058	3013.00	1316.00	1321.34	1320.76	1322.82	0.002084	9.79	307
Berneil Ditch	Lower Reach	11408	1294.00	1314.00	1317.21		1318.35	0.003086	8.59	150
Berneil Ditch	Lower Reach	11408	3013.00	1314.00	1319.08	1319.05	1321.05	0.003067	11.28	267
Berneil Ditch	Lower Reach	10808	1294.00	1312.80	1316.43	1315.49	1317.04	0.001288	6.26	206
Berneil Ditch	Lower Reach	10808	3013.00	1312.80	1318.11	1317.37	1319.45	0.001844	9.30	323
Berneil Ditch	Lower Reach	10000	1294.00	1312.30	1314.79	1314.55	1315.57	0.002704	7.10	182
Berneil Ditch	Lower Reach	10000	3013.00	1312.30	1316.30	1316.09	1317.66	0.002703	9.33	322
71 St. Channel	Lower Reach	37941	498.00	1379.10	1383.89	1383.89	1384.63	0.002280	7.73	8
71 St. Channel	Lower Reach	37941	1171.00	1379.10	1385.00	1385.00	1386.24	0.003136	10.45	13
71 St. Channel	Lower Reach	37808	498.00	1378.70	1383.74	1381.88	1384.13	0.000725	4.98	9
71 St. Channel	Lower Reach	37808	1171.00	1378.70	1384.82	1384.22	1385.77	0.001423	8.22	20
71 St. Channel	Lower Reach	37700	498.00	1378.60	1383.71	1381.20	1384.04	0.000601	4.64	11
71 St. Channel	Lower Reach	37700	1171.00	1378.60	1384.58	1383.19	1385.60	0.001624	8.48	21
71 St. Channel	Lower Reach	37658		Culvert						
71 St. Channel	Lower Reach	37615	498.00	1378.50	1382.62	1381.11	1383.13	0.001132	5.74	8
71 St. Channel	Lower Reach	37615	1171.00	1378.50	1384.50	1383.64	1385.44	0.001431	8.23	21
71 St. Channel	Lower Reach	37343	498.00	1378.20	1381.28	1381.28	1382.53	0.004004	8.97	5
71 St. Channel	Lower Reach	37343	1171.00	1378.20	1383.50	1383.50	1384.91	0.002350	9.89	17
71 St. Channel	Lower Reach	37048	13.00	1377.30	1377.58	1377.58	1377.71	0.007626	2.86	
71 St. Channel	Lower Reach	37048	686.00	1377.30	1380.98		1381.74	0.001917	7.74	22
71 St. Channel	Lower Reach	36912	13.00	1376.30	1376.93	1376.77	1376.99	0.002521	2.06	
71 St. Channel	Lower Reach	36912	686.00	1376.30	1380.32	1380.32	1381.38	0.003103	8.60	15
71 St. Channel	Lower Reach	36712	13.00	1375.60	1375.97	1375.97	1376.13	0.008565	3.23	
71 St. Channel	Lower Reach	36712	686.00	1375.60	1378.86		1379.35	0.002312	7.56	29
71 St. Channel	Lower Reach	36664	13.00	1375.20	1375.64		1375.74	0.004334	2.48	
71 St. Channel	Lower Reach	36664	686.00	1375.20	1378.90		1379.20	0.001253	6.12	36
71 St. Channel	Lower Reach	36579	13.00	1374.70	1375.07	1375.06	1375.23	0.008372	3.25	
71 St. Channel	Lower Reach	36579	686.00	1374.70	1377.76	1377.76	1378.93	0.004934	10.50	16
71 St. Channel	Lower Reach	36306	13.00	1372.85	1373.23	1373.23	1373.39	0.005539	3.27	
71 St. Channel	Lower Reach	36306	686.00	1372.85	1374.98	1374.98	1375.59	0.003989	9.11	16
71 St. Channel	Lower Reach	36233	13.00	1372.05	1372.29	1372.29	1372.38	0.006724	2.40	
71 St. Channel	Lower Reach	36233	686.00	1372.05	1373.77	1373.77	1374.35	0.003644	7.72	16
71 St. Channel	Lower Reach	36088	13.00	1370.86	1371.22	1371.21	1371.30	0.005490	2.24	
71 St. Channel	Lower Reach	36088	686.00	1370.86	1372.78	1372.78	1373.36	0.003294	7.59	16
71 St. Channel	Lower Reach	35845	13.00	1369.45	1369.69	1369.69	1369.78	0.007080	2.41	
71 St. Channel	Lower Reach	35845	686.00	1369.45	1371.18	1371.18	1371.75	0.003590	7.65	16
71 St. Channel	Lower Reach	35493	13.00	1367.25	1367.60	1367.60	1367.68	0.005086	2.19	
71 St. Channel	Lower Reach	35493	686.00	1367.25	1370.18		1370.34	0.000522	4.11	29
71 St. Channel	Lower Reach	35411	13.00	1366.83	1367.10	1367.10	1367.19	0.006875	2.39	
71 St. Channel	Lower Reach	35411	686.00	1366.83	1370.20		1370.30	0.000267	3.29	37
71 St. Channel	Lower Reach	35311	13.00	1366.00	1366.37	1366.37	1366.46	0.006816	2.38	
71 St. Channel	Lower Reach	35311	686.00	1366.00	1370.24	1367.70	1370.27	0.000046	1.54	58
71 St. Channel	Lower Reach	35252	13.00	1365.00	1365.40	1365.40	1365.55	0.006681	3.05	
71 St. Channel	Lower Reach	35252	686.00	1365.00	1368.59	1368.59	1370.11	0.003378	9.94	7

71	St. Channel	Lower	Reach	35023	13.00	1363.70	1364.20	1364.15	1364.31	0.004362	2.70	
71	St. Channel	Lower	Reach	35023	686.00	1363.70	1367.44	1367.44	1369.07	0.003320	10.32	6
71	St. Channel	Lower	Reach	34873	13.00	1363.30	1363.80	1363.66	1363.87	0.002013	2.10	
71	St. Channel	Lower	Reach	34873	686.00	1363.30	1367.04	1366.89	1368.47	0.002796	9.65	7
71	St. Channel	Lower	Reach	34673	13.00	1362.70	1363.02	1363.02	1363.17	0.007099	3.10	
71	St. Channel	Lower	Reach	34673	686.00	1362.70	1366.26	1366.26	1367.84	0.003379	10.16	7
71	St. Channel	Lower	Reach	34378	659.00	1354.50	1359.77		1359.97	0.001084	3.62	3
71	St. Channel	Lower	Reach	34378	1461.00	1354.50	1362.87		1363.07	0.000598	3.69	42
71	St. Channel	Lower	Reach	34338	659.00	1354.28	1359.34	1357.30	1359.88	0.001646	5.92	11
71	St. Channel	Lower	Reach	34338	1461.00	1354.28	1362.91	1359.42	1363.03	0.000239	2.84	54
71	St. Channel	Lower	Reach	34322		Culvert						
71	St. Channel	Lower	Reach	34307	659.00	1353.80	1358.61	1356.82	1359.21	0.001943	6.22	10
71	St. Channel	Lower	Reach	34307	1461.00	1353.80	1361.40	1358.94	1361.56	0.000388	3.30	45
71	St. Channel	Lower	Reach	34245	712.00	1353.50	1358.44		1359.04	0.004123	6.24	11
71	St. Channel	Lower	Reach	34245	1568.00	1353.50	1360.55	1359.32	1361.32	0.003398	7.15	22
71	St. Channel	Lower	Reach	33832	712.00	1351.50	1355.89	1355.89	1357.34	0.003694	9.65	7
71	St. Channel	Lower	Reach	33832	1568.00	1351.50	1358.17	1358.17	1359.98	0.002684	10.89	15
71	St. Channel	Lower	Reach	33446	792.00	1349.50	1354.13	1354.13	1355.66	0.003688	9.92	7
71	St. Channel	Lower	Reach	33446	1655.00	1349.50	1357.61		1358.69	0.001156	8.43	21
71	St. Channel	Lower	Reach	33413	792.00	1349.80	1354.14	1352.52	1354.68	0.001999	5.89	13
71	St. Channel	Lower	Reach	33413	1655.00	1349.80	1358.00	1354.24	1358.47	0.001080	5.59	34
71	St. Channel	Lower	Reach	33382		Culvert						
71	St. Channel	Lower	Reach	33352	792.00	1349.30	1352.02	1352.02	1353.39	0.009506	9.40	8
71	St. Channel	Lower	Reach	33352	1655.00	1349.30	1356.65		1357.24	0.001579	6.26	33
71	St. Channel	Lower	Reach	33290	792.00	1349.10	1353.02	1353.02	1354.40	0.010156	9.45	8
71	St. Channel	Lower	Reach	33290	1655.00	1349.10	1356.34		1357.26	0.003000	7.79	25
71	St. Channel	Lower	Reach	32899	792.00	1342.00	1350.34		1351.66	0.001583	9.22	8
71	St. Channel	Lower	Reach	32899	1655.00	1342.00	1354.51		1356.71	0.003282	11.90	14
71	St. Channel	Lower	Reach	32713		Culvert						
71	St. Channel	Lower	Reach	32542	822.00	1340.66	1347.12	1345.92	1348.87	0.001369	10.60	7
71	St. Channel	Lower	Reach	32542	1713.00	1340.66	1351.26	1349.22	1351.92	0.000562	6.67	29
71	St. Channel	Lower	Reach	32392	822.00	1340.20	1346.81	1346.81	1348.55	0.003858	10.57	
71	St. Channel	Lower	Reach	32392	1713.00	1340.20	1349.57	1349.57	1351.41	0.002549	10.99	
71	St. Channel	Lower	Reach	32024	822.00	1336.38	1344.76	1340.45	1345.20	0.000562	5.32	15
71	St. Channel	Lower	Reach	32024	1713.00	1336.38	1346.81	1343.01	1347.78	0.001003	8.14	25
71	St. Channel	Lower	Reach	31988		Culvert						
71	St. Channel	Lower	Reach	31952	822.00	1336.43	1343.50	1340.17	1344.02	0.000367	5.82	14
71	St. Channel	Lower	Reach	31952	1713.00	1336.43	1345.78	1342.53	1346.93	0.001189	8.60	20
71	St. Channel	Lower	Reach	31657	822.00	1336.50	1342.06	1342.06	1343.51	0.003290	9.76	8
71	St. Channel	Lower	Reach	31657	1713.00	1336.50	1343.98	1343.98	1346.11	0.002925	11.99	15
71	St. Channel	Lower	Reach	31292	822.00	1335.58	1340.97	1338.69	1341.45	0.000504	5.61	14
71	St. Channel	Lower	Reach	31292	1713.00	1335.58	1344.13	1340.60	1344.81	0.000572	6.62	26
71	St. Channel	Lower	Reach	31242		Culvert						
71	St. Channel	Lower	Reach	31192	822.00	1334.90	1339.70	1337.88	1340.28	0.002559	6.11	13
71	St. Channel	Lower	Reach	31192	1713.00	1334.90	1342.02	1339.76	1342.52	0.001985	5.66	30
71	St. Channel	Lower	Reach	31066	822.00	1335.00	1338.89		1339.68	0.008856	7.12	11
71	St. Channel	Lower	Reach	31066	1713.00	1335.00	1341.43		1342.12	0.003887	6.69	25
71	St. Channel	Lower	Reach	30889	822.00	1334.40	1338.90	1336.43	1339.10	0.001000	3.66	22
71	St. Channel	Lower	Reach	30889	1713.00	1334.40	1341.60	1337.70	1341.75	0.000522	3.17	56
71	St. Channel	Lower	Reach	30866		Culvert						
71	St. Channel	Lower	Reach	30844	822.00	1334.20	1338.65	1336.10	1338.82	0.000856	3.36	24
71	St. Channel	Lower	Reach	30844	1713.00	1334.20	1341.19	1337.30	1341.28	0.000362	2.50	72
71	St. Channel	Lower	Reach	30499	822.00	1333.40	1338.12		1338.39	0.001973	4.13	19
71	St. Channel	Lower	Reach	30499	1713.00	1333.40	1340.74		1341.05	0.001293	4.48	39
71	St. Channel	Lower	Reach	30130	822.00	1332.40	1337.11		1337.48	0.003063	4.88	16
71	St. Channel	Lower	Reach	30130	1713.00	1332.40	1340.27		1340.58	0.001191	4.48	39
71	St. Channel	Lower	Reach	30083	822.00	1331.40	1336.66	1334.69	1337.26	0.003626	6.21	13
71	St. Channel	Lower	Reach	30083	1713.00	1331.40	1339.79	1336.68	1340.41	0.002208	6.68	28
71	St. Channel	Lower	Reach	30041		Culvert						
71	St. Channel	Lower	Reach	30000	822.00	1331.20	1334.72		1335.74	0.009153	8.12	10
71	St. Channel	Lower	Reach	30000	1713.00	1331.20	1336.55		1338.47	0.011154	11.11	15

