BRIDGE HYDRAULICS REPORT

for

SR 29 Crossing at Lone Pine Creek

Bridge No. 050035

State Project No. 05090-1511
Work Program No. 1110874
Glades County

Prepared for the
Florida Department of Transportation
District 1, Bartow

Prepared by:
JMI Engineers, Inc.
March 7, 1996

Engineer of Record: ____________________
David F. Snyder, P.E.

EXECUTIVE SUMMARY

The proposed project involves the widening of the existing bridge at Lone Pine Creek on SR 29, Glades County, Florida (Bridge No. 050035). Lone Pine Creek is a Class III water body according to the F.A.C., Ch. 62-302. The Federal Emergency Management Agency has not classified this stream as a Regulatory Floodway, therefore a "No-Rise" certification will not be necessary.

The existing bridge is a Category 1 structure. It is being widened to bring it up to current roadway geometric standards. The proposed widening will provide two - 3.60 meter (11.81 feet) travel lanes with a 3.00 meter (9.84 foot) shoulder for both directions of SR29 traffic. The recommended structure will be a Category 1 structure.

Hydraulically, the existing structure is capable of conveying the design flood without overtopping however, the 0.61 meters (2 feet) of vertical clearance is not provided. The proposed widening has minimal effects on these hydraulic characteristics of the bridge. A design variance has been approved by District One to cover this deviation from FDOT hydraulic design criteria (see Appendix G).

Any impacts to the wetlands and environment due to the replacement of this bridge will be temporary. Maintenance of traffic will be handled by a shift and slight lane width reduction for SR 29 traffic and will remain on the existing bridge structure. No temporary detour road or bridge will be required for this bridge widening. Additional Right of Way will not be needed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The Florida Department of Transportation proposes the widening and resurfacing of existing bridge number 050035. This bridge is located in Glades County on State Road 29 between the towns of LaBelle and Palmdale. It crosses Lone Pine Creek which is designated a Class III water body according to Chapter 62-302.600, F.A.C..

SR 29 is being widened and resurfaced at this location due to a need for improved public safety at the bridge site. There has been no record of hydraulic problems at this site.

PRELIMINARY INFORMATION

General Site Location

The proposed project includes the widening and resurfacing of bridge number 050035 on State Road 29 in Glades County, Florida. The bridge crosses Lone Pine Creek and is located in Section 11, Township 42 South, Range 29 East. Figure 1 is a location map which shows the location of the proposed project.

State Road 29 is a two-lane, two-way rural road. The posted speed limit at the project location is 55 miles/hour. SR 29 is classified as both an evacuation and emergency access route for Glades County by the Glades County Emergency Management Agency.

Site Description and Drainage Basin Characteristics

Figure 2 is a copy of the Future Land Use Map provided by Glades County. It shows the drainage area for bridge number 050035 is classified as agricultural/open space and wetlands.

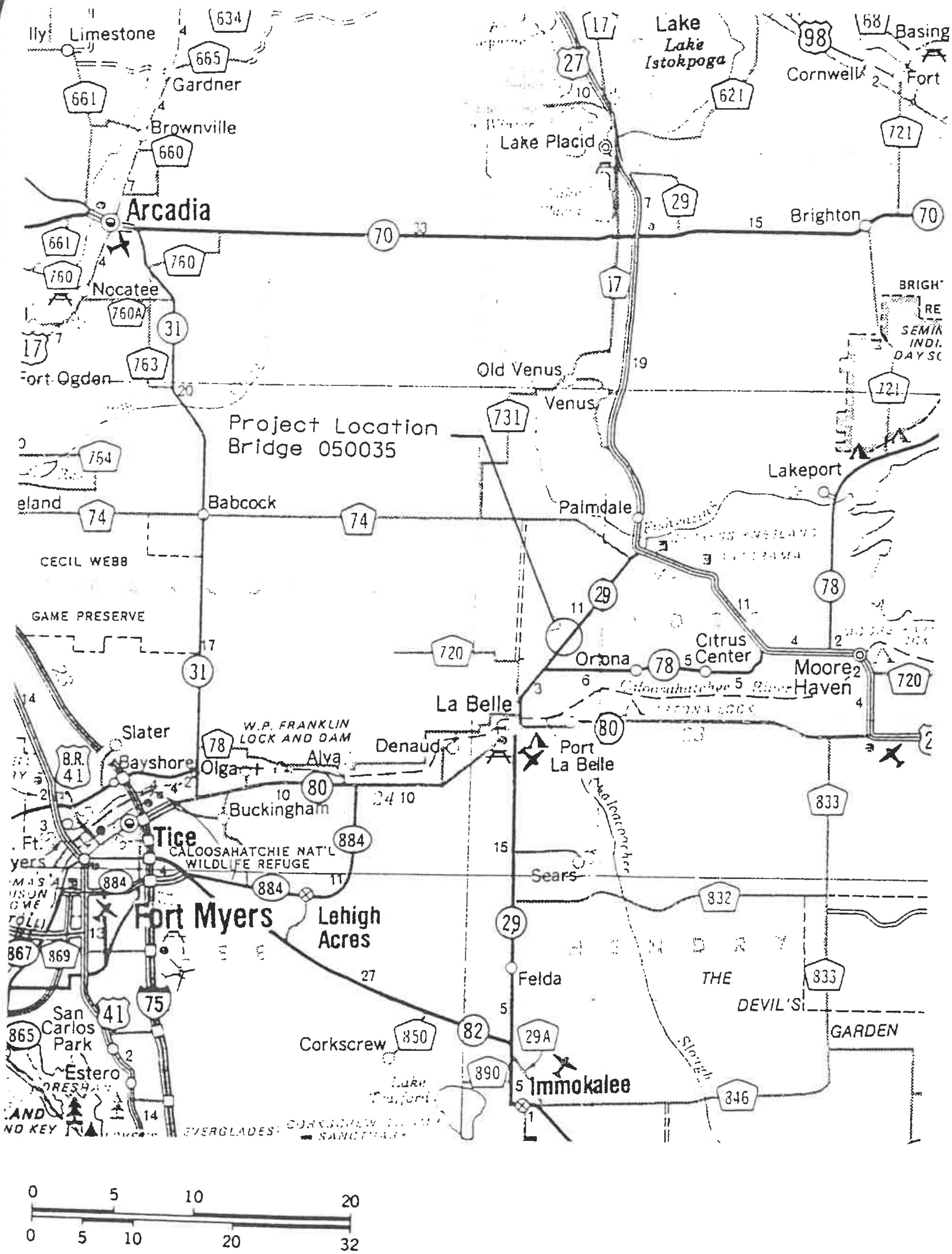


Figure 1. Project Location Map

Federal Emergency Management Agency

JMI ENGINEERS

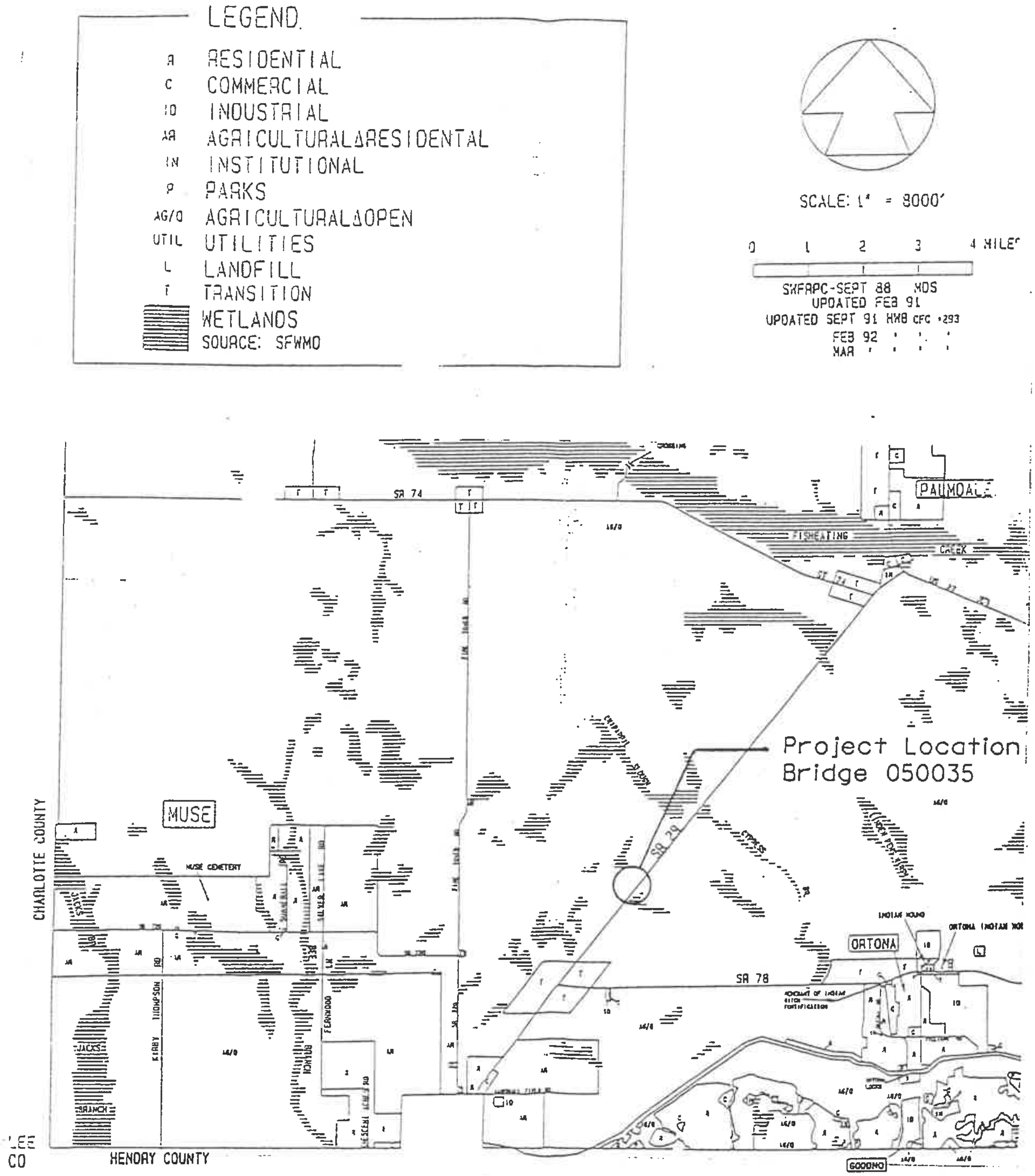


Figure 2. Glades County Future Land use Map - 2010
SW Florida Regional Planning Council

JMI ENGINEERS

There are no residences located within the drainage basin or downstream from the bridge. There is a cow pen located within the drainage basin and has been designated on the Drainage Basin Map, Figure 3.

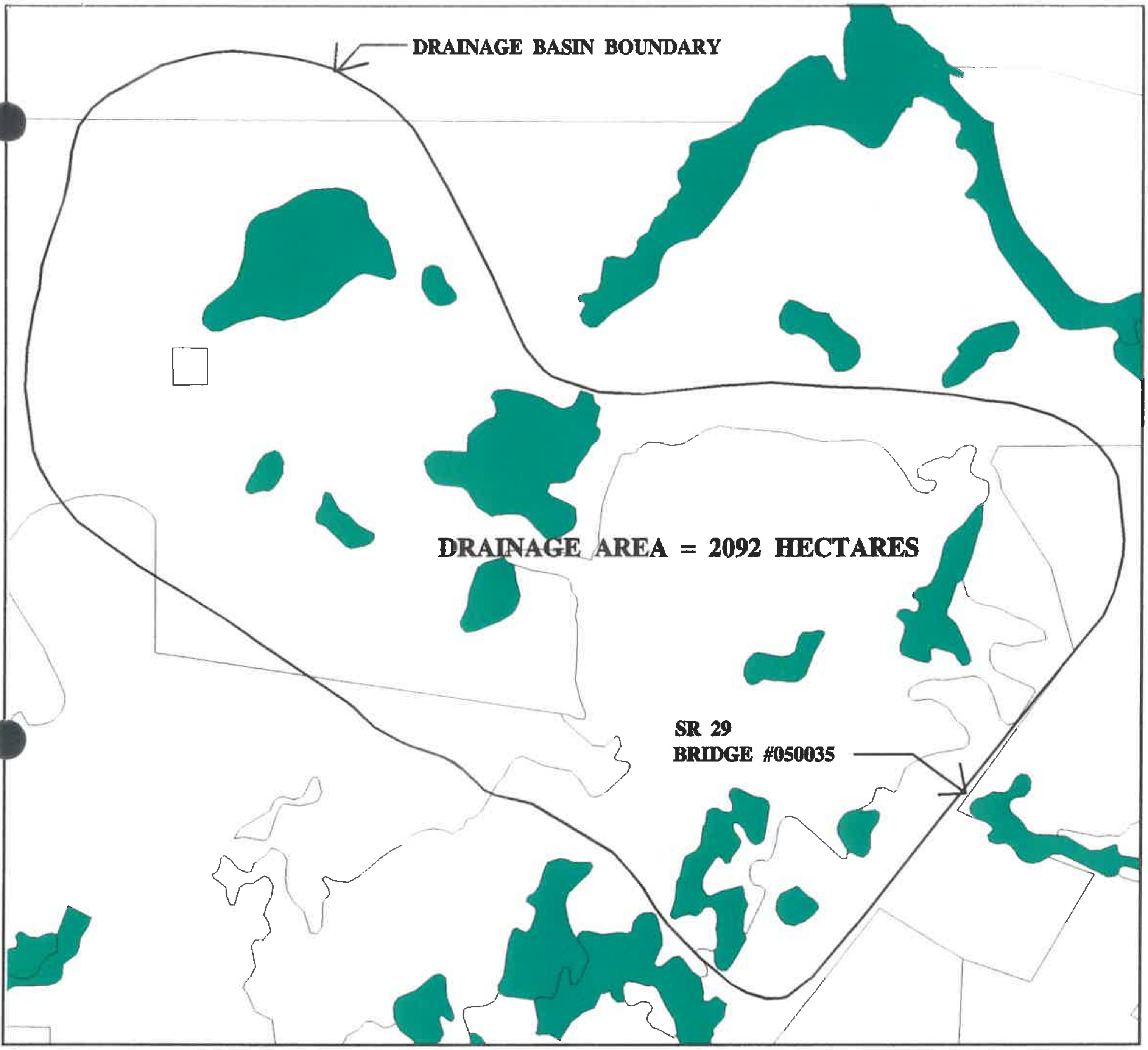
Lone Pine Creek is not considered a navigable waterway. There is a large amount of wetland area located within the drainage basin, however they are not well defined ponds or lakes. The creek is located within the Fisheating Creek Wildlife Management Area and is not directly being used as a source of domestic water supply.

Environmental constraints include the wetland areas delineated on both sides of the bridge. It is necessary that the proposed construction is minimized in these wetland areas.

Lone Pine Creek is located within the upper northwest fringe of the Florida Everglades. The topography of the area consist of areas of wetlands (swamp) and low lying undeveloped woodlands surrounded by relatively flat grasslands and open range. The contributing area to Bridge No. 050035 is about 2092 hectares (8.08 square miles) and lies on the northwest side of SR 29 (See Figure 3). The drainage boundaries were delineated using the United States Geological Survey (USGS) Quadrangle map for LaBelle, Florida, FEMA Flood Insurance Rate Maps for Community #120095, Panels 260B and 280B (Figure 4), and an aerial photograph of Sections 1,2,11 and 12 (Figure 5).

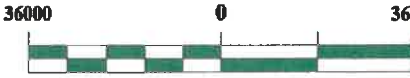
The slope of the terrain is mild and drains to the southeast. A review of the USGS Quadrangle maps and survey data indicate a slope of about 0.001 feet per foot (7 feet per mile). Figure 3 is a map of the area surrounding bridge number 050035 with the drainage basin for Lone Pine Creek delineated. Figure 5 shows an aerial view of the bridge location and a portion of the drainage basin. On the southeast side of the drainage basin, SR 29 acts as a drainage boundary.

There are two main channels which drain the basin into Bridge No. 050035. The most northerly stream drains the runoff from the majority of the basin into the roadside ditch on the west side of SR 29 which begins approximately 285 meters (940 feet) north of the bridge. The southerly channel flows approximately perpendicular to SR 29. It begins 425 meters (1400 feet) to the west of SR 29 at a wetland area. Both channels open up to a wetland at the upstream (west) side of the bridge.



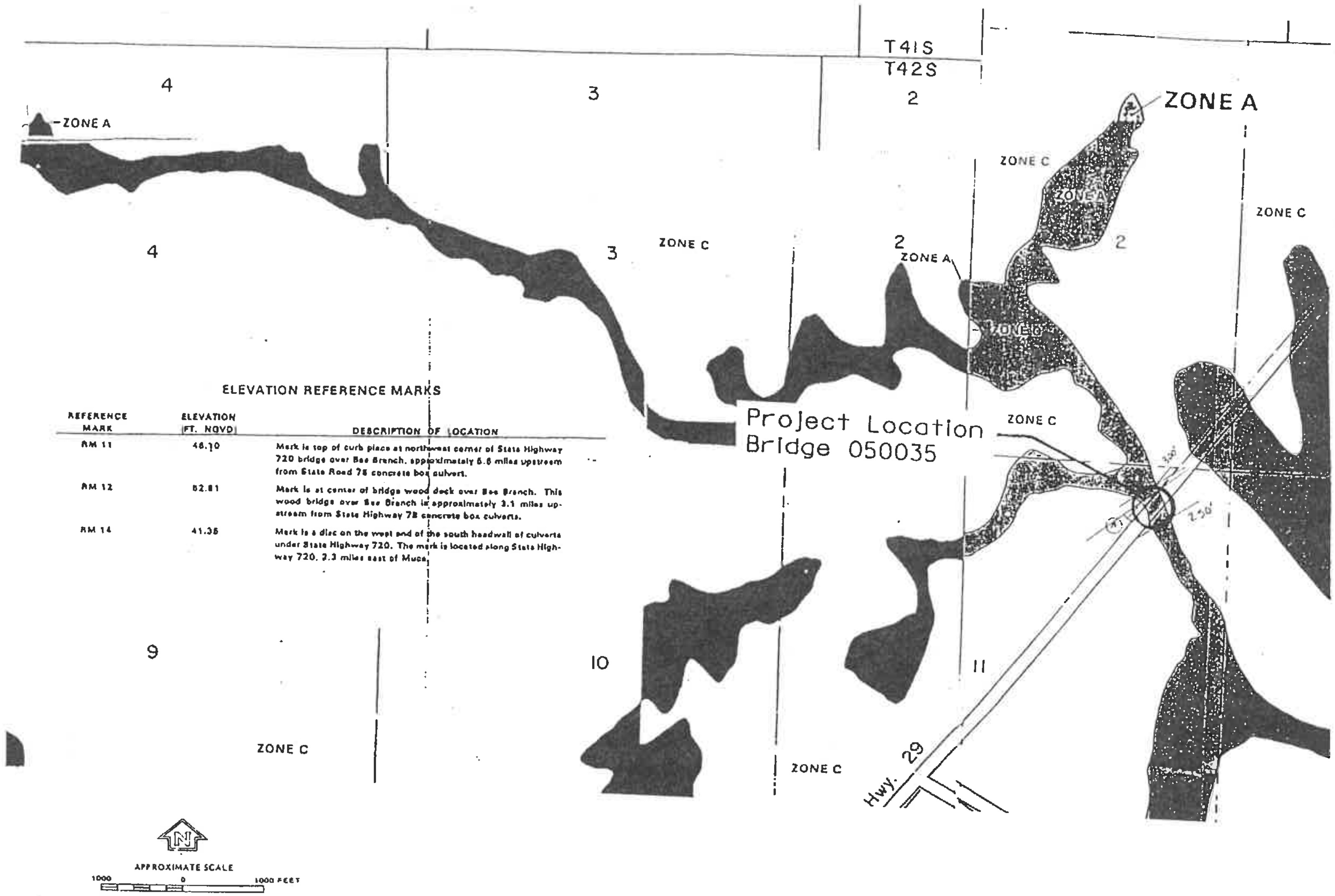
LEGEND

- WATER
- WETLANDS



GRAPHIC SCALE - 1:36000

BIOLOGICAL RESEARCH ASSOCIATES, INC. A DIVISION OF GENESIS GROUP, INC.	**FIGURE 3** DRAINAGE BASIN MAP	ECOLOGIST: DJD	DATE: 10 JANUARY 1996
		GIS TECHNICIAN: RLH	PROJECT NO: (FDT1-005-E2B)
		CHECKED BY: RZO	FILE NAME: BASIN8X11.MAP



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM 11	46.10	Mark is top of curb place at northwest corner of State Highway 720 bridge over Bee Branch, approximately 5.8 miles upstream from State Road 78 concrete box culvert.
RM 12	82.81	Mark is at center of bridge wood deck over Bee Branch. This wood bridge over Bee Branch is approximately 3.1 miles upstream from State Highway 78 concrete box culverts.
RM 14	41.36	Mark is a disc on the west end of the south headwall of culverts under State Highway 720. The mark is located along State Highway 720, 2.3 miles east of Muce.

JMI ENGINEERS

Figure 4. Flood Insurance Rate Map
Federal Emergency Management Agency

Figure 5. Aerial Photograph of Project Site

Hamrich Aerial Survey

JMI ENGINEERS

The runoff is then conveyed under the bridge and continues a southeasterly flow into a large wetland area. This wetland empties into Deadman's Branch and the Caloosahatchee River, approximately 4 miles away.

Channel Stability

A Level One Stream Stability Analysis (HEC-20) was performed for Lone Pine Creek. Aerial maps, quad maps, Bridge Inspection Reports, and a visit to the site were all utilized for this analysis. Documentation of the site visit and this analysis is provided in Appendix A along with several photographs. Based on the qualitative assessments resulting from this analysis, it can be concluded that the overall stability of Lone Pine Creek is moderate to high and is resistant to minor changes in the channel and watershed. There is no need for a more detailed analysis.

Potential Water Stages

The existing bridge is located within Flood Zone A as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Glades County. Flood Zone A designates an area of maximum flooding with no given base flood elevations, see Flood Map, Figure 4. A comparison of the FIRM with the USGS quadrangle map indicate the limits of the base flood coincide with elevation 10.67 meters (35 feet). The base flood elevation at the bridge should be no higher than 10.67 meters (35 feet) in order for the basin to drain properly. According to the FIRM, Lone Pine Creek is not a Regulatory Floodway and a "no rise" certification will not be necessary.

Potential water stages can be evaluated by studying historical water stages on Lone Pine Creek at the SR 29 bridge location. There is no gaging station present at this site and limited historic flood information is available for the area. The South Florida Water Management District (SFWMD) did not have any information on this particular bridge crossing. Appendix G contains all correspondence information, including that requested and received by SFWMD. Unfortunately, the only information they could provide is of no use on this project.

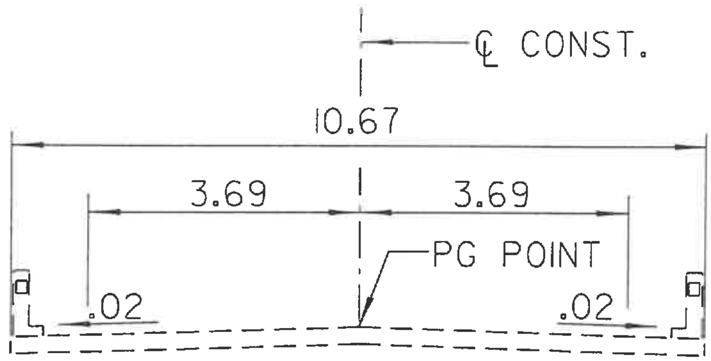
Bridge 050035 is maintained by the Florida Department of Transportation (FDOT) Maintenance Office in LaBelle, Florida. They have no records of this bridge ever overtopping. According to Robert Crawford, there was one occasion in 1970 where approximately 1.61 kilometers (1 mile) of roadway south of this structure that was underwater, however the bridge over Lone Pine Creek was not overtopped. FDOT Maintenance has periodically tried to clean the vegetation out of the channels at the bridges along SR 29 with little success.

The water surface elevation during the site visit, November 21, 1995, was approximately 0.76 meters (2.5 feet) below the low member, elevation 9.63 meters (31.6 feet). Historical flooding occurred this past summer and water levels appear to have been relatively high at this bridge site. However, little flow was noted in the channel at the time of our site visit. It is assumed that water levels have come down to within normal limits in the creek and appear within limits of normal flow conditions for this time of year. There are high water marks approximately 0.20 meters (8 inches) below the low member, elevation 10.18 meters (33.4 feet). It is unknown if they are from this summer's flood.

Lone Pine Creek drains an area of wetland west of SR 29 and empties into a large wetland area east of SR 29. Since it does not have a direct confluence with a major stream or river, there is little, if any, potential for backwater from other water bodies.

Existing Crossings

The existing 13.8 meter (45 foot) bridge was built in 1948. It consists of three, 4.6 meter (15 foot) cast in place reinforced concrete spans. The superstructure is supported by cast in place concrete piers and founded on concrete pile end bents and two intermediate bents. The low member elevation of the bridge is 10.39 meters (34.08 feet NGVD). There is no grade on the bridge and scuppers exist to provide deck drainage. The deck width is 10.7 meters (35.0 feet) out to out. The typical section, shown in Figure 6, consist of two - 3.69 meter (12 foot) travel lanes and a 1.26 meter (4.15 foot) paved shoulder on each side. A metal guardrail is provided on each



BRIDGE NO. 050035

JMI ENGINEERS

FIGURE 6
EXISTING BRIDGE
TYPICAL SECTION

side of the bridge. The average daily traffic (ADT) for this location is 2,231 according a 1991 traffic survey. The projected future ADT for 2013 is 5,508.

Historically, the existing structure appears to have been hydraulically adequate. There is no record of the bridge deck or approach roadway structure overtopping. During the most recent flooding, which occurred in late summer/early autumn 1995, the water level was reported to be 0.76 meters (2.5 feet) below the low member. The magnitude of flooding is not known for this event. See documentation in Appendix G.

There are no other crossings of Lone Pine Creek apart from this crossing at SR 29.

FINAL DESIGN DATA

Design Flood

The design flood for this bridge was selected based upon the importance of this route to the highway system. The 50 year storm has been selected as the design flood due to the use of SR 29 as an evacuation and emergency access route and the projected ADT of 5,508 (Florida Department of Transportation Drainage Manual, Vol.1, Section 4.3.2). The existing bridge and proposed improvements will be analyzed for this storm event to insure current FDOT hydraulic criteria is being met. FDOT design criteria includes a stream velocity between 0.61 and 0.91 meters per second (2-3 feet per second), a 0.61 meter (2 foot) vertical clearance and less than 0.30 meters (1 foot) increase in water surface elevation at the approach to the bridge (backwater).

The structure will also be analyzed for the Base Flood (100 year frequency) and the 500 year (greatest) flood event. Overtopping does not appear to be applicable.

Hydrologic Analysis

The hydraulic analysis of the SR 29 bridge over Lone Pine Creek involves only freshwater flow from the drainage basin located to the west of the bridge. The flow in the streams is perennial, but flashy; flowing most of the year, but responding to precipitation by rapid changes in stage and discharge.

There is very little flow in Lone Pine Creek and it has been noted by local residents that as the stage of the creek rises, there is usually very little increase in flow. Regional regression equations were developed by the USGS and FHWA for this particular region of Florida. However, direct application of these equations yield extremely high flows for this area. In comparison of other drainage basins in this region of south Florida, a flow rate between 30 and 45 cfsm (cfs per square mile) should be expected for the 25 year storm event. For this reason, the standard error of the USGS equations were taken into account in order to replicate the existing condition at Bridge 050035. Refer to Appendix B for documentation and analysis.

Peak Basin Discharge				
	USGS Regression Equations, Region A		FHWA Regression Equations, Zone 1	
Storm (yr.)	Flow (m^3/m)	Flow (cfs)	Flow (m^3/m)	Flow (cfs)
2	**234**	138	**514**	303
50	**1015**	598	**2138**	1258
100	**1164**	685	**2498**	1470
500	**1485**	874	**N/A**	N/A

Table 1. Peak Basin Discharge

The resistance to flow, Manning's "n" coefficients, in the main channel and the flood plain have been calculated using procedures and equations found in the <u>Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains</u>, FHWA-TS-84-204. Very high amounts of vegetation, a severe degree of irregularity, and a negligible effect of obstructions in the main channel are factors which effect the resistance to flow. A Manning's Roughness Coefficient of 0.10 was used to account for this resistance to flow in the main channel of Lone Pine Creek (calculations provided in Appendix B).

The Manning's Roughness Coefficients for the flood plain were computed without using the vegetation-density method. Since the roughness is not uniformly distributed across the flood plain it has been subdivided into two sections. These sections include an area with trees and area of pasture (no trees). The computed "n" value for the pasture section is 0.06 and 0.15 for the section with trees (calculations and photographs provided in Appendix B).

Hydraulic Analysis

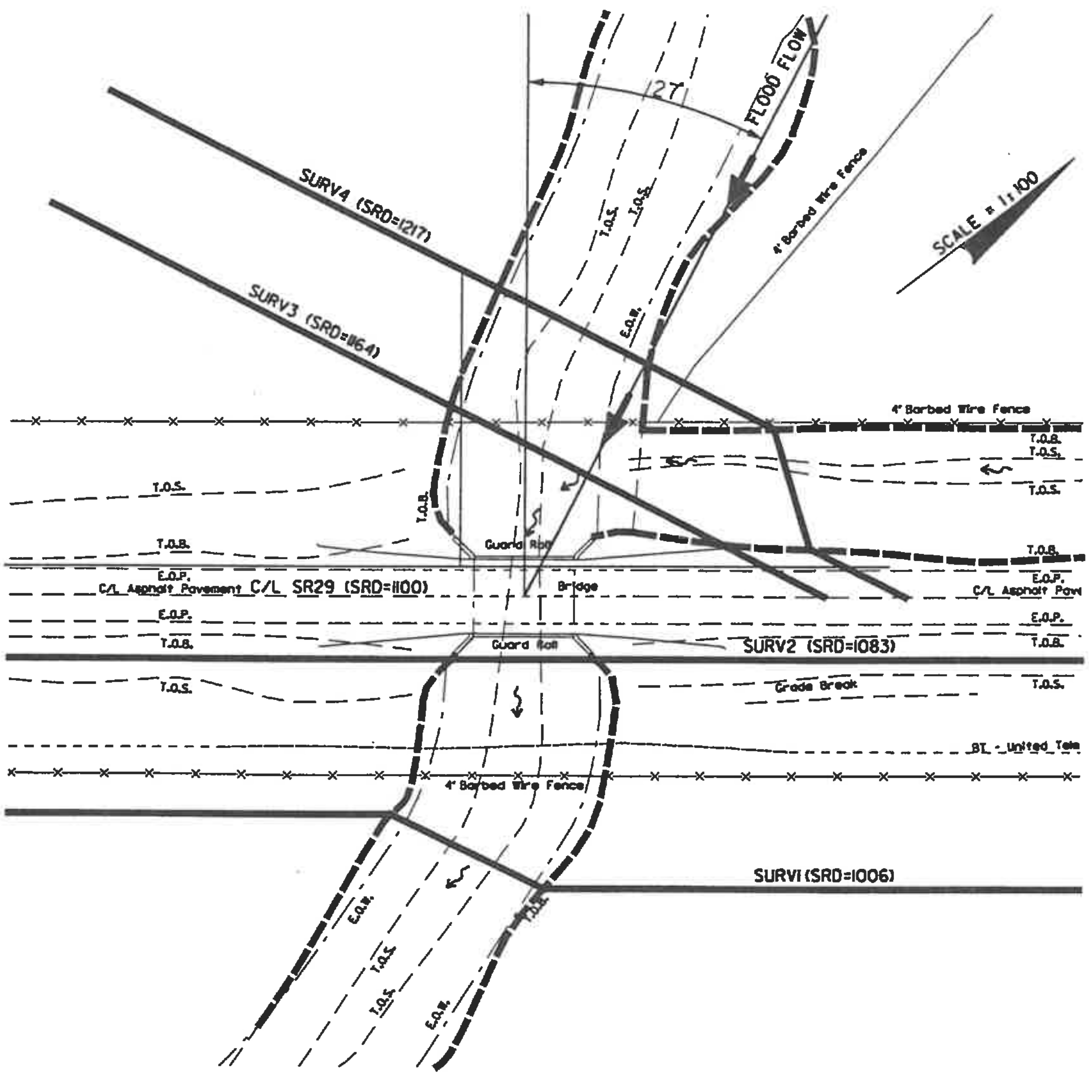
FHWA's Bridge Waterways Analysis Model (WSPRO) was used to create a hydraulic model of Lone Pine Creek at the crossing of SR 29.

Cross section data is required to describe the physical system of the stream. Ideally, this would consist of a lateral channel of uniform cross section and orientation that is perpendicular to the roadway. However, as described previously, runoff from the basin is conveyed to the bridge via two channels, one of which is the roadside ditch. Utilization of the cross sections surveyed resulted in numerous computational messages that are warnings of potential problems with the analysis. These include slope conveyance failures resulting in the use of the critical water surface elevation as the starting elevation. Also, conveyance differences between cross sections located up and downstream of the bridge resulted in K-ratios significantly outside the recommended limits. Therefore, cross section geometry was determined by interpolation of data provided by the survey.

The location of the cross sections used in the WSPRO analysis was determined from a review of the USGS Quadrangle map, the FIRM, aerial photographs and a visit to the site. The FIRM indicates that flood flow approaches the bridge at an angle approximately 27°. Since WSPRO requires cross sectional geometry be perpendicular to the flow, cross sections were cut perpendicular to the line of flood flow shown on the FIRM. Refer to Figure 7.

The five cross sections used in the WSPRO analysis are as follows. Plots of these cross sections are provided in Appendix D.

- SURV1 - Section located approximately 30 meters (100 feet) downstream of the existing bridge.
- SURV2 - Full Valley Section located at the downstream face of the bridge. This section does not include any bridge or embankment data.
- BRDG - Section located at the downstream face of the bridge, including all geometric information about the bridge.
- SURV3 - Section located one bridge length from the upstream face of the bridge.
- SURV4 - Reference Section located approximately 100 feet upstream of existing bridge. This section has been included for backwater comparisons.



JMI ENGINEERS

FIGURE 7
SURVEY CROSS SECTIONS USED FOR WSPRO ANALYSIS

SURV1 has been used as a template for the EXIT section located one bridge length downstream from the bridge. SURV2 and SURV3 are representative of the Full Valley and Approach sections, respectively. The actual location of the Approach varies from the existing bridge to the proposed bridge, therefore SURV3 has also been used as a template for the Approach cross section. The exit and approach sections have been coded in one bridge length from the bridge as required by WSPRO and the flow length (FL) option has been utilized to more accurately describe the flow pattern in both channels between cross sections.

The WSPRO analysis was modeled using the slope-conveyance method. This method was used instead of using a starting water surface elevation for several reasons. There is no gaging station located on Lone Pine Creek and there is no definitive tailwater information available for this location since the discharge area contains a vast flood plain. In order to converge the water surface profiles at the EXIT section, a cross section must be known at distance of several miles downstream. Since the slope on Lone Pine Creek is very small, it was assumed that this stream flows at normal depth. Therefore, the slope-conveyance method (SK card) was used to determine the initial water surface elevation and compute the water surface profiles. A slope of 0.1% (7.0 feet per mile), which is representative of the channels and surrounding terrain was used in the WSPRO model.

The following tables provide a summary of the results computed by WSPRO. Input and output from the WSPRO runs are provided in Appendix D.