Profile Output Table - Culvert Only

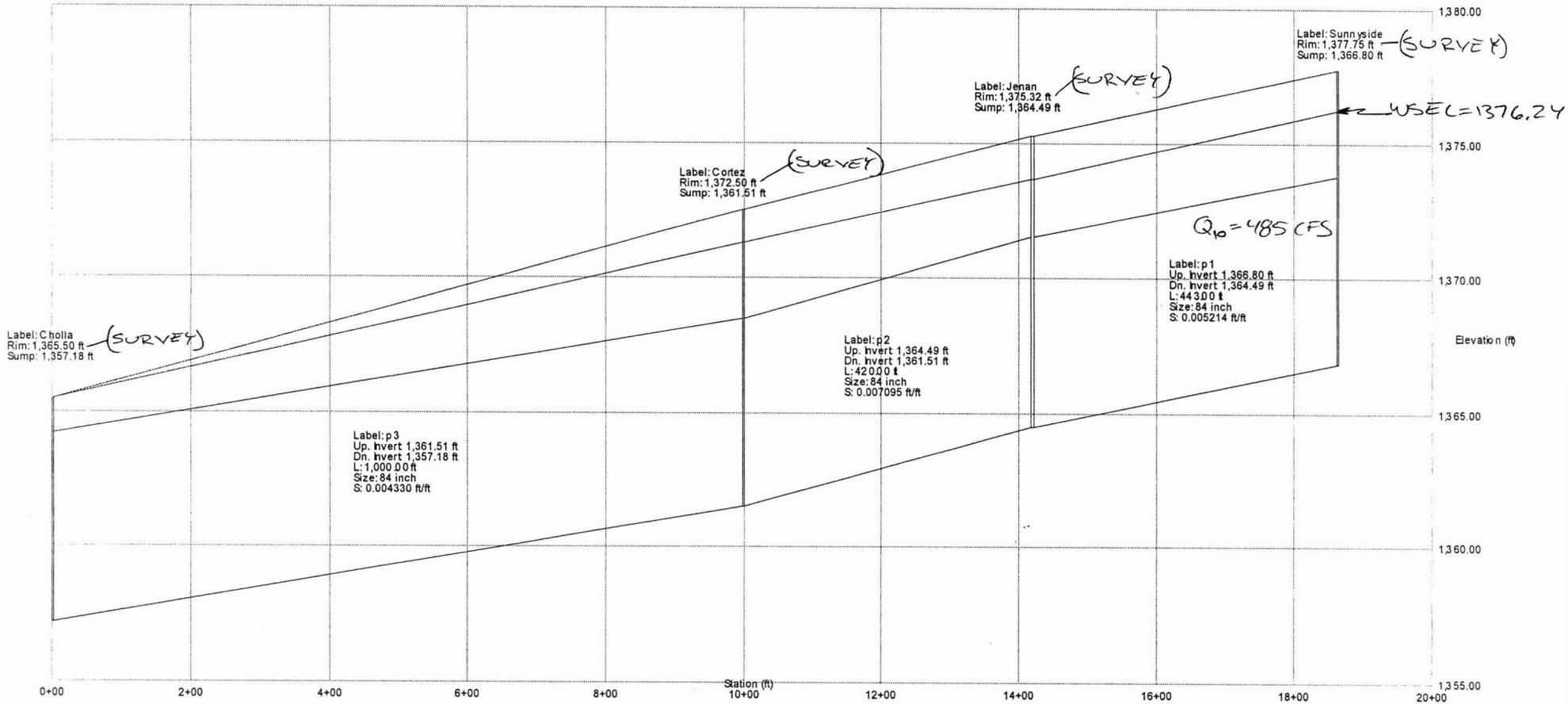
River	Reach	River Sta	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir	Flow (ft)	Culv Q (cfs)	Q Weir (cfs)
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Berneil Ditch	Lower Reach	12183	Culvert #1	1324.06	1323.66	1323.89	1324.06	1330.00	1294.00
Berneil Ditch	Lower Reach	12183	Culvert #1	1328.10	1327.56	1328.10	1327.29	1330.00	3013.00
71 St. Channel	Lower Reach	37658	Paradise Dr.	1384.04	1383.71	1383.56	1384.04	1383.70	423.43
71 St. Channel	Lower Reach	37658	Paradise Dr.	1385.61	1384.58	1385.46	1385.61	1383.70	210.87
71 St. Channel	Lower Reach	34322	Culvert #1	1359.88	1359.34	1359.43	1359.88	1361.62	659.00
71 St. Channel	Lower Reach	34322	Culvert #1	1363.04	1362.91	1362.63	1363.04	1361.62	986.32
71 St. Channel	Lower Reach	33382	Culvert #1	1354.68	1354.14	1354.27	1354.68	1357.38	792.00
71 St. Channel	Lower Reach	33382	Culvert #1	1358.47	1358.00	1357.63	1358.47	1357.38	1264.50
71 St. Channel	Lower Reach	32713	Culvert #1	1352.15	1350.34	1351.36	1352.15	1354.34	792.00
71 St. Channel	Lower Reach	32713	Culvert #1	1356.53	1354.51	1356.29	1356.53	1354.34	1163.16
71 St. Channel	Lower Reach	31988	Culvert #1	1345.20	1344.76	1343.44	1345.20	1344.36	777.28
71 St. Channel	Lower Reach	31988	Culvert #1	1347.78	1346.81	1346.97	1347.78	1344.36	843.48
71 St. Channel	Lower Reach	31242	Gold Dust	1341.45	1340.97	1341.05	1341.45	1342.11	822.00
71 St. Channel	Lower Reach	31242	Gold Dust	1344.81	1344.13	1344.31	1344.81	1342.11	1211.09
71 St. Channel	Lower Reach	30866	Culvert #2	1339.11	1338.90	1337.77	1339.11	1339.93	822.00
71 St. Channel	Lower Reach	30866	Culvert #2	1341.76	1341.60	1340.61	1341.76	1339.93	911.33
71 St. Channel	Lower Reach	30041	Berneil	1337.26	1336.66	1336.87	1337.26	1339.31	822.00
71 St. Channel	Lower Reach	30041	Berneil	1340.40	1339.79	1340.56	1340.40	1339.31	1553.24