50 YEAR STORM EVENT				
Bridge Configuration	Velocity at Bridge (m/sec)/(ft/sec)	WSEL at Bridge (m)/(ft)	WSEL at REFE (m)/(ft)	Increase in WSEL
No Bridge	0.33/1.07	10.09/33.09	10.14/33.27	0/0
Existing Bridge	0.77/2.54	10.09/33.12	10.24/33.60	0.10/0.33
Widened Bridge	0.78/2.57	10.09/33.11	10.25/33.64	0.11/0.37

Table 2. Design Storm: Comparison of Existing to Widened Bridge

100 YEAR STORM EVENT				
Bridge Configuration	Velocity at Bridge (m/sec)/(ft/sec)	WSEL at Bridge (m)/(ft)	WSEL at REFE (m)/(ft)	Increase in WSEL
No Bridge	**0.33**/1.07	**10.13**/33.22	**10.19**/33.42	**0/0**
Existing Bridge	**0.87**/2.84	**10.13**/33.24	**10.31**/33.81	**0.12**/0.39
Widened Bridge	**0.87**/2.87	**10.13**/33.23	**10.32**/33.87	**0.14**/0.45

Table 3. Base Flood Event: Comparison of Existing to Widened Bridge

500 YEAR STORM EVENT				
Bridge Configuration	Velocity at Bridge (m/sec)/(ft/sec)	WSEL at Bridge (m)/(ft)	WSEL at REFE (m)/(ft)	Increase in WSEL
No Bridge	**0.33**/1.09	**10.20**/33.46	**10.27**/33.69	**0/0**
Existing Bridge	**1.06**/3.47	**10.21**/33.49	**10.44**/34.24	**0.17**/0.55
Widened Bridge	**1.07**/3.51	**10.20**/33.48	**10.46**/34.32	**0.19**/0.63

Table 4. Greatest Flood Event: Comparison of Existing to Widened Bridge

The WSPRO analysis indicates that the existing and widened bridge both meet the requirements established by the FDOT, with one exception. The low member of the existing and widened bridge is at elevation 10.388 meters (34.08 feet). The water surface elevation at the existing and widened bridge during the 50 year design flood reaches 10.09 meters (33.12 feet). This allows only 0.29 meters (0.96 feet) of free board during the design storm. The FDOT criteria requires 0.61 meters (2 feet) of vertical clearance during the design storm (FDOT Drainage Manual, Vol.1, Ch.4.6.1). However, a variance for this requirement has been approved by the District, see documentation in Appendix G. The velocity and backwater requirements have also been met at both bridges. Since these hydraulic criteria have been satisfied by the widened bridge and the existing structure has a sufficiency rating of 83.7, it appears to be more economical to widen the bridge rather than replace the existing structure. A final recommendation for either widening or replacement of this existing bridge will be based on a structural inspection of the actual physical condition of Bridge 050035, specifically the substructure units. Existing structure documentation is provided in Appendix C.

Recommended Structure

The hydraulic analysis of the widened widening of Bridge Number 050035 confirms that the structure will be hydraulically capable of conveying the 50 year design storm in Lone Pine Creek. There is no need for channel modifications or water training devices at this site with the widened bridge design. The widened structure does not provide the required 0.61 meters (2 feet) of free board as recommended by the FDOT, however there is a vertical clearance of 0.29 meters (0.96 feet) provided during the 50 year design storm. There does not appear to be a problem with debris at this bridge location and the provided clearance appears to be adequate for this structure.

Proposed improvements will include the widening of the existing bridge structure 1.741 meters (5.71 feet) on each side providing the standard 3.0 meter (10 foot) paved shoulder with New Jersey barrier bridge railing, see Figure 8. The substructure units will be extended to support the widening of the superstructure. The 45° wingwalls will be replaced at their proper locations. Replacement alternatives were not analyzed since this is a widening project and the existing superstructure will be matched in the widened bridge section. A variance for the freeboard requirement has been granted by the District Design Engineer (see Appendix G).

Scour Analysis

The Bridge Inspection Report dated May 1994 and the Underwater Inspection Report dated February 1993 both indicate that the substructure and piles are in very good condition with no problems noted. The waterway measurements taken in May of 1994 show less than 20 centimeters (0.5 foot) of bed elevation change at the abutments and intermediate bents over the past 2 years. The channel profile included in the underwater inspection report shows there has

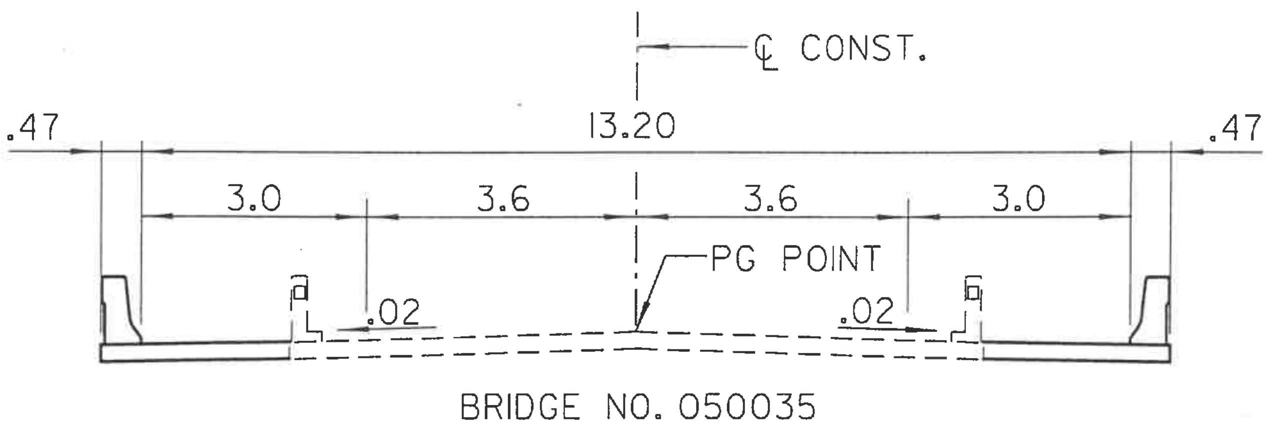


FIGURE 8
PROPOSED BRIDGE TYPICAL SECTION

JMI ENGINEERS

been less than 0.61 meters (2 feet) of bed elevation change at either side (up or downstream) of the existing bridge since June of 1982. According to this profile, the greatest amount of bed elevation change has occurred at Bent 2. Long term aggradation or degradation is not anticipated. The above mentioned reports have been provided in Appendix C.

The underwater investigation indicates that the material at the bottom of the channel is mud. The Glades County Soil survey reports the soil type at the bridge to be Floridana Fine Sand, Depressional. It is classified as nearly level and very poorly drained. The median diameter of the soil was determined to be 0.16 mm and has been used to evaluate potential scour at the existing and proposed structures. This information is provided in Appendix B.

Scour calculations for the existing and proposed bridges are provided in Appendix E. The results can be seen in the following table. Long term degradation, contraction, pier and abutment scour have all been estimated using the techniques found in FHWA's Evaluating Scour at Bridges, HEC-18.

There have not been any scour problems observed at this bridge site, as stated in the inspection reports, observed in the most recent field investigation and survey information used in this analysis. However, contraction scour estimates, based on HEC-18 equations, disagree with these observations. The hydraulic variables used in the scour equations are based on output from the WSPRO model of Lone Pine Creek, which is less than ideal for this hydraulic situation. The values calculated for contraction scour are considered to be excessive. Minimal contraction scour is anticipated.

Due to large amounts of vegetation in the stream, it appears that a clear-water scour condition is present at this bridge. The critical velocity was checked to confirm that this is true and the corresponding contraction scour equations were used. There are not specific equations for local clear-water scour, therefore pier scour depths were increased 10 percent since maximum local clear-water scour is about 10 percent greater than the equilibrium local live-bed pier scour (HEC-18, page 16).

Estimated Scour Depths and Elevations					
Bridge Configuration		Channel Bottom Elevation	Contraction Scour	Local Pier Scour	Scoured Elevation of Channel Bottom
100 Year Storm	Existing Bridge	8.23/27.0	2.974/9.76	1.003/3.29	4.286/14.06
	Widened Bridge	8.23/27.0	2.970/9.74	0.995/3.26	4.298/14.10
500 Year Storm	Existing Bridge	8.23/27.0	3.668/12.03	1.087/3.57	3.508/11.51
	Widened Bridge	8.23/27.0	3.661/12.01	1.101/3.61	3.501/11.49

Table 5. 100 Year & 500 Year Scour Predictions

Widening the bridge does not significantly change the scour values. Pile tip elevations are not known, however these scour values are considered to be excessive. Based on the steady state condition of the channel bed, contraction and pier scour is predicted to be minimal.

There are no countermeasures at the existing bridge to protect against scour and none are being recommended. The channel bed appears to be moderately to highly stable. Excavation of the channel bottom would be necessary in order to place riprap protection at the piles and vertical wall abutments, thereby removing the stabilized bed. Since velocities are minimal this would not be beneficial.

Economic Analysis

The estimated cost of the proposed widening to existing bridge number 050035 is $59,200. The bridge will be increased to the new standard width of 14.140 meters (47 feet 1 inch) from the existing width of 10.668 meters (35 feet), an increase in bridge area of 543.75 square feet. Based on the above cost, the proposed improvements to the bridge structure would cost approximately $110.00 per square foot.

Since the existing bridge is considered hydraulically adequate, with the exception of the 0.61 meter (2 feet) freeboard, there is no need for comparison with other hydraulic alternatives, i.e.

complete bridge replacement. This would not be an economically feasible option from a hydraulic point of view.

The estimated unit cost for this bridge widening is based on the sum of costs for driven piles, reinforced concrete substructure and reinforced concrete flat slab superstructure to match the existing. A more detailed explanation of the economic analysis can be found in Appendix F.

Deck Drainage

The bridge deck will have a slope of 0.2 %. Recent FDOT studies by the various District Drainage Departments concluded that scuppers will no longer be allowed on bridges less than 121.92 meters (400 feet) in length. Bridge stormwater drainage will sheet flow off the bridge into existing roadside drainage ditches. Calculations for deck drainage are located in Appendix H.

Permits

The permits required for this project have not been applied for yet. Biological Research Associates will be delineating the wetland area in the spring of 1996 when the flood waters recede. At that time, they will be responsible for applying to the required agencies in order to receive the necessary permits for this bridge widening project.

Maintenance of Traffic

Maintenance of traffic will be handled by shifting traffic to one side of the existing bridge and widening to one side of the existing structure at a time. A temporary construction barrier wall will be placed at the curb line and the existing traffic railing removed. The bridge will be widened behind the temporary construction barrier. When one side of the bridge has been widened, traffic will be shifted to the newly constructed section and the procedure repeated at the other side of the bridge. Very little impact will be placed on the approach roadway, wetlands and/or right-of-way via this maintenance of traffic scenario.

REFERENCES

Aerial Photograph, Sections 1, 2, 11, & 12, Township 42S, Range 29E, Hamrick Aerial Surveys, April 1993

Bridge Inspection Report, Bridge No. 050035, SR 29 over Lone Pine Creek, April 4, 1994

Evaluating Scour at Bridges, Hydraulic Engineering Circular 18

Federal Emergency Management Agency, Flood Insurance Rate Map, Community Number 120095, Panels 0170B, 260B and 0280B

Florida Administrative Code, Chapter 17-3

Florida Department of Transportation Drainage Manual, Vols. 1-3

Glades County Future Land Use Map, Southwest Florida Regional Planning Council, March 1992

Glades County Soil Survey, U.S.Department of Agriculture, Soil Conservation Service, April 1989

Guide for the Selection of Manning's Roughness Coefficients for Natural Channels and Flood Plains

Stream Stability at Highway Structures, Hydraulic Engineering Circular 20

Stream Stability and Scour at Highway Structures, Publication No. FHWA HI-91-011

USGS Quadrangle Map for LaBelle Quadrangle, Florida, 7.5 Minute Series (Topographic), 1958

Appendix A

Site Reconnaissance

Figure A-1: Bridge No. 050035, Downstream Elevation

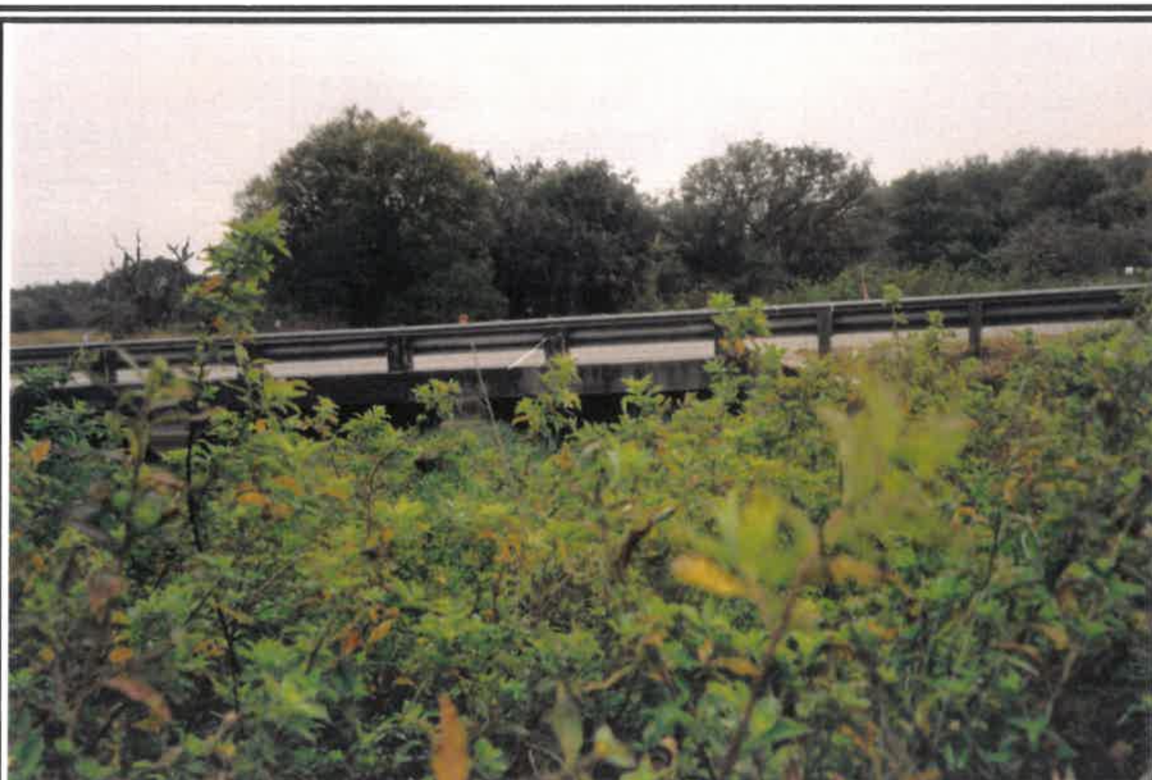


Figure A-2: Bridge No. 050035, Upstream Elevation

Figure A-3: Lone Pine Creek, View Downstream from SR29 Bridge

Figure A-4: Lone Pine Creek, View Upstream of SR 29 Bridge (Roadside Channel)

Figure A-5: View South from NE Corner of Bridge (Downstream Side)

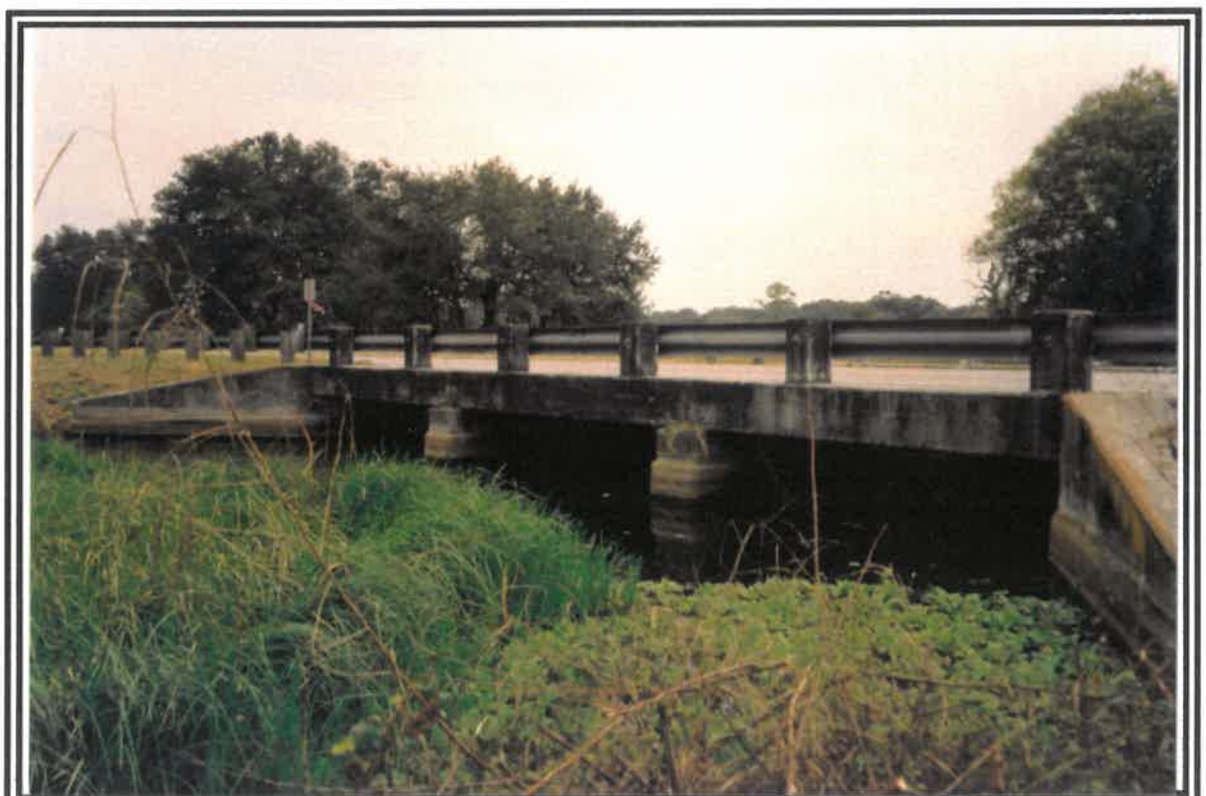


Figure A-6: View North from SW Corner of Bridge (Upstream Side)

Nov. 21, 1995

Bridge Number: 0050035
SR 29 over Lone Pine Creek

SITE FIELD REVIEW

Evidence of scour at structure:

1) Abutment Tilting/Moving in	( ) Yes	(√) No
2) Slopes Washing in/Sloughing	( ) Yes	(√) No
3) Scour Holes Near Abutments/Bents	(√) Yes	( ) No
4) Bed Deposits Downstream	( ) Yes	(√) No
5) Bridge Railing Sagging	( ) Yes	(√) No
6) Debris	( ) Yes	(√) No

7) High-Water Mark (√) Yes ( ) No (8") from top of low member

8) Other

Feasibility of Adding Riprap or Other Scour Countermeasures: (√) Yes ( ) No

ABUTMENTS

a. Type: (√) Bridge ( ) Bridge Culvert

( ) Spill-Through (√) Vertical Wall (√) Wing Walls ( ) Sheet Piles

b. Foundation	Dimensions (L,W,D) (ft)	Embedment (ft)	Current Scour Exposure (ft)
( ) Spread Footing			
( ) Pile Cap			
( ) Piles			
( ) Drilled Shafts			

Source of Data:
( ) Field Review
(√) As-built Plans
(√) Inspection Reports
( ) Design Plans
( ) Pile Driving Records
( ) Other

c. Location from Bank (Looking Downstream)	Left (ft)	Right (ft)
( ) Set Back		
(√) At Bank	Channel banks are not well defined.	
( ) In Channel		

d. Protection:

1) Countermeasures ( ) Sand-Cement ( ) Rubble ( ) Commercial Block
(√) None ( ) Grouted ( ) Sheet Piles ( ) Other

2) Condition	Good	Fair	Poor
Left	( )	( )	( )
Right	( )	( )	( )

e. Other:

Reviewers: Paula Coulliette
Jerry Washington

Nov. 21, 1995

Bridge Number: 0050035
SR 29 over Lone Pine Creek

SITE FIELD REVIEW			
PIER			
a. Type (Typical or Worst Pier):			
	(√) Concrete Wall	( ) Pile Bent	( ) Column
b. Shape:	(√) Square	( ) Rounded	( ) Sharp Nose
c. Width: (2) feet	Length: (37) feet		Diameter: ( ) feet
d. Foundation (Worst Pier)	Dimensions (L,W,D) (ft)	Embedment (ft)	Scour Exposure (ft)
( ) Spread Footing			
(√) Pile Cap	37',2',2'		
( ) Piles			
( ) Drilled Shafts			
Source of Data:	(√) Field Review (√) As-built Plans ( ) Inspection Reports	( ) Design Plans ( ) Pile Driving Records ( ) Other	
e. Protection:			
1) Countermeasures	( ) Sand-Cement	( ) Rubble	( ) Commercial Block
(√) None	( ) Grouted	( ) Sheet Piles	( ) Other
2) Condition	( ) Good	( ) Fair	( ) Poor
CHANNEL LATERAL STABILITY			
a. Bends:	( ) None		
1) Bridge Location	(√) Upstream of Bend	(√) Upstream of Bend	( ) In Bend
2) Channel Migration	( ) Yes	(√) No	
3) Countermeasures	( ) Yes	(√) No	Type:
b. Bank Condition:	Upstream	Downstream	
1) Eroding	( )	( )	
2) Stable	(√)	(√)	
3) Vegetated	(√)	(√)	
4) Sheet Piles	( )	( )	
5) Countermeasures	( ) Yes	(√) No	
c. Angle of Attack	Flood Flow (90°)	Normal Flow (90°)	
d. Point Bar Under Bridge	( ) Yes	(√) No	
e. Islands or Bars:			
1) Upstream	( ) Yes	(√) No	
2) Downstream	( ) Yes	(√) No	
f. Other: Lone Pine Creek flows into western ditch alongside SR 29, approximately 1500 feet north of the bridge. The channel is very heavily vegetated and about 25 feet wide. Flood flow, however, appears to come from the wetland area directly to the west of the bridge. Should be verified by survey.			

Reviewers: Paula Coulliette
Jerry Washington

Nov. 21, 1995

Bridge Number: 0050035
SR 29 over Lone Pine Creek

SITE FIELD REVIEW			
CHANNEL VERTICAL STABILITY			
a. Exposed Footing:	( ) Yes	(√) No	( ) Unknown
b. Exposed Piles	( ) Yes	(√) No	( ) Unknown
c. Contraction Scour (Encroachment)			
1) Overbank Flow: Left	( ) Yes	(√) No	( ) feet
(Looking Downstream) Right	( ) Yes	(√) No	( ) feet
2) Relief Bridge:	( ) Yes	(√) No	
3) Roadway Overtopping (At Structure)	( ) Yes ( ) Unknown	(√) No ( ) Possible	 ( ) Partial
4) Bridge Overtopping (Low Member)	( ) Yes ( ) Unknown	( ) No (√) Possible	 (√) Partial
d. Long Term:			
1) Aggradation	( ) Yes	(√) No	( )Unknown
2) Degradation	( ) Yes	(√) No	( )Unknown
e. Bed Material:			
( ) Sand	( ) Sandy Loam		
( ) Clay	( ) Sandy Clay Loam		
( ) Muck	( ) Clayey Fine Sand		
( ) Shell	( ) Marl		
( ) Coated with Organic Matter	( ) Limestone		
( ) Other			
GEOMORPHOLOGY			
a. Alluvial Fan	( ) Yes	(√) No	
b. Dam or Reservoir	( ) Yes	(√) No	
c. River Form	( ) Straight ( ) Braided	(√) Meandering ( ) Manmade	
d. Instream Mining/Dredging	( ) Yes	(√) No	
e. Headcuts or Nickpoints	( ) Yes	(√) No	
f. Diversions	( ) Yes	(√) No	
g. Channel Straightening	( ) Yes	(√) No	
h. Stream Size: (√) Small (<100 feet) ( ) Medium (100-500 feet) ( ) Large (>500)			
i. Flow Characteristics: (√) Intermittent ( ) Perennial ( ) Tidal			
j. Other: Flood plain is very wide (<10Xchannel width), Stream is incised, Trees are present <50% bankline, Channel boundaries are not well defined. Very mild slope.			

Reviewers: Paula Coulliette
Jerry Washington

Nov. 21, 1995

Bridge Number: 0050035
SR 29 over Lone Pine Creek

SITE FIELD REVIEW				
OTHER CONSIDERATIONS				
a. Sediment Transport (During High Flow):				
1) ( ) Live Bed Condition	( ) Clear Water Condition	(√) Unknown		
2) Armored Bed	( ) Yes	(√) No	( ) Partial	
b. Watershed	(√) Agricultural	( ) Forested	(√) Swamp	( ) Urban
c. Tidal Influence	( ) Yes	(√) No	( ) Unknown	( ) Possible
d. Tidal Features	( ) Bay	( ) Estuary	( ) Inlet	( ) Barrier Island
1) Normal Range	( ) feet	( ) Tidal Gage	( ) Tide Table	( ) Field Observation
2) Observed Surface Velocity	(0) ft/sec			
3) Seiching (wind set up)	( ) Yes	(√) No	( ) Possible	
4) Distance to coast	( ) miles-shortest distance	( ) miles along thalweg		
5) Traffic:	( ) Ship	( ) Recreation	( ) Commercial	
	( ) Barge	(√) Snakes & Alligators	(√) None	
e. Tributaries:				
( ) Upstream	( ) Downstream	(√) No Factor		
Distance to confluence of next stream or water body:	( ) upstream			
	( ) feet downstream			
f. Observed Stream Velocity	(0) ft/sec			
g. Estimated Manning's n:	Channel (0.08)	Overbank (0.15)		
ADDITIONAL COMMENTS				
a. Photographs:	(√) Upstream Face	(√) Upstream Channel		
	(√) Downstream Face	(√) Downstream Channel		
	(√) East Abutment	(√) West Abutment		
b. Remarks:	Water under bridge was not moving. There is heavy vegetation both up and downstream of the bridge. See photographs. Water level at the time of site visit was 2.5' below the low member. Significant flooding has occured over the past few months. There was no evidence of roadway or bridge overtopping. Water level at time of wetland evaluation (10/30) was 2-2.5' below low member.			

Reviewers: Paula Coulliette
Jerry Washington

JMI ENGINEERS	Project:	Page No. : of
		Designed by : Date :
	Job No. :	Checked by : Note No. :

Area at Bridge Opening ~

$$87.65^* + (WSEL - 31.2)(43)$$

$$87.65 + WSEL(43) - 1341.6$$

$$\boxed{Area \approx 43(WSEL) - 1255}$$

* Taken from cross section plot using Microstation Area at WSEL = 31.2 feet

Measured Data: survey 12/6/96 WSEL = 9.656m / 31.68 feet

site visit tape measure 11/21/96 WSEL = 31.58 feet (based on LSEL 34.08)

SUMMARY OF FIELD REVIEW

28-Feb-96

Bridge 050035

From a known height of 35.55 feet, an elevation of the top of curb (SE corner of bridge) was taken to be 35.53 feet. Using this information, we measured the depth of structure, water surface elev. and the depth of the channel. The results follow.

Elevation of top of curb:	35.53	feet
Depth of structure:	1.5	feet
Depth to water surface:	4.9	feet
LSEL	34.03	feet
WSEL	30.63	feet

From the calculated WSEL, we measured the distance from the channel bottom to the water surface at each guardrail post and both intermediate bents.

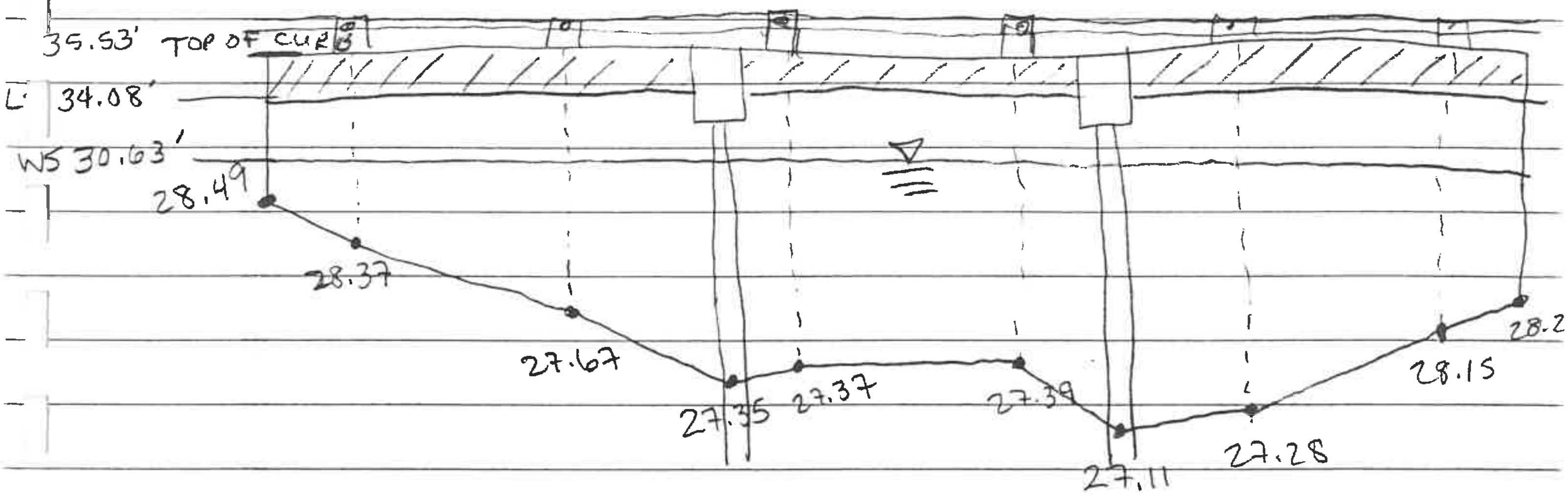
	Offset from north end bent	Channel Bottom Elevation	Depth of Water
	0	**34.08**	
0	0	28.49	2.14
1.5	1.5	28.37	2.26
8	9.5	27.67	2.96
4.5	14	27.35	3.28
3.5	17.5	27.37	3.26
8	25.5	27.39	3.24
3.5	29	27.11	3.52
4.5	33.5	27.28	3.35
8	41.5	28.15	2.48
1.5	43	28.23	2.4
	43	**34.08**	
	0	**34.08**	

There was no measurable velocity observed. An attempt was made to use a USGS flow meter to measure the velocity however, this attempt was futile since the water was obviously stagnant. An alternative method of measuring the velocity was also attempted. We placed a bottle (found on site), partly full of water in the stream in hopes of measuring the time it would take to travel under the bridge (a known distance). However, the bottle did not move during the 18 hours we observed it.

050035

2/28/96

Channel Bottom Elevations:



Area of Opening
@ WSEL 30.63 ≈ 130 ft^2

Observed velocity = 0 fps

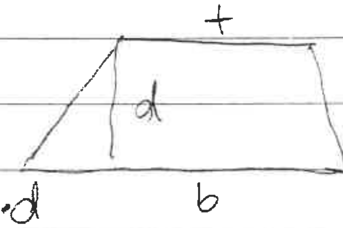
Measured Max velocity use = 0.113 fps

Q = (130 ft^2)(0.113 fps)
Q = 14.69 cfs

Area of Flow 2/28/96

050035

9 Sub Areas



Trapezoid Area = $\frac{(t+b)}{2} \cdot d$

$$\#1 = \frac{(2.14 + 2.26)}{2}(1.5) = 3.3$$

$$\#2 = \frac{(2.26 + 2.96)}{2}(8) = 20.88$$

$$\#3 = \frac{(2.96 + 3.28)}{2}(4.5) = 14.4$$

$$\#4 = \frac{(3.28 + 3.26)}{2}(3.5) = 11.445$$

$$\#5 = \frac{(3.26 + 3.24)}{2}(8) = 26.00$$

$$\#6 = \frac{(3.24 + 3.52)}{2}(3.5) = 11.83$$

$$\#7 = \frac{(3.52 + 3.35)}{2}(4.5) = 15.458$$

$$\#8 = \frac{(3.35 + 2.48)}{2}(8) = 23.32$$

$$\#9 = \frac{(2.48 + 2.40)}{2}(1.5) = 3.66$$

11/21/95

WSEL = 31.58'
Observed velocity = 0 fps
Assume velocity = 1 fps

Q = 31.58 cfs

WSEL 2/28/96 is ~ 1 foot lower than 11/21/95. No measurable change in velocity.

12/6/95
WSEL = 31.68'

Assume No channel Bottom change

Area @ 31.68' = 175 ft^2

Area @ 31.58' = 170 ft^2

Appendix B

Hydrology

Discharge Calculations

The FDOT Drainage Manual, Vol.1, Ch.4.7.1 states that a frequency analysis of observed (gage) data shall be used when available. If this information is unavailable, regional or local regression equations, the rational equation or Talbot's Equation is to be used to determine the freshwater flow conditions.

The USGS and FHWA have developed regional regression equations for the area of Bridge No. 050035. These equations are found in Vol. 2, Chapter 5 of the Drainage Manual. Both equations were used and the results were compared. The USGS equations are preferred because they are based on more specific data.

USGS Regression Equations for Region A were used for this analysis of Lone Pine Creek. These equations provide conservative, yet comparable discharge rates.

The FHWA equations are shown for comparison purposes only.

The following assumptions were made to evaluate the variables required by the regression equations:

1. The drainage area is 5170 acres or 8.08 square miles.
2. The slope of the main channel is 0.0012 feet per foot (6.2 feet per mile) and was determined from the USGS Quadrangle Map.
3. The percentage of lake or storage area in the basin has been estimated at 55.3 acres or 1.07 % of the total drainage area. This is based on the enclosed depressional areas on the USGS Quadrangle Map. It was assumed that during a flood event, these areas plus 10% will act as lake areas. (See Memorandum of Meeting, February 29, 1996, Appendix G).

RegionA

USGS Regression Equations

Peak Runoff Equation	CFS	% error	Adjuste	CMM	CFSM
Q_2 = 93.4*(DA)^0.756*(SL)^0.268*(LK+3)^-0.803	**240**	42.6	**138**	234	17.0
Q_{10} = 274*(DA)^0.708*(SL)^0.248*(LK+3)^-0.738 =	**671**	44.2	**375**	637	46.4
Q_{25} = 395*(DA)^0.696*(SL)^0.240*(LK+3)^-0.717 =	**958**	47.3	**505**	858	62.5
Q_{50} = 496*(DA)^0.69*(SL)^0.234*(LK+3)^-0.705 =	**1195**	50.0	**598**	1015	74.0
Q_{100} = 609*(DA)^0.685*(SL)^0.227*(LK+3)^-0.695 =	**1454**	52.9	**685**	1164	84.8
Q_{500} = 985*(DA)^0.668*(SL)^0.196*(LK+3)^-0.687 =	**2169**	59.7	**874**	1485	108.2

Q_t = Peak runoff rate for return period of t-years, in cfs.
DA = Drainage area, in sq. mi. 8.08
SL = Channel slope, in ft/mile 6.21
LK = Lake area, in percent of total 1.07

Basin Characteristics	Range of Applicability
Drainage Area	1,170 acres to 3,066 $miles^2$
Slope	0.15 to 0.24 ft/miles
Lake Area	0 to 28.16%

Reference: FDOT Drainage Manual, Table 5-12

Note: Wetland storage area, 529 acres, has been subtracted from the total drainage area.
Drainage manual, 5.8.2.

Zone 1

FHWA Regression Equations

	Peak Runoff Equations	CFS	CMM
Q_{10} =	0.0214*(A^0.44)*(R^1.164)*(DH^0.785)	**740**	1257
Q_2 =	0.41*Q_{10}=	**303**	515
Q_{50} =	1.46*(Q_{10}^1.023)=	**1258**	2137
Q_{100} =	1.64*(Q_{10}^1.029)=	**1470**	2497

Q_t =	Peak runoff rate for t-year flood, in cfs	
A =	Drainage Area, in $miles^2$	8.08
R =	Iso-erodent factor, from Figure 17-1	400
DH =	Difference in elevation from the most distance point in the watershed to the design point, in ft.	26

Limitation: Drainage Area should be less than 50 square miles.

Reference: FDOT Drainage Manual, Table 5-15

Table 5-12
USGS REGRESSION EQUATIONS FOR
NATURAL FLOW CONDITIONS IN FLORIDA:
REGION A

Peak Runoff Equation	R^2	Standard Error in %
$Q_2 = 93.4\ DA^{0.756}\ SL^{0.268}\ (LK + 3)^{-0.803}$	0.868	42.6
$Q_5 = 192\ DA^{0.722}\ SL^{0.255}\ (LK + 3)^{-0.759}$	0.858	42.4
$Q_{10} = 274\ DA^{0.708}\ SL^{0.248}\ (LK + 3)^{-0.738}$	0.843	44.2
$Q_{25} = 395\ DA^{0.696}\ SL^{0.240}\ (LK + 3)^{-0.717}$	0.821	47.3
$Q_{50} = 496\ DA^{0.690}\ SL^{0.234}\ (LK + 3)^{-0.705}$	0.803	50.0
$Q_{100} = 609\ DA^{0.685}\ SL^{0.227}\ (LK + 3)^{-0.695}$	0.784	52.9
$Q_{200} = 779\ DA^{0.674}\ SL^{0.205}\ (LK + 3)^{-0.694}$	0.763	55.8
$Q_{500} = 985\ DA^{0.668}\ SL^{0.196}\ (LK + 3)^{-0.687}$	0.738	59.7

Q_T = Peak runoff rate for return period of T-years, in cfs

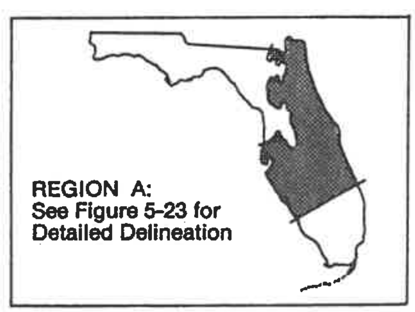
DA = Drainage area, in miles²

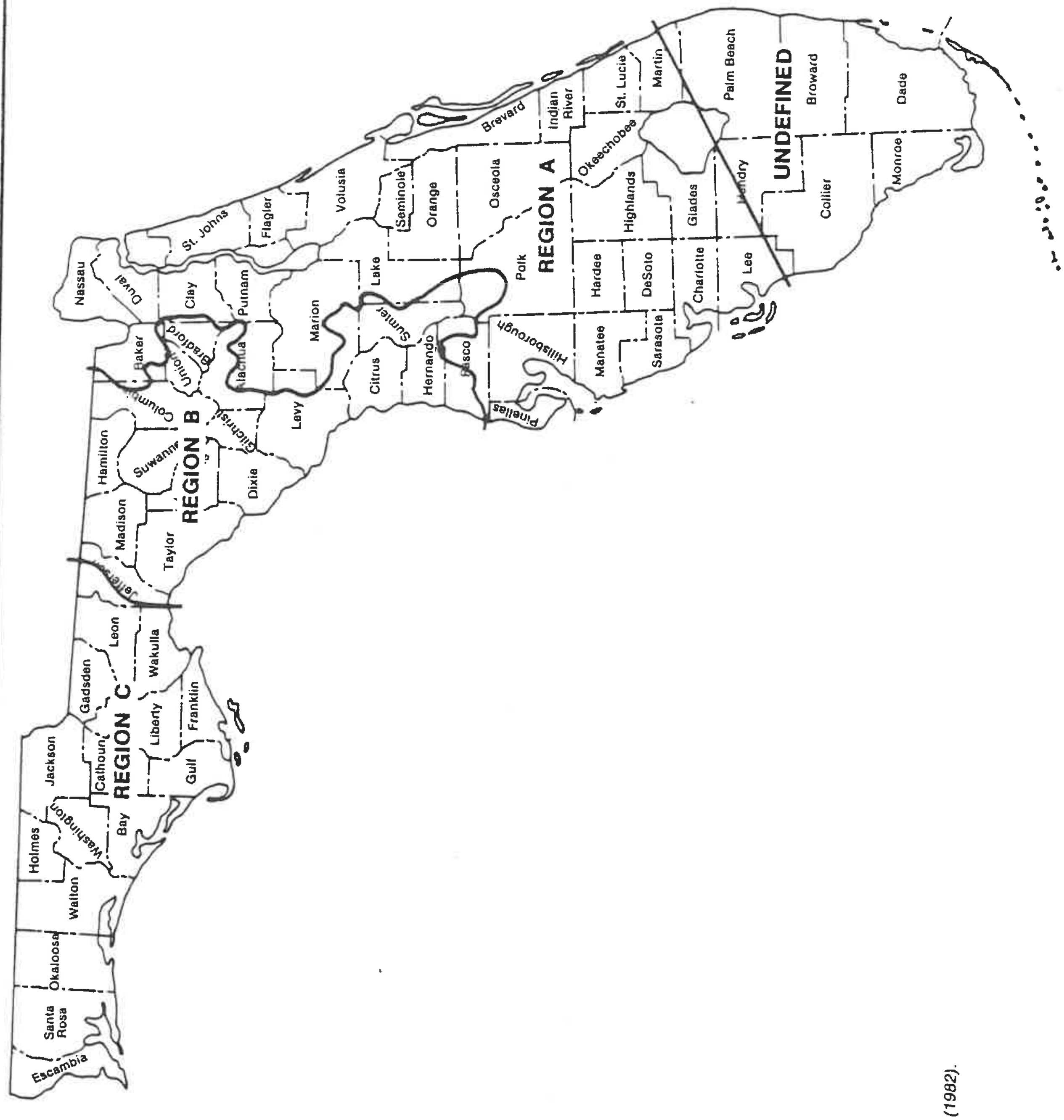
SL = Channel slope between points at 10 and 85 percent of total channel length, in ft/mile (minimum = 0.9)

LK = Lake area, in percent of total

Basin Characteristic	Range of Applicability
Drainage area	1,170 acres to 3,066 miles²
Slope	0.15 to 24.2 ft/miles
Lake area	0 to 28.16 %

Reference: Bridges (1982).





Reference: Bridges (1982).

FIGURE 5-23
Regions for USGS Regression Equations for Natural Flow Conditions

Table 5-15
FHWA REGRESSION EQUATIONS FOR NATURAL FLOW CONDITIONS IN FLORIDA

Zone	Equation
1	$Q_{10} = 0.0214\ A^{0.440}\ R^{1.164}\ DH^{0.785}$
2	$Q_{10} = 11.890\ A^{0.573}\ R^{0.443}\ DH^{0.295}$

Q_{10} = Peak runoff rate for 10-year flood, in cfs

A = Drainage area, in miles²

R = Iso-erodent factor, from Figure 17-1

DH = Difference in elevation from the most distant point in the watershed to the design point, in ft

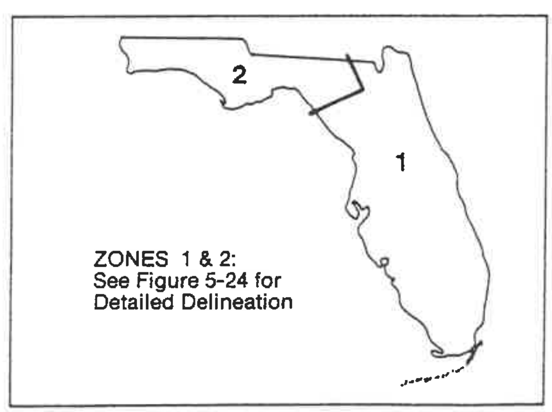
$Q_2 = 0.41\ Q_{10}$ = 2-year peak runoff rate, in cfs

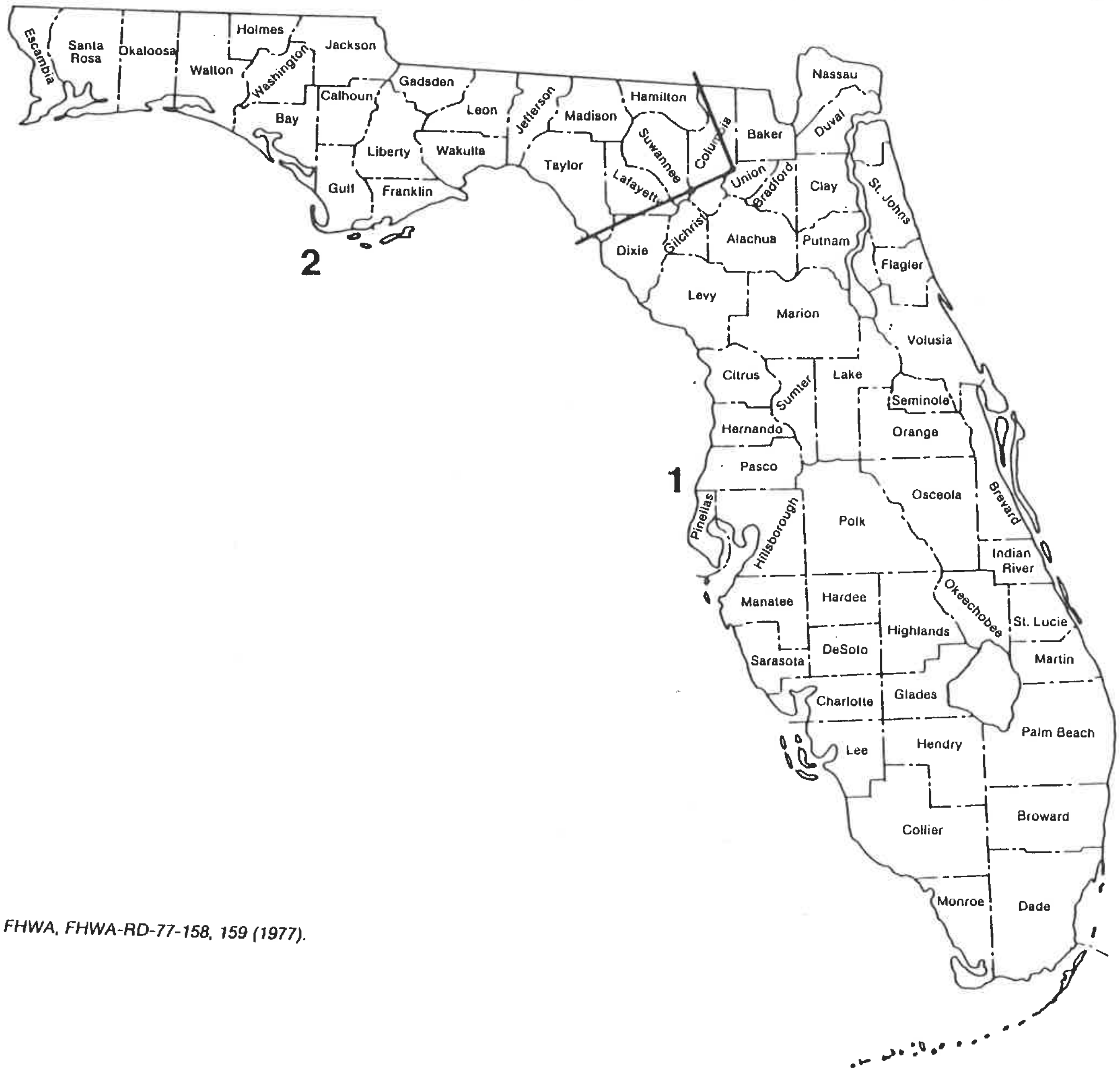
$Q_{50} = 1.46\ Q_{10}^{1.023}$ = 50-year peak runoff rate, in cfs

$Q_{100} = 1.64\ Q_{10}^{1.029}$ = 100-year peak runoff rate, in cfs

Limitation: Drainage area (A) should be less than 50 square miles.

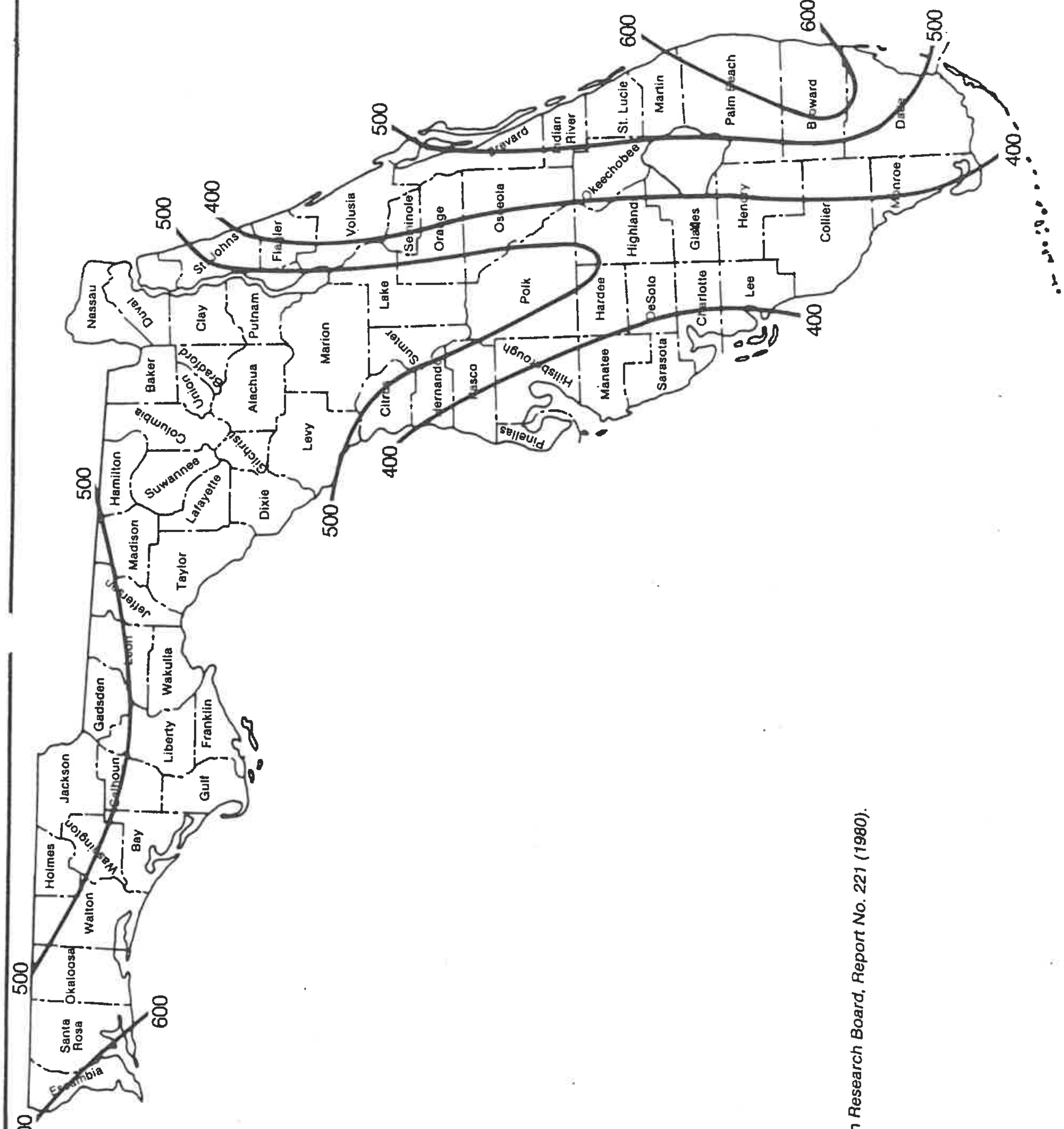
Reference: USDOT, FHWA, FHWA-RD-77-158,159 (1977).





Reference: USDOT, FHWA, FHWA-RD-77-158, 159 (1977).

FIGURE 5-24
Zones for FHWA Regression Equations for Natural Flow Conditions



Reference: Transportation Research Board, Report No. 221 (1980).

FIGURE 17-1
USLE Rainfall Factor (R) Values for Florida

JMI ENGINEERS	Project: 050035	Page No.: ___ of ___
	DOUBLE CHECK	Designed by: 2/96 Date: PNC
	Job No.: 9523-01	Checked by: ___ Note No.: ___

Channel Length = $\frac{8.5(24000)}{12}$ = 17,000 ft

10% of Channel = 1,700 ft elev = 35 ft

85% of Channel = 14,450 ft elev = 50 ft

Slope = $\frac{50-35}{14,450-1,700}$ = 0.001176 ft/ft

0.001176 $\frac{ft}{ft}$ x $\frac{5280\ ft}{1\ mile}$ = 6.21 ft/mi

DH = 61 ft (most distant point) − 35 ft (design point)

DH = 26 ft

	Project: SR29	Page No. : ___ of ___
JMI ENGINEERS	050035	Designed by : PNC Date : 3/96
	Job No. : 9523-01	Checked by : ___ Note No. : ___

Depressional Area (from quad.)

385,000 ft^2
126,000 ft^2
503,000 ft^2
785,000 ft^2
196,000 ft^2
196,000 ft^2

2,191,000 ft^2

Assume depressional areas will store water up to 1.1 x the area and act as lake area.

$$1.1\,(2{,}191{,}000) = 2{,}410{,}100\ ft^2$$

$$2{,}410{,}100\ ft^2 \times \frac{1\ mi^2}{(5280)^2\ ft^2} = 0.0865\ mi^2$$

$$LK = \frac{0.0865\ mi^2}{8.08\ mi^2} = 1.07\ \%$$

Manning's N Value's for Cow Log Branch using Cowen's equation

$$n = (n_0 + n_1 + n_2 + n_3 + n_4)\, m_5$$

Material Involved	n_0	Main Channel
Earth	0.020	
Rock Cut	0.025	
Fine Gravel	0.024	
Coarse Gravel	0.028	
	Enter value:	0.02
Degree of Irregularity	n_1	
Smooth	0.000	
Minor	0.001 - 0.005	
Moderate	0.006 - 0.010	
Severe	0.011 - 0.020	
	Enter value:	0.015
Variations of Channel Cross Section	n_2	
Gradual	0.000	
Alternating Occasionally	0.001 - 0.005	
Alternating Frequently	0.010 - 0.015	
	Enter value:	0
Relative Effect of Obstructions	n_3	
Negligible	0.000 - 0.004	
Minor	0.005 - 0.015	
Appreciable	0.020 - 0.030	
Severe	0.040 - 0.050	
	Enter value:	0.004
Vegetation	n_4	
Low	0.002-0.010	
Medium	0.010-0.025	
High	0.025-0.050	
Very High	0.050-0.100	
	Enter value:	0.05
Degree of Meandering	m_5	
Minor	1.000	
Appreciable	1.150	
Severe	1.300	
	Enter value:	1.15
	n =	0.10

Table 7-5
COEFFICIENTS FOR COMPUTING MANNING'S n VALUES
FOR NATURAL OR EXCAVATED CHANNELS USING COWAN'S EQUATION[a]

Channel Conditions			Values[b]
Material Involved	Earth	n_0	0.020
	Rock Cut		0.025
	Fine Gravel		0.024
	Coarse Gravel		0.028
Degree of Irregularity	Smooth	n_1	0.000
	Minor		0.005
	Moderate		0.010
	Severe		0.020
Variations of Channel Cross Section	Gradual	n_2	0.000
	Alternating Occasionally		0.005
	Alternating Frequently		0.010-0.015
Relative Effect of Obstructions	Negligible	n_3	0.000
	Minor		0.010-0.015
	Appreciable		0.020-0.030
	Severe		0.040-0.060
Vegetation	Low	n_4	0.005-0.010
	Medium		0.010-0.025
	High		0.025-0.050
	Very High		0.050-0.100
Degree of Meandering	Minor	m_5	1.000
	Appreciable		1.150
	Severe		1.300

[a] Cowan's equation is presented as Equation 7-2.

[b] From Chow (1959), Table 5-5, page 109.

Stream and location: LONE PINE CREEK - SR29

Reach or section: UP/DOWN STREAM OF BRIDGE

Event for which n is assigned: 50 YEAR

1. Is roughness uniform throughout the reach being considered? no, under bridge is less vegetated.
   If not, n should be assigned for the average condition of the reach.

2. Is roughness uniformly distributed along the cross section?

   Is a division between channel and flood plain necessary? yes
   (Channel roughness uses steps 3-13, flood-plain roughness uses steps 14-23).

   Is roughness uniformly distributed across the channel? yes

   If not, on what basis should n for the individual segments be weighted?

3. Describe the channel. Approx. 30' wide, 5' deep, heavily vegetated. 2' above water level.

   Are present conditions representative of those during the flood? yes, very close. Has experienced recent flooding.
   If not, describe the probable conditions during the flood.

4. How will the roughness producing effects of the following on the channel be accounted for?

   Bank roughness: —

   Bedrock outcrops: —

   Isolated boulders: —

   Vegetation: High

   Obstructions: —

   Meander: Appreciable

Figure 22.--Sample form for computing n values.

(Modified from Aldridge and Garrett, 1973, fig. 4)

Factor	Describe conditions briefly	Adjustment
Irregularity, n_1	Severe, non-uniform channel	0.015
Variations in Channel ~~Alinement~~, n_2	Gradual	0.00
Obstructions, n_3	Negligible	0.004
Vegetation, n_4	Very High	0.05
Meander, m	Appreciable	1.15
	Weighted n plus adjustments	0.02
	Use n =	0.10

14. Describe the flood plain. Cut Pasture, Some Palm trees and wet areas, oaks and other hardwoods

Are present conditions representative of those during the flood? no

If not describe probable conditions during the flood. most of flood plain is likely to also be flooded

15. Is the roughness coefficient to be determined by roughness factors only or to include vegetation-density method? roughness factors only

16. Is roughness uniformly distributed across the flood plain? no

If not, how should the flood plain be subdivided?

pasture area, tree area

17-23. Computation of n for flood plain.

Adjustment factors without vegetation-density method

Subsection	Base n, n_b	Irregularity, n_1	Obstructions, n_3	Vegetation, n_4	Computed n
Pasture	0.02	minor 0.005	Negligible 0.004	Medium 0.025	0.06
Trees	0.02	moderate 0.006	Appreciable 0.02	Very large 0.100	0.15

Specific Authority: 403.061, 403.062, 403.087, 403.504, 403.704, 403.804, F.S.
Law Implemented: 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.702, 403.708, F.S.
History: New 1-28-90, Formerly 17-3.065, Amended 2-13-92, 6-17-92, 4-25-93, Formerly 17-302.530.

62-302.600 Classified Waters.

(1) The surface waters of the State of Florida are classified as Class III - Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife, except for certain waters which are described in this section. A water body may be designated as an Outstanding Florida Water or an Outstanding National Resource Water in addition to being classified as Class I, Class II, or Class III. A water body may also have special standards applied to it. Outstanding Florida Waters and Outstanding National Resource Waters are listed in Rule 62-302.700, F.A.C.

(2) Unless otherwise specified, the following shall apply:

(a) The landward extent of a classification shall coincide with the landward extent of waters of the state, as defined in FAC Rules 62-301.400.

(b) Water quality classifications shall be interpreted to include associated water bodies such as tidal creeks, coves, bays and bayous.

(3) Exceptions to Class III:

(a) All secondary and tertiary canals wholly within agricultural areas are classified as Class IV and are not individually listed as exceptions to Class III. "Secondary and tertiary canals" shall mean any wholly artificial canal or ditch which is behind a control structure and which is part of a water control system that is connected to the works (set forth in Section 373.086, F.S.) of a water management district created under Section 373.069, F.S., and that is permitted by such water management district pursuant to Section 373.103, Section 373.413, or Section 373.416, F.S. Agricultural areas shall generally include lands actively used solely for the production of food and fiber which are zoned for agricultural use where county zoning is in effect. Agricultural areas exclude lands which are platted and subdivided or in a transition phase to residential use;

(b) The following listed water bodies are classified as Class I, Class II, or Class V:

1. Alachua County - none.
2. Baker County - none.
3. Bay County

Class I

Bayou George and Creek - Impoundment to source.
Bear Creek - Impoundment to source.
Big Cedar Creek - Impoundment to source.
Deer Point Impoundment - Dam to source.
Econfina Creek - Upstream of Deer Point Impoundment.

Class II

East Bay and Tributaries - East of U.S. Highway 98 to, but excluding Wetappo Creek.
North Bay and Tributaries - North of U.S. Highway 98 to Deer Point Dam excluding Alligator Bayou and Fanning Bayous north of an east-west line through Channel Marker 3.
West Bay and Tributaries - West of North Bay (line from West Bay Point on the north to Shell Point on the South) except West Bay Creek (northwest of Channel Marker 27C off Goose Point), Crooked Creek (north of a line from Crooked Creek Point to Doyle Point), and Burnt Mill Creek (north of a line from Graze Point to Cedar Point).

4. Bradford County - none.
5. Brevard County

Class I

St. Johns River and Tributaries - Lake Washington Dam south through and including Sawgrass Lake, Lake Hellen Blazes, to Indian River County Line.

Class II

Goat Creek.
Indian River - South from a line due east of Barnes Blvd. SR 405 to South Section Line of Section 29, T26S, R37E, Palm Shores.
Indian River - From a line from Cape Malabar northeastward through Intracoastal Waterway marker 16, to shore, then southward to S. Brevard county line.
Indian River - N. Brevard County Line south to Florida East Coast Railroad Crossing (vicinity of Jay Jay).
Kid Creek.

17. Escambia County

Class II

Escambia Bay - Louisville and Nashville Railroad Trestle south to Pensacola Bay (Line from Emanuel Point east northeasterly to Garcon Point).
Pensacola Bay - East of a line connecting Emanuel Point on the north to the south end of the Pensacola Bay Bridge (U.S. Highway 98).
Santa Rosa Sound - East of a line connecting Gulf Breeze approach to Pensacola Beach (Bascule Bridge), and Sharp Point with exception of the Navarre Beach area from a north-south line through Channel Marker 106 to Navarre Bridge.

18. Flagler County

Class II

Matanzas River (Intracoastal Waterway) - N. Flagler County Line south to an east-west line through Fl. Marker 109.
Pellicer Creek.

19. Franklin County

Class II

Alligator Harbor - East from a line from Peninsula Point north to St. James Island to mean high water.
Apalachicola Bay - with exception of an area encompassed within a 2-mile radius from Apalachicola entrance of John Gorrie Memorial Bridge.
East Bay and Tributaries - with the exception of area encompassed within 2-mile radius from Apalachicola entrance of John Gorrie Memorial Bridge.
Gulf of Mexico - North of a line from Peninsula Point on Alligator Point to the southeastern tip of Dog Island and bounded on the east by Alligator Harbor and west by St. George Sound.
Ochlockonee Bay - From the confluence of Sopchoppy and Ochlockonee Rivers eastward to a line through the two flashing beacons marking the end of the main channel and south channel, to the shoreline south of Bald Point., north to the county line.
St. George Sound - Gulf of Mexico westerly to Apalachicola Bay.
St. Vincent Sound - Apalachicola Bay to Indian Pass.

20. Gadsden County

Class I

Holman Branch - SR 270-A to source.

62-302.600(3)(b)17. - 62-302.600(3)(b)20.

Mosquito Creek - U.S. Highway 90 north to Florida State Line.
Quincy Creek - SR 65 to source.

21. Gilchrist County - none.
22. Glades County

Class I*

Lake Okeechobee.

23. Gulf County

Class II

Indian Lagoon - West of Indian Pass and St. Vincent Sound.

St. Joseph Bay - South of a line from St. Joseph Point due east,excluding an area that is both within an arc 2.9 miles from the center of the mouth of Gulf County Canal and east of a line from St. Joseph Point to the northwest corner of section 13, T8S, R11W.

24. Hamilton County - none.
25. Hardee County - none.
26. Hendry County

Class I

Lake Okeechobee.

27. Hernando County - none.
28. Highlands County - none.

29. Hillsborough County

Class I

Cow House Creek - Hillsborough River to source.
Hillsborough River - City of Tampa Water Treatment Plant Dam to Flint Creek.

Class II

Old Tampa Bay - Waters within Hillsborough County between SR 60 (Courtney Campbell Parkway), and Interstate 275 (Howard Frankland Bridge), to the line of mean high water.
Old Tampa Bay and Mobbly Bay - Beginning at the intersection of the north shore of SR 60 (Courtney Campbell Parkway) and Longitude 82°35'45" west, thence due north to the line of mean high water, thence westward along the line of mean high water, (except Rocky and Double Branch Creeks which are included only to SR 580), and up Channel A to a line connecting the lines of mean high water on the outer sides of the canal banks, to the county line,

62-302.600(3)(b)20. cont. - 62-302.600(3)(b)29.

DTS
JR

Biological Research Associates, Inc.

Memorandum

Date:	8 November 1995	Subject:	DeSoto; Glades FDOT Bridge Inspections
To:	Tim Neldner		
From:	Craig Schmittler CS	Project Name:	FDOT Bridge Inspections
Through:	Dana West	Project No.:	FDT1-005-B1C; FDT1-005-B2C

State Proj. Nos 04010-1517 & 05090-1511
WPI Nos.: 1110459 & 1110874

Remarks:

DeSoto County, Prairie Creek Bridge

This bridge is located on County Road 31 which is oriented in a general north/south alignment. Prairie Creek flows in an east to west direction as it crosses under CR 31.The entire area on both sides of the bridge has been severely impacted due to recent heavy flooding. Extensive sand deposits were found well outside of the existing jurisdictional limits on the downstream side of the bridge as a result of the flooding that has occurred this summer. The understory vegetation in the upstream jurisdictional area is very sparse and was apparently washed out during the high water events. Jurisdictional limits on the eastern side of the bridge appear to be more encompassing in the upstream sections of the waterbody probably because there are two (2) separate channels that meet at the bridge in this location. Carolina ash, laurel oak, live oak, pepper vine, green briar, willows, and scattered live oak are all present in the jurisdictional area between the two channels. Laurel oak and ash appear to be dominant in the upstream flood plain. This entire forested area is jurisdictional for the COE, DEP and SWFWMD. The western side of the bridge, the downstream side, appears to be somewhat less encompassing as far as jurisdictional limits. The central portion of the creek and the immediately associated flood plain contains maidencane, a few willows, scattered Carolina ash, and live oak on both sides of the flood plain/creek bank. Primrose willow is also very abundant on both sides of the bridge scattered throughout. The approximate limits of jurisdiction as per the inspection on 8 November 1995 are shown in green on the attached aerials. The temporary bridge would best be located on the western side of the bridge.

There are four (4) bridges located on SR 29 between SR 74 and LaBelle. These bridges will be described as being oriented in a North/South direction to simplify the evaluation of the adjacent jurisdictional areas.

RECEIVED NOV 20 1995

5969 Cattleman Lane • Sarasota, FL 34232 • (941) 378-0660 • Fax (941) 378-0787
Chipley Jacksonville Sarasota St. Petersburg Tallahassee Tampa

Glades County, Bridge #050035

The area adjacent to this bridge is probably the least encompassing as far as jurisdictional limits are concerned. The steep creek bank widens slightly on both sides of the road. Wetland vegetation on these banks is dominated with primrose willow, water lettuce, scattered maidencane, and some hyacinth throughout with wax myrtles present on the shoreline adjacent to these areas. Jurisdictional limits are fairly well defined due to the steep slope of the creek bank with the exception of the northwest side of the road where there is a wide densely-vegetated ditch adjacent to the road which also appears to be within permitting jurisdiction of the agencies. It has been delineated on the aerial as a green line paralleling the road for approximately 250 to 300 feet. Water levels appeared to have been relatively high in the recent past but have come down to within normal limits in the creek and appear to be back within limits of normal flow condition for this time of year. There were a few trees, right at or adjacent to the right of way limits on the eastern side of the road. The best location for the temporary bridge would be on the east side of the existing bridge.

Glades County, Bridge #050031

The jurisdictional limits on the western side of the road are fairly well defined extending slightly outside the existing channelized flowway to the south and even less to the north. Hemp vine, cordgrass, primrose willow, pickerelweed, hyacinth, scattered maidencane and mermaidweed along with various sedges and rushes made up the vegetation within the jurisdictional limits on the western side of the road. Jurisdictional limits on the eastern side of the road extend 50 to 75 feet south of the bridge crossing on the southeastern side and are relatively contiguous for over one half mile to the north due to the presence of an existing wetland system northeast of the bridge. The roadside ditch contains wax myrtles, primrose willow, and scattered pickerelweed with hyacinth and hemp vine and occasional salt bush throughout. These areas are all within the jurisdiction of the permitting agencies and would require wetland permitting during construction within the right-of-way. However, most of the vegetation in this area is of the nuisance variety where there is a dominant vegetation present and as such permitting should be achievable. The temporary bridge should be constructed on the west side of the bridge.

Glades County Bridge #050032

Jurisdiction on the west side of the bridge in the southwest corner extends approximately 150 to 175 feet south and triangulates back into the main flow way of the waterbody at this location. The northwestern jurisdiction extends at least 500 feet, possibly more depending on the conditions the day the agencies are there, but most likely will extend at least to the palmetto line adjacent to the fence row on the west side of the road as shown on the aerial. Vegetation on the southwest side consists mostly of primrose willow with scattered maidencane. Hemp vine, pickerelweed, arrowhead, cordgrass, and several other small herbaceous sedges and rushes make up the vegetation in this area. On the northwest side of the creek broom sedge, various sedges, hydrocotyle, maidencane, scattered primrose, occasional wax myrtle, and mermaid weed make up the dominant vegetation in this area. Jurisdictional limits on the east side of the road extend about 100 feet south of the road and 100 to 150 feet north. Dominant vegetation on the east side includes primrose willow, scattered wax myrtle, pickerelweed, arrowhead, water hyacinth in the open water, and occasional arrowhead. The temporary bridge should be placed on the east side of the existing bridge.

5969 Cattleman Lane • Sarasota, FL 34232 • (941) 378-0660 • Fax (941) 378-0787
Chipley Jacksonville Sarasota St. Petersburg Tallahassee Tampa

Glades County, Bridge #050941

The top of bank in this area has recently been mowed. However, jurisdiction along this ditch on both sides of the road should be limited to top of bank or an additional 5 to 10 feet more due to the great slope in this area. Vegetation is mostly herbaceous with smart weed, pepper vine, sesbania, primrose willow and maidencane found along the banks on all shorelines on both sides of the road and is consistent throughout the general area. There are some cattails present in the southwest corner of the ditch on the west side of the road. The temporary bridge will have the least impacts on the east side of the existing bridge.

CC: Art deLaski/GGI
Reuben Ohanian/GGI
Dave Snyder/JMI, Tally

Org: DFS
cc: PC ✓

Biological Research Associates, Inc.

Memorandum

Date: 14 November 1995

To: Dave Snyder/JMI Engineers

From: Tim Neldner TLN

Subject: Approximate Wetland Delineation

Project Name: SR 29, Bridge No. 050035
State Project No. 05090-1511
WPI No. 1110874

Project No.: FDT1-005-B1C

Remarks:

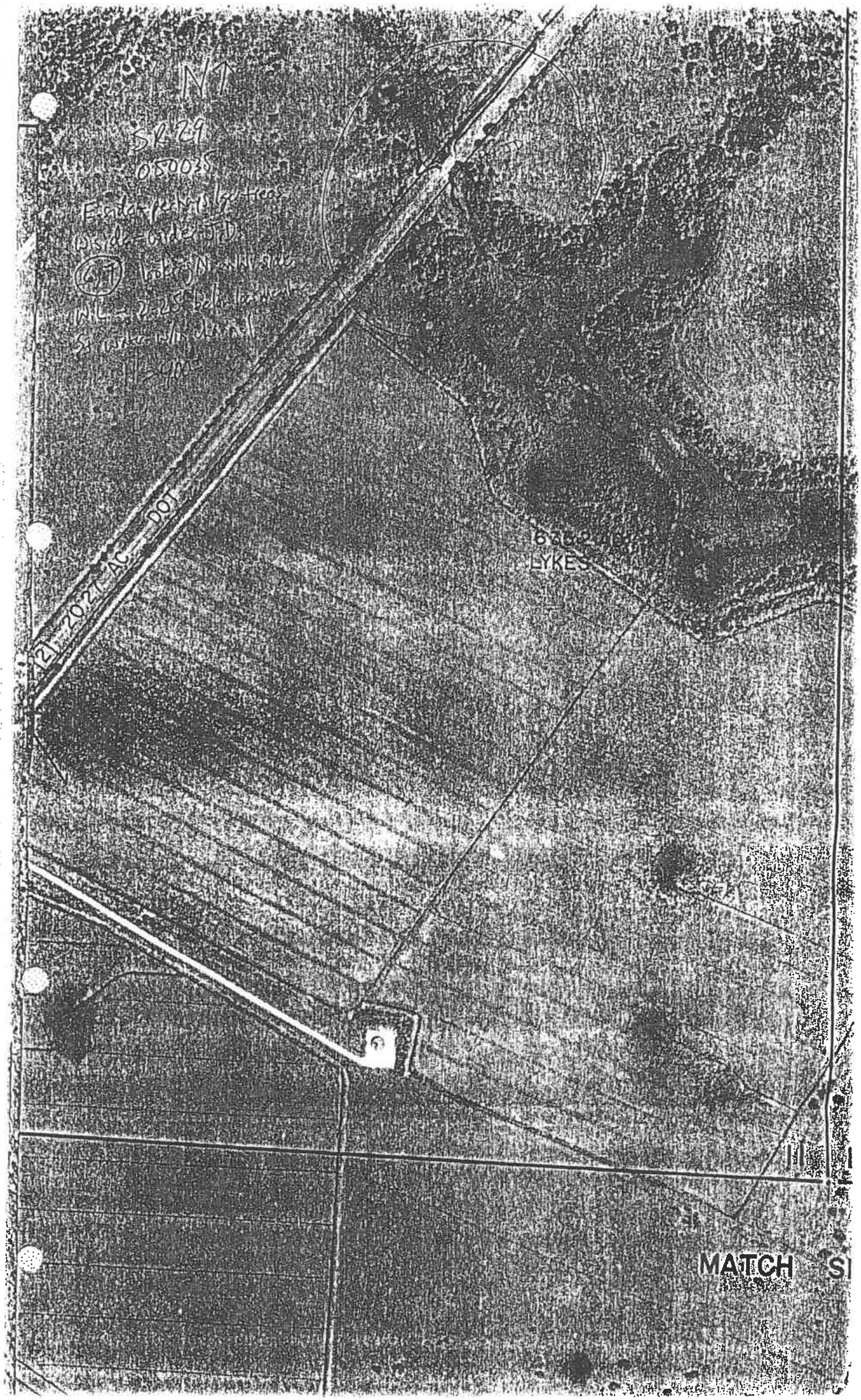
Please find enclosed the approximate wetland delineation for the referenced site for your use. The original aerial was at scale 1" = 400'. The red line approximates the wetland delineation. It appears at this early stage that the "east" side of the existing bridge contains less wetland area. Please call me if you have any questions.