"WITH RECOMMENDED ALTERNATIVE" STORMCAD  
AND HEC-RAS PROFILES

Profile  
Scenario: Base

84" & S-  
DRAIN  
FROM CHOLLA TO  
SUNNYSIDE

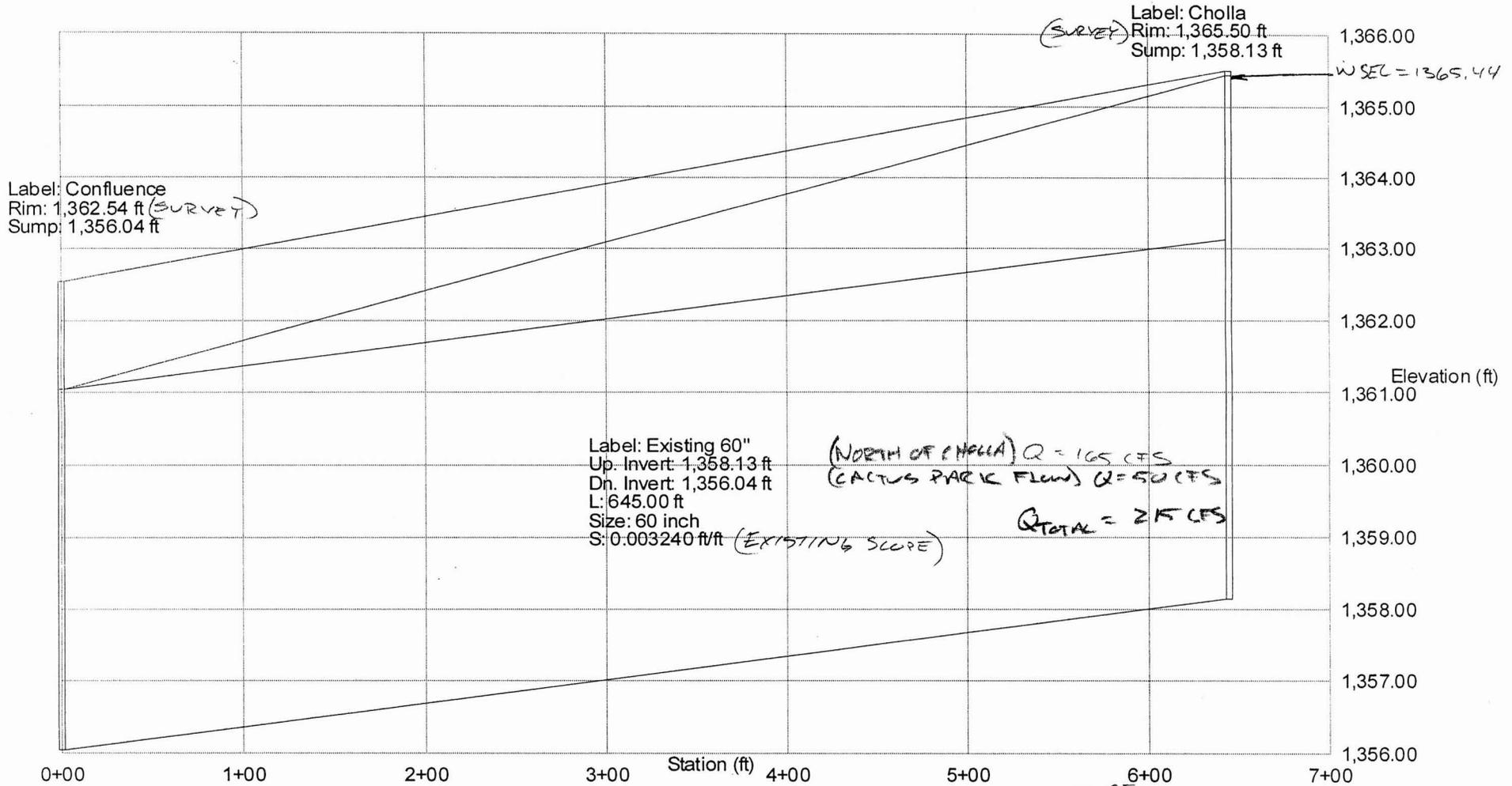


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71<sup>ST</sup> STREET CHANNEL  
RECOMMENDED ALT  
STORM DRAIN  
CHOLLA TO SUNNYSIDE