Enclosure: Aerial Photocopy (2 copies)

CC: Mr. John Previte, Project Manager/FDOT, Bartow: without enclosure
Ms. Sherry Swinford/FDOT, Bartow: with enclosure
Mr. Art deLaski/GGI: without enclosure
Mr. Craig Schmittler/BRA, Sarasota: without enclosure

RECEIVED NOV 16 1995

3910 US Highway 301 N. • Suite 180 • Tampa, FL 33619 • (813) 664-4500 • Fax (813) 664-0440
Chipley Jacksonville Sarasota St. Petersburg Tallahassee Tampa


N
SR 29
050035
2.02 AC DOT
LYKES
MATCH

Glades County Soil Survey Information for Bridge No. 050035 SR 29

Soil Type Along Channels
16 Floridana Fine Sand, Depressional

This soil is nearly level and very poorly drained. It is in wet depressions. This soil is ponded for much of the year. Floridana soils range from 3 to 40 acres in size. Slopes are less than 2 percent.

Typically the upper part of the surface layer is black muck about 4 inches thick. The lower part of the surface layer is black fine sand to a depth of 19 inches. The subsurface layer is light brownish gray fine sand to a depth of 25 inches. The subsoil layer is gray fine sandy loam to a depth of 45 inches. The substratum is gray fine sand and extends to 80 inches.

15 - Pineda Fine Sand
This poorly drained, nearly level soil is on broad low flats and large drainageways in flatwoods. Areas are irregular in shape and range in size from 20 acres to more than 100 acres. Slopes are smooth.

Typically, the surface layer is gray fine sand about 4 inches thick. The subsurface layer is light gray and pale brown fine sand to a depth of about 32 inches. The subsoil is grayish brown loamy sand and gray sandy loam to a depth of 47 inches. Below this to a depth of 80 inches or more is light gray fine sand mixed with shell fragments.

Soil Type in Vicinity
23 - Oldsmar Fine Sand
This poorly drained, nearly level soil occurs on flatwoods areas adjacent to sloughs and streams in the county. Areas are irregular in shapes and range in size from 10 to 50 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is gray fine sand 8 inches thick. Below this is the subsurface layer of light brownish gray and white sand to a depth of 34 inches then is olive sandy clay loam and sandy loam to a depth of 80 inches or more.

26 - Immokalee Sand
This soil is nearly level and poorly drained. It is on broad flatwoods of irregular shape ranging in size from 15 acres to more than 100. Slopes are smooth.

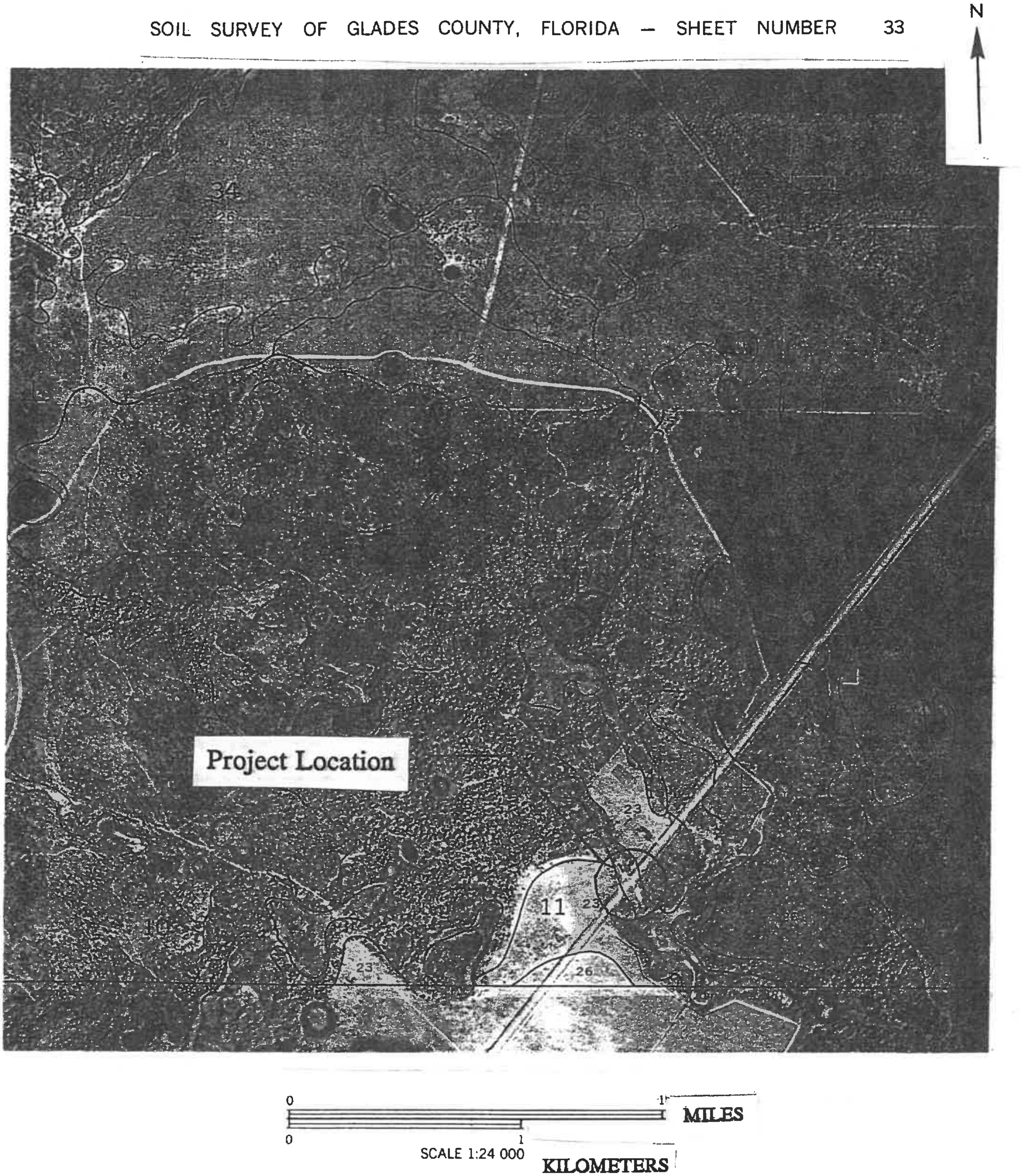
Typically the surface is very dark gray sand about 8 inches thick. The subsurface layer is gray an dwhite sand to a depth of 32 inches. The subsoil extends to 80 inches. The upper subsoil is black sand about 6 inches thick. Below this sand. The lower subsoil is brown sand.

36 - Malabar Fine Sand, High

This poorly drained nearly level soil is in the flatwoods. Areas are irregular in shape and range from 20 acres to more than 300 acres in size. Slopes are smooth.

Typically, there is black fine sand about 8 inches thick. The subsurface is light gray fine sand to a depth of 35 inches, the upper part of the subsoil is brownish yellow fine sand at a depth of 42 inches. Below this is grayish brown fine sandy loam to 60 inches. The substratum extends to 80 inches and is grayish brown fine sand. The lower 10 inches has shell fragments and pockets of loamy material.

SOIL SURVEY OF GLADES COUNTY, FLORIDA — SHEET NUMBER 33



FLORIDA
LAWTON CHILES
GOVERNOR

DEPARTMENT OF TRANSPORTATION
BEN G. WATTS
SECRETARY

RECEIVED
DEC 29 1995
GENESIS GROUP, INC.

DATE: December 28, 1995

TO: John Previte, Project Manager

FROM: Brian W. Jory, P.E., Asst. District Geotechnical Engineer
By: Michael A. Enot

COPIES TO: Art deLaski/Genesis, Ruben Ohanian/Genesis, File

SUBJECT: Budget Item Number: 1110874
State Job Number: 05090-1511
County: Glades
Description: SR 29 at Bridge No. 050031, 050032, 050035 And 050941

RE: Particle Size Distribution Curves and Environmental Classification

---

In response to your request dated November 13, 1995, we have performed two (2) Standard Penetration Tests (SPT) , obtained a water sample of the surface water and a grab sample of the existing soil at each corresponding bridge location. Based on our preliminary investigation, we have developed grain size curves representative of the upper material in the existing waterway and provided an environmental classification for each corresponding bridge location. A summary of our results are provided below:

__Bridge No. 050031__

We are submitting two (2) grain size distribution curves for this bridge. At the time we conducted our site reconnaissance the water was approximately 1.64 m (5.4 ft) deep. Based on the depth of water, freeboard and location of the boring site the top 2.1 m (6.9 ft) of the borings performed at the subject bridge location is above the existing channel bottom and was not considered in the particle size distribution curve. The first curve is representative of the surficial layer present on the channel bottom. The second curve is representative of insitu material present from the existing channel bottom to a depth of 9.3 m (30.51 ft). The grain size curves for representative soil sample are presented in Appendix "A" and may be used to estimate the corresponding D50 values for scour analysis.

In addition to the grain size distribution, we performed a series of corrosion tests on the water and soil obtained form the subject bridge site. Based on test results the water appeared to be more corrosive. The results of the corrosion series on the water sample are as follows:

Corrosion Series Test Results

pH:	5.5
Resistivity:	10,000
Chlorides:	40
Sulfates:	<2

Environmental Classification

Substructure:	Concrete	Moderately Aggressive
	Steel	Extremely Aggressive
Superstructure:	Slightly Aggressive	
Location:	Inland	

Bridge No. 050032

We are submitting three (3) grain size distribution curves for this bridge. Based on the depth of water, freeboard and location of the boring site the top 2.0 m (6.6 ft) of the borings performed at the subject bridge location is above the existing channel bottom and was not considered in the particle size distribution curves. The first curve is representative of the surficial layer present on the channel bottom. The second curve is representative of the insitu material present from the existing channel bottom to a depth of 1.6 m (5.25 ft) and the material present 3.1 m (10.17 ft) to 6.9 m (22.64 ft) beneath the existing ground surface. The third curve is representative of the insitu material lying directly beneth the above strata from 1.6 m (5.25 ft) to 3.1 m (10.17 ft) beneath the existing ground surface and on underlying strata present from 6.9 m (22.64 ft) to 9.9 m, (32.48 ft) beneath the existing ground surface. The grain size curves for these representative soil samples are presented in Appendix "B" and may be used to estimate the corresponding D50 values for scour analysis.

In addition to the grain size distribution, we performed a series of corrosion tests on the water and soil obtained from the subject bridge site. Based on test results, the water appeared to be more corrosive. The results of corrosion series tests on the water sample are as follows:

Corrosion Series Test Results

pH:	4.7
Resistivity:	10,000 +
Chlorides:	40
Sulfates:	<2

Environmental Classification

Substructure:	Extremely Aggressive
Superstructure:	Slightly Aggressive
Location:	Inland

Bridge No. 050035

We are submitting two (2) grain size distribution curves for this structure. Based on our site reconnaissance the water was approximately 1.83 m (6.0 ft) deep. Based on the depth of water, freeboard and location of the boring site the top 2.4 m (8 ft) of the borings performed at the subject bridge location is above the existing channel bottom and was not considered in the particle size distribution curves. The first curve is representative of the surficial layer present on the channel bottom. The second curve is representative of the insitu material present from the existing channel bottom to a depth of 3.5 m (11.48 ft) and the material present 4.6 m (15.09 ft) to 8.0 m (26.25 ft) beneath the existing ground surface. In addition to the material covered by the curves above there exists a clay layer from 3.5 m (11.48 ft) to 4.6 m (15.09 ft) in which seventy-five (75) percent passes the number 200 sieve.

Based on my telephone conversation of December 26, 1995 at approximately 11:00 a.m. with Mr. Ruben O'Hanian, a hydrometer is being run on a representative sample and the results of this test will be forwarded to you upon completion. The grain size curves for the representative soil samples are presented in Appendix "C" and may be used to estimate the corresponding D50 values of each strata for scour analysis.

In addition to the grain size distribution, we performed a series of corrosion tests on the water and soil obtained from the subject bridge site. Based on test results, the water appear to be more corrosive. The results of the corrosion series tests on the water samle are as follows:

<u>Corrosion Series Test Results</u>

pH:	5.0
Resistivity:	10,000 +
Chlorides:	60
Sulfates:	2

Environmental Classififcation

Substructure:	Extremely Aggressive
Superstructure:	Slightly Aggressive
Location:	Inland

<u>Bridge No. 050941</u>

We are submitting two (2) grain size distribution curves for this structure. Based on the depth of water, freeboard and location of the boring site the top 2.0 m (6.56 ft) of the borings performed at the subject bridge location is above the existing channel bottom and was not considered in the particle size distribution curves. The first curve is representative of the surficial layer of the channel bottom. The second curve is representative of the upper 7.0 m (22.96 ft) beneath the existing channel bottom. The grain size of these rperesentative soil samples are presented in Appendix "D" and may be used to obtain D50 values of the corresponding strata for scour analysis.

In addition to the grain size distribution, we performed a series of corrosion tests on the water and soil obtained from the subject bridge site. Based on test results the water appeared to be comre corrosive. The results of corrosion series tests on the water sample are as follows:

<u>Corrosion Series Test Results</u>

pH:	5.9
Resistivity:	8970
Chlorides:	40
Sulfates:	<2

Environmental Classifications

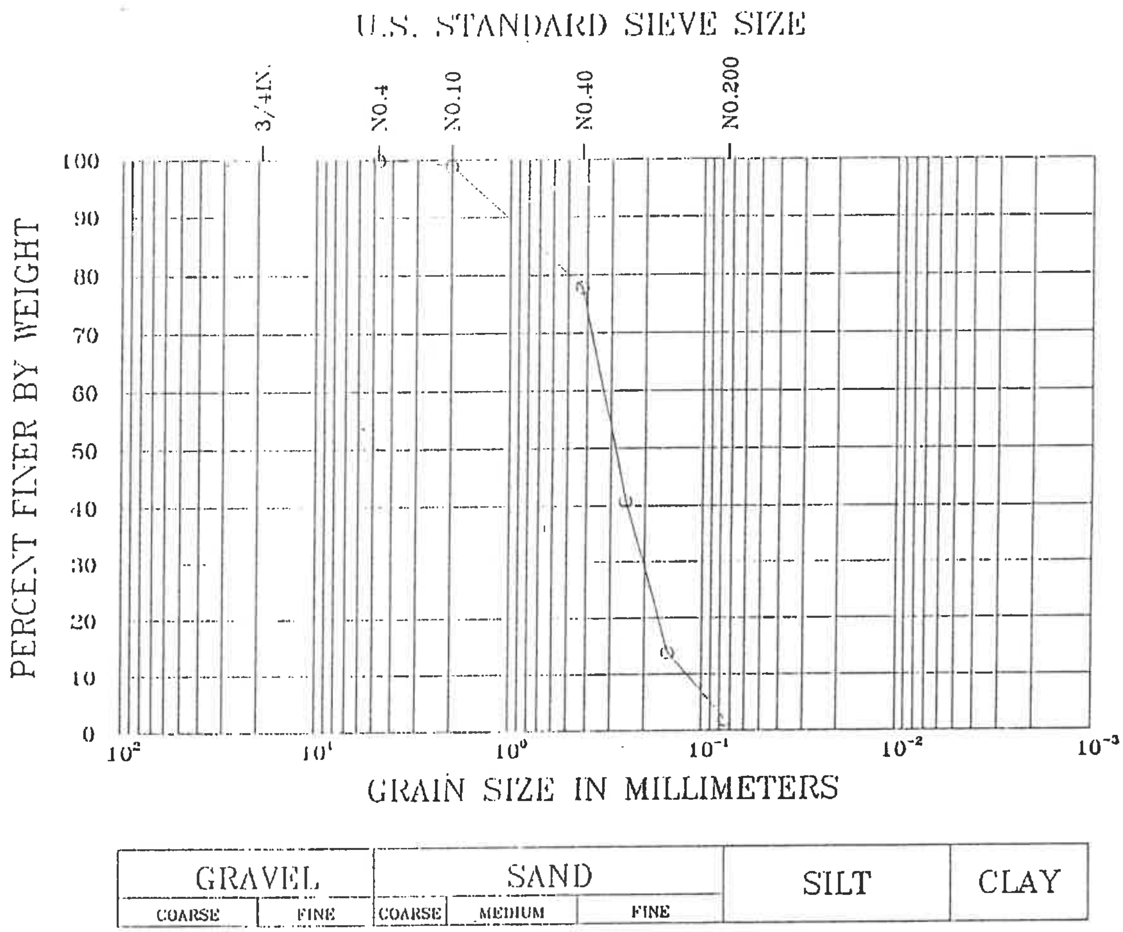
Substructure:	Concrete - Moderately Aggressive
	Steel - Extremely Aggressive
Superstructure:	Slightly Aggressive
Location:	Inland

The results contained in this letter are based on the information obtained from our preliminary analysis. We should receive a copy of all the final test results and associated borings by January 4, 1995 and will begin evaluating the data and prepare a preliminary geotechnical structures report. This report will not consider scour. When scour analyses have been performed, please forward the information to this office so that we can being our Phase I report for the BDR. We will be completing the report based on the priority list received from you on November 15, 1995.

If you have any questions, please contact this office.

BWJ/MAE/skw
Attachaments

APPENDIX A - GRAIN SIZE DISTRIBUTION CURVES
BRIDGE NO. 050031



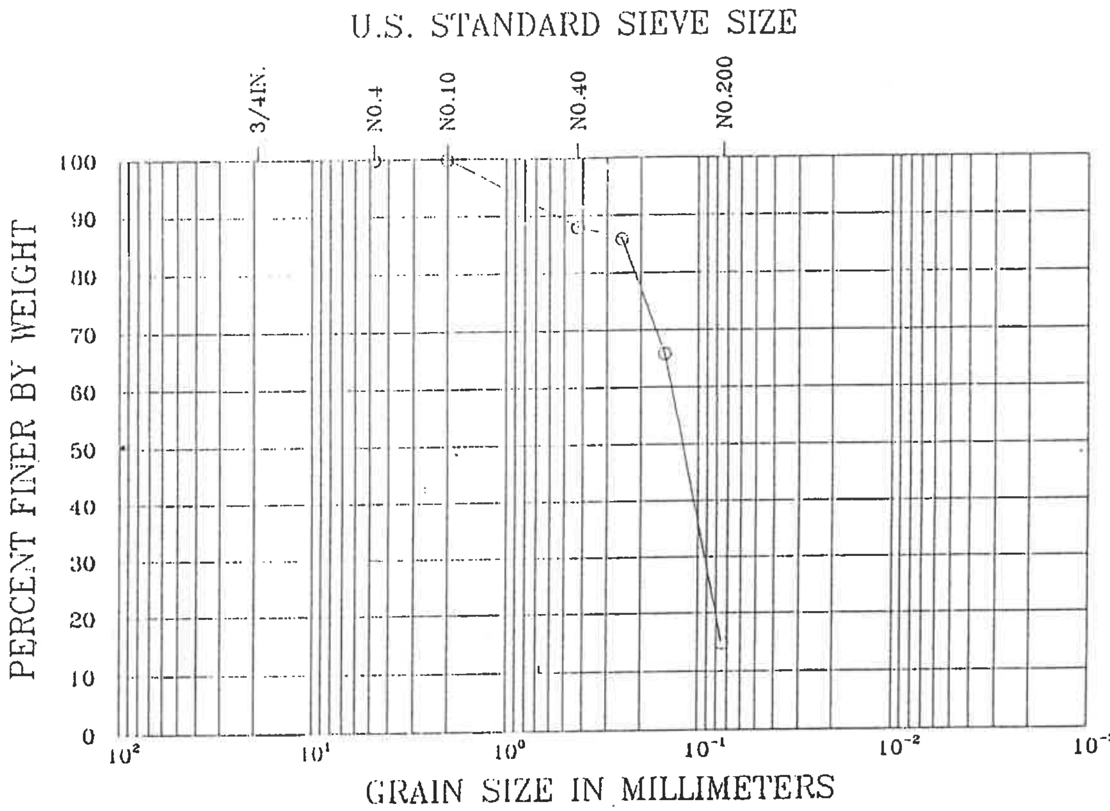
LOCATION: NORTHEAST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

-ө-

SOIL CLASSIFICATION: A-3, SP

REPRESENTATIVE OF SURFICIAL MATERIAL

STATE PROJECT # 05090-1511
BRIDGE # 050031



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

LOCATION: STATION 195+54 11m LT OF C.L.
SAMPLE DEPTH: 8.69m

-ө-

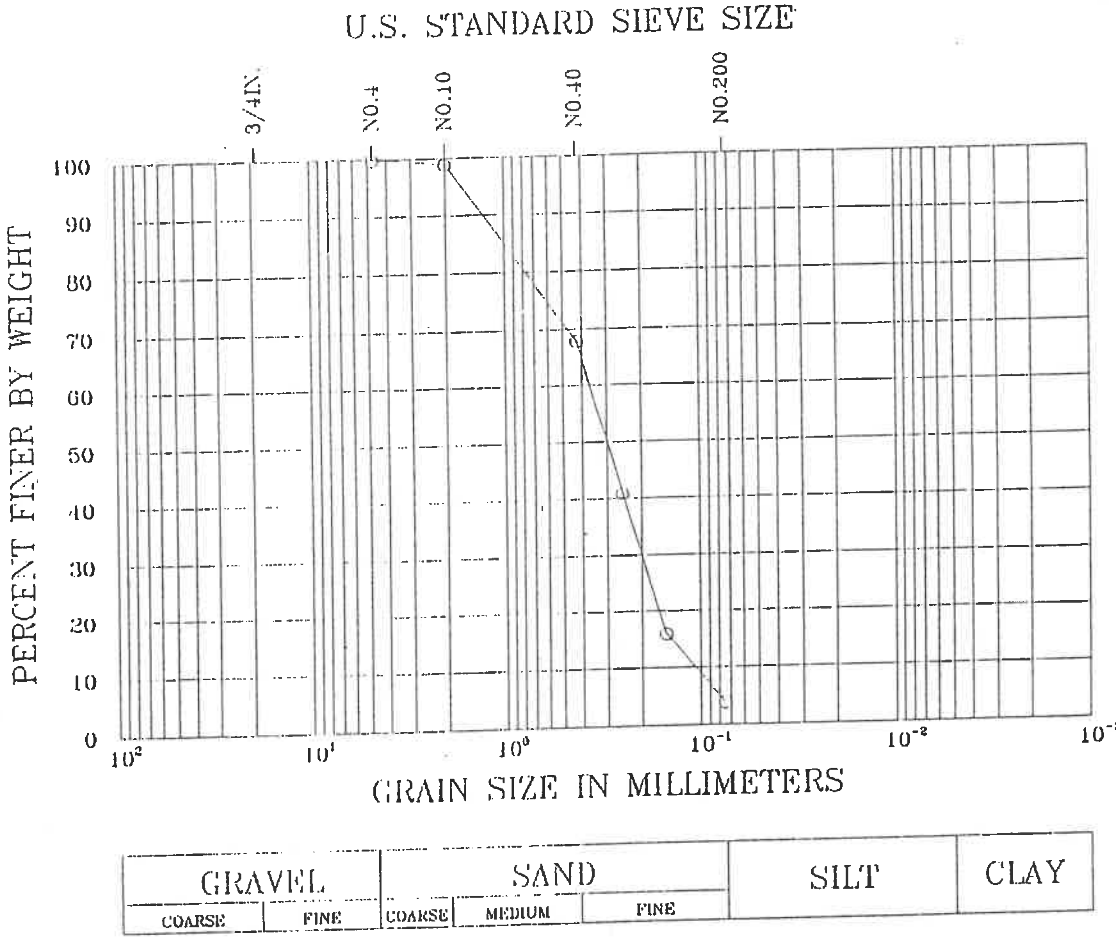
SOIL CLASSIFICATION: A-2-4, SC

STATE PROJECT # 05090-1511
BRIDGE # 050031

THIS CURVE REPRESENTS MATERIAL
0.0 m TO 9.3m BENEATH CHANNEL BOTTOM

CURVE 2

APPENDIX B - GRAIN SIZE DISTRIBUTION CURVES
BRIDGE NO. 050032



LOCATION: SOUTHWEST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

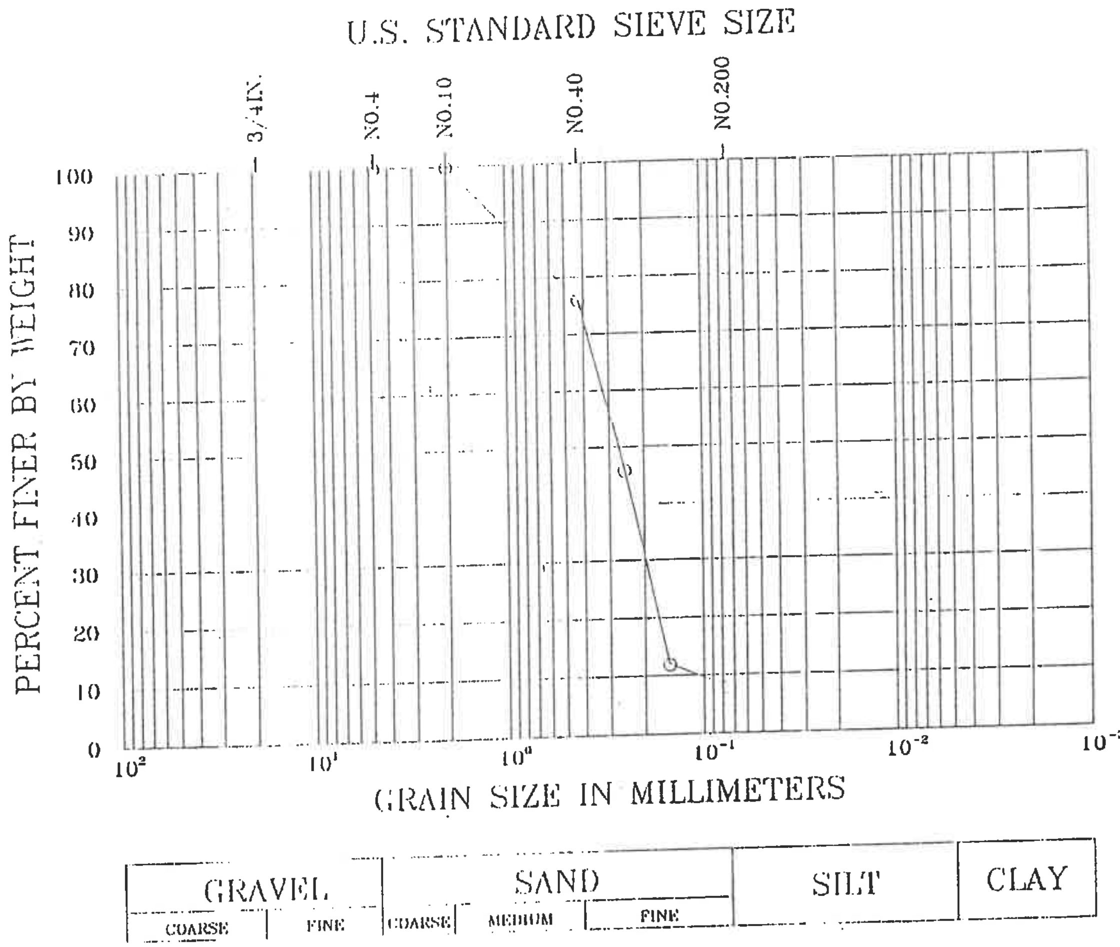
-o-

SOIL CLASSIFICATION: A-3, SP

REPRESENTATIVE OF SURFICIAL MATERIAL

STATE PROJECT # 05090-1511
BRIDGE # 050032

CURVE 1



LOCATION: STATION 170+46 11m RT OF C.L.
SAMPLE DEPTH: 6.4 m

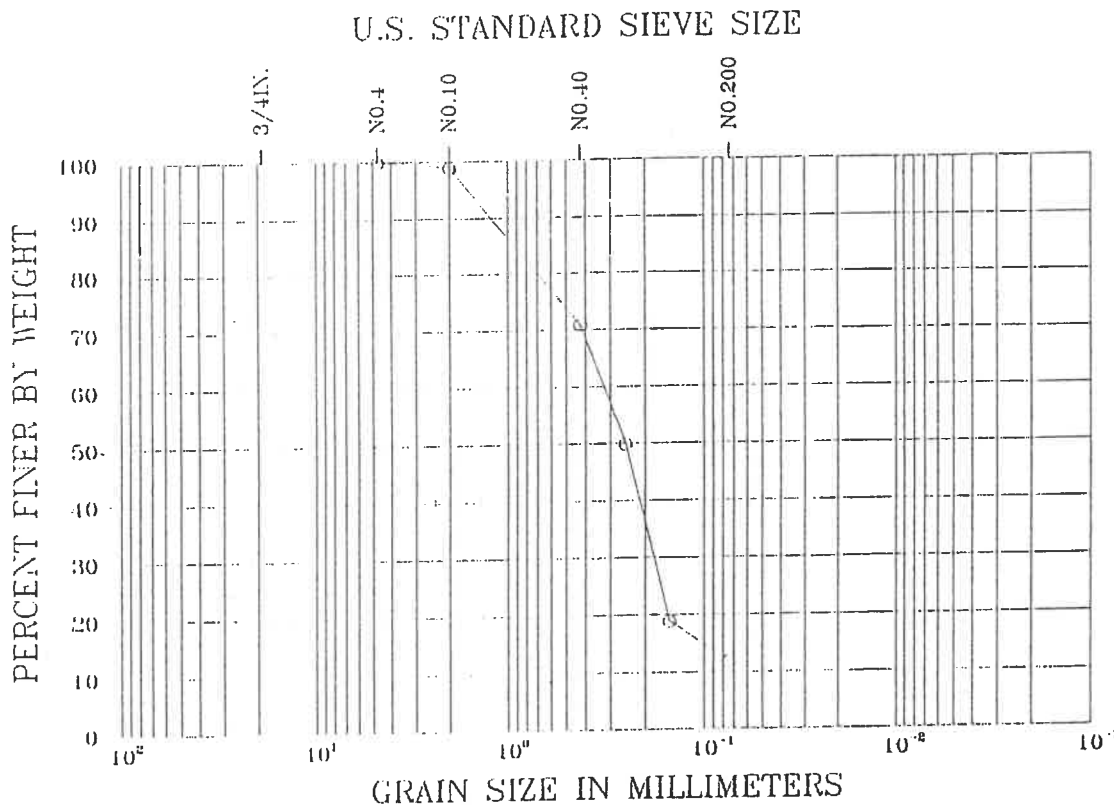
-o-

SOIL CLASSIFICATION: A-2-4, SP-SC

THIS CURVE REPRESENTS MATERIAL
0.0 m to 1.6 m and 3.1 m to 6.9 m
BENEATH CHANNEL BOTTOM

STATE PROJECT # 05090-1511
BRIDGE # 050032

CURVE 2



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

LOCATION: STATION 170+46 11m RT OF C.L.
SAMPLE DEPTH: 24.7 m

-⊖-

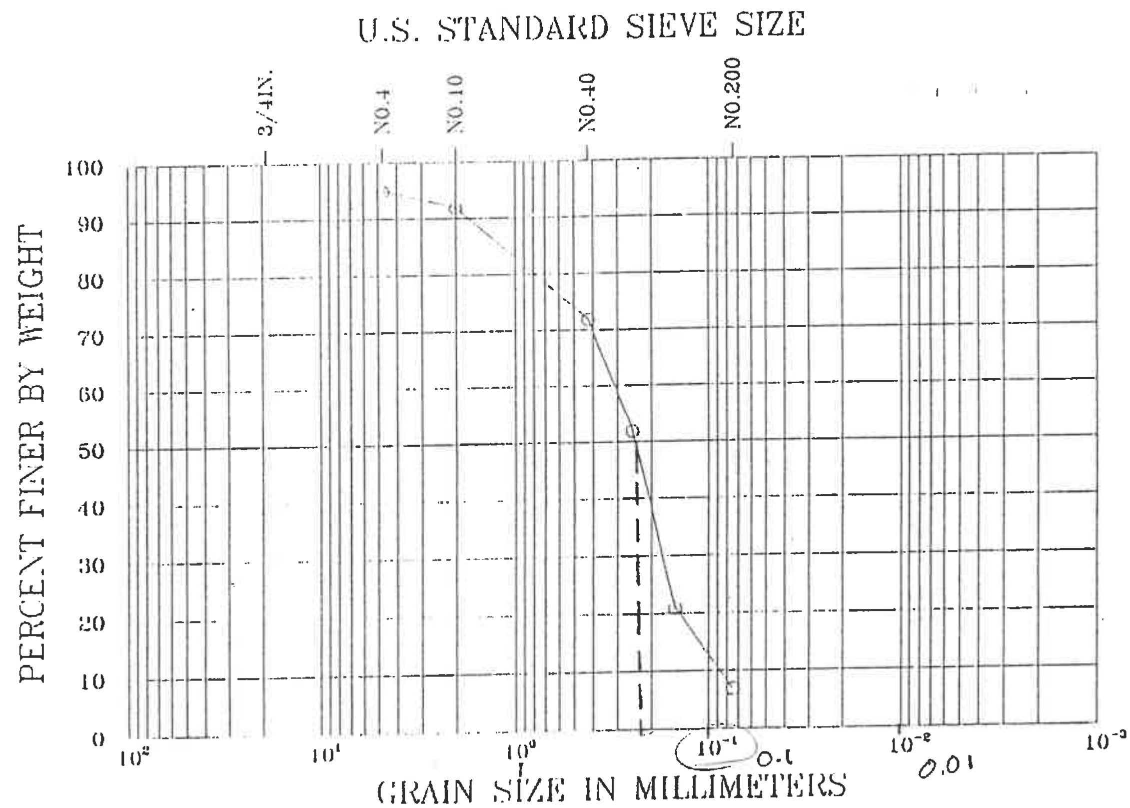
SOIL CLASSIFICATION: A-2-4, SM-SC

STATE PROJECT # 05090-1511
BRIDGE # 050032

THIS CURVE REPRESENTS MATERIAL
1.6 m to 3.1 m and 6.9 m to 9.9 m
BENEATH CHANNEL BOTTOM

CURVE 3

APPENDIX C - GRAIN SIZE DISTRIBUTION CURVES
BRIDGE NO. 050035



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

LOCATION: NORTHEAST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

-o-

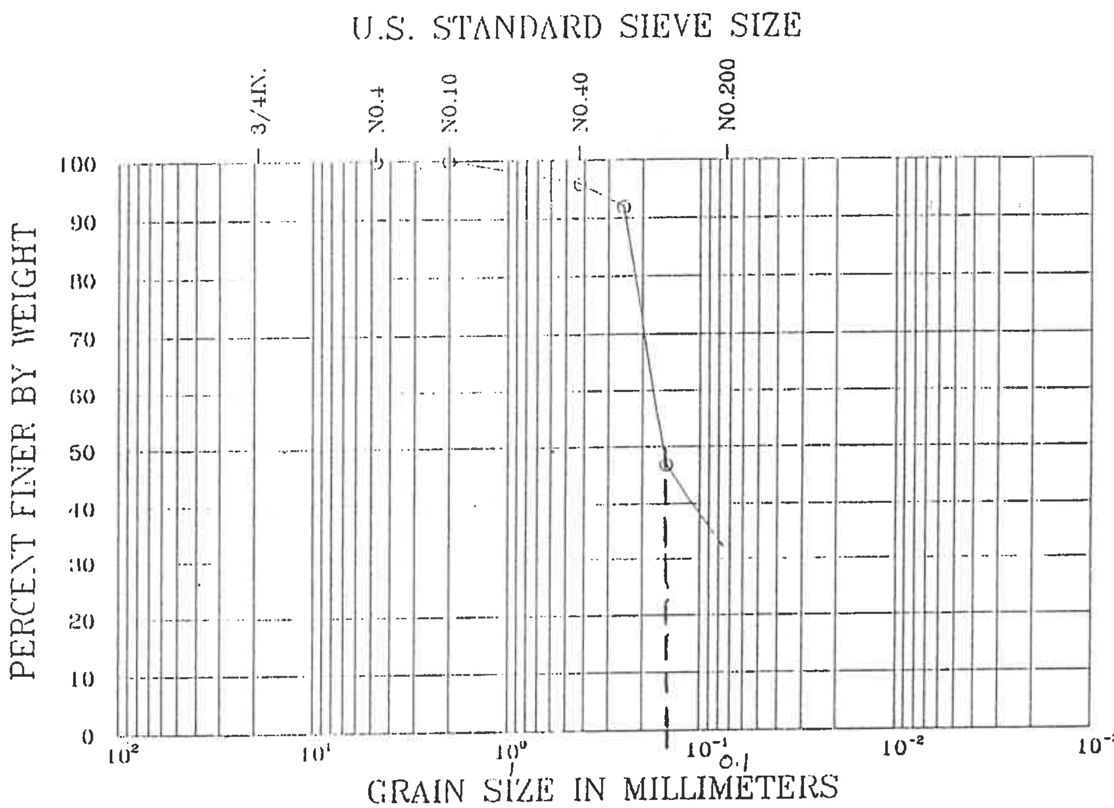
SOIL CLASSIFICATION: A-3, SP-SM

STATE PROJECT # 05090-1511
BRIDGE # 050035

REPRESENTATIVE OF SURFICIAL MATERIAL

CURVE 1

D_{50} = 0.23 mm surficial Layer



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

LOCATION: STATION 95+39 10m LT OF C.L.
SAMPLE DEPTH: 10.21 m

-⊖-

SOIL CLASSIFICATION: A-2-4, SC

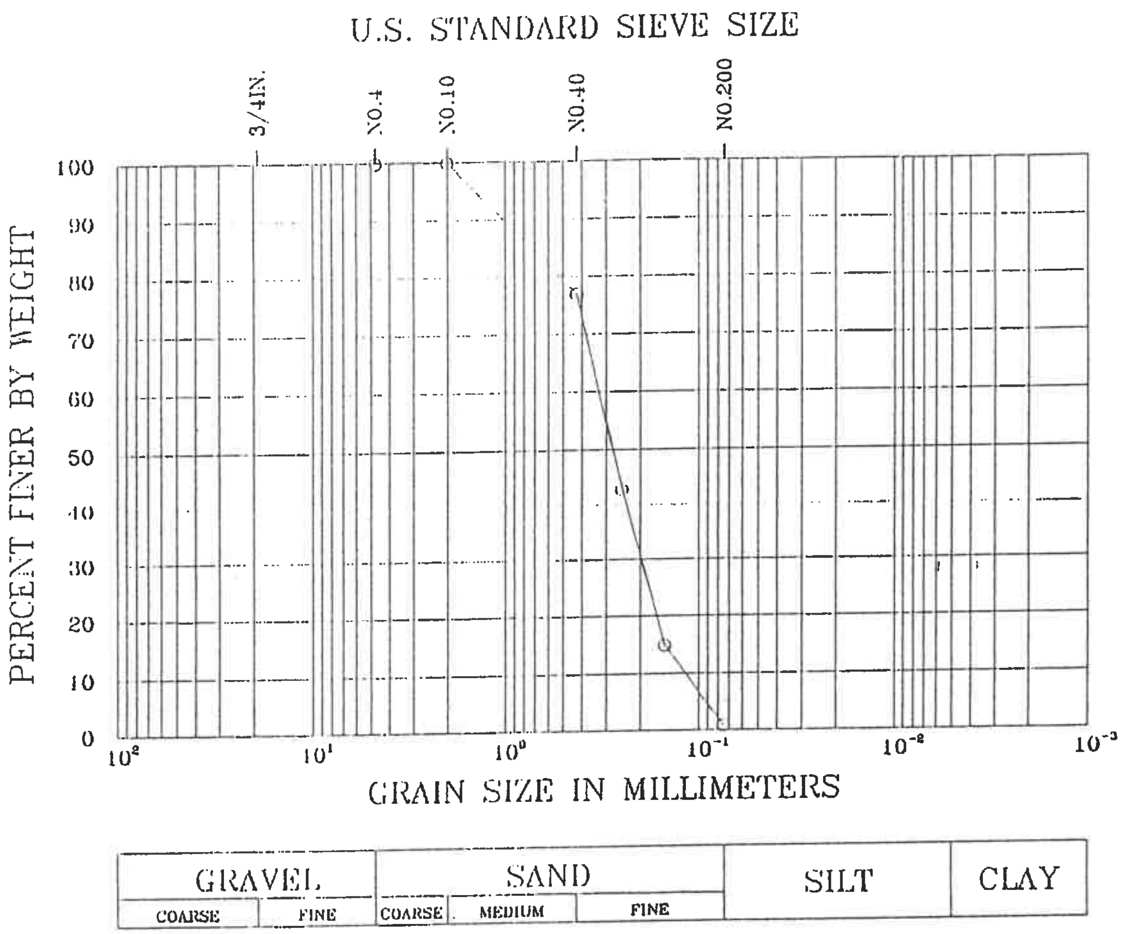
STATE PROJECT # 05090-1511
BRIDGE # 050035

THIS CURVE REPRESENTS MATERIAL
0.0 m to 3.5 m and 4.6 m to 8.0 m
BENEATH CHANNEL BOTTOM

CURVE 2

D_{50} = 0.16 (from 0 - 11.48 feet)

APPENDIX D - GRAIN SIZE DISTRIBUTION CURVES
BRIDGE NO. 050941



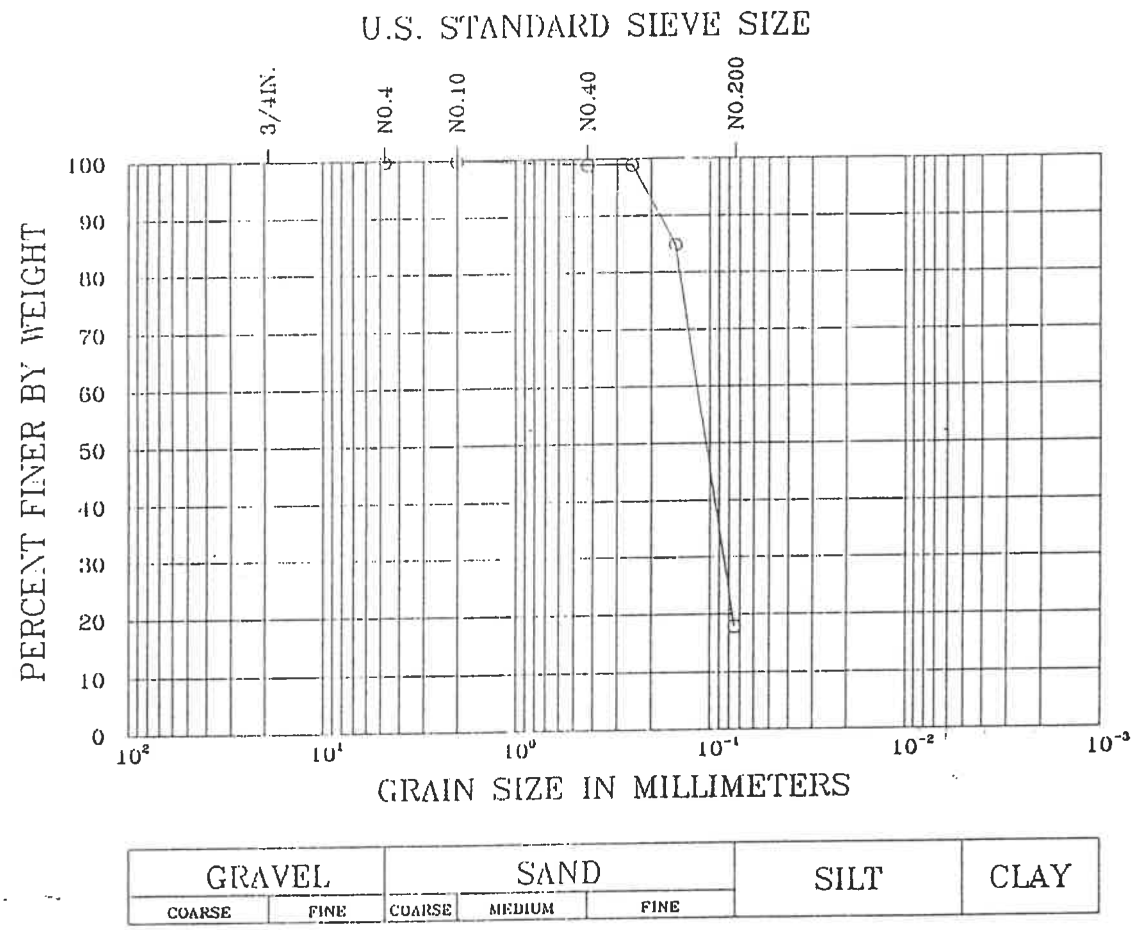
LOCATION: SOUTHEAST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

STATE PROJECT # 05090-1511
BRIDGE # 050941

SOIL CLASSIFICATION: A-3, SP

REPRESENTATIVE OF SURFICIAL MATERIAL

CURVE 1



LOCATION: STATION 49+27 12m RT OF C.L.
SAMPLE DEPTH: 8.7 m

-o-

SOIL CLASSIFICATION: A-2-4, SC

STATE PROJECT # 05090-1511
BRIDGE # 050941

THIS CURVE REPRESENTS MATERIAL
0.0 m TO 7.0 m BENEATH CHANNEL BOTTOM

CURVE 2

Appendix 2 have received this treatment since publication of earlier versions of Appendix 2.

The new values in Appendix 2 come from many sources, some as described above, a few from basin studies, and others from estimates by the District, local governments, permit applicants, etc. The best available sources were used, but new studies were not conducted.

The end result of the above is a series of values which generally ignore basin size. They range from less than one half inch per day to as much as 12 inches per day. These of course range from a large flat basin to a steeper basin. It is unlikely that there is really that much disparity in south Florida waterways or the discharges to them. It is also likely that the smaller basins should have higher unit area discharges. Therefore, Appendix 2 should be used as follows:

Case 1: If the immediate receiving water is a natural stream, overland sheetflow area, secondary or tertiary man made ditch, swale or other conveyance with undefined capacity; then the post-development instantaneous peak discharge rate should equal the pre-development rate for the approprate design storm event such that new adverse water quantity impacts are not created.

Case 2: If the immediate receiving water is a primary waterway with allowable discharge capacity listed in Appendix 2, then the allowable instantaneous peak discharge rate is the lesser of either the listed value or the value calculated by using the appropriate formula below:

For a 25 year/3 day design storm: $Q = 53A^{0.64}$

For a 25 year/1 day design storm: $Q = 46A^{0.64}$

For a 10 year/3 day design storm: $Q = 30A^{0.64}$

where: Q = allowable discharge (cubic feet/second)

A = contributing area (square miles)

Note: These two cases do not apply to the C-51 Basin. Use the subbasin discharge coefficients for that basin.

The above formulas were derived from the experience gained in many years of issuing permits and reviewing applicants submissions. They generally fit an average basin with an SCS curve number of 65. If an applicant believes either the formula or the listed value are inappropriate, the District will consider other submitted information. It is acknowledged that such conditions as; downstream flow attenuation areas, steep slopes, reduced soil storage and other such factors may make pre-development/post-development values more appropriate. The important factors are:

1) That waterway capacity not be unused,
2) That new adverse impacts are not created,
3) That historic drainage rights are preserved and,
4) Recognition is given to contributing drainage area size when possible.

ORANGE RIVER (Lee County)

The allowable discharge rate is 55 CSM. This value is from the Lee County Surface Water Management Plan (December 1992). The design storm is a 25 year event. See Figure 105.

MULLOCK CREEK (Lee County)

The allowable discharge rate is 69 CSM. This value is from the Lee County Surface Water Management Plan (December 1992). The design storm is a 25 year event. See Figure 105.

ESTERO RIVER (Lee County)

The allowable discharge rate is 42 CSM. This value is from the Lee County Surface Water Management Plan (December 1992). The design storm is a 25 year event. See Figure 105.

HALFWAY CREEK (Lee County)

The allowable discharge rate is 60 CSM. This value is from the Lee County Surface Water Management Plan (December 1992). The design storm is a 25 year event. See Figure 105.

SPRING CREEK (Lee County)

The allowable discharge rate is 81 CSM. This value is from the Lee County Surface Water Management Plan (December 1992). The design storm is a 25 year event. See Figure 105.

C-19 BASIN (Glades County)

The allowable discharge for this conveyance is 57.8 CSM. The design storm is a 25 year event. See Figure 106.

CALOOSAHATCHEE RIVER (Glades, Hendry and Lee Counties)

The allowable discharge rate is 30.1 CSM for areas within this basin that are not discussed someplace else within this appendix. This rate is based upon Corps of Engineers design criteria. The design storm is a 25 year event. See Figure 124.

IMPERIAL RIVER (Lee County)

The allowable discharge rate is 59 CSM for areas west of Bonita Grande Drive. Areas east of Bonita Grande Drive are allowed 25 CSM. These values are from the Lee County Surface Water Management Plan (June 1991). The design storm is a 25 year event. See Figures 105 and 108.

TEN MILE CANAL (Lee County)

The allowable discharge rate for the majority of the basin is 64 CSM. This rate is based on the Needles report. Approximately 2,033 acres of this basin drains through the Harper Bothers Farm (SWM Permit #36-00736-S). The allowable discharge, for this area, has been determined, by previous permit action, to be 43 CSM. The design storm is a 25 year event. See Figures 105, 107 and 109.

HENDRY CREEK (Lee County)

The allowable discharge rate is 102 CSM upstream of the Lakes Park weir. Other areas within the basin should be allowed 131 CSM. These values are from the Lee County SurfaceWater Management Plan (June 1991). The design storm is a 25 year event. See Figures 105 and 110.

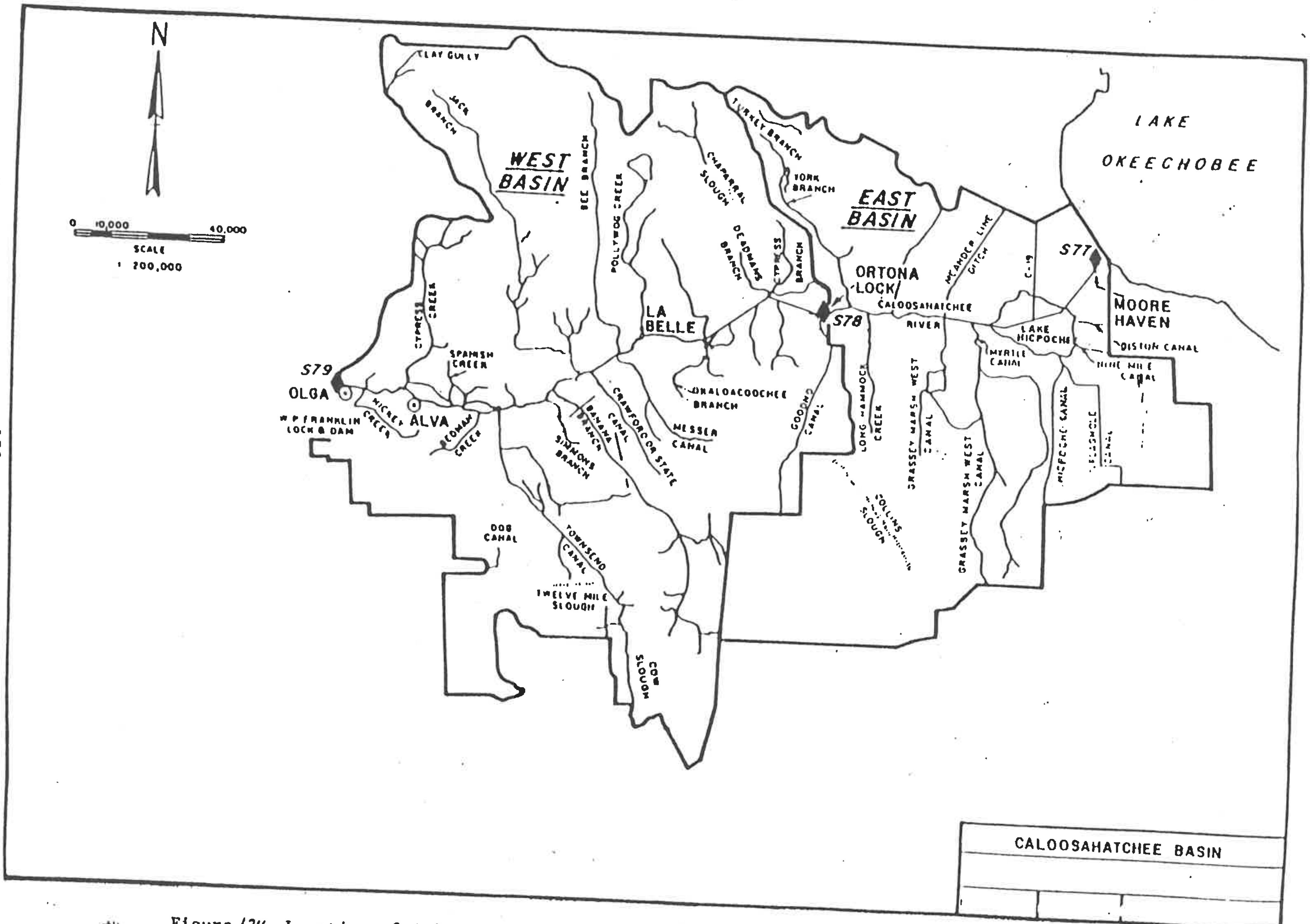


Figure /24 Location of Caloosahatchee Basin

United States Department of the Interior
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
224 West Central Parkway, Suite 1006
Altamonte Springs, Florida 32714
(407) 865-7575

DATE: 2-22-96

TO: Paula Coulliette

FROM: Howard George

SPECIAL NOTE:

SUBJECT: Fisheating Creek 02256500

No. of Pages ~~4~~ 5
(including this page)
If all pages not received, please call: 407-865-7575

Sent by: Sally

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - ORLANDO 02/22/96

STATION NUMBER 02256500 FISHEATING CREEK AT PALMDALE, FLA. STREAM SOURCE AGENCY USGS
LATITUDE 265556 LONGITUDE 0811854 DRAINAGE AREA 311.00 DATUM 27.19 STATE 12 COUNTY 043
PROVISIONAL DATA SUBJECT TO REVISION

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1960	130	116	379	154	312	189	25	5.2	---	---	---
2	1760	132	103	337	143	264	177	23	5.2	---	---	---
3	1590	137	99	298	130	223	152	21	6.2	---	---	---
4	1430	140	91	264	124	188	132	20	6.6	---	---	---
5	1290	143	89	237	120	159	115	25	11	---	---	---
6	1170	143	93	208	113	137	135	36	24	---	---	---
7	1060	137	98	196	104	118	194	37	33	---	---	---
8	966	124	104	207	97	116	244	32	31	---	---	---
9	877	109	108	194	89	147	268	29	27	---	---	---
10	796	95	108	181	81	148	275	31	23	---	---	---
11	728	86	110	168	75	143	318	33	20	---	---	---
12	718	76	124	156	71	133	348	32	17	---	---	---
13	846	69	128	152	70	123	331	28	23	---	---	---
14	900	65	129	202	86	121	292	24	---	---	---	---
15	840	74	123	297	106	120	246	20	---	---	---	---
16	716	152	115	310	118	116	205	18	---	---	---	---
17	588	170	108	308	120	119	166	16	---	---	---	---
18	495	173	101	298	122	176	134	14	---	---	---	---
19	431	187	94	332	146	391	105	12	---	---	---	---
20	381	255	86	397	225	556	84	11	---	---	---	---
21	340	380	164	405	320	797	70	11	---	---	---	---
22	300	410	285	380	325	970	60	9.8	---	---	---	---
23	262	379	357	349	301	901	51	9.9	---	---	---	---
24	229	335	419	315	279	755	42	10	---	---	---	---
25	199	290	549	281	317	625	36	9.7	---	---	---	---
26	172	250	655	251	378	522	33	9.1	---	---	---	---
27	155	215	644	222	375	439	30	8.4	---	---	---	---
28	145	186	595	195	343	372	29	7.5	---	---	---	---
29	131	161	537	174	---	315	30	6.7	---	---	---	---
30	124	138	479	171	---	262	28	6.0	---	---	---	---
31	135	---	426	166	---	216	---	5.6	---	---	---	---
TOTAL	21734	5341	7237	8030	4932	9984	4519	580.7	---	---	---	---
MEAN	701	178	233	259	176	322	151	18.7	---	---	---	---
MAX	1960	410	655	405	378	970	348	37	---	---	---	---
MIN	124	65	86	152	70	116	28	5.6	---	---	---	---
CFSM	2.25	.57	.75	.83	.57	1.04	.48	.06	---	---	---	---
IN.	2.60	.64	.87	.96	.59	1.19	.54	.07	---	---	---	---

YR 1994 TOTAL 114558.4 MEAN 314 MAX 2650 MIN 2.7 CFSM 1.01 IN. 13.70

Period of Record

Table 6.--A comparison of station, regional, and weighted T-year flood estimates--Continued

[Discharge-frequency relationships for each gaging station are presented as follows: Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted or best estimate of T-year flood]

Map No.	Station number and name	Years of record: Systematic	Years of record: Historic	Drainage area mi²	Slope ft/mi	Lake area in percent	Discharge, in cubic feet per second, for recurrence interval, in years: 2	5	10	25	50	100	200	500
						Region A								
50	2256500 Fisheating Creek at Palmdale	47	--	311	1.33	0.15	3,290	6,740	9,730	14,300	18,300	22,800	27,800	35,400
							3,080	5,450	7,340	10,100	12,400	14,900	17,800	21,900
							3,270	6,600	9,420	13,700	17,400	21,400	26,100	32,800
51	2261500 Myrtle-Mary Jane Canal near Narcoossee	17	--	111	.29	28.16	267	534	760	1,100	1,400	1,730	2,090	2,640
							202	412	592	868	1,100	1,370	1,680	2,110
							253	503	712	1,030	1,300	1,600	1,950	2,440
52	2262900 Boggy Creek near Taft	19	--	83.6	2.04	8.79	453	969	1,430	2,150	2,800	3,530	4,360	5,630
							443	865	1,220	1,740	2,180	2,670	3,210	4,000
							451	946	1,380	2,030	2,620	3,250	3,980	5,040
53	2263500 St. Cloud Canal at S-59 near St. Cloud	18	--	308	.31	22.78	456	1,070	1,660	2,640	3,540	4,600	5,830	7,760
							508	994	1,400	2,020	2,550	3,150	3,800	4,760
							465	1,050	1,590	2,450	3,230	4,090	5,110	6,590
54	2263800 Shingle Creek at Airport, near Kissimmee	20	--	89.2	1.78	6.72	511	980	1,370	1,940	2,430	2,970	3,570	4,430
							523	1,010	1,420	2,020	2,530	3,100	3,730	4,640
							513	986	1,380	1,960	2,460	3,010	3,620	4,490
55	2264000 Cypress Creek at Vineland	33	--	30.3	.41	27.55	30	87	149	261	372	509	675	946
							77	164	240	356	457	571	708	899
							33	95	160	276	386	521	681	936
56	2265000 South Port Canal at S-61 near St. Cloud	16	--	620	.29	19.42	789	2,260	3,870	6,830	9,810	13,500	18,200	25,800
							965	1,830	2,550	3,640	4,560	5,600	6,710	8,350
							821	2,150	3,450	5,640	7,770	10,100	13,100	17,200
57	2266300 Reedy Creek near Vineland	17	19	75	3.60	9.92	355	662	913	1,280	1,590	1,920	2,290	2,830
							441	862	1,210	1,730	2,170	2,650	3,150	3,900
							370	703	983	1,400	1,740	2,130	2,540	3,160

based on years of gage data

takes into account gage + Reg.

gives higher end.

best answer

check ranges

take log Pearson / D.a = cfsm for Q_T

100 year/62 year good data!

60

STATION 02256500 FISHEATING CREEK AT PALMDALE, FLA.

62 years

AGENCY: USGS
STATE: 12
COUNTY: 043
DISTRICT: 12

STATION LOCATOR
LAT. LONG.
265556 0811854

DRAINAGE AREA: 311.00 SQ MI
CONTRIBUTING DRAINAGE AREA: SQ MI
GAGE DATUM: 27.19 (NGVD)
BASE DISCHARGE: 1500.00 CFS

WATER YEAR	DATE	PEAK DISCHARGE (CFS)	DISCHARGE CODES	GAGE HEIGHT (FT)	GAGE HT CODES	HIGHEST SINCE	MAX GAGE HEIGHT (FT)	DATE	GAGE HT CODES	NUMBER OF PARTIAL PEAKS
1932	09/13/32	5570.00 - 5		8.26						0
1933	09/06/33	6460.00		8.60						0
1934	08/09/34	920.00					6.30	09/22/34 (33.49)		0
1935	09/07/35	1480.00		6.42						0
1936	06/16/36	5800.00 - 5		8.10						0
1937	07/01/37	3010.00		6.98						0
1938	08/01/38	1730.00		6.30						0
1939	10/17/38	3230.00		7.14						0
1940	09/12/40	3090.00		6.92						0
1941	04/10/41	2790.00					6.85	07/15/41 (34.04)		0
1942	02/26/42	3260.00		7.04						0
1943	09/15/43	2240.00		6.74						0
1944	10/05/43	3620.00		7.30						0
1945	09/17/45	8980.00 - 20		9.18						0
1946	10/13/45	2500.00		6.62						0
1947	09/19/47	16400.00 - 100 - 200		11.06						0
1948	09/24/48	14500.00 = 100		10.52						0
1949	08/29/49	5300.00		7.86						0
1950	10/01/49	4500.00		7.60						0
1951	09/05/51	1430.00		6.42						0
1952	10/03/51	31400.00 - 500 +		12.44						0
1953	08/30/53	6200.00					7.77	10/21/52 (34.96)		0
1954	10/10/53	7520.00 - 10		8.53						0
1955	08/01/55	644.00		6.07						0
1956	09/09/56	258.00		5.11						0
1957	08/25/57	3800.00 - 2+		6.70						0
1958	08/13/58	3230.00 - 2+		6.48						0
1959	06/20/59	6220.00		7.16						0
1960	09/13/60	7250.00 - 10		8.19						0
1961	10/11/60	2350.00		6.70						0
1962	09/23/62	6420.00		7.39						0
1963	09/24/63	1680.00		5.87						0
1964	09/15/64	3870.00 - 2+		6.76						0
1965	09/02/65	1600.00		5.84						0
1966	10/03/65	3470.00		6.66						0
1967	10/04/66	1520.00		5.76						0
1968	06/11/68	3650.00		6.74						0
1969	06/22/69	2100.00		6.05						0
1970	03/27/70	7460.00 - 10		7.79						0
1971	09/17/71	2440.00		6.20						0
1972	06/22/72	2630.00		6.28						0
1973	08/09/73	1700.00		5.86						0
1974	07/03/74	8390.00 = 20		8.02						0
1975	08/24/75	1260.00		5.88						0
1976	08/02/76	3910.00		6.77						0
1977	09/10/77	1010.00		5.32						0

Fishtrap Cr

1978	08/25/78	1910.00	5.96			
1979	09/17/79	4270.00	7.49			0
1980	09/10/80	290.00	4.78	7.60	09/06/79	0
1981	09/13/81	830.00	5.80			0
1982	06/26/82	7040.00 – 10	7.83			0
1983	02/15/83	3650.00	6.59			0
1984	03/15/84	6870.00 – 8	7.78			0
	07/07/84	2390.00	6.29			2
	07/24/84	5820.00	7.50			
1985	09/06/85	1500.00	6.05			
1986	09/12/86	3680.00	6.84			0
	07/02/86	1870.00	6.14			1
1987	09/17/87	700.00	5.44			
1988	10/15/87	3230.00	7.28			0
1989	08/19/89	1100.00	5.92			0
1990	08/18/90	1950.00	6.61			0
	08/09/90	1520.00	6.30			1
1991	08/07/91	1530.00	6.12			
1992	06/29/92	4670.00	7.82			0
1993	09/10/93	1200.00	6.02			0
1994	09/23/94	2690.00	7.15			0
	10/21/93	1600.00	6.36			1

PC ✓

United States Department of the Interior

GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
224 West Central Parkway, Suite 1006
Altamonte Springs, Florida 32714
(407) 865-7575

DATE: 2-27-96

TO: Paula Coulliette
JMI

FROM: Howard George

SPECIAL NOTE:

SUBJECT: Flood frequencies

No. of Pages 5
(including this page)
If all pages not received, please call: 407-865-7575

Sent by: HGG

UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

TECHNIQUE FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS ON NATURAL-FLOW STREAMS IN FLORIDA

By Wayne C. Bridges

U.S. GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS 82-4012

Prepared in cooperation with the

FLORIDA DEPARTMENT OF TRANSPORTATION

Tallahassee, Florida

1982

Table 6.--A comparison of station, regional, and weighted T-year flood estimates--Continued

[Discharge-frequency relationships for each gaging station are presented as follows: Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted or best estimate of T-year flood]

Map No.	Station number and name	Years of record: Systematic	Years of record: Historic	Basin characteristics: Drainage area mi²	Basin characteristics: Slope ft/mi	Basin characteristics: Lake area in percent	Discharge, in cubic feet per second, for recurrence interval, in years: 2	5	10	25	50	100	200	500
	Region A													
58	2269000 Kissimmee River below Lake Kissimmee	36	--	1,607	0.21	17.18	2,310	4,660	6,640	9,620	12,200	15,000	18,100	22,600
							2,160	3,940	5,410	7,610	9,480	11,600	13,700	17,000
							2,290	4,570	6,450	9,260	11,700	14,300	17,200	21,300
59	[1]2269720 Morgan Hole Creek near Avon Park	8	--	13.9	6.40	1.07	872	1,590	2,090	2,740	3,240	3,790	4,240	4,930
							364	710	993	1,410	1,750	2,120	2,540	3,130
							652	1,170	1,520	2,010	2,430	2,830	3,280	3,880
60	2270500 Arbuckle Creek near DeSoto City	39	--	379	1.40	8.99	1,750	3,430	4,850	6,970	8,780	10,800	13,000	16,300
							1,240	2,310	3,190	4,500	5,600	6,830	8,140	10,100
							1,690	3,280	4,590	6,520	8,200	9,990	12,000	14,900
61	2271500 Josephine Creek near DeSoto City	29	--	109	3.81	19.32	379	734	1,030	1,470	1,840	2,250	2,710	3,370
							383	756	1,070	1,540	1,930	2,370	2,800	3,480
							379	737	1,040	1,480	1,860	2,280	2,730	3,400
62	2273000 Kissimmee River at S65E near Okeechobee	34	--	2,899	.26	13.49	4,930	10,100	14,400	21,000	26,600	32,800	39,600	49,700
							3,960	7,040	9,540	13,300	16,400	19,900	23,500	28,900
							4,820	9,640	13,500	19,400	24,500	29,800	35,900	44,400
63	2276984 Monreve Ranch Drainage Canal near Stuart	14	--	6.20	1.68	.01	199	377	524	739	920	1,120	1,340	1,650
							176	355	503	723	907	1,110	1,380	1,730
							194	371	518	734	916	1,120	1,350	1,680
64	[2]2293050 Orange River at Buckingham near Fort Myers	18	--	70	4.00	3.37	599	1,120	1,550	2,190	2,730	3,330	3,980	4,940
							760	1,440	1,995	2,810	3,490	4,230	5,020	6,190
							625	1,180	1,650	2,350	2,920	3,580	4,270	5,330
65	[1]2293390 North Prong Alligator Creek near Punta Gorda	8	--	8.46	3.55	9.69	220	422	602	875	1,100	1,340	1,590	2,000
							86	180	261	383	486	600	730	918
							161	304	421	595	751	897	1,080	1,320

[1] Rainfall-runoff gaging station.
[2] Crest-stage partial record gaging station.

Table 6.--A comparison of station, regional, and weighted T-year flood estimates--Continued

[Discharge-frequency relationships for each gaging station are presented as follows: Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted or best estimate of T-year flood]

Map No.	Station number and name	Years of record: Systematic	Years of record: Historic	Basin characteristics: Drainage area mi²	Basin characteristics: Slope ft/mi	Basin characteristics: Lake area in percent	Discharge, in cubic feet per second, for recurrence interval, in years: 2	5	10	25	50	100	200	500
	Region A													
66	[2]2293400 Alligator Creek near Punta Gorda	13	--	31.1	2.46	5.31	645 292 535	1,290 579 1,030	1,850 818 1,430	2,710 1,180 2,030	3,460 1,470 2,560	4,300 1,810 3,090	5,250 2,200 3,770	6,680 2,730 4,630
67	2293986 Peace Creek Drainage Canal near Alturus	24	44	160	1.26	12.79	549 503 542	989 979 987	1,350 1,380 1,360	1,880 1,970 1,900	2,340 2,480 2,370	2,850 3,050 2,900	3,410 3,680 3,480	4,240 4,590 4,330
68	2294650 Peace River at Bartow	39	--	390	1.25	13.28	978 960 976	1,740 1,820 1,750	2,350 2,520 2,370	3,240 3,580 3,290	3,990 4,490 4,060	4,810 5,490 4,920	5,700 6,560 5,840	7,010 8,140 7,210
69	[1]2295435 Hog Branch near Wauchula	8	--	5.31	12.20	0	313 267 297	607 527 575	854 738 802	1,230 1,050 1,140	1,540 1,300 1,420	1,890 1,570 1,720	2,240 1,870 2,050	2,820 2,310 2,540
70	2295637 Peace River at Zolfo Springs	46	--	826	1.38	7.15	4,830 2,540 4,590	8,370 4,580 7,890	11,300 6,240 10,600	15,600 8,690 14,400	19,400 10,800 18,000	23,600 13,000 21,600	28,400 15,400 25,900	35,600 19,000 32,100
71	2296500 Charlie Creek near Gardner	28	--	330	1.68	.10	2,310 3,470 2,430	3,840 6,110 4,120	4,990 8,200 5,450	6,590 11,300 7,340	7,890 13,800 8,820	9,260 16,600 10,500	10,700 19,700 12,300	12,800 24,100 14,900
72	2296750 Peace River at Arcadia	47	57	1,367	1.30	4.35	7,320 4,740 7,070	12,500 8,300 12,000	17,000 11,100 16,200	23,800 15,300 22,500	29,900 18,800 28,200	36,900 22,700 34,400	45,100 26,700 41,800	57,700 32,800 52,700
73	2297100 Joshua Creek near Nocatee	28	--	132	4.06	.14	1,920 2,180 1,950	3,570 3,910 3,620	4,930 5,290 4,990	6,950 7,280 7,010	8,660 8,930 8,710	10,500 10,700 10,500	12,600 12,600 12,600	15,700 15,400 15,600

[1] Rainfall-runoff gaging station.
[2] Crest-stage partial record gaging station.

Table 6.--A comparison of station, regional, and weighted T-year flood estimates--Continued

[Discharge-frequency relationships for each gaging station are presented as follows: Top line--log-Pearson Type III analysis; Middle line--regression equations; Bottom line--weighted or best estimate of T-year flood]

Map No.	Station number and name	Years of record: Systematic	Years of record: Historic	Drainage area mi^2	Slope ft/mi	Lake area in percent	Discharge, in cubic feet per second, for recurrence interval, in years: 2	5	10	25	50	100	200	500
	Region A													
74	2297310 Horse Creek near Arcadia	28	--	218	2.79	0.12	2,230	3,580	4,580	5,930	7,000	11,300	13,500	16,600
							2,890	5,130	6,910	9,480	11,600	13,900	16,400	20,100
							2,300	3,780	4,920	6,510	7,740	11,800	14,100	17,400
75	2298202 Shell Creek near Punta Gorda	13	--	373	2.44	1.00	2,230	3,580	4,580	5,930	7,000	8,130	9,310	11,000
							3,430	6,050	8,130	11,200	13,700	16,400	19,300	23,600
							2,470	4,140	5,490	7,430	8,850	10,600	12,300	15,000
							35	75	115	165	210	250	300	365
76	[1]2298482 Johnson Creek near Myakka Head	8	--	3.18	8.04	0	114	242	358	531	661	792	944	1,160
							162	327	463	663	827	1,010	1,220	1,510
							128	272	400	589	735	894	1,070	1,330
77	2298830 Myakka River near Sarasota	42	--	229	2.14	1.81	2,080	3,490	4,590	6,160	7,470	8,890	10,400	12,700
							1,970	3,580	4,860	6,750	8,320	10,000	11,900	14,700
							2,070	3,500	4,620	6,240	7,590	9,060	10,600	13,000
78	[2]2299800 Phillippi Creek at Sarasota	19	--	45.1	3.24	5.79	849	2,080	3,310	5,420	7,440	9,900	12,800	17,600
							398	779	1,090	1,560	1,950	2,390	2,860	3,550
							744	1,700	2,540	3,880	5,190	6,500	8,210	10,500
							30	35	40	45	50	51	55	60
79	2299950 Manatee River near Mayakka Head	12	--	65.3	5.83	.17	1,860	2,310	2,580	2,900	3,130	3,350	3,560	3,830
							1,400	2,560	3,490	4,830	5,940	7,140	8,390	10,300
							1,730	2,380	2,850	3,500	3,960	4,530	5,020	5,850
							30	50	70	100	125	155	185	230
80	2300000 Manatee River near Bradenton	27	--	87.1	4.93	.22	2,410	4,520	6,260	8,840	11,000	13,400	16,100	20,100
							1,640	2,990	4,060	5,610	6,890	8,280	9,740	11,900
							2,290	4,240	5,790	8,050	9,990	12,000	14,400	17,600
							20	35	40	50	60	65	75	85
81	2300100 Little Manatee River near Fort Lonesome	15	--	32.9	5.77	.34	713	1,070	1,320	1,660	1,910	2,170	2,440	2,810
							795	1,500	2,100	2,880	3,560	4,290	5,090	6,260
							730	1,160	1,510	1,980	2,330	2,750	3,150	3,790

Small basin high slope Low lake area

[1] Rainfall-runoff gaging station.
[2] Crest-stage partial record gaging station.