Profile  
Scenario: Base

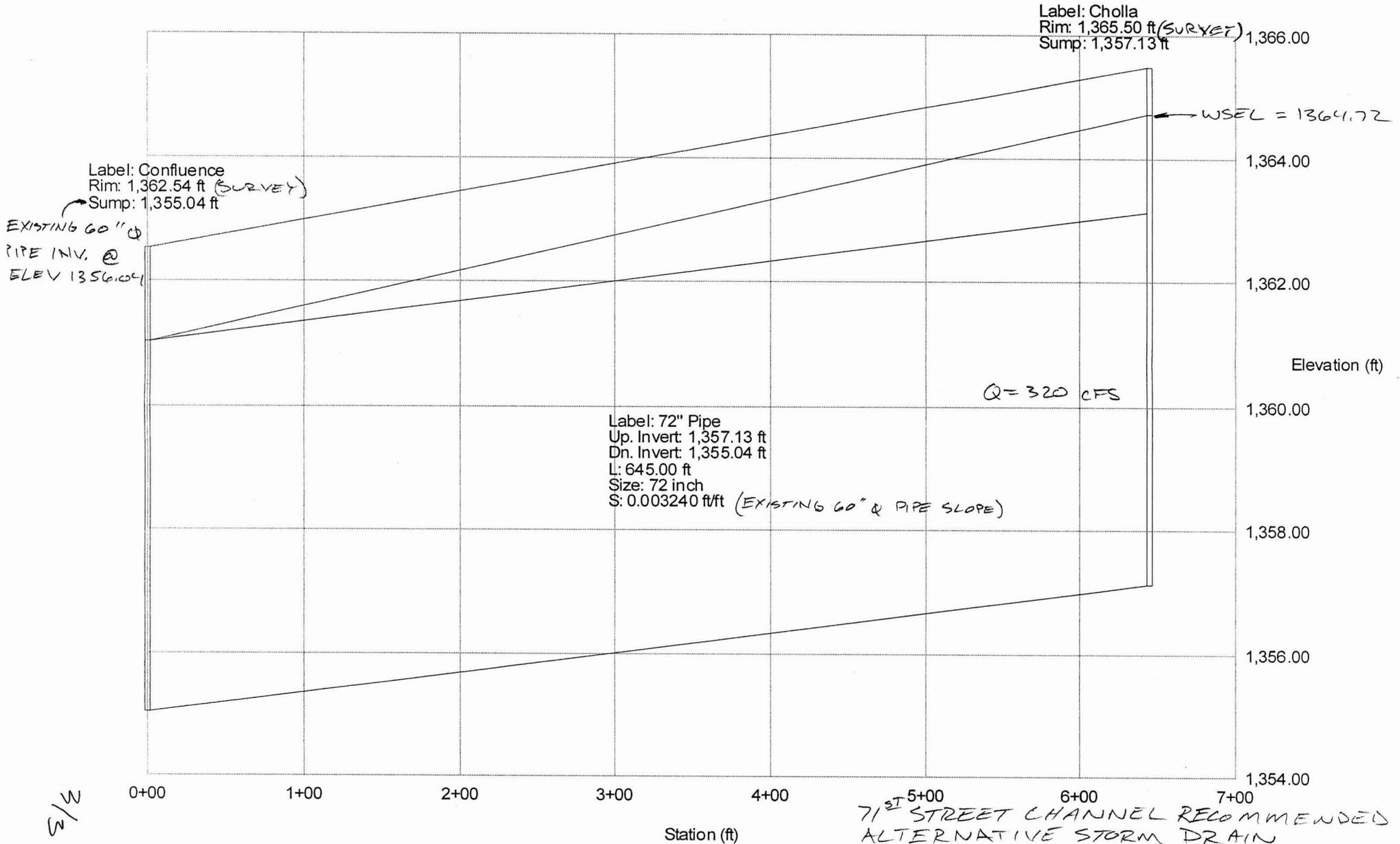
DCE # 15581  
8-20-02  
EXISTING 60" DIAM PIPE  
FROM CONFL TO CHOLLA



5/2

Profile  
Scenario: Base

11-11-13706  
6-21  
72" Q PIPE FROM  
CONFL TO CHOLLA

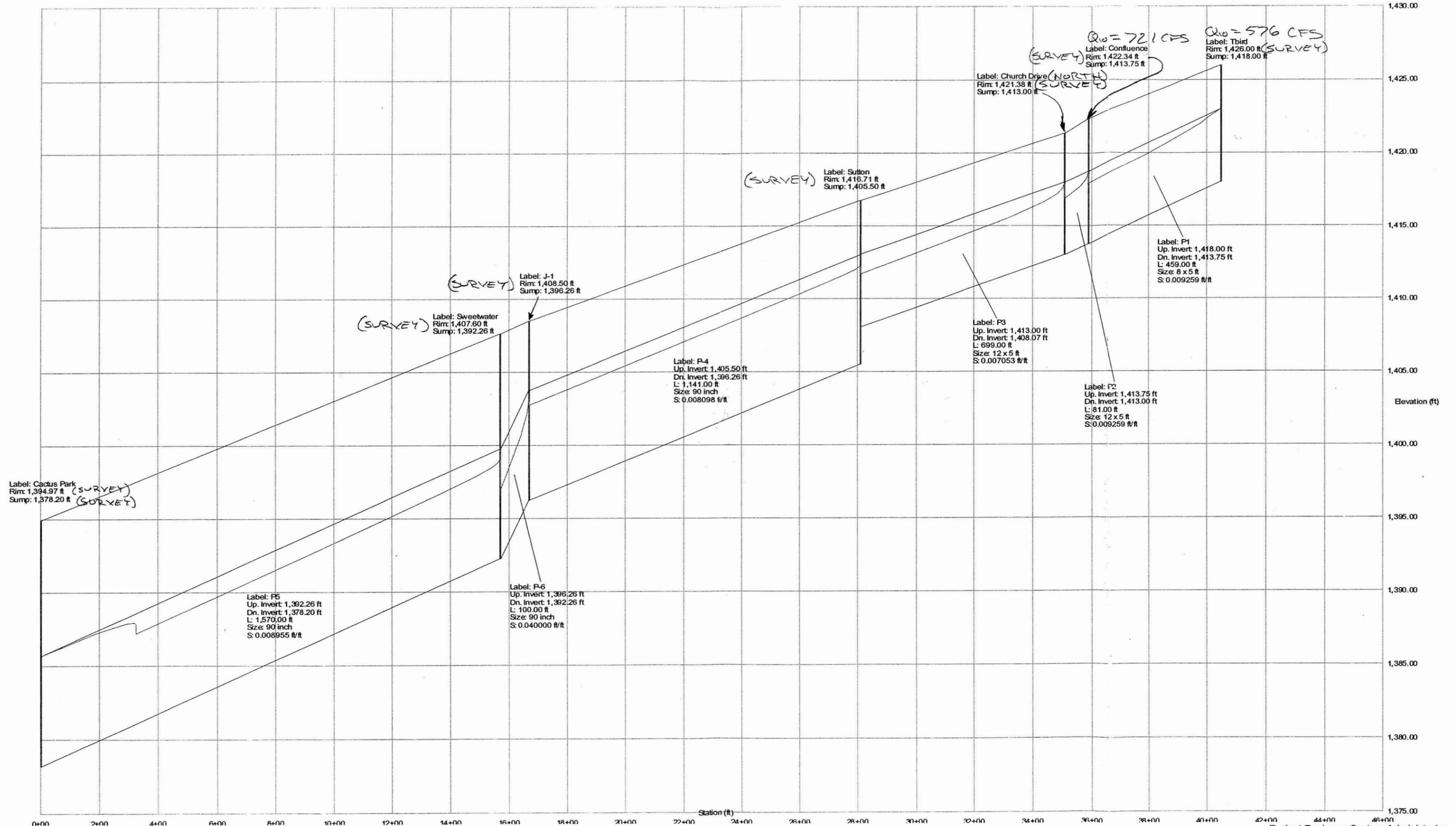


M/S

71<sup>ST</sup> STREET CHANNEL RECOMMENDED  
ALTERNATIVE STORM DRAIN  
CONFLUENCE TO CHOLLA

Profile  
Scenario: Base

SCOTTSDALE ROAD  
PROPOSED STORM DRAIN  
TBIRD TO CACTUS PARK



Title: test1  
q:\...15%, sdale road preferred alt, rev02.stm  
10/18/02 04:36:54 PM

=====  
 Scenario: Base

>>>> Info: Subsurface Analysis iterations: 1  
 >>>> Info: Convergence was achieved.

=====  
 Gravity subnetwork discharging at: Cactus Park  
 -----

>>>> Info: Loading and hydraulic computations completed successfully.  
 >>>> Info: P5 Hydraulic jump formed.  
 >>>> Info: P5 Critical depth assumed upstream.  
 >>>> Warning: P5 Pipe fails maximum velocity constraint.  
 >>>> Warning: P1 Pipe fails maximum velocity constraint.  
 >>>> Warning: P-4 Pipe fails maximum velocity constraint.  
 >>>> Warning: P-4 Pipe discharge is above full flow capacity.  
 >>>> Warning: P-6 Pipe fails maximum velocity constraint.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
Sweetwater	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Sutton	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Church Drive	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Confluence	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Tbird	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Cactus Park

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P5	1	90 inch	Circular	1,570.00	721.00	16.78	1,399.00	1,385.70
P-6	1	90 inch	Circular	100.00	721.00	20.87	1,403.00	1,397.00
P-4	1	90 inch	Circular	1,141.00	721.00	17.49	1,412.24	1,402.75
P3	1	12 x 5 ft	Box	699.00	721.00	14.50	1,417.82	1,411.70
P2	1	12 x 5 ft	Box	81.00	721.00	13.94	1,418.57	1,416.90
P1	1	8 x 5 ft	Box	459.00	576.00	15.87	1,423.00	1,417.90

SCOTTSDALE RD F POSED  
STORM DRAIN

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Cactus Park	721.00	1,394.97	1,385.70	1,385.70
Sweetwater	721.00	1,407.60	1,399.00	1,399.00
J-1	721.00	1,408.50	1,403.00	1,403.00
Sutton	721.00	1,416.71	1,412.24	1,412.24
Church Drive	721.00	1,421.38	1,417.82	1,417.82
Confluence	721.00	1,422.34	1,418.57	1,418.57
Tbird	576.00	1,426.00	1,423.00	1,423.00

=====  
Completed: 10/18/2002 04:37:15 PM

Scottsdale Rd. Storm Drain Alternative

Scenario: Base

SCOTTSDALE PAD  
PROPOSED SILEM DRAIN

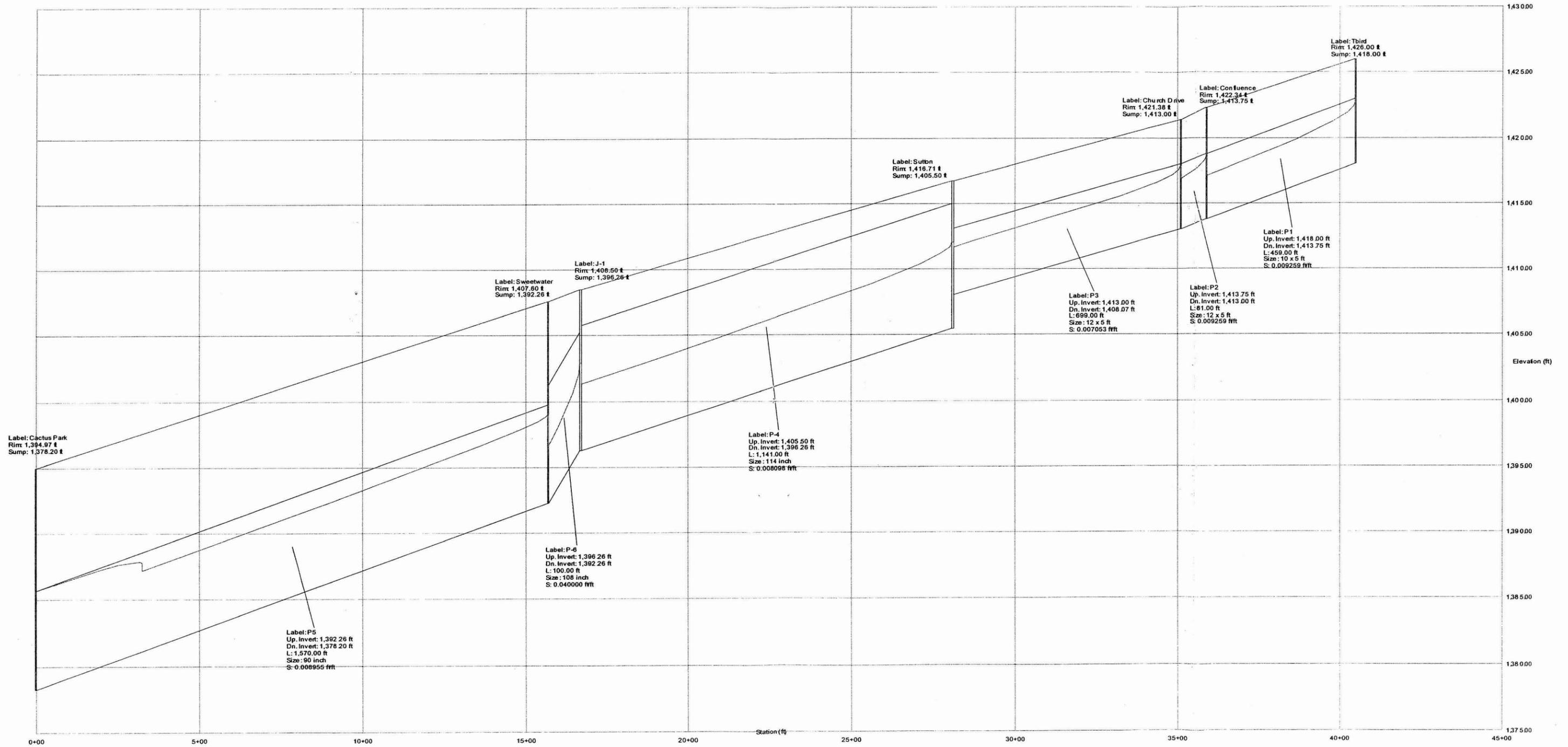
Pipe Report

Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Energy Grade Line In (ft)	Energy Grade Line Out (ft)	Description
Tbird	Confluence	576.00	459.00	0.009259	8 x 5 ft	0.013	1,418.00	1,413.75	1,426.00	1,422.34	1,423.00	1,417.90	1,426.22	1,422.58	
Confluence	Church Driv	721.00	81.00	0.009259	12 x 5 f	0.013	1,413.75	1,413.00	1,422.34	1,421.38	1,418.57	1,416.90	1,420.98	1,420.59	
Church Driv	Sutton	721.00	699.00	0.007053	12 x 5 f	0.013	1,413.00	1,408.07	1,421.38	1,416.71	1,417.82	1,411.70	1,420.23	1,415.95	
Sutton	J-1	721.00	1,141.00	0.008098	90 inch	0.013	1,405.50	1,396.26	1,416.71	1,408.50	1,412.24	1,402.75	1,416.86	1,407.64	
J-1	Sweetwater	721.00	100.00	0.040000	90 inch	0.013	1,396.26	1,392.26	1,408.50	1,407.60	1,403.00	1,397.00	1,407.62	1,406.33	
Sweetwater	Cactus Par	721.00	1,570.00	0.008955	90 inch	0.013	1,392.26	1,378.20	1,407.60	1,394.97	1,399.00	1,385.70	1,403.62	1,389.84	

Scottsdale Rd Storm Drain Alternatives

Profile  
Scenario: Base

SLI #15586  
SCOTTSDALE RD CORRIDOR DMP  
SDALE RD RECOMMENDED ALTERNATIVE  
ADJUSTED TO ACCOUNT FOR FCD  
FUTURE STORM DRAIN CRITERIA



SLI #15586

SCI #15586  
 SCOTTSDALE RD CORRIDOR DMP  
 SDALE RD RECOMMENDED  
 ALTERNATIVE ADJUSTED  
 TO ACCOUNT FOR FUTURE  
 FCD STORM DRAW CRITERIA

=====  
 Scenario: Base

>>> Info: Subsurface Analysis iterations: 1  
 >>> Info: Convergence was achieved.