U.S. Geological Survey
Water Resources Division
Miami, Florida

Date: 2-23-96

To: Paula Couillette

Fax number: 904-385-3545 Voice:

No. of pages incl. this one: 22

From: Carolyn Price

TELEPHONE #: (305) 526-2895 FAX:(305)526-2881

If you do not receive all pages, please contact:

U.S. Geological Survey, WRD
9100 NW 36th Street, Suite 107
Miami, Florida 33178
(305)594-0655

Subject: Data Request

Special Instructions:

United States Geological Survey
Data Request Form

Date Requested: 2/2/96

Requesters' Information

Organization: JMI

Name: Paula Coulliette

Address:

City, State, Zip:

Phone Number: Fax Number:

SW Data Request GW

Paula - here's all the stats I can run on our system automatically for the discharge data at S-78. If further Statistics are needed you would need to Request all of the data to use on your Computer system

Request Compiled By: Carolyn Price

Date Compiled: 2/23/96

JMI ENGINEERS

FACSIMILE TRANSMITTAL COVER PAGE

DATE: 2/22/96 TIME: 3:00 A.M.(P.M.)

MESSAGE TO: USGS - Miami

ATTENTION: Carolyn Price

PROJECT REFERENCE: SR29 - Glades County

FACSIMILE NUMBER: (305) 526-2881

MESSAGE FROM: Paula Couilliette

TOTAL NUMBER OF PAGES: (Including Cover Sheet) 1

COMMENTS:

This is to further explain my request for information from the gage on the Caloosahatchee at the Ortuna Locks. If you could please send me the peak discharges, daily discharge values for 1994-1995, and discharge comparisons (Log + Pearson, regression, gage) for this station, I would appreciate it greatly. Thank you for your assistance. If you have any questions, please call.

1424 Piedmont Drive East, Suite 100, Tallahassee, FL 32312 — Tel: 904-385-7450 — Fax: 904-385-3545
San Diego, CA • Chicago, IL • Paris, France • Bangkok, Thailand

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MIAMI SUBDISTRICT OFFICE 02/23/96

STATION NUMBER 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE STREAM SOURCE AGENCY USGS
LATITUDE 264722 LONGITUDE 0811811 DRAINAGE AREA ~~[illegible]~~ DATUM STATE 12 COUNTY 043

No d.a. for this nothing in SF has d.a. determined

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1993 TO SEPTEMBER 1994
DAILY MEAN VALUES

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	538	13	13	192	192	13	---	1030	735	e403	574
2	13	224	13	13	1860	1080	13	---	1160	1360	764	13
3	13	224	13	391	1850	1360	13	---	974	1690	467	13
4	13	107	13	106	1170	1020	13	---	859	1740	714	99
5	13	157	13	115	496	567	245	334	1740	1790	944	1090
6	83	403	13	181	539	403	403	13	1920	1360	1160	1300
7	932	287	13	13	505	174	155	293	2210	1790	1250	---
8	2040	186	97	13	13	403	14	265	1620	995	1030	---
9	2260	13	192	77	237	236	14	13	1970	622	241	---
10	3280	69	192	381	192	13	127	277	834	212	676	784
11	3140	225	123	403	192	13	192	253	570	403	773	906
12	2210	224	13	139	71	13	63	13	793	169	1030	933
13	1070	63	13	196	13	13	13	97	564	676	1030	973
14	793	13	13	393	13	13	13	192	193	517	982	959
15	938	13	13	13	13	13	180	169	193	e349	537	1250
16	1870	13	13	13	13	13	285	60	56	541	740	1900
17	3200	13	13	340	14	245	13	123	13	13	403	1950
18	1870	13	13	328	440	159	13	13	422	14	230	1900
19	1450	13	13	403	260	13	14	14	1250	14	115	3030
20	649	13	13	485	116	13	85	113	1510	e341	561	4350
21	635	13	13	403	13	13	395	193	995	e701	425	5280
22	793	13	13	276	13	13	496	192	633	e557	83	5820
23	708	14	147	192	103	121	403	83	1220	e435	147	5840
24	427	14	269	76	13	283	403	180	1270	e212	781	4590
25	582	56	13	13	166	13	296	403	1280	e350	529	4240
26	536	404	13	149	361	111	230	252	432	e13	403	5340
27	403	287	127	279	403	13	403	192	192	e13	489	4930
28	404	188	169	582	348	13	243	192	263	e245	601	3810
29	404	53	13	461	---	13	161	161	224	e538	818	3510
30	309	153	13	243	---	13	13	186	284	e793	1090	3740
31	469	---	13	192	---	13	---	1150	---	e708	793	---
ĿAL	31820	3976	1615	6884	9839	6575	4834	---	26484	18915	20169	---
IEAN	1020	133	52.1	222	351	212	164	---	882	610	651	---
IAX	3280	538	269	582	1860	1360	496	---	2210	1790	1250	---
I	13	13	13	13	13	13	13	---	13	13	83	---
FT	62720	7890	3200	13650	19520	13040	9590	---	52490	37500	40010	---

ƗTATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1971 - 1994, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
0 N	552	215	154	520	936	1044	1012	478	858	787	1281	845
G	4200	1639	638	3707	6842	8436	7449	2085	2624	3882	8724	3640
WY)	1980	1988	1980	1978	1983	1983	1983	1983	1982	1974	1974	1974
IIN	40.4	10.1	7.01	8.20	6.16	14.9	37.8	52.3	10.1	.64	.23	12.6
٭	1973	1977	1974	1972	1982	1973	1973	1990	1990	1981	1981	1981

ĿĿARY STATISTICS

	FOR 1993 CALENDAR YEAR		WATER YEARS 1971 - 1994	
N̄AL TOTAL	325247			
N AL MEAN	891		723	
I EST ANNUAL MEAN			2615	1983
OWEST ANNUAL MEAN			113	1981
IGHEST DAILY MEAN	5950	Apr 3	9720	Aug 8 1974
O ST DAILY MEAN	12	Mar 13	.00	Oct 3 1971
N AL SEVEN-DAY MINIMUM	13	Nov 14	.00	Jun 15 1976
NNUAL RUNOFF (AC-FT)	645100		523600	
0 PERCENT EXCEEDS	2650		1940	
) ERCENT EXCEEDS	343		185	
) ERCENT EXCEEDS	13		8.1	

ĮATISTICS COMPUTED BY: NVERJANO DATE: 03/10/1995 AT: 05:15:04

\ Estimated

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - MIAMI SUBDISTRICT OFFICE 02/23/96

STATION NUMBER 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE STREAM SOURCE AGENCY USGS
LATITUDE 264722 LONGITUDE 0811811 DRAINAGE AREA 0.00 DATUM STATE 12 COUNTY 043
PROVISIONAL DATA SUBJECT TO REVISION

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1994 TO SEPTEMBER 1995
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4830	5590	4880	5270	5270	4950	4420	404	265	14	5520	8180
2	5800	4400	4770	5270	5270	5030	3520	106	180	13	4610	8130
3	7780	3720	4770	5270	5210	3190	3340	13	139	13	5840	8160
4	7590	2700	4770	4180	4580	2690	2020	151	396	159	5020	8190
5	6550	2040	4770	5390	4700	1710	1350	368	1080	131	3810	8160
6	4850	1310	4840	5140	4930	996	793	534	1700	42	2750	8130
7	3760	612	4930	5410	2980	793	729	327	1660	116	1950	8210
8	2160	236	4930	5270	4440	1140	1540	82	1390	63	1270	8180
9	1480	253	4930	5230	5940	1560	2010	13	120	13	3870	8110
10	1670	13	4930	4930	5610	3880	2030	13	13	68	4990	8190
11	4030	1310	4930	4610	5340	4690	1690	13	13	91	5430	8130
12	7290	2230	4720	5270	4240	4460	1770	13	13	180	5610	8160
13	7840	2310	4600	5500	3010	3270	1510	13	37	758	5610	8170
14	6230	5820	4600	6170	3580	2310	1510	13	211	916	5610	8000
15	4440	4870	4800	6260	3580	1680	940	13	131	607	5610	7890
16	3430	4820	4600	6260	1510	966	375	13	14	13	5350	7510
17	2350	4260	4600	5910	1530	1720	192	293	13	13	5230	7500
18	1480	2820	4600	5270	3290	2060	568	403	50	1060	4520	7230
19	1360	3460	4600	5270	4090	3530	820	139	392	1800	4930	7230
20	2170	4570	4770	5270	4930	4850	1160	13	1020	1560	5180	7110
21	3580	5090	6860	5210	3280	4640	1180	262	798	1590	5740	6910
22	6420	5210	7560	4690	3010	4030	1280	220	1570	880	6260	6910
23	6060	5120	7400	4430	2590	3540	865	61	1860	687	6650	6910
24	4950	5270	6840	4260	1600	2530	544	309	1980	783	6760	7140
25	3880	5270	6480	4320	1210	1800	392	455	1690	790	3880	6990
26	2420	5080	6430	4600	793	1320	793	363	1480	1830	4620	7100
27	1840	4600	5690	4600	1080	450	754	82	427	3240	6280	7190
28	1520	4600	5880	4600	3620	192	580	236	181	3210	7950	6340
29	583	4600	5400	4830	---	1060	184	13	187	3010	8120	4730
30	1130	4640	5270	5080	---	3580	404	13	241	3070	8160	5280
31	3270	---	5270	5270	---	4720	---	314	---	4700	8070	---
TOTAL	122543	106624	163730	158840	101423	83237	39323	5263	19251	31380	165200	223890
MEAN	3953	3554	5282	5124	3622	2685	1311	170	642	1012	5329	7463
MAX	7780	5820	7580	6260	5940	5030	4420	534	1980	4700	8160	8210
MIN	583	13	4600	4180	793	192	164	13	13	13	1270	4730
AC-FT	243100	211500	324800	315100	201200	165100	78000	10440	38180	62240	327700	444100

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1971 - 1995, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	694	354	368	712	1047	1112	1024	485	657	806	1443	1121
MAX	4200	3554	5282	5124	6842	8436	7449	2085	2624	3882	8724	7463
(WY)	1980	1995	1995	1995	1983	1983	1983	1983	1982	1974	1974	1995
MIN	40.4	10.1	7.01	8.20	6.16	14.9	37.8	52.3	10.1	.64	.23	12.6
(WY)	1973	1977	1974	1972	1982	1973	1973	1990	1990	1981	1981	1981

SUMMARY STATISTICS

	FOR 1995 WATER YEAR		WATER YEARS 1971 - 1995	
ANNUAL TOTAL	1220704			
ANNUAL MEAN	3344		837	
HIGHEST ANNUAL MEAN			3344	1995
LOWEST ANNUAL MEAN			113	1981
HIGHEST DAILY MEAN	8210	Sep 7	8720	Aug 8 1974
LOWEST DAILY MEAN	13	Nov 10	.00	Oct 3 1971
ANNUAL SEVEN-DAY MINIMUM	13	May 9	.00	Jun 15 1976
ANNUAL RUNOFF (AC-FT)	2421000		606100	
10 PERCENT EXCEEDS	6910		2490	
50 PERCENT EXCEEDS	3580		190	
90 PERCENT EXCEEDS	127		8.3	

STATISTICS COMPUTED BY: MDIAMOND DATE: 11/27/1995 AT: 09:44:44

VSTAT BATCH ERROR FILE
CREATED: THU, FEB 22 1996 - 10:49:10

OR STATION ID 02292480
ARAMETER CODE 00060
TISTIC CODE 00003
R YEAR 1971
URATION DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

FOR STATION ID 02292480
ARAMETER CODE 00060
TATISTIC CODE 00003
ATER YEAR 1971
LOW-VALUE DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

OR STATION ID 02292480
PARAMETER CODE 00060
STATISTIC CODE 00003
ATER YEAR 1971
IGH-VALUE DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

FOR STATION ID 02292480
RAMETER CODE 00060
ATISTIC CODE 00003
WATER YEAR 1994
DURATION DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

OR STATION ID 02292480
PARAMETER CODE 00060
STATISTIC CODE 00003
TER YEAR 1994
W-VALUE DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

OR STATION ID 02292480
METER CODE 00060
ISTIC CODE 00003
WATER YEAR 1994
HIGH-VALUE DATA CANNOT BE GENERATED, MISSING DATA ENCOUNTERED.

ROR OCCURED WRITING DATA TO APTRAF FILE

DVSTAT - DAILY VALUES STATISTICAL PROGRAM

STATION ID - 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE - 00060 DISCHARGE
STATISTIC CODE - 00003 MEAN

DURATION TABLE OF DAILY VALUES
FOR PERIOD OCT TO SEP

NUMBER OF DAYS IN CLASS

CLASS / WATER YEAR RANGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	3
1972 1972	6							5		12	8	16	27	69	62	44	10		1	7	3	17	24	7	16	12	8	2	3	2	4	1			
1973 1973	5										2	5	17	33	59	52	21	1	1	3	22	14	26	3	8	9	20	28	13	4	15	4			
1974 1974										2	1	13	22	40	42	25	5	2	14	6	25	14	38	7	11	13	4	6	5	3	5	7	6	47	
1975 1975										2	1	5	10	20	26	35	8	1	1	11	9	18	25	76	52	17	22	9	11	4	2				
1976 1976	19							1		1	1	1	8	19	30	29	3	3	8	5	26	14	36	28	61	33	16	9	9	5		1			
1977 1977										1	3	3	13	42	58	46	10	1	2	1	8	12	48	16	32	20	22	9	9	4	2	3			
1978 1978										1			3	22	40	36	14	1	3	6	11	12	37	32	40	6	38	18	13	6	3	3	20		
1979 1979												1	2	13	23	44	11	4	3	10	12	10	47	24	35	9	12	11	13	28	7	5	27	14	
1980 1980	1							1		1		4	5	10	19	19	9		1	9	5	13	35	24	13	14	18	5	18	17	35	38	46	6	
1981 1981	58							6	5	8	14	7	13	18	39	37	10		1	12	10	14	41	8	37	24	3								
1982 1982	2						2		10	11	21	60	34	8	1			2	4	4	7	20	29	13	14	15	25	14	21	18	18	9	1	2	
1983 1983	1									1		4	6	10	25	32	7		3	3	5	8	20	15	22	17	21	17	11	4	11	14	38	70	
1984 1984											1		2	5	8	25	3		2	4	6	16	42	18	28	23	22	19	16	20	39	19	43	5	
1985 1985												2	8	15	39	55	26	2	2	11	12	18	50	21	17	18	23	18	18	9		1			
1986 1986	15												1	5	19	29	32	5	4	3	7	15	59	29	31	14	20	15	36	10	14	2			
1987 1987	1									1			6	21	22	33	36	6	3	6	9	14	35	19	44	22	23	26	17	11	6	4			
1988 1988		1										1	2	8	6	13	16	1	4	7	8	7	60	21	58	23	32	21	31	20	14	11	1		
1989 1989	7							4			5	3	1	7	18	36	47	1	6	13	17	15	58	19	37	14	20	18	8	9	1	1			
1990 1990		1								1		6	21	42	92	44	17		5	4	8	11	28	13	29	9	6	8	7	11	2				
1991 1991														7	33	92	2		3	4	4	8	47	19	40	17	37	12	21	18	1				
1992 1992															5	137			2	1	6	17	13	19	45	15	34	15	15	17	9	10	6		
1993 1993															1	113			1	7	9	12	28	14	33	13	15	24	33	21	20	16	5		
1995 1995																24			3	3	3	7	9	9	12	8	14	15	24	26	19	60	90	39	

DVSTAT - DAILY VALUES STATISTICAL PROGRAM

STATION ID - 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE - 00060 DISCHARGE
STATISTIC CODE - 00003 MEAN

CLASS	VALUE	TOTAL	ACCUM	PERCT
1	0.00	115	8401	100.00
2	0.10	2	8286	98.63
3	0.14	0	8284	98.61
4	0.20	0	8284	98.61
5	0.28	0	8284	98.61
6	0.40	0	8284	98.61
7	0.57	2	8284	98.61
8	0.80	17	8282	98.58
9	1.10	15	8265	98.38
10	1.60	42	8250	98.20
11	2.30	57	8208	97.70
12	3.20	131	8151	97.02
13	4.60	201	8020	95.46
14	6.40	414	7819	93.07
15	9.10	667	7405	88.14
16	13.00	1000	6738	80.20
17	18.00	287	5738	68.30
18	26.00	30	5451	64.89
19	37.00	77	5421	64.53
20	52.00	140	5344	63.61
21	73.00	232	5204	61.94
22	104.00	306	4972	59.18
23	147.00	835	4666	55.54
24	208.00	454	3831	45.60
25	294.00	715	3377	40.20
26	416.00	365	2662	31.69
27	589.00	455	2297	27.34
28	834.00	319	1842	21.93
29	1180.00	352	1523	18.13
30	1670.00	267	1171	13.94
31	2360.00	227	904	10.76
32	3340.00	209	677	8.06
33	4730.00	283	468	5.57
34	6700.00	183	185	2.20
35	9480.00	2	2	0.02

DURATION CURVE STATISTICAL CHARACTERISTICS FOR ...
STATION ID: 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE = 00060
STATISTIC CODE - 00003 MEAN

DURATION DATA VALUES ARE INTERPOLATED FROM DURATION TABLE:
DATA ARE NOT ANALYTICALLY FITTED TO A PARTICULAR STATISTICAL DISTRIBUTION, AND THE USER IS RESPONSIBLE FOR ASSESSMENT AND INTERPRETATION.

ADDITIONAL CONDITIONS FOR THIS RUN ARE:
STATISTICS ARE BASED ON LOGARITHMS (BASE 10).
NUMBER OF VALUES IS REDUCED FOR EACH NEAR-ZERO OR ZERO VALUE.

NUMBER OF VALUES = 19 (NUMBER OF NEAR-ZERO VALUES = 0)
LISTING OF DATA FOLLOWS:

PERCENT OF TIME VALUE EQUALED OR EXCEEDED	DATA VALUE	
95.0	4.79	(LOG = 0.68072)
90.0	7.65	(LOG = 0.88348)
85.0	10.3	(LOG = 1.01233)
80.0	13.1	(LOG = 1.11681)
75.0	15.2	(LOG = 1.18145)
70.0	17.3	(LOG = 1.23771)
65.0	25.7	(LOG = 1.41046)
60.0	94.8	(LOG = 1.97696)
55.0	150.3	(LOG = 2.17702)
50.0	181.0	(LOG = 2.25769)
45.0	217.6	(LOG = 2.33761)
40.0	296.8	(LOG = 2.47251)
35.0	368.5	(LOG = 2.56644)
30.0	483.2	(LOG = 2.68409)
25.0	694.9	(LOG = 2.84195)
20.0	1009.5	(LOG = 3.00410)
15.0	1545.9	(LOG = 3.18918)
10.0	2635.9	(LOG = 3.42092)
5.0	5063.8	(LOG = 3.70447)

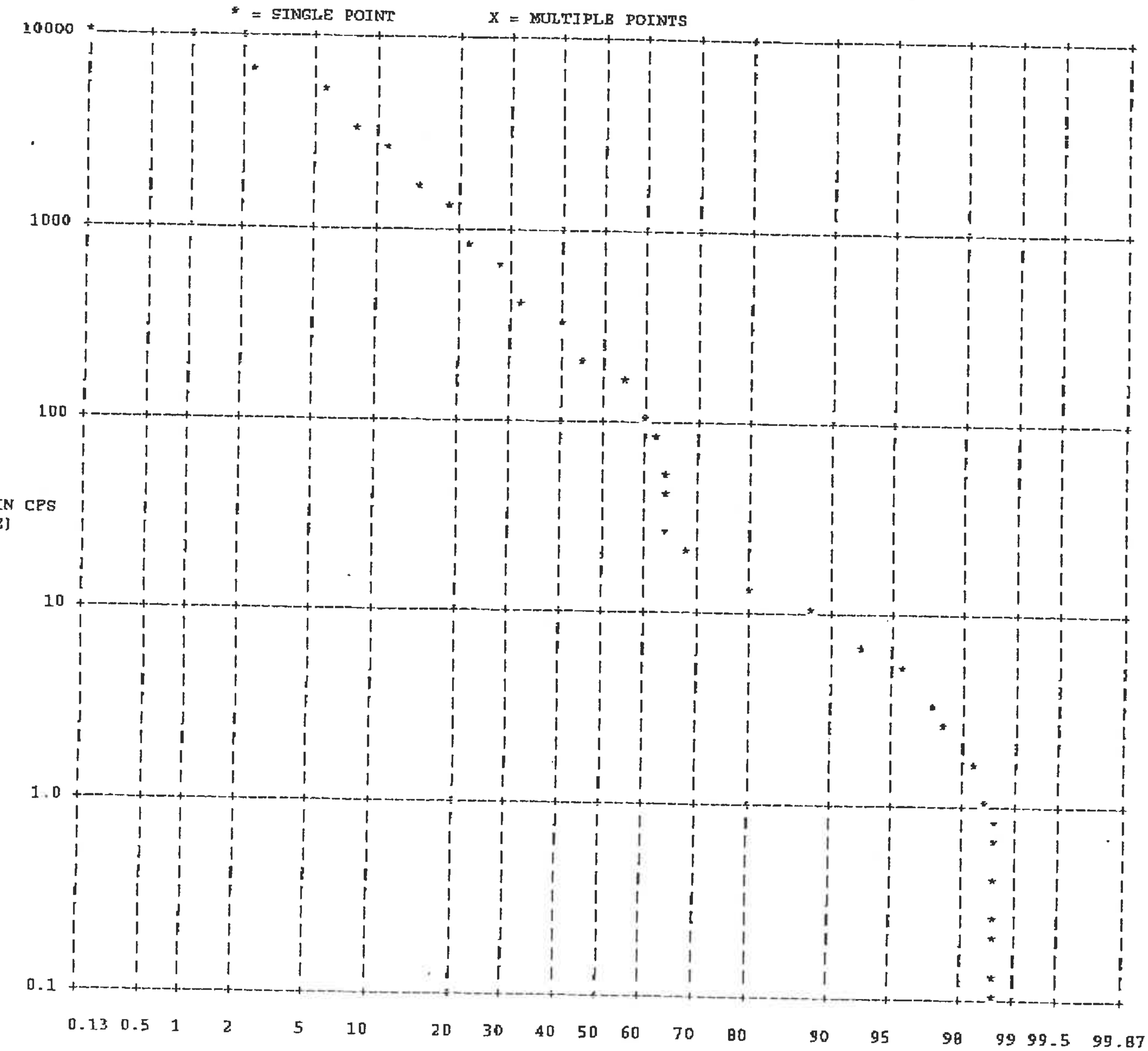
MEAN OF LOGS = 2.11347

STANDARD DEVIATION OF LOGS = 0.92626 (VARIABILITY INDEX - SEE USGS WSP 1542-A)

COEFFICIENT OF VARIATION = 0.43732

COEFFICIENT OF SKEW = -0.00146

LOG-NORMAL DURATION PLOT FOR PERIOD OCT TO SEP [YEARS 1971 - 1995]
STATION ID: 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
STATISTIC CODE - 00003 MEAN



DVSTAT - DAILY VALUES STATISTICAL PROGRAM

STATION ID - 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE - 00060 DISCHARGE
STATISTIC CODE - 00003 MEAN

LOWEST MEAN VALUE AND RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS
FOR PERIOD OCT TO SEP

WATER YEAR RANGE	1	3	7	14	30	60	90	120	183
1972 1972	.0000 1	.60 6	2.76 5	4.58 4	7.26 4	7.72 3	8.03 2	9.11 1	22.8 1
1973 1973	.0000 2	1.20 7	4.13 7	5.99 7	8.03 6	11.4 6	28.4 5	33.1 4	46.6 3
1974 1974	1.90 15	3.17 10	4.27 8	5.65 6	6.30 3	7.31 2	8.16 3	19.9 3	44.7 2
1975 1975	1.90 16	4.67 13	7.61 13	9.38 9	24.3 13	40.9 9	45.4 8	48.2 6	100 6
1976 1976	.0000 3	.0000 1	.0000 2	.0000 1	9.32 7	28.9 7	29.2 6	48.7 7	113 8
1977 1977	1.80 13	4.63 12	7.03 10	8.36 8	9.34 8	9.78 5	17.4 4	93.7 9	92.1 5
1978 1978	1.80 14	7.07 17	7.57 12	9.69 11	45.0 15	84.6 13	129 16	131 13	162 13
1979 1979	4.50 18	8.17 20	10.7 20	25.9 18	68.8 19	89.4 15	108 14	204 16	317 16
1980 1980	.0000 4	1.93 8	7.06 11	12.4 15	145 22	292 22	438 23	466 21	1108 21
1981 1981	.0000 5	.0000 2	-.0010 1	.11 2	.14 1	.43 1	1.10 1	11.6 2	106 7
1982 1982	.0000 6	.43 5	.86 4	1.48 3	6.03 2	39.1 8	37.5 7	44.8 5	62.9 4
1983 1983	.0000 7	2.43 9	9.56 19	10.7 13	22.0 11	69.2 10	154 17	592 22	2022 23
1984 1984	2.80 17	5.10 14	8.55 14	54.9 21	140 21	217 20	226 20	283 17	1070 20
1985 1985	4.50 19	6.50 16	8.63 15	9.51 10	13.5 9	90.9 16	97.8 12	117 11	130 10
1986 1986	.0000 8	.0000 3	.0000 3	26.6 19	65.0 18	97.6 17	103 13	121 12	224 15
1987 1987	.0000 9	5.50 15	9.21 17	11.3 14	35.7 14	224 21	262 21	318 18	417 17
1988 1988	.10 11	7.27 18	9.38 18	55.6 22	108 20	186 19	206 19	397 20	564 18
1989 1989	.0000 10	.30 4	3.17 6	24.2 17	56.8 17	108 18	190 18	179 15	216 14
1990 1990	.10 12	3.50 11	4.63 9	5.15 5	7.56 5	8.78 4	59.2 9	56.6 8	119 9
1991 1991	6.90 20	7.47 19	8.99 16	10.5 12	22.6 12	70.2 11	94.1 11	137 14	151 12
1992 1992	12.0 21	12.0 21	12.6 21	12.8 16	20.9 10	80.8 12	112 15	103 10	132 11
1993 1993	12.0 22	12.7 22	13.0 22	32.6 20	51.9 16	88.0 14	89.2 10	326 19	790 19
1995 1995	13.0 23	13.0 23	13.0 23	92.6 23	162 23	325 23	408 22	711 23	1534 22

DVSTAT - DAILY VALUES STATISTICAL PROGRAM

STATION ID - 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE - 00060 DISCHARGE
STATISTIC CODE - 00003 MEAN

HIGHEST MEAN VALUE AND RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS
FOR PERIOD OCT TO SEP

WATER YEAR RANGE	1	3	7	15	30	60	90	120	183
1972 1972	3340 19	3247 15	2393 14	1627 14	1027 17	547 22	387 22	296 22	211 22
1973 1973	4420 13	3860 12	3379 11	3229 11	2485 11	1719 10	1381 11	1228 11	748 13
1974 1974	9720 1	9537 1	9294 1	9016 1	8774 1	7367 2	5687 2	4302 3	2857 4
1975 1975	3000 21	2570 18	2037 16	1521 16	992 18	626 20	574 18	574 16	507 16
1976 1976	3450 17	1870 22	1730 20	1325 17	986 19	679 19	543 19	473 19	422 19
1977 1977	4310 14	3370 14	1817 17	1250 20	853 21	754 17	577 17	496 18	476 17
1978 1978	6600 8	6587 7	6383 7	6229 7	4433 7	2897 7	2126 7	1684 8	1202 8
1979 1979	7390 5	7280 5	7164 4	6656 4	5956 4	4683 4	3575 5	2705 6	1880 6
1980 1980	7560 4	7450 4	6784 5	6441 5	4546 6	4172 6	3603 4	3187 4	2472 5
1981 1981	688 23	542 23	508 23	440 23	401 23	383 23	293 23	249 23	189 23
1982 1982	7220 6	6457 8	5009 8	3854 8	2626 10	2174 8	1968 8	1658 9	1185 9
1983 1983	9360 2	9023 2	8893 2	8860 2	8664 2	8359 1	7605 1	6527 1	4511 1
1984 1984	7080 7	7023 6	6654 6	6345 6	5160 5	4190 5	3230 6	2867 5	2908 3
1985 1985	3440 18	2063 20	1814 18	1242 21	985 20	775 16	664 16	559 17	469 18
1986 1986	3480 16	3120 16	2667 13	2334 13	1743 13	1280 13	1298 12	1110 12	821 12
1987 1987	4150 15	3427 13	2142 15	1578 15	1337 14	914 15	731 15	699 15	583 15
1988 1988	4890 11	4040 11	2930 12	2461 12	1922 12	1389 12	1022 13	818 14	961 11
1989 1989	4700 12	3007 17	1576 22	1227 22	837 22	557 21	493 21	431 20	392 20
1990 1990	3300 20	2310 19	1618 21	1317 18	1052 16	712 18	497 20	375 21	324 21
1991 1991	2360 22	2037 21	1779 19	1317 19	1162 15	1031 14	933 14	845 13	616 14
1992 1992	6140 9	5750 9	4997 9	3336 10	2663 9	1669 11	1785 10	1519 10	1078 10
1993 1993	5950 10	5157 10	3337 10	3591 9	2772 8	1893 9	1927 9	1784 7	1312 7
1995 1995	8210 3	8177 3	8170 3	8157 3	7755 3	6397 3	5075 3	4517 2	4048 2

DVSTAT - DAILY VALUES STATISTICAL PROGRAM

STATION ID - 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
PARAMETER CODE - 00060 DISCHARGE
STATISTIC CODE - 00003 MEAN

ANNUAL AND/OR SEMI-ANNUAL VALUES

MEAN VALUE AND RANKING FOR
PERIOD INCLUDED IN LOW-VALUE ANALYSIS
(OCT-SEP)

WATER YEAR RANGE		
1972 1972	144	2
1973 1973	401	10
1974 1974	1472	19
1975 1975	304	6
1976 1976	275	4
1977 1977	286	5
1978 1978	687	15
1979 1979	1158	18
1980 1980	1790	21
1981 1981	113	1
1982 1982	629	14
1983 1983	2615	22
1984 1984	1651	20
1985 1985	321	8
1986 1986	518	12
1987 1987	449	11
1988 1988	722	16
1989 1989	307	7
1990 1990	220	3
1991 1991	398	9
1992 1992	620	13
1993 1993	819	17
1995 1995	3344	23

MEAN VALUE AND RANKING FOR
PERIOD INCLUDED IN HIGH-VALUE ANALYSIS
(OCT-SEP)

WATER YEAR RANGE		
1972 1972	144	22
1973 1973	401	14
1974 1974	1472	5
1975 1975	304	18
1976 1976	275	20
1977 1977	286	19
1978 1978	687	9
1979 1979	1158	6
1980 1980	1790	3
1981 1981	113	23
1982 1982	629	10
1983 1983	2615	2
1984 1984	1651	4
1985 1985	321	16
1986 1986	518	12
1987 1987	449	13
1988 1988	722	8
1989 1989	307	17
1990 1990	220	21
1991 1991	398	15
1992 1992	620	11
1993 1993	819	7
1995 1995	3344	1

1DVMAS - DAILY VALUES MONTHLY AND ANNUAL STATISTICS - REV85.1
0**
You have chosen to print the following for each station:

@ Zero value, no value summary
@ Monthly values
@ Statistics of monthly values
@ Correlation of monthly values
@ Serial autocorrelation of monthly values
@ Quartiles of monthly values
@ Quartiles of cumulative monthly runoff in inches
@ Quartiles of cumulative monthly runoff in acre-feet
@ Annual values
@ Statistics of annual values
@ Quartiles of annual values
****
0**
For printed output, you have chosen the following computation options:

@ All days, untransformed
****
0**
MAXIMUM NUMBER OF NO-VALUE DAYS FOR A MONTH TO BE INCLUDED IS 0
1National Water Information System - Automated DAta Processing System (NWIS - ADAPS)
Daily Values Monthly and Annual Statistics (Program DVMAS) -- Revision 85.1

Report for station 02292480
CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0MEAN DISCHARGE
0Number of years retrieved is 25
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Zero-value, No-value Summary - By Years
0

Year	Total No. of Days	No. of 0-Value Days	Prct. of 0-Value Days	No. of No-Value Days	Prct. of No-Value Days
1971	365	0	0.0	273	74.8
1972	366	6	1.6	0	0.0
1973	365	5	1.4	0	0.0
1974	365	0	0.0	0	0.0
1975	365	0	0.0	0	0.0
1976	366	19	5.2	0	0.0
1977	365	0	0.0	0	0.0
1978	365	0	0.0	0	0.0
1979	365	0	0.0	0	0.0
1980	366	1	0.3	0	0.0
1981	365	58	15.9	0	0.0
1982	365	2	0.5	0	0.0
1983	365	1	0.3	0	0.0
1984	366	0	0.0	0	0.0
1985	365	0	0.0	0	0.0
1986	365	15	4.1	0	0.0
1987	365	1	0.3	0	0.0
1988	366	0	0.0	0	0.0
1989	365	7	1.9	0	0.0
1990	365	0	0.0	0	0.0
1991	365	0	0.0	0	0.0
1992	366	0	0.0	0	0.0
1993	365	0	0.0	0	0.0
1994	365	0	0.0	7	1.9

1995	365	0	0.0	0	0.0
0					
0					
	No. of Years	No. of 0-Value Years	Prct. of 0-Value Years	No. of No-Value Years	Prct. of No-Value Years
	25	0	0.0	2	8.0
0					

0 (NOTE -- Percent of 0-value days calculated as fraction of valued days)
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Zero-value, No-value Summary - By Month
0

Month	Total No. of Days	No. of 0-Value Days	Prct. of 0-Value Days	NO. OF No-Value Days	PRCT. OF No-Value Days
OCT	775	12	1.5	31	4.0
NOV	750	10	1.3	30	4.0
DEC	775	0	0.0	31	4.0
JAN	775	1	0.1	31	4.0
FEB	706	3	0.4	28	4.0
MARCH	775	0	0.0	31	4.0
APRIL	750	2	0.3	30	4.0
MAY	775	11	1.4	35	4.5
JUNE	750	20	2.7	30	4.0
JULY	775	23	3.0	0	0.0
AUG	775	26	3.4	0	0.0
SEPT	750	7	0.9	3	0.4
0TOTAL	9131	115	1.3	280	3.1

0
0

Month	Total No. of Months	No. of 0-Value Months	Prct. of 0-Value Months	No. of No-Value Months	Prct. of No-Value Months
OCT	25	0	0.0	1	4.0
NOV	25	0	0.0	1	4.0
DEC	25	0	0.0	1	4.0
JAN	25	0	0.0	1	4.0
FEB	25	0	0.0	1	4.0
MARCH	25	0	0.0	1	4.0
APRIL	25	0	0.0	1	4.0
MAY	25	0	0.0	2	8.0
JUNE	25	0	0.0	1	4.0
JULY	25	0	0.0	0	0.0
AUG	25	0	0.0	0	0.0
SEPT	25	0	0.0	1	4.0
0TOTAL	300	0	0.0	11	3.7

0
0 (NOTE -- Percent of 0-value days calculated as fraction of valued days)
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Normal monthly means [All days]

Year	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept
1971	*	*	*	*	*	*	*	*	*	352.3	232.4	811.1
1972	315.9	111.6	7.99	8.20	9.54	21.4	49.0	56.7	758.5	300.7	34.3	57.9
1973	40.4	65.8	13.3	14.2	173.5	14.9	37.8	53.0	317.0	672.4	1970	1426
1974	297.9	10.1	7.01	17.6	55.8	88.2	120.8	96.0	542.5	3882	8724	3640
1975	70.8	64.7	76.5	31.5	74.2	281.0	327.9	382.3	603.6	636.5	114.4	992.3
1976	243.8	22.9	44.2	75.6	166.9	234.5	359.0	285.1	275.0	256.1	880.1	455.8
1977	80.0	10.1	10.2	306.6	41.8	113.6	296.9	812.3	483.6	275.9	356.2	633.3
1978	111.4	85.9	420.0	144.1	47.6	195.4	170.6	407.8	394.2	820.2	4263	1090
1979	271.4	114.8	291.1	3707	3914	2937	107.6	508.0	102.7	98.2	168.8	1865
1980	4200	883.8	637.6	2022	4324	2830	3109	1524	740.1	206.8	617.7	483.6
1981	70.4	107.0	59.0	75.2	141.3	173.5	385.9	289.8	43.5	.635	.229	12.6

1982	101.2	75.9	76.6	73.5	6.16	74.3	130.2	509.3	2624	1723	1512	608.1
1983	2413	67.8	266.3	1491	6842	8436	7449	2085	1016	365.6	653.6	660.4
1984	592.9	204.1	234.7	304.4	1259	3810	4447	929.1	1496	3346	2543	624.7
1985	311.9	252.9	23.4	244.4	22.2	171.5	285.1	324.1	224.2	452.2	547.6	982.6
1986	311.8	69.2	123.4	211.3	78.8	730.4	156.6	288.5	1455	813.4	1413	522.6
1987	290.5	427.5	230.9	588.5	246.4	677.6	1123	336.7	261.3	309.1	439.9	451.1
1988	906.8	1639	275.0	238.0	761.6	1472	688.5	211.2	248.8	898.0	966.5	359.5
1989	155.7	347.1	116.9	162.0	382.2	183.5	517.1	126.7	258.7	375.8	505.5	573.9
1990	109.5	15.0	152.5	33.9	314.1	122.1	377.8	52.3	10.1	348.7	891.0	210.2
1991	294.7	65.6	176.9	360.9	73.3	86.5	161.0	531.1	339.1	995.8	1060	584.3
1992	328.9	32.6	186.8	156.0	106.8	240.9	81.9	462.0	1452	1099	1856	1420
1993	157.0	132.9	63.5	1470	2091	906.8	2725	251.3	597.4	255.8	354.0	981.5
1994	1020	132.5	52.1	222.1	351.4	212.1	164.5	*	882.1	642.4	650.6	*
1995	3953	3554	5282	5124	3622	2685	1311	169.8	641.7	1012	5329	7463

* Indicates a no-value month

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Statistics on Normal monthly means (All days)

By rows (Number, Mean, Variance, Standard Deviation, Skewness, Coefficient of Variation, Percentage of Average Value)

	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept
0Number	24.00	24.00	24.00	24.00	24.00	24.00	24.00	23.00	24.00	25.00	25.00	24.00
0Mean	693.70	353.87	367.83	711.75	1046.07	1112.42	1024.26	464.87	656.96	805.54	1443.31	1121.23
0Var	0.133E+07	591805.63	0.112E+07	0.162E+07	0.325E+07	0.366E+07	0.312E+07	235696.25	360492.69	867365.25	0.394E+07	0.237E+07
0Std	1154.40	769.29	1057.44	1273.07	1802.97	1913.63	1766.30	485.49	600.41	931.32	1985.70	1538.28
0Skew	2.48	3.61	4.74	2.58	2.09	2.80	2.67	2.27	1.79	2.47	2.60	3.46
0Cvar	1.66	2.17	2.87	1.79	1.72	1.72	1.72	1.04	0.91	1.16	1.38	1.37
0Pavg	7.08	3.61	3.75	7.26	10.67	11.35	10.45	4.74	6.70	8.22	14.72	11.44

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Correlation Matrix for Normal monthly means (All days)

	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept
Oct	1.000	0.696	0.675	0.679	0.733	0.588	0.511	0.533	0.087	-0.061	0.167	0.483
Nov	*	1.000	0.909	0.693	0.340	0.218	0.080	-0.080	-0.078	0.000	0.297	0.726
Dec	*	*	1.000	0.780	0.376	0.239	0.091	-0.053	-0.005	0.028	0.400	0.861
Jan	*	*	*	1.000	0.723	0.493	0.265	0.205	-0.090	-0.155	0.151	0.700
Feb	*	*	*	*	1.000	0.902	0.772	0.727	0.029	-0.166	-0.040	0.272
March	*	*	*	*	*	1.000	0.901	0.805	0.162	0.033	-0.023	0.128
April	*	*	*	*	*	*	1.000	0.814	0.207	0.083	-0.068	-0.043
May	*	*	*	*	*	*	*	1.000	0.286	-0.046	-0.188	-0.180
June	*	*	*	*	*	*	*	*	1.000	0.422	0.102	-0.011
July	*	*	*	*	*	*	*	*	*	1.000	0.755	0.315
Aug	*	*	*	*	*	*	*	*	*	*	1.000	0.694
Sept	*	*	*	*	*	*	*	*	*	*	*	1.000

Correlation between Aug-Oct, Sept-Oct, and Sept-Nov of the same calendar year

Aug -Oct	-0.166
Sept-Oct	0.207
Sept-Nov	-0.012

* In correlation matrix signifies no computed value

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Serial Autocorrelation for Normal monthly means (All days)

Lag	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Aug	Sept
1	-0.025	0.050	-0.115	0.096	0.083	0.219	0.210	0.232	-0.068	-0.123	-0.127	0.216
2	-0.197	-0.111	-0.127	0.073	-0.193	-0.210	-0.182	-0.024	0.337	0.002	-0.173	-0.114
3	0.216	-0.148	0.019	-0.102	0.149	0.088	0.155	0.379	-0.253	-0.288	-0.239	0.098
4	-0.065	-0.136	0.028	0.052	0.203	0.247	0.078	0.011	0.028	0.091	0.533	-0.019
5	-0.150	-0.180	-0.035	-0.236	-0.148	-0.016	-0.164	-0.165	-0.342	-0.329	-0.163	-0.033
6	-0.174	-0.036	-0.120	-0.211	-0.280	-0.310	-0.177	-0.156	-0.144	-0.119	-0.055	-0.087
7	-0.126	0.772	0.129	-0.225	-0.271	-0.273	-0.201	-0.275	-0.313	-0.194	-0.310	-0.270

0 NOTE -- Read the table vertically; Lag is in year
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Ranked Normal monthly means (All days)

Oct		Nov		Dec		Jan		Feb		March	
*	1971	*	1971	*	1971	*	1971	*	1971	*	1971
40.4	1973	10.1	1974	7.01	1974	8.20	1972	6.16	1982	14.9	1973
70.4	1981	10.1	1977	7.99	1972	14.2	1973	9.54	1972	21.4	1972
70.8	1975	15.0	1990	10.2	1977	17.6	1974	22.2	1985	74.3	1982
80.0	1977	22.9	1976	13.3	1973	31.5	1975	41.8	1977	86.5	1991
101.2	1982	32.6	1992	23.4	1985	33.9	1990	47.6	1978	88.2	1974
109.5	1990	64.7	1975	44.2	1976	73.5	1982	55.8	1974	113.6	1977
111.4	1978	65.6	1991	52.1	1994	75.2	1981	73.3	1991	122.1	1990
155.7	1989	65.8	1973	59.0	1981	75.6	1976	74.2	1975	171.5	1985
157.0	1993	67.8	1983	63.5	1993	144.1	1978	78.8	1986	173.5	1981
243.8	1976	69.2	1986	76.5	1975	156.0	1992	106.8	1992	183.5	1989
271.4	1979	75.9	1982	76.6	1982	162.0	1989	141.3	1981	195.4	1978
290.5	1987	85.9	1978	116.9	1989	211.3	1986	166.9	1976	212.1	1994
294.7	1991	107.0	1981	123.4	1986	222.1	1994	173.5	1973	234.5	1976
297.9	1974	111.6	1972	152.5	1990	238.0	1988	246.4	1987	240.9	1992
311.8	1986	114.8	1979	176.9	1991	244.4	1985	314.1	1990	281.0	1975
311.9	1985	132.5	1994	186.8	1992	304.4	1984	351.4	1994	677.6	1987
315.9	1972	132.9	1993	230.9	1987	306.6	1977	382.2	1989	730.4	1986
328.9	1992	204.1	1984	234.7	1984	360.9	1991	761.6	1988	906.8	1993
592.9	1984	252.9	1985	266.3	1983	588.5	1987	1259	1984	1472	1988
906.8	1988	347.1	1989	275.0	1988	1470	1993	2091	1993	2685	1995
1020	1994	427.5	1987	291.1	1979	1491	1983	3622	1995	2830	1980
2413	1983	883.8	1980	420.0	1978	2022	1980	3914	1979	2937	1979
3953	1995	1639	1988	637.6	1980	3707	1979	4324	1980	3810	1984
4200	1980	3554	1995	5282	1995	5124	1995	6842	1983	8436	1983

* Indicates a no-value month
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Ranked Normal monthly means (All days)

April		May		June		July		Aug		Sept	
*	1971	*	1971	*	1971	.635	1981	.229	1981	*	1994
37.8	1973	*	1994	10.1	1990	98.2	1979	34.3	1972	12.6	1981
49.0	1972	52.3	1990	43.5	1981	206.8	1980	114.4	1975	57.9	1972
81.9	1992	53.0	1973	102.7	1979	255.8	1993	168.8	1979	210.2	1990
107.6	1979	56.7	1972	224.2	1985	256.1	1976	232.4	1971	359.5	1988
120.8	1974	96.0	1974	248.8	1988	275.9	1977	354.0	1993	451.1	1987
130.2	1982	126.7	1989	258.7	1989	300.7	1972	356.2	1977	455.8	1976
156.6	1986	169.8	1995	261.3	1987	309.1	1987	439.9	1987	483.6	1980
161.0	1991	211.2	1988	275.0	1976	348.7	1990	505.5	1989	522.6	1986
164.5	1994	251.3	1993	317.0	1973	352.3	1971	547.4	1985	573.9	1989

18120	1991	23290	1986	33650	1992	47370	1989	51930	1985	64480	1991
18320	1974	23520	1979	35670	1985	50700	.1985	59170	1991	79880	1989
19170	1986	26070	1972	37410	1989	55100	1991	68600	1989	93150	1986
19180	1985	30230	1989	37780	1978	81750	1984	107000	1994	120000	1994
19430	1972	34230	1985	41420	1979	87460	1994	107400	1987	149000	1987
20220	1992	43300	1987	57500	1987	93680	1987	154200	1984	283700	1993
36450	1984	48600	1984	63030	1984	111800	1993	228000	1993	319200	1988
55760	1988	70600	1994	73810	1994	184900	1988	228700	1988	388400	1984
62720	1994	152400	1983	168800	1983	260400	1983	486700	1979	667300	1979
148400	1983	153300	1988	170200	1988	269300	1979	640400	1983	897100	1980
243100	1995	310900	1980	350100	1980	474400	1980	723100	1980	1159000	1983
258300	1980	454600	1995	779300	1995	1094000	1995	1296000	1995	1461000	1995

* Indicates a no-value month
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Ranked Cumulative monthly runoff in acre-feet (All days)

April		May		June		July		Aug		Sept	
*	1971	*	1971	*	1971	*	1971	*	1971	*	1971
20890	1973	*	1994	*	1994	*	1994	*	1994	*	1994
31840	1972	24140	1973	43010	1973	80860	1981	80880	1981	81630	1981
32620	1982	35320	1972	70330	1990	84350	1973	101100	1972	104500	1972
36150	1974	42050	1974	74330	1974	91770	1990	146600	1990	159100	1990
51960	1977	63940	1982	80460	1972	98950	1972	161400	1975	200000	1976
55760	1975	69740	1990	80820	1981	118700	1976	169600	1977	207200	1977
60420	1981	78240	1981	103000	1976	140500	1985	172900	1976	220400	1975
66520	1990	79260	1975	112700	1985	147700	1977	174200	1985	222200	1989
69070	1992	86640	1976	115200	1975	154300	1975	188000	1989	232600	1985
69110	1976	96530	1978	120000	1978	156900	1989	205500	1973	288000	1991
71450	1978	97480	1992	126900	1991	170400	1978	253300	1991	290300	1973
74060	1991	99380	1985	130700	1977	188100	1991	298200	1987	325000	1987
79450	1985	101900	1977	133800	1989	251500	1992	343700	1986	374800	1986
102500	1986	106700	1991	183900	1992	256800	1986	365600	1992	450100	1992
110600	1989	118400	1989	206800	1986	271100	1987	419000	1982	455200	1982
129800	1994	120200	1986	220100	1982	313000	1974	432600	1978	497400	1978
215900	1987	236600	1987	252100	1987	326000	1982	502600	1988	524000	1988
360200	1988	373100	1988	387900	1988	443200	1988	534400	1993	592800	1993
445900	1993	463300	1993	496900	1993	512600	1993	727500	1979	838500	1979
653000	1984	705000	1979	711100	1979	717100	1979	849400	1974	1066000	1974
673700	1979	710200	1984	799200	1984	1005000	1984	1161000	1984	1198000	1984
1082000	1980	1176000	1980	1220000	1980	1233000	1980	1271000	1980	1299000	1980
1539000	1995	1549000	1995	1587000	1995	1650000	1995	1854000	1983	1893000	1983
1602000	1983	1731000	1983	1791000	1983	1814000	1983	1977000	1995	2421000	1995

* Indicates a no-value month
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Quartiles of Cumulative monthly runoff in acre-feet (All days)

	Oct	Nov	Dec	Jan	Feb	March
0 Twenty-Fifth Percentile	6763	11040	17520	21260	27390	36550
0 Fiftieth Percentile	17990	22720	33280	47010	50660	64340
0 Seventy-Fifth Percentile	32400	47270	61650	167300	209500	310300

	April	May	June	July	Aug	Sept
0 Twenty-Fifth Percentile	56920	78240	103000	140500	172900	220400
0 Fiftieth Percentile	76750	101900	133800	251500	343700	374800
0 Seventy-Fifth Percentile	424400	461300	496900	512600	727500	838500

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Ranked Cumulative monthly runoff in acre-feet (All days)

April-September

*	1971
*	1994
44170	1981
75580	1972
115000	1990
142300	1989
152200	1976
170200	1985
171200	1979
172900	1977
176000	1987
184200	1975
204800	1988
223600	1991
271700	1973
281600	1986
309100	1993
385900	1992
402200	1980
430300	1982
436100	1978
733900	1983
810000	1984
960600	1995
1037000	1974

* Indicates a no-value year
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Quartiles of Cumulative monthly runoff in acre-feet (All days)

0 Twenty-Fifth Percentile
170200
0 Fiftieth Percentile
223600
0 Seventy-Fifth Percentile
430300

NOTE -- Percentiles based on available data.
1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE
0 MEAN DISCHARGE
Normal annual means (All days)

Year	
1971	*
1972	144.0
1973	401.0
1974	1472
1975	304.4
1976	275.5
1977	286.3
1978	687.1
1979	1158
1980	1790
1981	112.7
1982	628.7
1983	2615
1984	1651
1985	321.3
1986	517.7
1987	448.9
1988	721.8
1989	306.9
1990	219.7
1991	397.9
1992	620.0
1993	818.8
1994	*
1995	3344

* Indicates a no-value year

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE

0 MEAN DISCHARGS

Statistics on normal annual means (All days)

Number	Mean	Variance	Standard Deviation	Skewness	Coeff. of Variation
23	836.64	687296.25	829.03	1.84	0.99

0 Serial Autocorrelation for Normal annual means (All days)

Lag	Serial Correlation
1	0.195
2	-0.235
3	0.015
4	0.087
5	-0.100
6	-0.247
7	-0.423

0(NOTE--Read the table vertically; Lag is in years.

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE

0 MEAN DISCHARGS

Ranked Normal annual means (All days)

*	1971
*	1994
112.7	1981
144.0	1972
219.7	1990
275.5	1976
286.3	1977
304.4	1975

306.9	1985
321.3	1985
397.9	1991
401.0	1972
448.9	1987
517.7	1986
620.0	1992
628.7	1982
687.1	1978
721.8	1988
818.8	1993
1158	1979
1472	1974
1551	1984
1790	1980
2615	1983
3344	1995

* Indicates a no-value year

1 Station 02292480 CALOOSAHATCHEE CANAL AT ORTONA LOCK NR LA BELLE

0 MEAN DISCHARGE

Quartiles of Normal annual means (All days)

0 Twenty-Fifth Percentile
304.4

0 Fiftieth Percentile
517.7

0 Seventy-Fifth Percentile
1158

NOTE -- Percentiles based on available data.

1

South Florida Water Management District

3301 Gun Club Road, West Palm Beach, Florida 33406 • (407) 686-8800 • FL WATS 1-800-432-2045

FAX COVER SHEET

DATE: Nov 17, 1995

TO: PAULA N. COULLIETTE
JMI ENG.

FAX# 904-385-3545

Gal-A-90

FROM: Ernest Gallego

Data Management Division

FAX # 407-687-6442

Number of pages (including cover sheet): 6

Upon receipt of this data, the recipient of the enclosed information hereby acknowledges the following:

> **Any information, including but not limited to software and data, received from the South Florida Water Management District ("District") in fulfillment of a public records request is provided "as is" without warranty of any kind, and the District expressly disclaims all express and implied warranties, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. The District does not warrant, guarantee, or make any representations regarding the use, or the results of the use, of the information provided to you by the District in terms of correctness, accuracy, reliability, timeliness or otherwise. The entire risk as to the results and performance of any information obtained from the District is entirely assumed by the recipient.**

PERIOD OF RECORD STATISTICAL SUMMARY FOR DBKEY 15627
FOR PERIOD: 19720101 TO 19950630

DBKEY	STATION	DATA TYPE	SAMPLE SIZE	MINIMUM	MEAN	MAXIMUM	STDDEV
15627	FISHP_O	FLOW	8575	.000	217.056	8030.000	482.49

STATION	ALTERNATE ID	AGCY	CO	TYPE	METH	FQ	STRAT	RCDR	STRT	END	STATION DESCRIPTION	DBKEY	SETNRG	LAT	LONG
S78_H	02292480	USGS	GLA	STG	MEAN	DA	0	????	1982	1995	S-78 HEADWATER ON CALOOSAHATCHEE RI	00856	264230	264722	811811
FISHP	02256500	USGS	GLA	STG	MEAN	DA	0	????	1968	1995	FISHEATING CREEK AT PALMDALE, FLA.	00088	34130	265556	811854
S78_R	MRF64	COE	GLA	RAIN	SUM	DA	0		1968	1995	S-78 SPILLWAY & LOCK ON CALOOSAHATC	06221	264230	264722	811811
FISHP_O	02256500	WMD	GLA	FLOW	MEAN	DA	0	PREP	1972	1995	FISHEATING CREEK AT PALMDALE, FLA.	15627	34130	265556	811854

LOCATION

FINISHED! YOU RETRIEVED 4 INFORMATION RECORDS.
GALLEGO job terminated at 17-NOV-1995 14:51:46.59

Accounting information:

Buffered I/O count:	238	Peak working set size:	3760
Direct I/O count:	148	Peak page file size:	60111
Page faults:	4756	Mounted volumes:	0
Charged CPU time:	0 00:00:03.37	Elapsed time:	0 00:00:11.47

PERIOD OF RECORD STATISTICAL SUMMARY FOR DBKEY 00856
FOR PERIOD: 19821001 TO 19950925

DBKEY	STATION	DATA TYPE	SAMPLE SIZE	MINIMUM	MEAN	MAXIMUM	STDDEV
00856	S78_H	STG	4647	10.200	11.119	12.170	.22

PERIOD OF RECORD STATISTICAL SUMMARY FOR DBKEY 00088
FOR PERIOD: 19681001 TO 19950613

DBKEY	STATION	DATA TYPE	SAMPLE SIZE	MINIMUM	MEAN	MAXIMUM	STDDEV
00088	FISHP	STG	9526	.080	25.735	35.140	9.90

PERIOD OF RECORD STATISTICAL SUMMARY FOR DBKEY 06221
FOR PERIOD: 19681015 TO 19950531

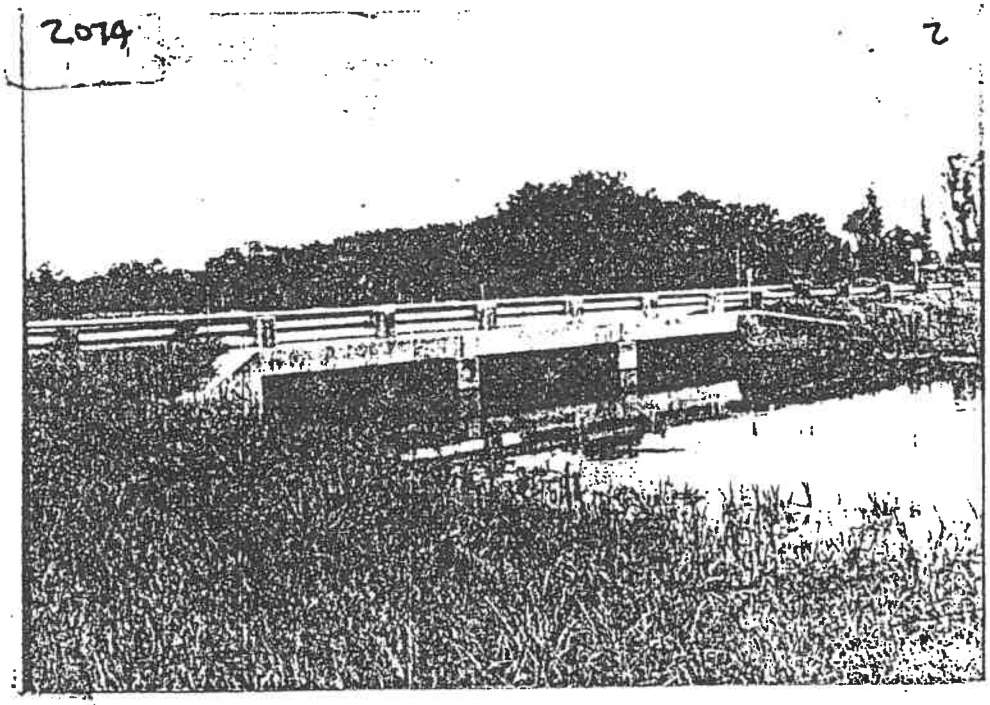
DBKEY	STATION	DATA TYPE	SAMPLE SIZE	MINIMUM	MEAN	MAXIMUM	STDDEV
06221	S78_R	RAIN	8135	.000	.131	7.850	.41

Appendix C

Existing Structure Documentation

State of Florida Department of Transportation

BRIDGE RECORD



BRIDGE NUMBER 050035

BRIDGE NAME Lone Pine Creek

Section No 05090 SR-29 M.P. 4.699

BRIDGE RECORD CONTENTS

I. Inspection Reports - This section contains periodic bridge inspection reports, bridge repair work orders and accident reports.

II. Inventory - Contained in this section is the following bridge information: Photographs; location map; detailed data; history; load carrying capacity; inspection preparation; and drawings.

III. Communications - Correspondence such as letters, memorandums and notices directly related to this bridge are contained in this section.

Form
850-010-14-a
Replaces 571-26
MAINTENANCE
04/91

BRIDGE INSPECTION REPORT

CONTENTS OF REPORT

* This section is not included in this report.

REPORT IDENTIFICATION

Bridge No.: 050035 Bridge Name: Lone Pine Creek

Location: 2.2 miles North of SR 78

Section No. 05090

US R.

S.R. 29

M.P. 4.699

RD. SYS. 901

NO	YES	
[X]	[ ]	This bridge contains fracture critical components?
[X]	[ ]	This bridge is scour critical?
[X]	[ ]	This report identifies deficiencies which require prompt corrective action?

Type of inspection: [X] Routine [ ] Interim [ ] Special

Field Inspection Date: Above Water 05/04/94 Under Water:

Name of Inspector/Diver		Initials	Engineering Registration Number	Certified Bridge Inspection No.
R.W. Seichko, E-II	(Senior Inspector In Charge)	RWS		00199
C.A. Faxon, SHEO				T0006
R.S. Raiola, E-II	(Senior Diving Inspector/Diver)			00038
M.I. Werner, E-I				00262

Reviewing Bridge Inspection Supervisor

Name: R.W. Nelson, E-III 00031 Initials: RWN

PE or CBI Number:

Confirming Registered Professional Engineer

Name: C.D. Oliver, P.E. Number: 23475

Signature C. D. Oliver

STATE OF FLORIDA DEPARTMENT OF TRANSPORTA

FORM 850-010-08-a
REPLACES 571-30
MAINTENANCE
04/91

CONDENSED INSPECTION REPORT
FIXED SPANS

BRIDGE NUMBER 050035

INSPECTION DATE 05/04/94

DECK COMPONENT

BMIS NO.	ELEMENT TITLE	NCR **
G1.00 (58)	Deck Overall Rating	8
G1.01	Deck(Top)/Surfacing	*7
G1.02	Deck(Underside)	7
G1.03	Expansion Joints	N
G1.04	Construction Joints	N
G1.05	Drainage System	8
G1.06	Curbs/Medians/Sidewalks	N
G1.07	Handrails/Barriers/Parapets	8

SUPERSTRUCTURE COMPONENT

BMIS NO.	ELEMENT TITLE	NCR **
G2.00 (59)	Superstructure Overall Rating	8
G2.01	Bearings	N
G2.02	Beams/Stringers/Box& Plate Girders/Flat Slabs/Arches	7
G2.03	Floor Beams	N
G2.04	Main Girders	N
G2.05	Diaphragms/Sway Bracing	N
G2.06	Lateral Bracing	N
G2.07	Upper Chords	N
G2.08	Lower Chords	N
G2.09	Verticals	N
G2.10	Diagonals	N
G2.11	Portals	N
G2.12	Fracture Critical Members	N

SUBSTRUCTURE COMPONENT

BMIS NO.	ELEMENT TITLE	NCR **
G3.00 (60)	Substructure Overall Rating	6
G3.01	Piling/Shafts	6
G3.02	Footings/Caissons	N
G3.03	Columns/Wall Piers	N
G3.04	Intermediate Caps (Bent & Pier)	6
G3.05	Bracing/Struts/Web Walls	N
G3.06	Abutements/End Bents	6
G3.07	Slope Protection/Slope	N

APPROACH ROADWAY MAJOR FEATURE

BMIS NO.	ELEMENT TITLE	NCR **
G4.00	Approach Roadway Overall Rating	8
G4.01	Approach Slabs	N
G4.02	Retaining Walls/Approach Slopes/Embankments/Shoulder	8
G4.03	Roadway-Bridge Transition	7
G4.04	Guardrails	8
G4.05	Roadway Alignment	8

CHANNEL- MAJOR FEATURE

BMIS NO.	ELEMENT TITLE	NCR **
G5.00 (61)	Channel and Channel Protection Overall Rating	8
G5.01	Fender System	N
G5.02	Navigation Lights and Aids	N
G5.03	Embankments/Slopes/ Bulkheads	8
G5.04	Degradation/Aggregation	8
G5.05	Alignment	8
G5.06	Flow	7

NON-STRUCTURAL FEATURES

BMIS NO.	ELEMENT TITLE	NCR **
G6.01	Lighting Systems	N
G6.02	Signs	N
G6.03	Striping (Roadway Reflective)	3
G6.04	Reflectors	4
G6.05	Utility Attachements	N
G6.06	Fishing Walks	N
G6.07	Attenuators	N
G6.08	Traffic Control and Monitoring Systems	N
G6.09	Deck Cleanness	3
G6.10	Superstructure Cleanness	3
G6.11	Substructure Cleanness	3
G6.12	Fences and Glare Screens	N

* - Deficiencies exist in this element that warrant written and/or sketched descriptions that are provided in section B of this report.

** - NCR is an abbreviation for Numerical Condition Rating, the definitions of which can be found on the back of this page.

621-526

Bridge No.:	050035	Location:	2.2 miles North of SR 78
County Section No.:	05090	Inspection Date:	05/04/94
State Road No.:	29	Inspector:	R.W. Seichko, E-II
US Road No.:		Mile Post No.:	4.699

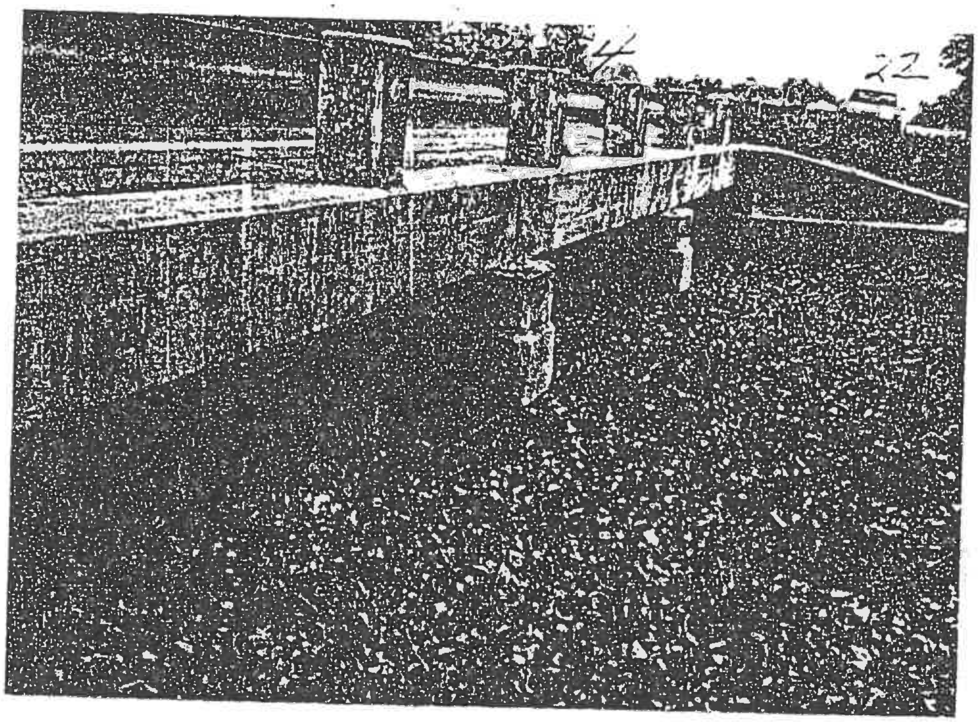
B. COMPREHENSIVE REPORT OF DEFICIENCIES

G1.01 DECK(TOP)/SURFACING

The asphalt overlay is cracking over each bent.

NOTE: Due to the present water level, (2' freeboard) the above water inspection team was unable to inspect the underside of this structure. The structural ratings in this report are taken from the last inspection report.

See the photo on page 4.



[redacted]
Heavy vegetation

Bridge Number: 050035

Inspection Date: [redacted]

Waterway Measurements

	LEFT		RIGHT	
Distance from Top of bridgerail to water at time of inspection:	Dist.	Bent No.	Dist. 2	Bent No. 5.0

Distance from Top of bridgerail to mudline

"-" Sign Denotes Degradation

Dates? Left 5/04/94 Right

Bent No.	Original	Previous	Present	Difference	Original	Previous	Present	Difference
Abut.1	8.3	8.0	8.0	0	7.6	7.2	7.2	0
Bent 2	9.7	8.4	8.4	0	9.0	8.0	8.3	[redacted]
Bent 3	8.8	8.2	8.2	0	8.5	8.4	8.0	0.4
Abut.4	8.5	7.8	7.7	0.1	7.3	7.2	7.0	0.2
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0

Remarks:

Bridge No.: 050035

County Section No.: 05090

State Road No.: 29

US Road No.:

Location: 2.2 miles North of SR 78

Inspection Date: 05/04/94

Inspector: R.W. Seichko, E-II

Mile Post No.: 4.699

D. Required Maintenance Repair and Rehabilitation

STATE FORCES

No Recommendations

COMMENTS:

```
********** IDENTIFICATION ********************            ********************************************
 (1) STATE NAME - FLORIDA                     CODE  124
 (8) STRUCTURE NUMBER                #        050035     SUFFICIENCY RATING =  083.7
 (5) INVENTORY ROUTE (ON/UNDER) - ON   =   131000290     STATUS = NO SIGNIFICANT DEFICIENCY
 (2) STATE HIGHWAY DEPARTMENT DISTRICT           01
 (3) COUNTY CODE    043    (4) PLACE CODE     00000      ********** CLASSIFICATION **************** CODE
 (6) FEATURES INTERSECTED - LONE PINE CREEK         (112) NBIS BRIDGE LENGTH                          YES
 (7) FACILITY CARRIED      - SR 29                  (104) HIGHWAY SYSTEM - STRUCTURE IS NOT ON NHS     0
 (9) LOCATION              - 2.2 MILES NORTH OF SR-78 (26) FUNCTIONAL CLASS - RURAL MINOR ARTERIAL    06
(11) MILEPOINT                              004.699 (100) DEFENSE HIGHWAY  - NOT A DEFENSE HIGHWAY     0
(16) LATITUDE  26 D 50.2' (17) LONGITUDE 081 D 23.3' (101) PARALLEL STRUCTURE - NONE EXISTS            N
(98) BORDER BRIDGE STATE CODE  000   % SHARE  00 %  (102) DIRECTION OF TRAFFIC - TWO WAY TRAFFIC       2
(99) BORDER BRIDGE STRUCTURE NO.   #                (103) TEMPORARY STRUCTURE  - NOT APPLICABLE        N
                                                    (110) DESIGNATED NATIONAL NETWORK - NOT PART OF N  0
     ********** STRUCTURE TYPE AND MATERIAL *********  (20) TOLL        - ON FREE ROAD                 3
(43) STRUCTURE TYPE MAIN: MATERIAL - CONCRETE        (21) MAINTAIN - STATE HIGHWAY AGENCY          01
       TYPE - SLAB                          CODE 101  (22) OWNER    - STATE HIGHWAY AGENCY          01
(44) STRUCTURE TYPE APPR:  MATERIAL - OTHER          (37) HISTORICAL SIGNIFICANCE - NOT ELIGIBLE FOR 5
       TYPE - OTHER                         CODE 000
(45) NUMBER OF SPANS IN MAIN UNIT               003      ********** CONDITION ******************** CODE
(46) NUMBER OF APPROACH SPANS                  0000  (58) DECK                                        8
(107) DECK STRUCTURE TYPE - CAST IN PLACE CONC CODE 1 (59) SUPERSTRUCTURE                             8
(108) WEARING SURFACE / PROTECTIVE SYSTEM:           (60) SUBSTRUCTURE                               6
   A) TYPE OF WEARING SURFACE - BITUMINOUS   CODE 6  (61) CHANNEL & CHANNEL PROTECTION               8
   B) TYPE OF MEMBRANE         NONE          CODE 0  (62) CULVERTS                                   N
   C) TYPE OF DECK PROTECTION - NONE         CODE 0
                                                         ********** LOAD RATING AND POSTING ******** CODE
     ********** AGE AND SERVICE *********************  (31) DESIGN LOAD  -                 H 15         2
(27) YEAR BUILT                                1948  (64) OPERATING RATING -            HS-20 TRU  246
(106) YEAR RECONSTRUCTED                       0000  (66) INVENTORY RATING -            HS-20 TRU  228
(42) TYPE OF SERVICE:  ON - HIGHWAY                  (70) BRIDGE POSTING   - EQ OR GT LEGAL LOAD NO P  5
       UNDER - WATERWAY                     CODE 15  (41) STRUCTURE OPEN, POSTED OR CLOSED -          A
(28) LANES:  ON STRUCTURE  02   UNDER STRUCTURE  00        DESCRIPTION - OPEN, NO RESTRICTION
(29) AVERAGE DAILY TRAFFIC                   002231
(30) YEAR OF ADT   1991    (109) TRUCK ADT     15 %      ********** APPRAISAL ********************* CODE
(19) BYPASS, DETOUR LENGTH                    15 MI  (67) STRUCTURAL EVALUATION                       6
                                                     (68) DECK GEOMETRY                               4
     ********** GEOMETRIC DATA **********************  (69) UNDERCLEARANCES, VERTICAL & HORIZONTAL    N
(48) LENGTH OF MAXIMUM SPAN                 0015 FT  (71) WATERWAY ADEQUACY                           8
(49) STRUCTURE LENGTH                     000045 FT  (72) APPROACH ROADWAY ALIGNMENT                  8
(50) CURB OR SIDEWALK:   LEFT 00.0 FT  RIGHT 00.0 FT (36) TRAFFIC SAFETY FEATURES                  1111
(51) BRIDGE ROADWAY WIDTH CURB TO CURB     032.3 FT  (113) SCOUR CRITICAL BRIDGES                     6
(52) DECK WIDTH OUT TO OUT                 035.0 FT
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS)    042 FT      ********** PROPOSED IMPROVEMENTS ***************
(33) BRIDGE MEDIAN - NO MEDIAN               CODE 0  (75) TYPE OF WORK - NO IMPROVEMENT PLANNED  CODE 000
(34) SKEW    00 DEG    (35) STRUCTURE FLARED     NO  (76) LENGTH OF STRUCTURE IMPROVEMENT     000000 FT
(10) INVENTORY ROUTE MIN VERT CLEAR       99 FT 99 IN (94) BRIDGE IMPROVEMENT COST          $      ,000
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR      32.3 FT  (95) ROADWAY IMPROVEMENT COST         $      ,000
(53) MIN VERT CLEAR OVER BRIDGE RDWY      99 FT 99 IN (96) TOTAL PROJECT COST              $      ,000
(54) MIN VERT UNDERCLEAR REF - NOT A HI  00 FT 00 IN (97) YEAR OF IMPROVEMENT COST ESTIMATE       20
(55) MIN LAT UNDERCLEAR RT  REF - NOT A HI  99.9 FT  (114) FUTURE ADT                          005508
(56) MIN LAT UNDERCLEAR LT                  00.0 FT  (115) YEAR OF FUTURE ADT                      2013

     ********** NAVIGATION DATA ********************      ********** INSPECTIONS **************************
(38) NAVIGATION CONTROL - BRIDGE HAS NO NA   CODE 0  (90) INSPECTION DATE   94/05   (91) FREQUENCY   24 MO
(111) PIER PROTECTION - NAVIGATION PROTECTI  CODE 1  (92) CRITICAL FEATURE INSPECTION:     (93) CFI DATE
(39) NAVIGATION VERTICAL CLEARANCE           000 FT     A) FRACTURE CRIT DETAIL - NO   __ MO   A)
(116) VERT LIFT BRIDGE NAV MIN VERT CLEAR    000 FT     B) UNDERWATER INSP      - YES  24 MO   B)   93 02
(40) NAVIGATION HORIZONTAL CLEARANCE        0000 FT     C) OTHER SPECIAL INSP   - NO   __ MO   C)
```

DATE OF INSPECTION: 2/8/93

DATE: 2/8/93

FIXED AND MOVEABLE

UNDERWATER BRIDGE INSPECTION REPORT

BRIDGE NO.	LOCAL NAME	S.R. NO.	TOPSIDE INSP.	DIVER INSP.
050035	LONG PINE	29	JED	~~BSH~~/MIW/AMB

FIXED SPAN COMPONENTS

G3.00 (60)	Substructure Overall Rating	8
G3.01	Piling / Shafts	8
G3.02	Footings/Caissons	N
G3.03	Columns/Wall Piers	
G3.04	Intermediate Caps (Bent & Pier)	
G3.05	Bracing/Struts/Web Walls	
G3.06	Abutments/End Bents	
G3.07	Slope Protection/ Slopes	N

CHANNEL - MAJOR FEATURE

G5.00 (61)	Channel & Channel Protection Overall	N
G5.01	Fender System	
G6.06	Fishing Walks	
G5.03	Embankments/ Slopes/Bulkheads	
G5.04	Degradation/ Aggregation	
G5.05	Alignment	
G5.06	Flow	
	Obstruction	N

MOVEABLE SPAN ELEMENTS

G13.01	Piling/Shafts	N
G13.02	Footings/Caissons	
G13.03	Caps(Bent, Pier)	
G13.04	Columns/Piers(Wall/ Pivot/Rest/Bascule	
G9.07	Submarine Cable	
G13.00	Substructure Overall Rating	N

WATER/SCOUR CONDITIONS

SCOUR CRITICAL: NO

TYPE:
1. GENERAL
2. LOCAL
3. AGGREGATION/DEGRADATION

TIDAL: NO

WATER TYPE: 2
1.FRESH/CLEAR
2.FRESH/TANNIC
3.SALT
4.BRACKISH
5.STAGNANT

(K9)WATER QUALITY: 0
0.NO DATA AVAILABLE
1.GOOD
2.FAIR
3.POOR
N.NOT APPLICABLE

K(10)WATER DEPTH:
AVERAGE 4 FT.
MAXIMUM 5 FT.