=====  
 Gravity subnetwork discharging at: Cactus Park

>>> Info: Loading and hydraulic computations completed successfully.  
 >>> Info: P5 Hydraulic jump formed.  
 >>> Info: P5 Critical depth assumed upstream.  
 >>> Warning: P5 Pipe fails maximum velocity constraint.  
 >>> Info: P1 Hydraulic jump formed.  
 >>> Info: P1 Critical depth assumed upstream.  
 >>> Info: P-4 Hydraulic jump formed.  
 >>> Info: P-4 Critical depth assumed upstream.  
 >>> Warning: P-4 Pipe fails minimum cover constraint.  
 >>> Info: P-6 Hydraulic jump formed.  
 >>> Info: P-6 Critical depth assumed upstream.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
Sweetwater	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Sutton	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Church Drive	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Confluence	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
Tbird	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: Cactus Park

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P5	1	90 inch	Circular	1,570.00	721.00	16.78	1,399.00	1,385.70
P-6	1	108 inch	Circular	100.00	721.00	14.21	1,402.91	1,399.00
P-4	1	114 inch	Circular	1,141.00	721.00	13.72	1,412.06	1,402.91
P3	1	12 x 5 ft	Box	699.00	721.00	14.50	1,417.82	1,411.70

Title: test1  
 q:\...\sdale rd rec alt sd, fcd criteria.stm  
 10/25/02 10:03:47 AM

P2	1	12 x 5 ft	Box	81.00	721.00	13.94	1,418.57	1,416.90
P1	1	10 x 5 ft	Box	459.00	576.00	12.11	1,422.69	1,418.57

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
Cactus Park	721.00	1,394.97	1,385.70	1,385.70
Sweetwater	721.00	1,407.60	1,399.00	1,399.00
J-1	721.00	1,408.50	1,402.91	1,402.91
Sutton	721.00	1,416.71	1,412.06	1,412.06
Church Drive	721.00	1,421.38	1,417.82	1,417.82
Confluence	721.00	1,422.34	1,418.57	1,418.57
Tbird	576.00	1,426.00	1,422.69	1,422.69

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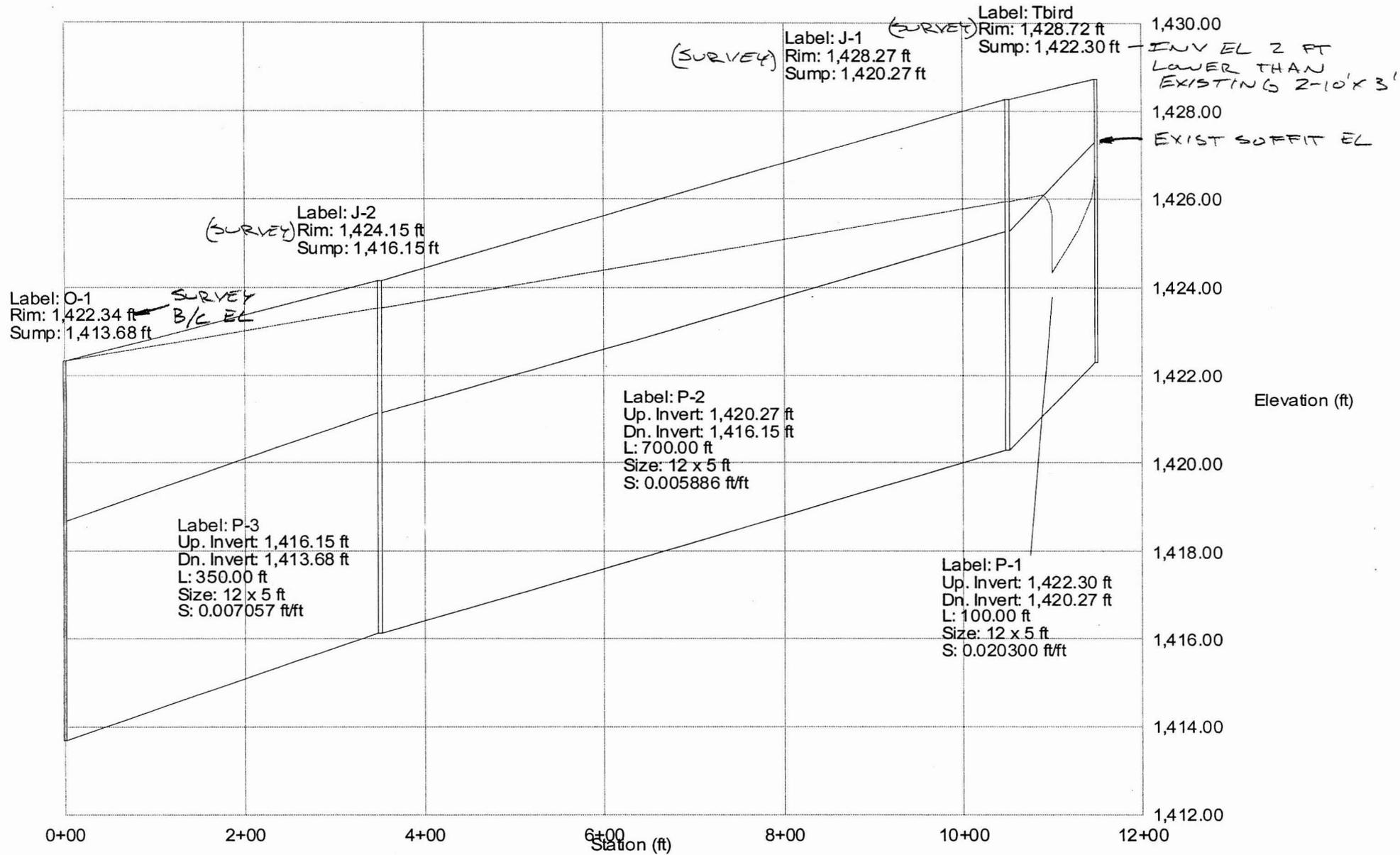
SOI # 15586  
SCOTTSDALE RD CORRIDOR DMP  
SDALE RD RECOMMENDED  
ALTERNATIVE ADJUSTED TO  
ACCOUNT FOR FUTURE  
FCD STORM DRAIN CRITERIA

	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Energy Grade Line In (ft)	Energy Grade Line Out (ft)	Average Velocity (ft/s)	Inlet Froude #	Outlet Froude #	Avg Froude #
P1	Tbird	Confluence	576	459	0.009259	10 x 5 ft	0.013	1,418.00	1,413.75	1,426.00	1,422.34	1,422.69	1,418.57	1,425.03	1,420.79	12.11	0.985439	0.972059	0.978749
P2	Confluence	Church Drive	721	81	0.009259	12 x 5 ft	0.013	1,413.75	1,413.00	1,422.34	1,421.38	1,418.57	1,416.90	1,420.98	1,420.59	13.94	1.118952	1.243949	1.18145
P3	Church Drive	Sutton	721	699	0.007053	12 x 5 ft	0.013	1,413.00	1,408.07	1,421.38	1,416.71	1,417.82	1,411.70	1,420.23	1,415.95	14.5	1.163902	1.341179	1.252541
P-4	Sutton	J-1	721	1,141.00	0.008098	114 inch	0.013	1,405.50	1,396.26	1,416.71	1,408.50	1,412.06	1,402.91	1,415.02	1,405.79	13.72	0.944005	0.937595	0.9408
P-6	J-1	Sweetwater	721	100	0.04	108 inch	0.013	1,396.26	1,392.26	1,408.50	1,407.60	1,402.91	1,399.00	1,406.09	1,402.09	14.21	0.971081	0.964575	0.967828
P5	Sweetwater	Cactus Park	721	1,570.00	0.008955	90 inch	0.013	1,392.26	1,378.20	1,407.60	1,394.97	1,399.00	1,385.70	1,403.62	1,389.84	16.78	1.139027	1.079775	1.109401

SCI #15586  
 SCOTTSDALE RD CORRIDOR DMP  
 SDALE RD RECOMMENDED  
 ALTERNATIVE ADJUSTED  
 TO ACCOUNT FOR FCD  
 FUTURE STORM DRAIN  
 CRITERIA

**Profile  
Scenario: Base**

SCI # 15586  
SDALE AIRPORT OUTFALL  
PROPOSED BOX  
ESTIMATION



Scenario: Base

SC# 15586  
SDALE AIRPORT OUTFALL  
PROPOSED BOX ESTIMATION

>>>> Info: Subsurface Analysis iterations: 1  
>>>> Info: Convergence was achieved.

Gravity subnetwork discharging at: O-1

>>>> Info: Loading and hydraulic computations completed successfully.  
>>>> Info: P-1 Hydraulic jump formed.  
>>>> Info: P-1 Critical depth assumed upstream.  
>>>> Warning: P-1 Pipe fails minimum cover constraint.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
Tbird	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

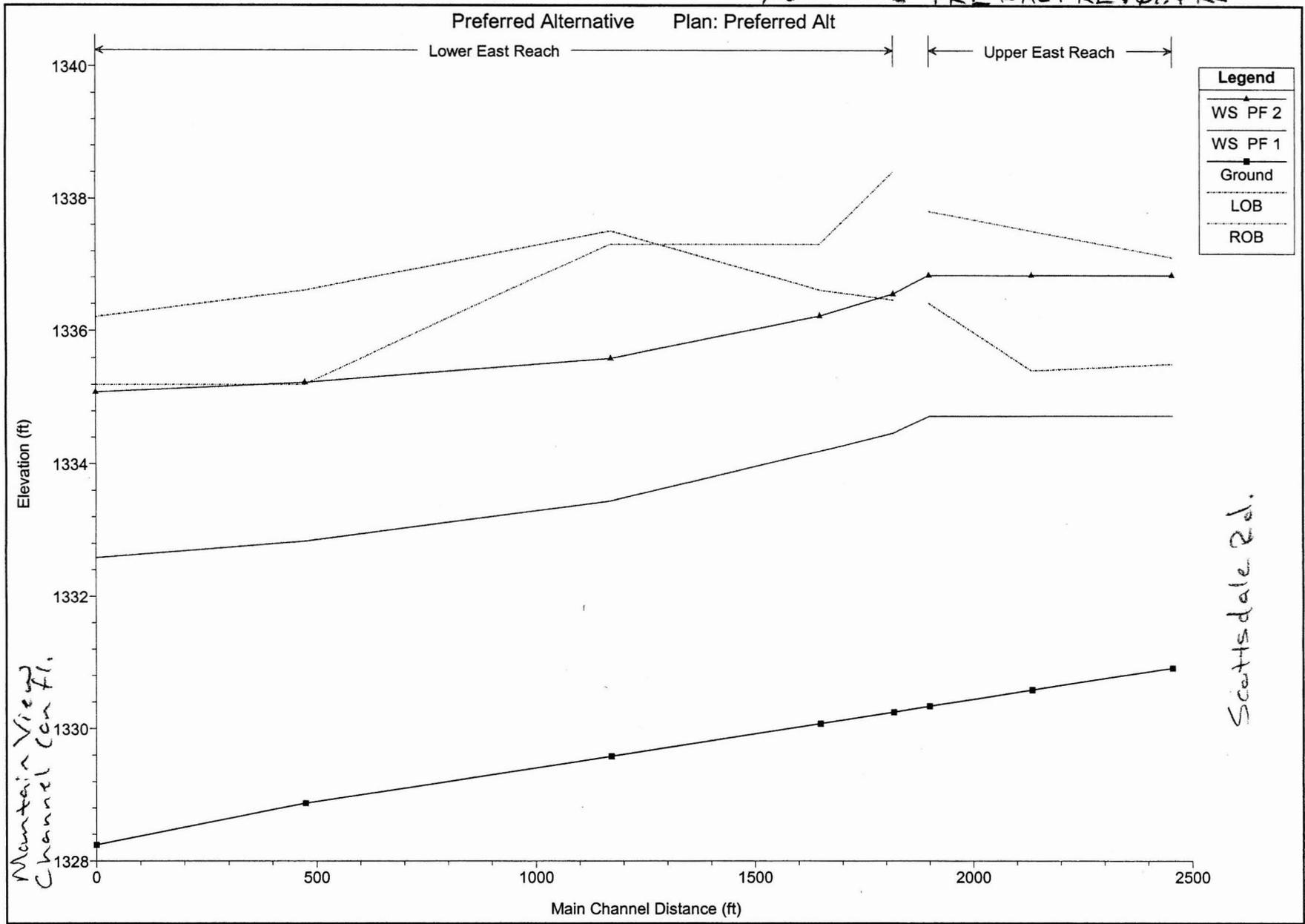
CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-3	1	12 x 5 ft	Box	350.00	587.00	9.78	1,423.54	1,422.34
P-2	1	12 x 5 ft	Box	700.00	587.00	9.78	1,425.95	1,423.54
P-1	1	12 x 5 ft	Box	100.00	587.00	10.71	1,426.51	1,425.95

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	587.00	1,422.34	1,422.34	1,422.34
J-2	587.00	1,424.15	1,423.54	1,423.54
J-1	587.00	1,428.27	1,425.95	1,425.95
Tbird	587.00	1,428.72	1,426.51	1,426.51

Title: Airport Outfall Pipe  
q:\...stormcad\15%, airport outfall box.stm  
10/18/02 04:41:02 PM

HEL-RAS PREFALT REV 01.PRT



SCIT # 15586  
 Bernell Ditch Recommended Alt  
 State Rd to Mtn View Chnl

71<sup>ST</sup> STREET CHANNEL PROPOSED STORM DRAIN INLET CALCULATIONS

## Spatially Varied Flow With Decreasing Discharge "Complete Withdrawal"

The following information was taken from Chow, Open-Channel Hydraulics.

Starting with the specific energy equation,

$$E = y + \frac{V^2}{2g} = y + \frac{Q^2}{2gb^2y^2} \quad (\text{Eq 1.1})$$

For a spatially varied flow with decreasing discharge, the specific energy can be considered constant along the channel. Thus,  $dE/dx = 0$ ; or, from Eq. 1.1,

$$\frac{dy}{dx} = \frac{Qy(-dQ/dx)}{gb^2y^3 - Q^2} \quad (\text{Eq 1.2})$$

Where  $-dQ/dx$  is the discharge withdrawn through a length  $dx$  of the rack. Equation 1.2 is the general dynamic equation for the flow under consideration.

For vertical flow through the rack, in this case the discharge through a length  $dx$  of the rack may be expressed by:

$$-\frac{dQ}{dx} = \epsilon cb\sqrt{2gE} \quad (\text{Eq 1.3})$$

where  $\epsilon$  is the ratio of the opening area to the total area of the rack surface and  $c$  is the coefficient of discharge through the openings.

From Eq. (1.1), the discharge is:

$$Q = by\sqrt{2g(E - y)} \quad (\text{Eq 1.4})$$

Substituting Eq. 1.3 for  $dQ/dx$  and Eq. 1.4 for  $Q$  in Eq. 1.2 and simplifying yields:

$$\frac{dy}{dx} = \frac{2\epsilon c\sqrt{E(E - y)}}{3y - 2E} \quad (\text{Eq 1.5})$$

Integration of this equation gives the equation of the flow profile as

$$x = \frac{-E}{\epsilon c} \frac{y}{E} \sqrt{1 - \frac{y}{E}} + C \quad (\text{Eq. 1.6})$$

For  $y = y_1$ , and  $x = 0$ , the integration constant is determined from Eq. 1.6 as

$$C = \left( \frac{E}{\epsilon c} \right) \left( \frac{y_1}{E} \right) \sqrt{1 - \frac{y_1}{E}} \quad \text{Thus,}$$

$$x = \frac{E}{\epsilon c} \left( \frac{y_1}{E} \sqrt{1 - \frac{y_1}{E}} - \frac{y}{E} \sqrt{1 - \frac{y}{E}} \right) \quad (\text{Eq. 1.7})$$

When  $y = 0$ , Eq 1.7 gives the length of the rack required for a complete withdrawal of the main flow through the rack, or

$$L_g = \frac{E}{\epsilon c} \left( \frac{y_1}{E} \sqrt{1 - \frac{y_1}{E}} \right) \quad \text{Eq. (1.8)}$$

Simplifying Eq. 1.8 yields the following:

$$L_g = \frac{Q_1}{\epsilon cb \sqrt{2gE}} \quad \text{Eq. (1.9)}$$

Where  $Q_1$  is the discharge through the entrance to the reach of the rack and is also equal to the withdrawal discharge  $Q_w$  through the rack.

## Length of Grate Required for Complete Withdrawal

$$L_g = \frac{Q_1}{\epsilon cb \sqrt{2gE}}$$

Where,

$$Q_1 = 485 \text{ cfs}$$

$\epsilon$  is the ratio of the effective area to the total area of the grate.

$$\epsilon = \frac{(.75 * 3.97)}{6.56} = .454$$

Where,

.75 is equal to 25% clogging, 3.97 is equal to the effective grate area from the table on MAG Standard Detail 540-2, and 6.56 is equal to the area of the grate from the table on MAG Standard Detail 540-2.

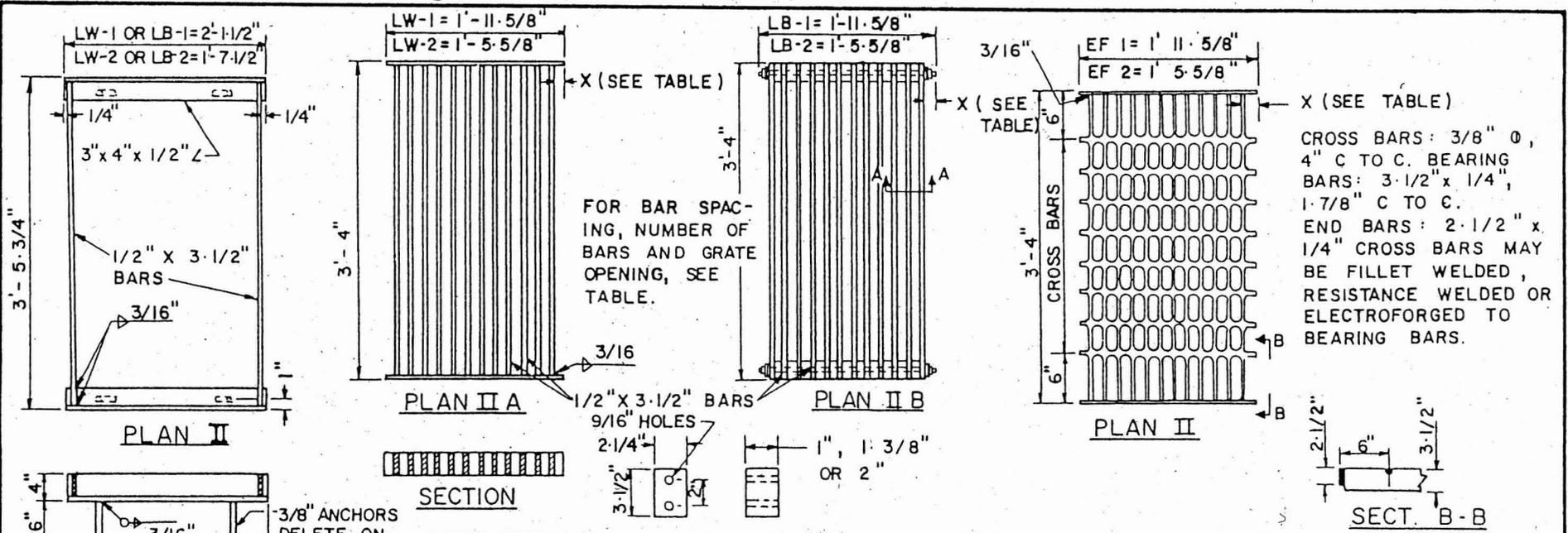
$c = .435$ , From Chow; Open Channel Hydraulics, assuming bars perpendicular to direction of flow, Pg. 339

$b = 16'$ , Grate width equal to channel bottom width

$$g = 32.2 \frac{ft}{sec^2}$$

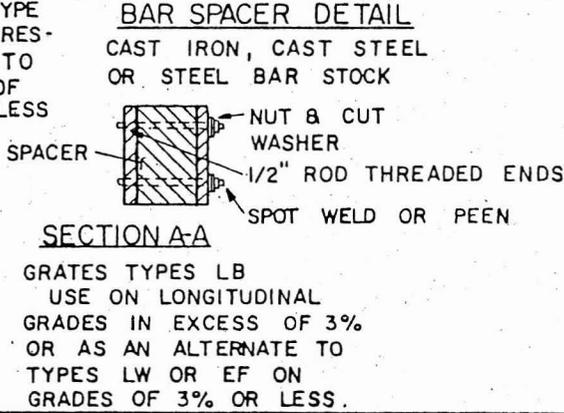
$E = 4.33'$ , Energy grade line from HEC RAS cross-section 373+43

$$L_g = \frac{485}{.454 * .435 * 16 * \sqrt{2 * 32.2 * 4.33}} = 9.2'$$



- NOTES:**
1. LW INDICATES LONGITUDINAL WELDED.
  2. LB INDICATES LONGITUDINAL BOLTED.
  3. EF INDICATES ELECTROFORGED.
  4. GRATING UNITS AND FRAMES SHALL BE FABRICATED FROM STRUCTURAL STEEL "A-36" EXCEPT AS NOTED.
  5. ALL WELDING SHALL BE IN ACCORDANCE WITH STANDARD WELDING SPECIFICATIONS.
  6. THE COMPLETED ASSEMBLY SHALL BE GIVEN ONE SHOP COAT OF NO.1 PAINT.
  7. FRAMES AND GRATES SHALL FIT TO A MAXIMUM ROCK OF 0.093 AT ANY POINT.

GRATE TYPE	CLEAR BAR SPACING	NO. BARS	X	GRATE OPENING SQ. FT.
LW OR LB-1.0	1"	16	5/16"	3.97
" -1.1	1-3/8"	13	5/16"	4.34
" -1.2	2"	9	1-9/16"	4.84
EF-1	1-5/8"	13	7/16"	4.66
LW OR LB-2.0	1"	12	5/16"	2.98
" -2.1	1-3/8"	9	1-1/16"	3.35
" -2.2	2"	7	1-1/16"	3.60
EF-2	1-5/16"	10	1/4"	3.48



DETAIL NO. 540-2	MARICOPA ASSOCIATION of GOVERNMENTS STANDARD DETAIL	CATCH BASIN - GRATES	DETAIL NO. 540-2
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b/h



## **APPENDIX E**

### **SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN EXHIBITS, FIGURES & CD-ROM**

**EXHIBIT 1, COMPOSITE USGS TOPOGRAPHY FOR THE STUDY AREA**

**EXHIBIT 2, EXISTING MAJOR DRAINAGE FACILITIES  
FOUND IN THE STUDY AREA**

**FIGURE 7, HEC-RAS SECTION LOCATIONS**

**CD-ROM DISKETTE (HEC-RAS & STORMCAD MODELS)**

## **CD-ROM**

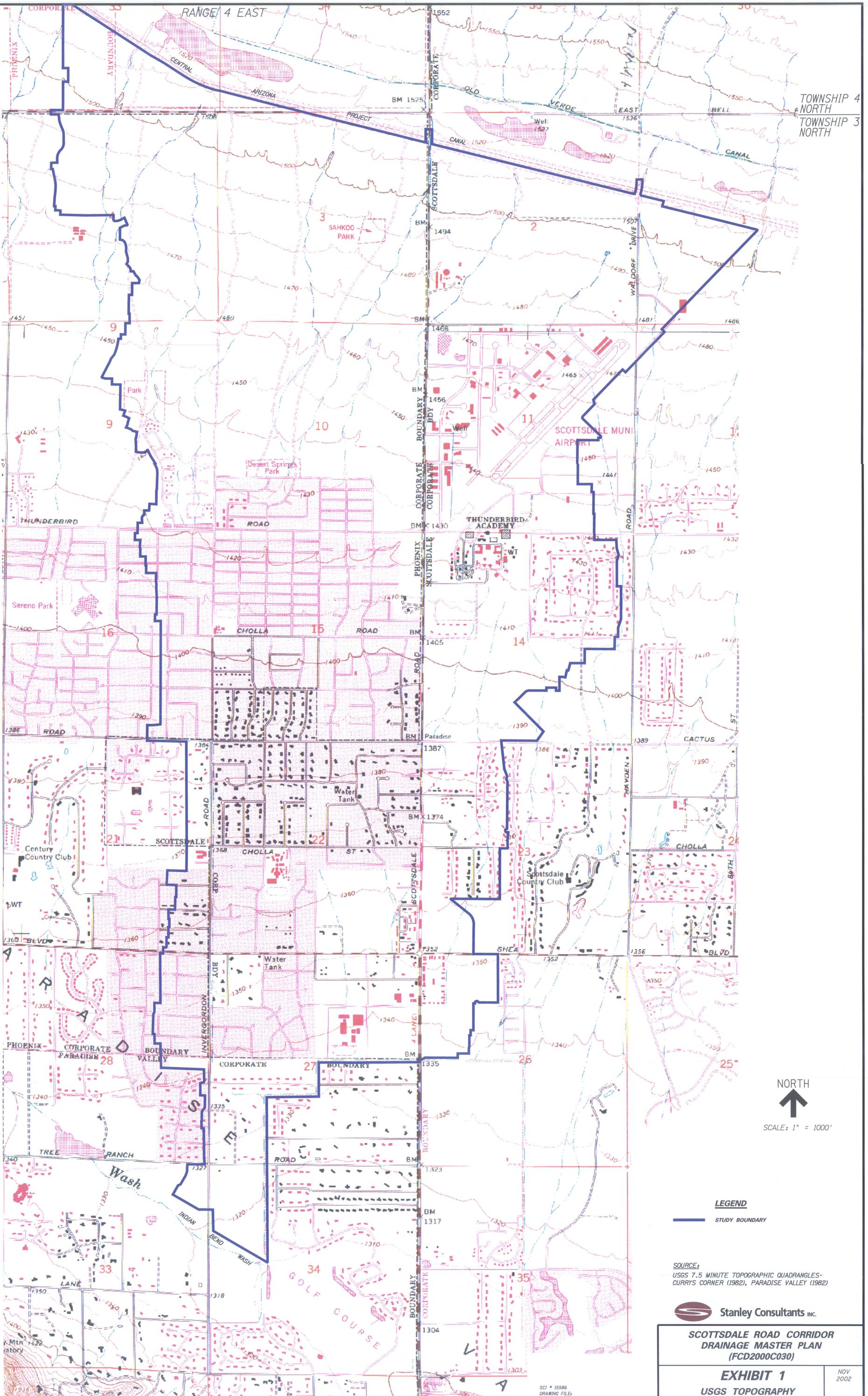
### **SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN HYDRAULIC MODELS**

#### **HEC-RAS MODELS**

- EXISTING CONDITION FLOW – EXISTCONDREV01.F01
- EXISTING CONDITION GEOMETRY – EXISTCONDREV01.G01
- EXISTING CONDITION OUTPUT – EXISTCONDREV01.O01
- EXISTING CONDITION PLAN – EXISTCONDREV01.P01
- EXISTING CONDITION PROJECT – EXISTCONDREV01.PRJ
  
- “WITH RECOMMENDED ALTERNATIVE” FLOW – PREFALTREV01.F01
- “WITH RECOMMENDED ALTERNATIVE” GEOMETRY – PREFALTREV01.G01
- “WITH RECOMMENDED ALTERNATIVE” OUTPUT – PREFALTREV01.O01
- “WITH RECOMMENDED ALTERNATIVE” PLAN – PREFALTREV01.P01
- “WITH RECOMMENDED ALTERNATIVE” PROJECT – PREFALTREV01.PRJ

#### **STORMCAD MODELS**

- 15% CHOLLA TO CONFL 2<sup>ND</sup> PIPE, PREFERRED ALT, REV01
- 15%, AIRPORT OUTFALL BOX
- 15%, CULVERT EXTENTION SHEA TO SAHUARO, 100YR
- 15%, CULVERT EXTENTION SHEA TO SAHUARO, 10YR
- 15%, EXISTING 60IN PREFERRED ALT, REV01
- 15%, SDALE ROAD PREFERRED ALT, REV02
- 15%, SUNNYSIDE TO CHOLLA PREFERRED ALT, REV03
- Sdale Rd Rec Alt SD, FCD Criteria



TOWNSHIP 4 NORTH  
TOWNSHIP 3 NORTH

NORTH  
↑  
SCALE: 1" = 1000'

**LEGEND**  
— STUDY BOUNDARY

**SOURCE:**  
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLES-  
CURRY'S CORNER (1982), PARADISE VALLEY (1982)

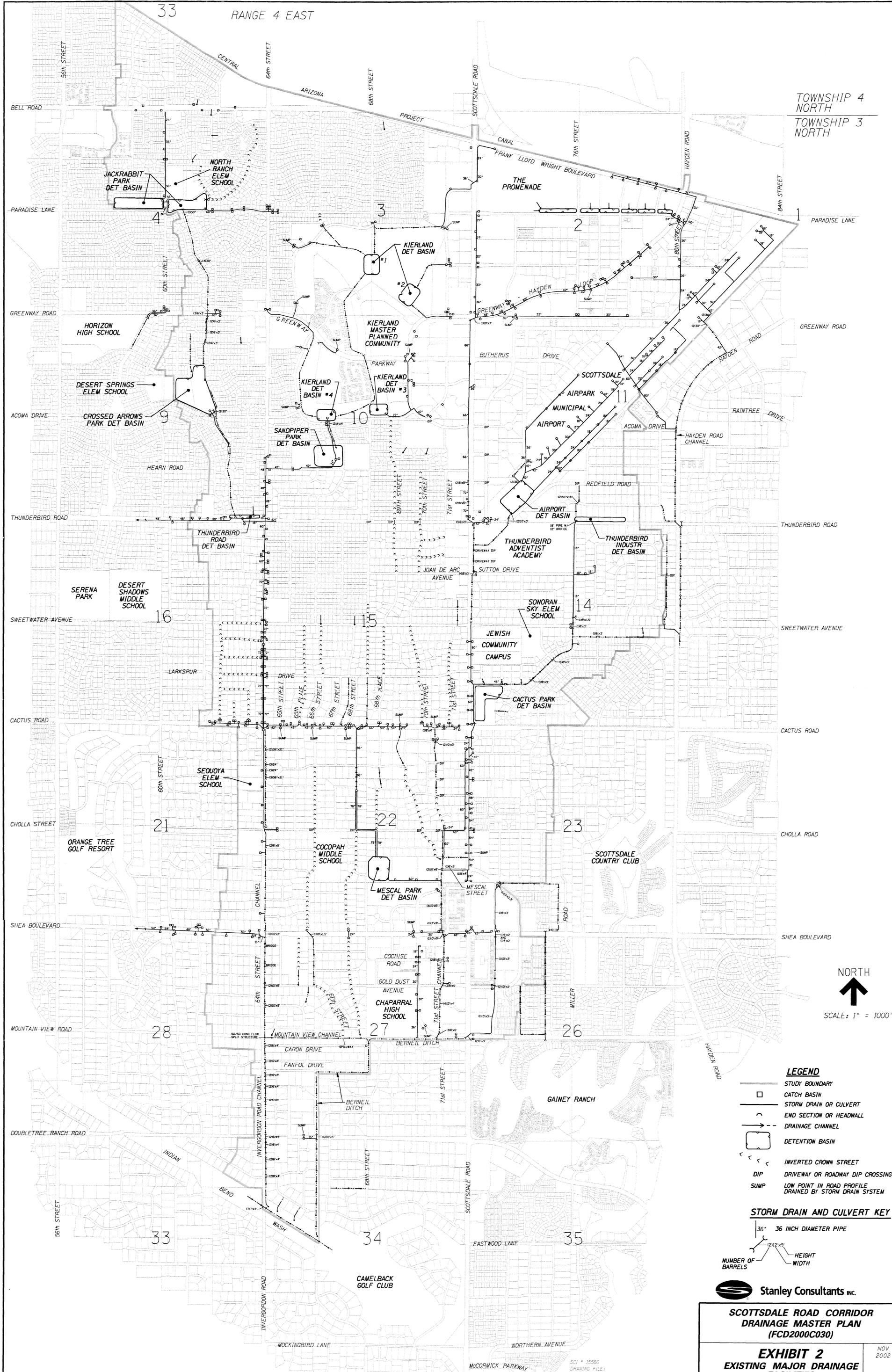
 Stanley Consultants inc.

**SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN  
(FCD2000C030)**

**EXHIBIT 1  
USGS TOPOGRAPHY**

SCI 15586  
DRAWING FILE:  
Q:\15586\GRAPHICS\DRN\HYDRAUL-EXHIBFULL.dgn

NOV  
2002  
DATE

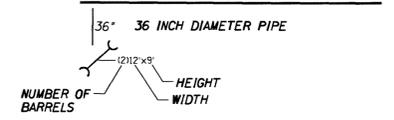


NORTH  
SCALE: 1" = 1000'

**LEGEND**

- STUDY BOUNDARY
- CATCH BASIN
- STORM DRAIN OR CULVERT
- END SECTION OR HEADWALL
- DRAINAGE CHANNEL
- DETENTION BASIN
- INVERTED CROWN STREET
- DRIVEWAY OR ROADWAY DIP CROSSING
- LOW POINT IN ROAD PROFILE DRAINED BY STORM DRAIN SYSTEM

**STORM DRAIN AND CULVERT KEY**



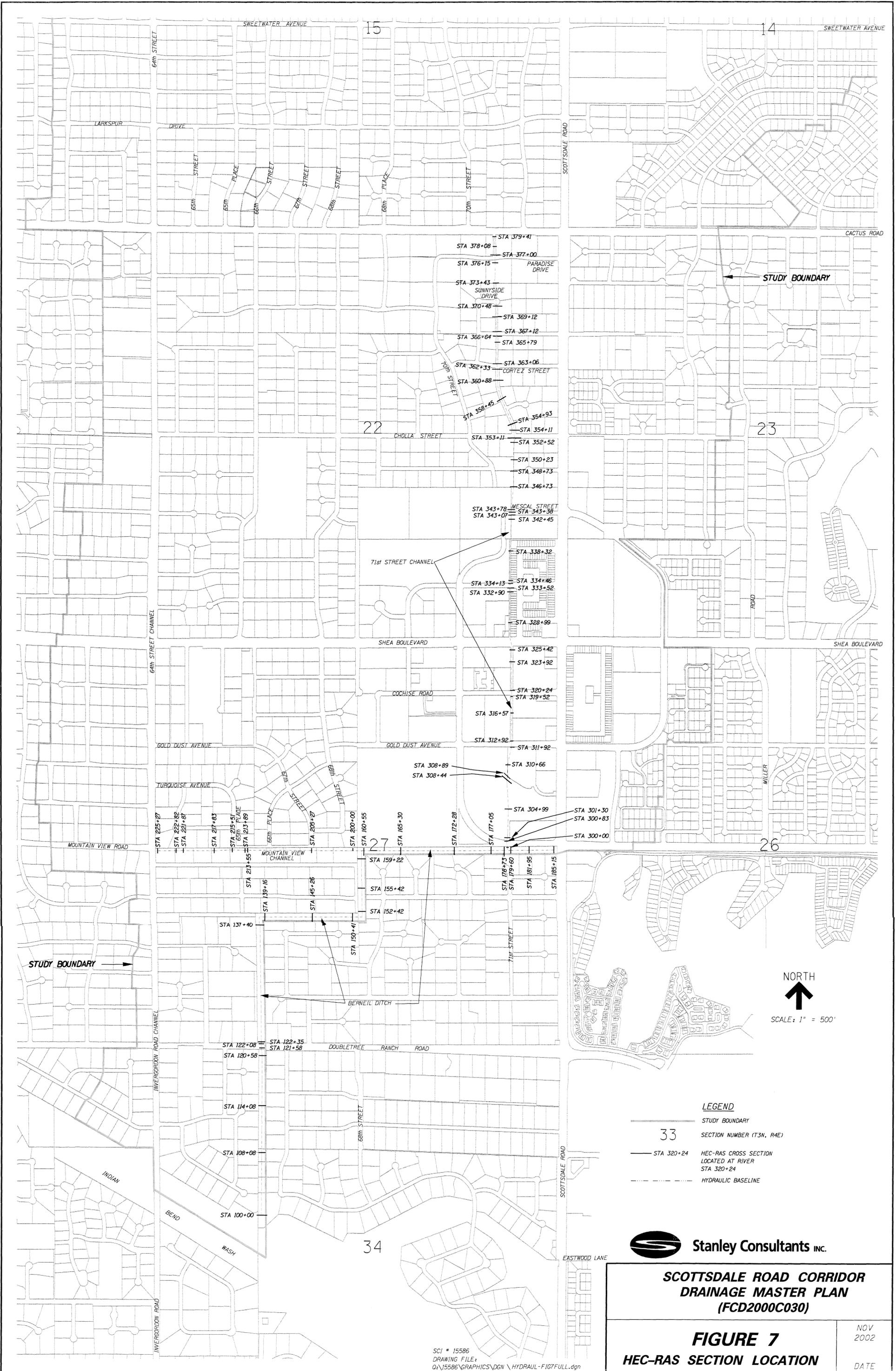
Stanley Consultants inc.

SCOTTSDALE ROAD CORRIDOR  
DRAINAGE MASTER PLAN  
(FCD2000C030)

**EXHIBIT 2**  
EXISTING MAJOR DRAINAGE FACILITIES

NOV 2002  
DATE

SCI # 15586  
DRAWING FILE:  
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**LEGEND**

— STUDY BOUNDARY

33 SECTION NUMBER (T3N, R4E)

— STA 320+24 HEC-RAS CROSS SECTION LOCATED AT RIVER

— STA 320+24 HYDRAULIC BASELINE



**SCOTTSDALE ROAD CORRIDOR DRAINAGE MASTER PLAN (FCD2000C030)**

**FIGURE 7 HEC-RAS SECTION LOCATION**

NOV 2002  
DATE

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