(K11)BOTTOM MATERIAL: 1
1.MUD
2.SAND
3.MARINE GROWTH/CORAL
4.ROCK
5. GRAVEL
6.OTHER

TOTAL MAN HOURS: 2

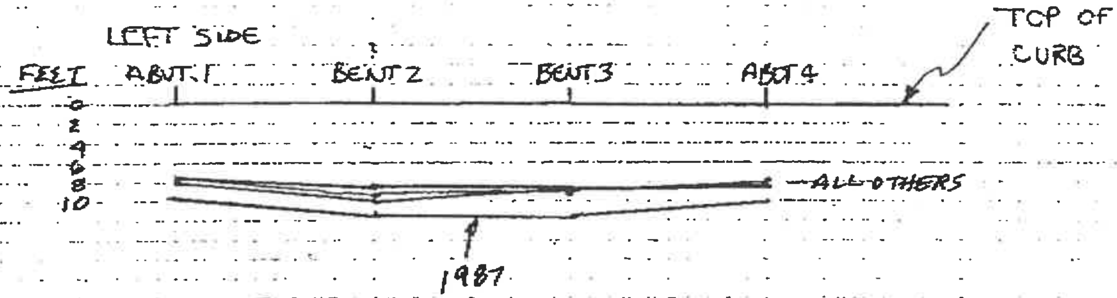
ITEMS INSPECTED:
CONCRETE PILES 1 THRU 5 OF BENTS 2 AND 3.

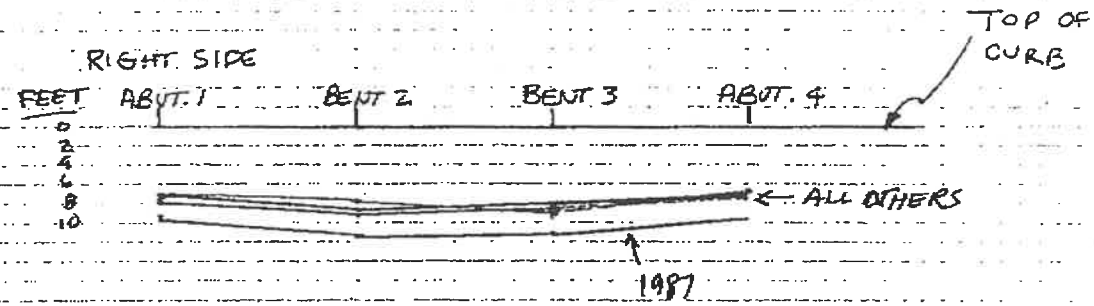
COMMENTS:
THE UNDERWATER INSPECTION OF CONCRETE PILES EXHIBIT MODERATE TO HEAVY MATRIX LOSS WITH NO SIGNIFICANT CRACKS OR SPALLS.

RECOMMENDATIONS:

Post-it® Fax Note 7671	Date 11-6	# of pages ▶ 2
To PAULA COULLIETT	From LYNDON SCHMIDT	
Co./Dept.	Co. FDOT	
Phone # 385-7450	Phone # 813-744-6050	
Fax # 904-385-3545	Fax #	

Note: No report of scour for divers. Channel profile did not change significantly over the years (1987 measurements may be in error).





050035

Channel Profile

SCALE: 1" = 20' for WATERWAY MEASUREMENTS

KEY
- 6-15-82
- 9-6-83 Not plotted due to no change
- 06/11/85 RWH
- JMS 06-14-87
- RWN & MB 12-21-88 no significant change
- GAO & BCM 5-4-90 " " "
- JED 8-25-92
- 5-4-94 RWS

G

WATERWAY MEASUREMENTS

BRIDGE NO. 050035

6-15-82

Distance from top of ~~bridgerail~~ curb to top of water.

Bent No.	Left	Right
2	-	3.6'

Distance from top of ~~bridgerail~~ curb to mudline.

Bent No.	Left	Right
Abutment 1	8.3'	7.6'
Bent 2	9.7'	9.0'
Bent 3	8.8'	8.5'
Abut. 4	8.5'	7.3'

G

BR. NO. ___________

WATERWAY MEASUREMENTS

050035
09/06/83

Distance from top of curb to top of water

Bent No.	Left	Right
2	–	3.5'

Distance from top of curb to mudline.

Bent No.	Left	Right
ABUT. 1	8.4'	7.6'
BENT 2	9.6'	9.0'
BENT 3	8.8'	8.6'
ABUT. 4	8.6'	7.4'

NOTE: MEASURMENTS TAKEN 09/06/83 COMPARE FAVORABLY WITH MEASUREMENTS TAKEN o6/15/83.

WATERWAY MEASUREMENTS

BRIDGE NO. 050035
6/11/85

Distance from top of CURB to top of water.

Bent No.	Left	Right

Distance from top of CURB to mudline.

Bent No.	Left	Right
Abutment No. 1	7.8	7.6
Bent No. 2	8.5	8.4
Bent No. 3	8.6	8.2
Abutment No. 4	8.3	7.9

WATERWAY MEASUREMENTS

BRIDGE NO. 050035

Distance from top of bridgerail to top of water.

Bent No.	Left	Right

Distance from top of bridgerail to mudline.

Bent No. TOP POST		Left	Right
Abutment	1	9.7'	9.5'
Bent	2	10.3'	10.6'
"	3	10.4'	10.2'
Abutment	4	10.0'	9.8'

BRIDGE NUMBER 050035

INSPECTION DATE 9-5-90

Waterway Measurements

Depth of Water at time of inspection:	LEFT		RIGHT	
	Bent No.	Depth	Bent No.	Depth

Distance from top of bridgerail to mudline:

"+" Sign denotes aggregation
"-" Sign denotes degradation

	LEFT				RIGHT			
Bent No.	Orignal	Previous	Present	Difference	Orignal	Previous	Present	Difference
Abut.1		10.0'	9.9'	+0.1'		9.8'	9.8'	0
Bent 2		10.4'	10.5'	-0.1'		10.8'	10.6'	+0.2'
Bent 3		10.4'	10.8'	-0.4'		10.2'	10.0'	+0.2'
Abut.4		10.2'	10.4'	-0.2'		10.0'	9.8'	+0.2'

Waterway Measurements

	LEFT		RIGHT	
	Dist.	Bent No.	Dist.	Bent No.
Distance from Top of bridgerail to water at time of inspection:			2	5.0

Distance from Top of bridgerail to mudline

"-" Sign Denotes Degradation

	Left				Right			
Bent No.	Original	Previous	Present	Difference	Original	Previous	Present	Difference
Abut.1	8.3	8.0	8.0	0	7.6	7.2	7.2	0
Bent 2	9.7	8.4	8.4	0	9.0	8.0	8.3	-0.3
Bent 3	8.8	8.2	8.2	0	8.5	8.4	8.0	0.4
Abut.4	8.5	7.8	7.7	0.1	7.3	7.2	7.0	0.2
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0
				0				0

Remarks:

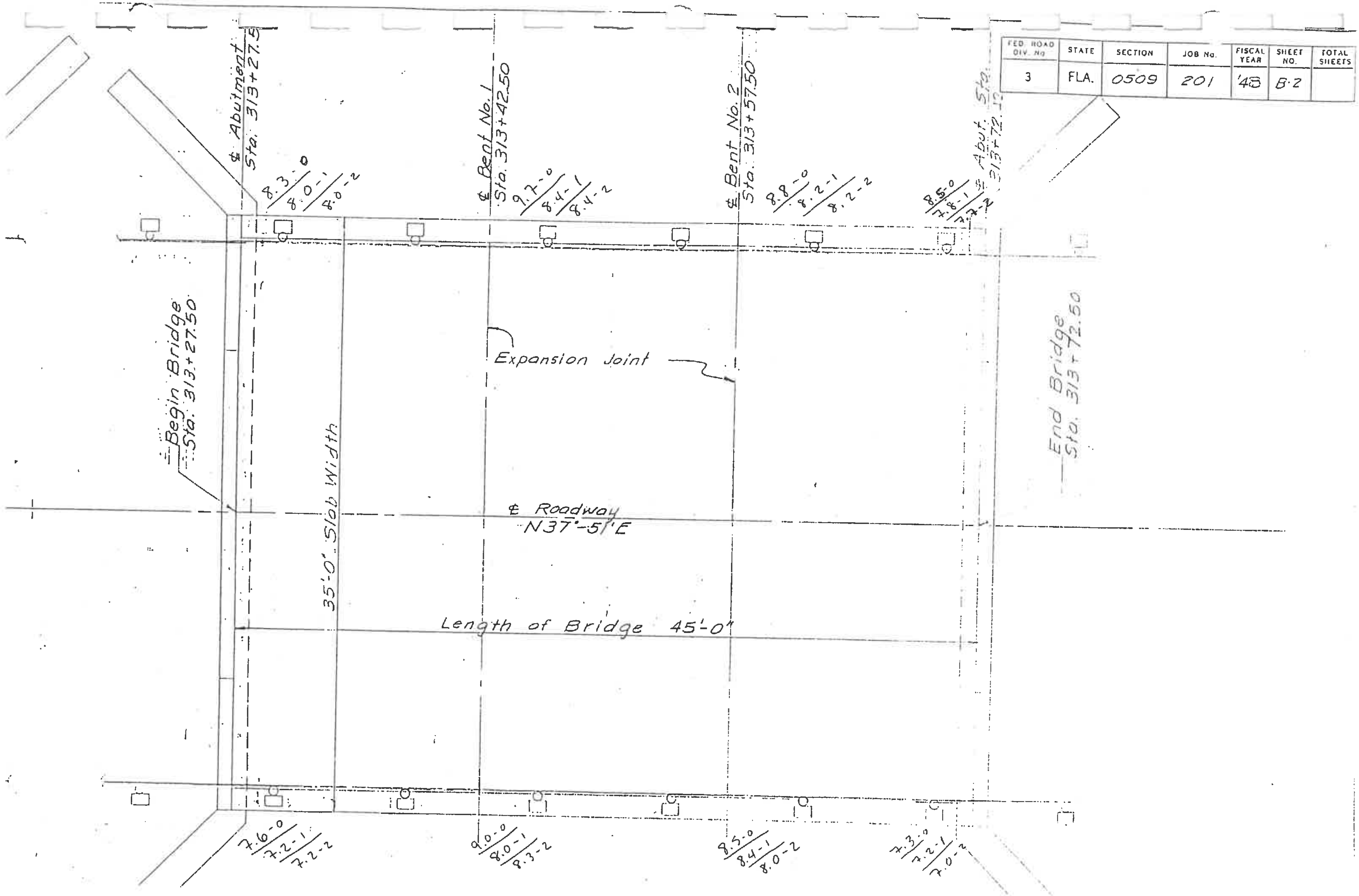
NUMERICAL CONDITION RATING DEFINITIONS FOR DECK, SUPERSTRUCTURE, SUBSTRUCTURE, APPROACH ROADWAY

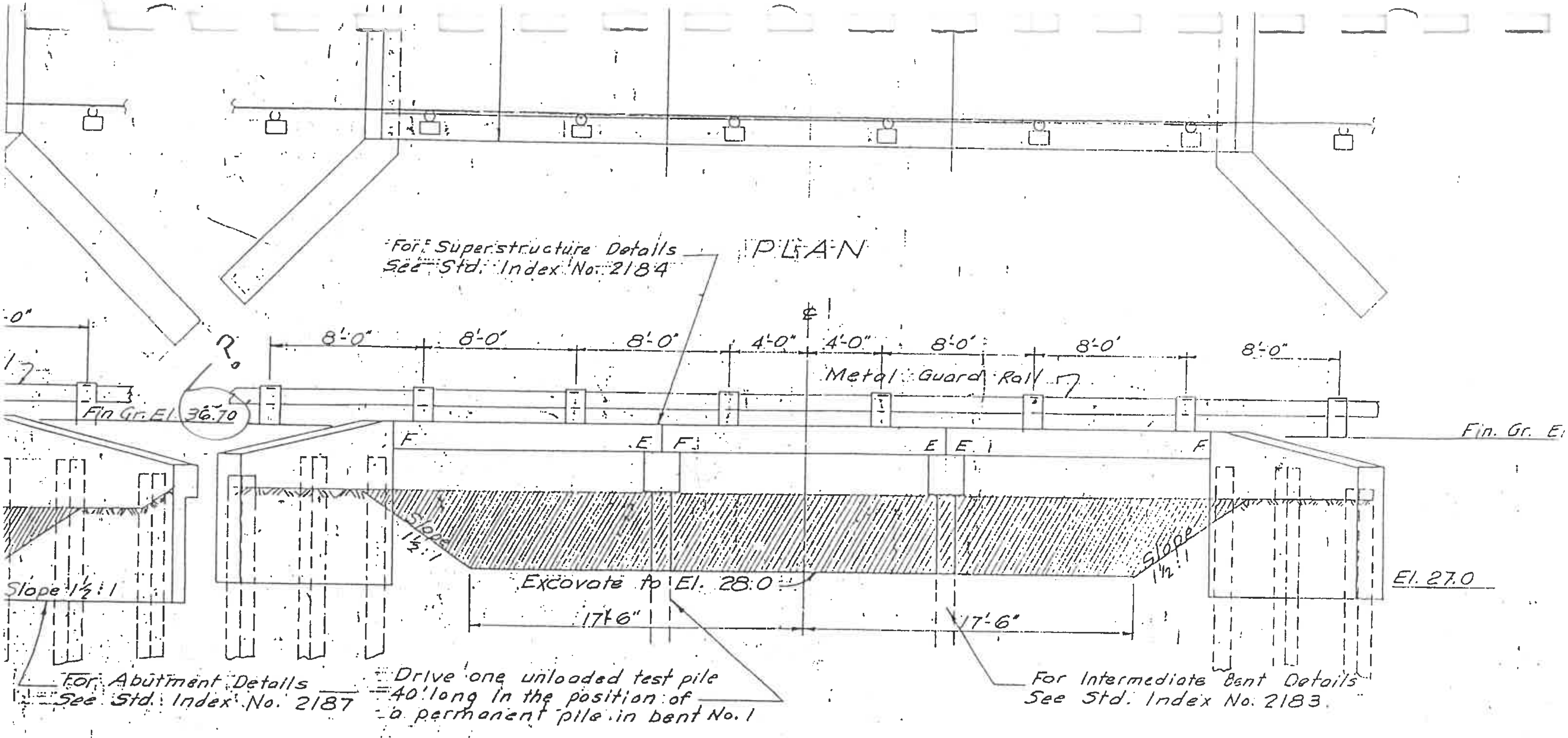
CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - No problems noted.
7	GOOD CONDITION - Some minor problems. Minor maintenance may be needed.
6	SATISFACTORY CONDITION - Structural elements show some minor deterioration. Major maintenance is needed.
5	FAIR CONDITION - All primary structural elements are sound but may have minor section loss, cracking, spalling. Minor rehabilitation may be needed.
4	POOR CONDITION - Advanced section loss, deterioration, spalling. Major rehabilitation may be needed.
3	SERIOUS CONDITION - Loss of section, deterioration, spalling have seriously affected primary structural elements. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present. Repair or rehabilitation required immediately.
2	CRITICAL CONDITION - Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION - Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - Out-of-Service - beyond corrective action.

NUMERICAL CONDITION RATING DEFINITIONS FOR CHANNEL AND CHANNEL PROTECTION

CODE	DESCRIPTION
N	NOT APPLICABLE - Use when bridge is not over a waterway.
9	EXCELLENT CONDITION - No noticeable or noteworthy deficiencies which affect the condition of the channel.
8	VERY GOOD CONDITION - Banks are protected or well vegetated. River control devices, such as spur dikes and embankment protection, are not required or are in a stable condition. Some minor scour has occurred near bridge.
7	GOOD CONDITION - Bank protection is in need of minor repairs. River control devices and embankment protection have minor damage. Banks and/or channel have minor amounts of drift. Minor local scour developing near substructure.
6	SATISFACTORY CONDITION - Bank is beginning to slump. River control devices and embankment protection have considerable minor damage. There is minor stream bed movement evident. Debris is restricting the waterway slightly. Scour holes deepening.
5	FAIR CONDITION - Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel. Scour holes are becoming more prominent, affecting the stability of the substructure.
4	POOR CONDITION - Bank and embankment protection undermined with corrective action required. River control devices have severe damage. Large deposits of debris in the waterway. The stream bed has changed its location but is causing no problem.
3	SERIOUS CONDITION - Bank protection has failed completely. Scour holes forming in embankment. River control devices have been destroyed. Stream bed aggradation or degradation has changed the waterway to now threaten the bridge and/or approach roadway.
2	CRITICAL CONDITION - Abutment has failed (portion has settled) due to undermining of footing. The waterway has changed and now threatens the bridge and/or embankment. Scour is of sufficient depth beneath footing that substructure is near state of collapse.
1	"IMMINENT" FAILURE CONDITION - Bridge closed. Corrective action may put the structure back into light service.
0	FAILED CONDITION - Bridge closed. Replacement necessary.

FED. ROAD DIV. No.	STATE	SECTION	JOB No.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	FLA.	0509	201	'48	B-2	





ELEVATION
BRIDGE AT STATION
313 + 50

GENERAL PLANS & ELEVA

STATE OF FLORIDA STATE ROAD DEPARTMENT		
BRIDGES AT STATIO 162+00 213+00 313+		
ROAD NO.	COUNTY	SECTIONS
29	GLADES	05092

Appendix D

WSPRO Analysis

LOCATION OF CROSS SECTIONS USED IN WSPRO

EXISTING BRIDGE

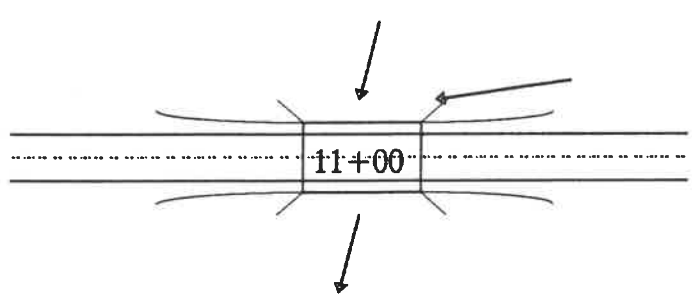
Station CL of Existing Bridge	1100 ft
Width of Existing Bridge	35 ft
Length of Existing Bridge	45 ft

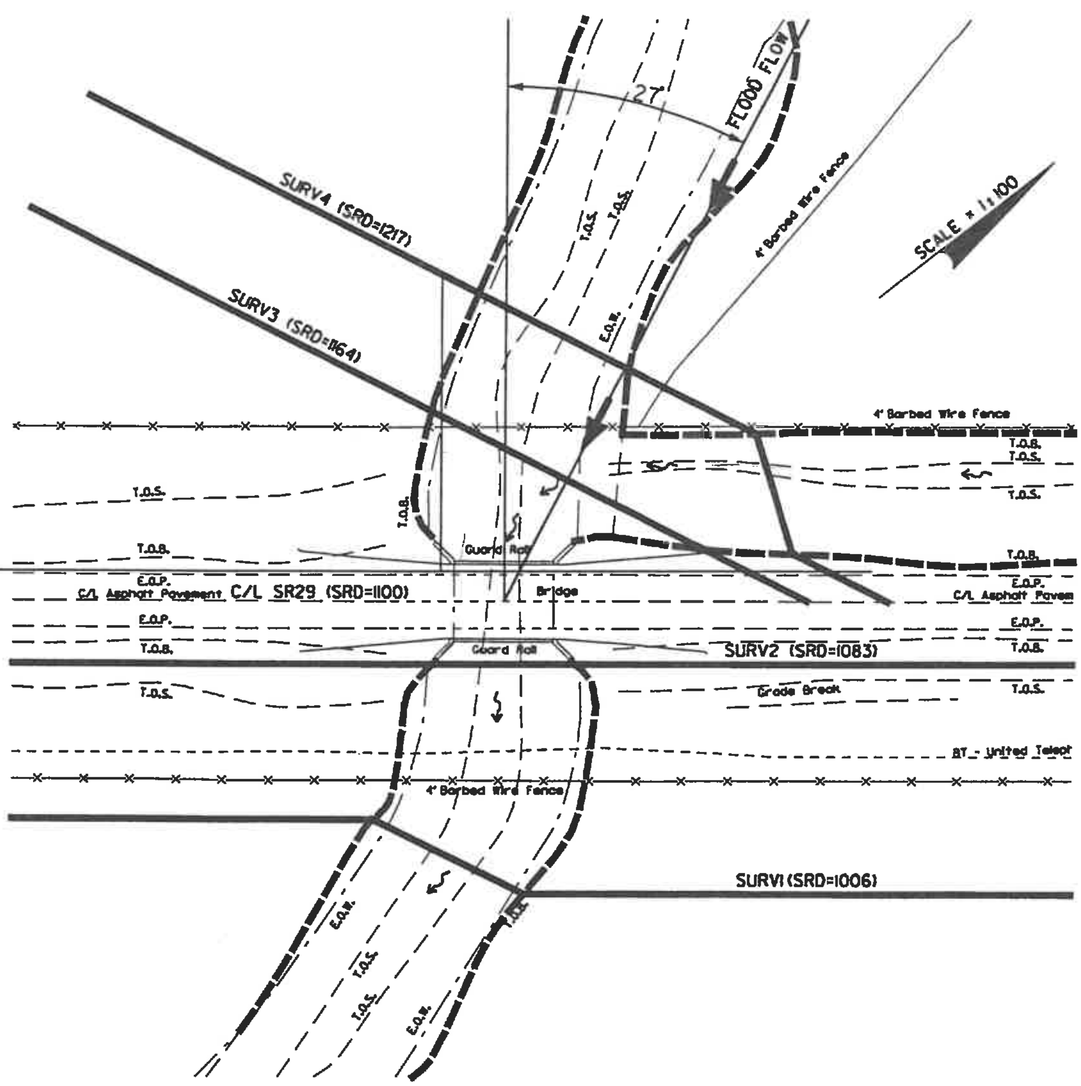
Station of **EXIT** Section:	1100 - 45 - 35/2 =	**1037**
Station of **FULLV** Section:	1100 - 35/2 =	**1083**
Station of **APPR** Section:	1100 + 45 + 35/2 =	**1163**

PROPOSED BRIDGE

Station CL of Proposed Bridge	1100 ft
Width of Proposed Bridge	47 ft
Length of Proposed Bridge	45 ft

Station of **EXIT** Section:	1100 - 45 - 47/2 =	**1031**
Station of **FULLV** Section:	1100 - 47/2 =	**1076**
Station of **APPR** Section:	1100 + 45 + 47/2 =	**1169**

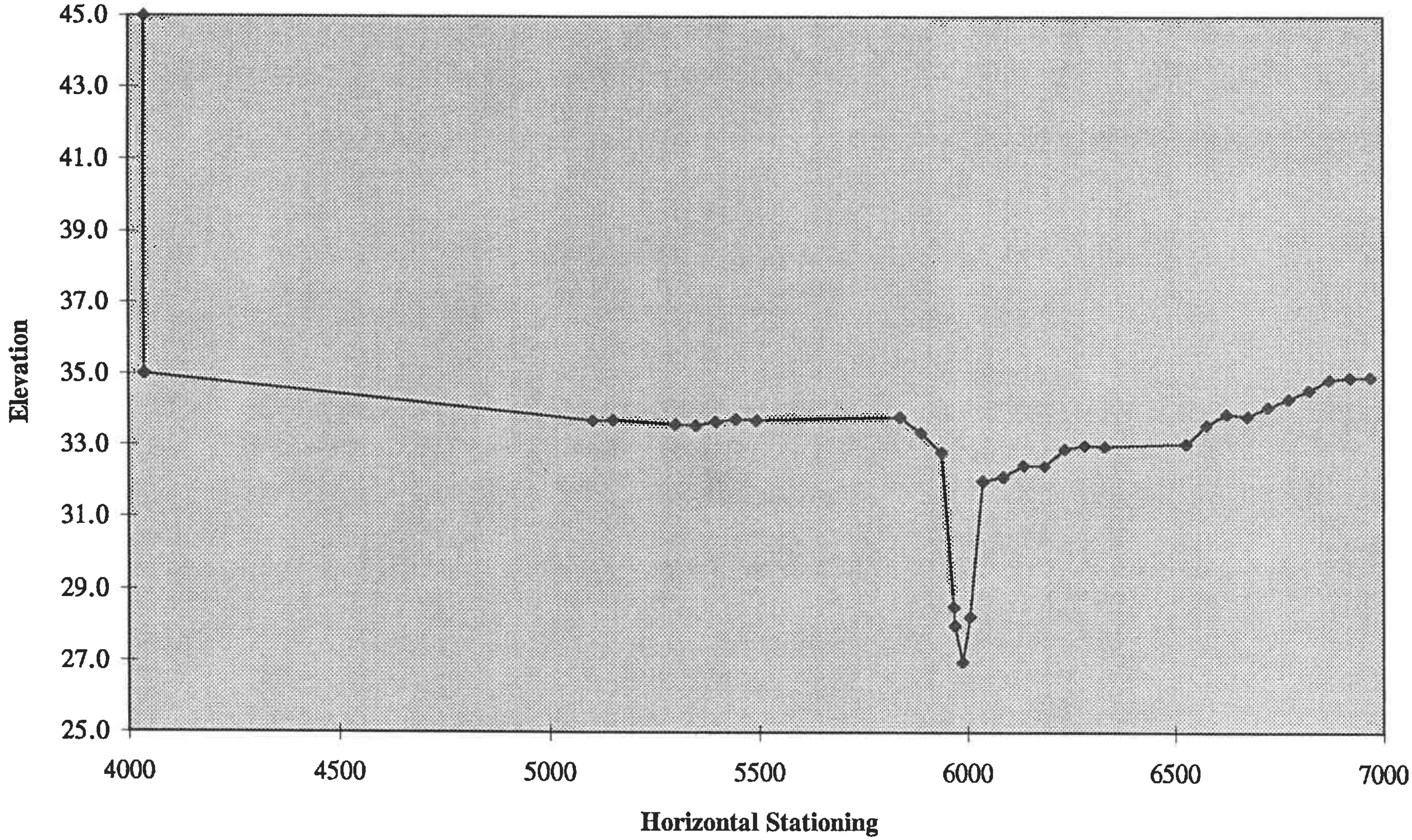


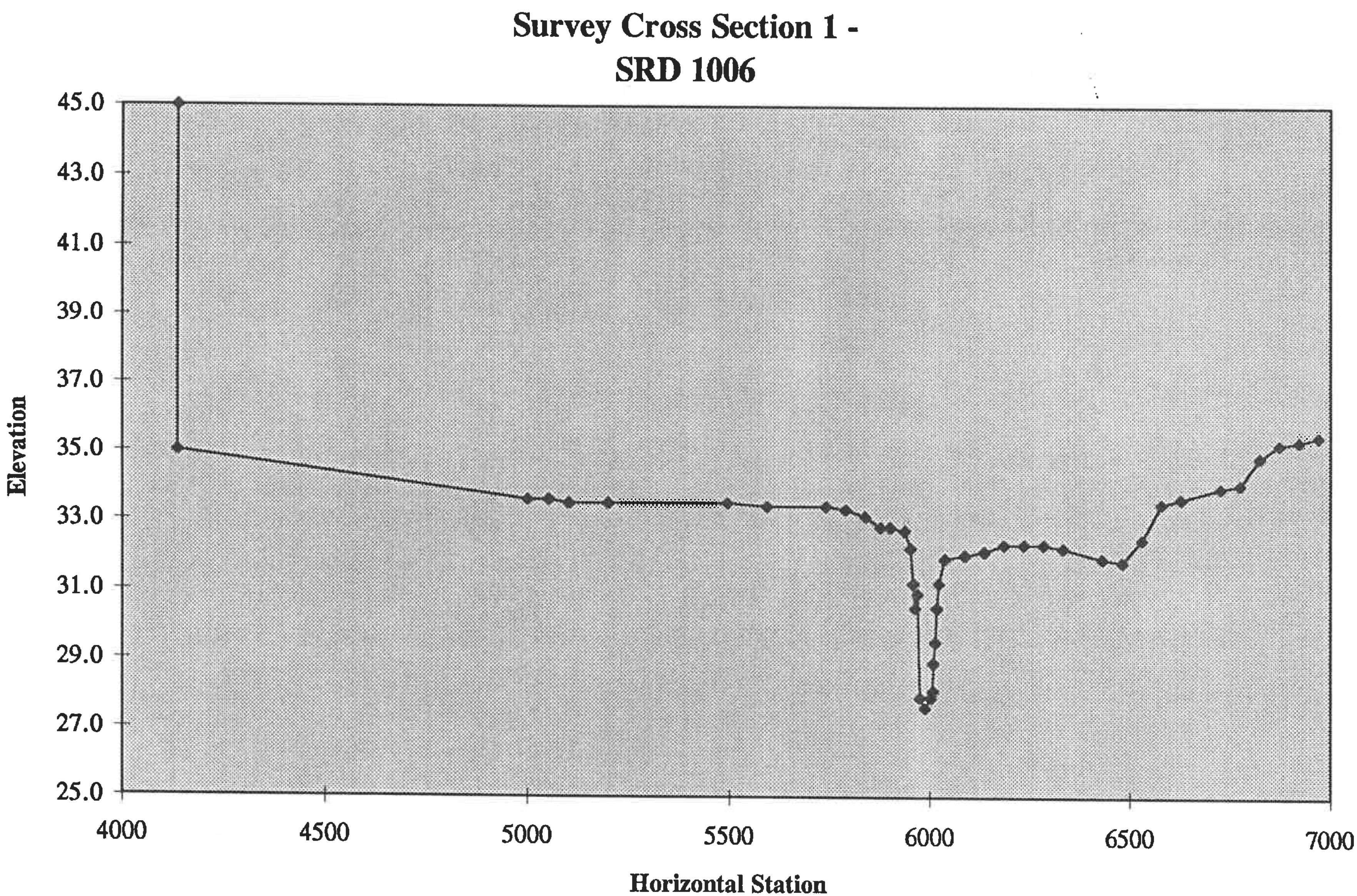


JMI ENGINEERS

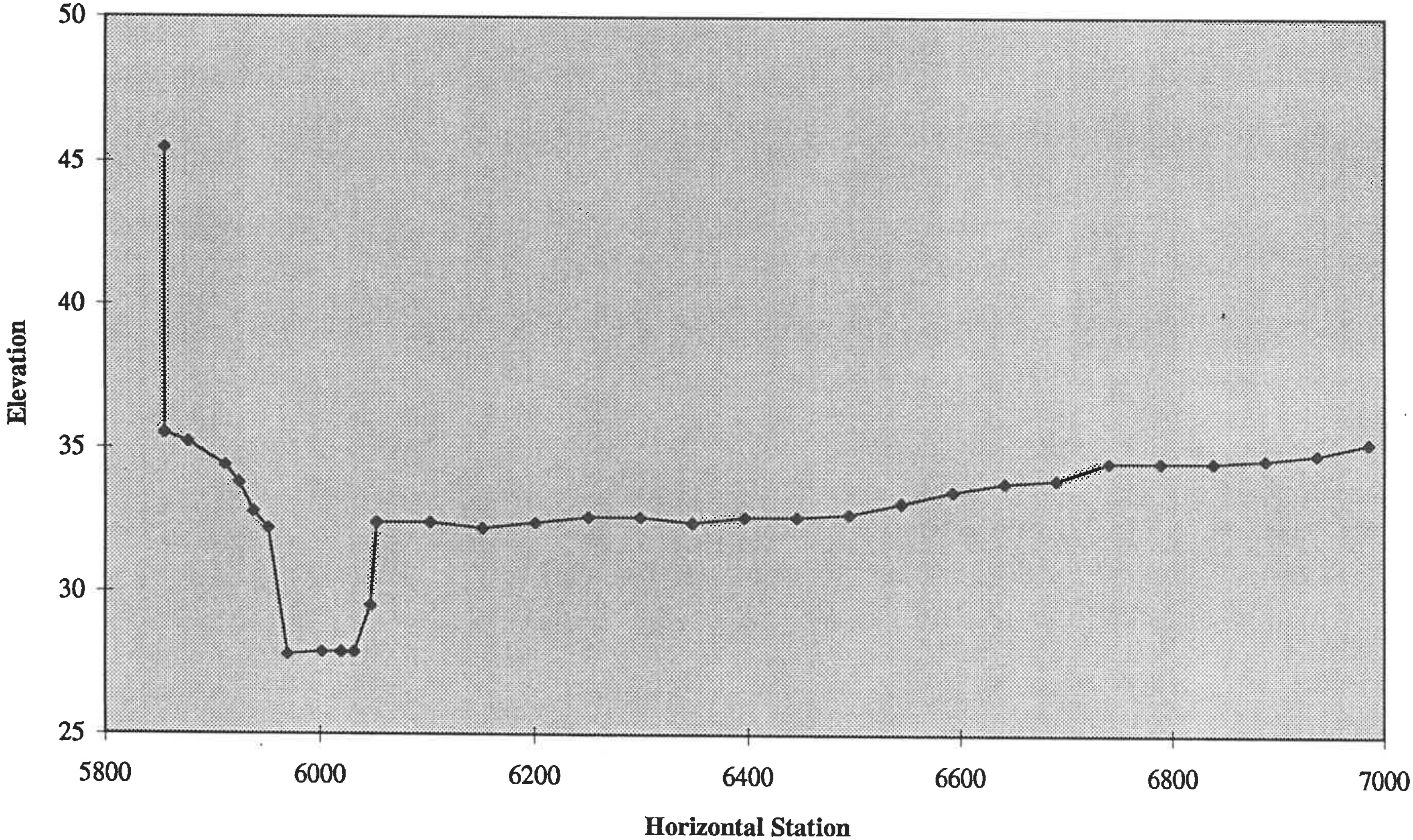
FIGURE D-1
SURVEY CROSS SECTIONS USED FOR WSPRO ANALYSIS

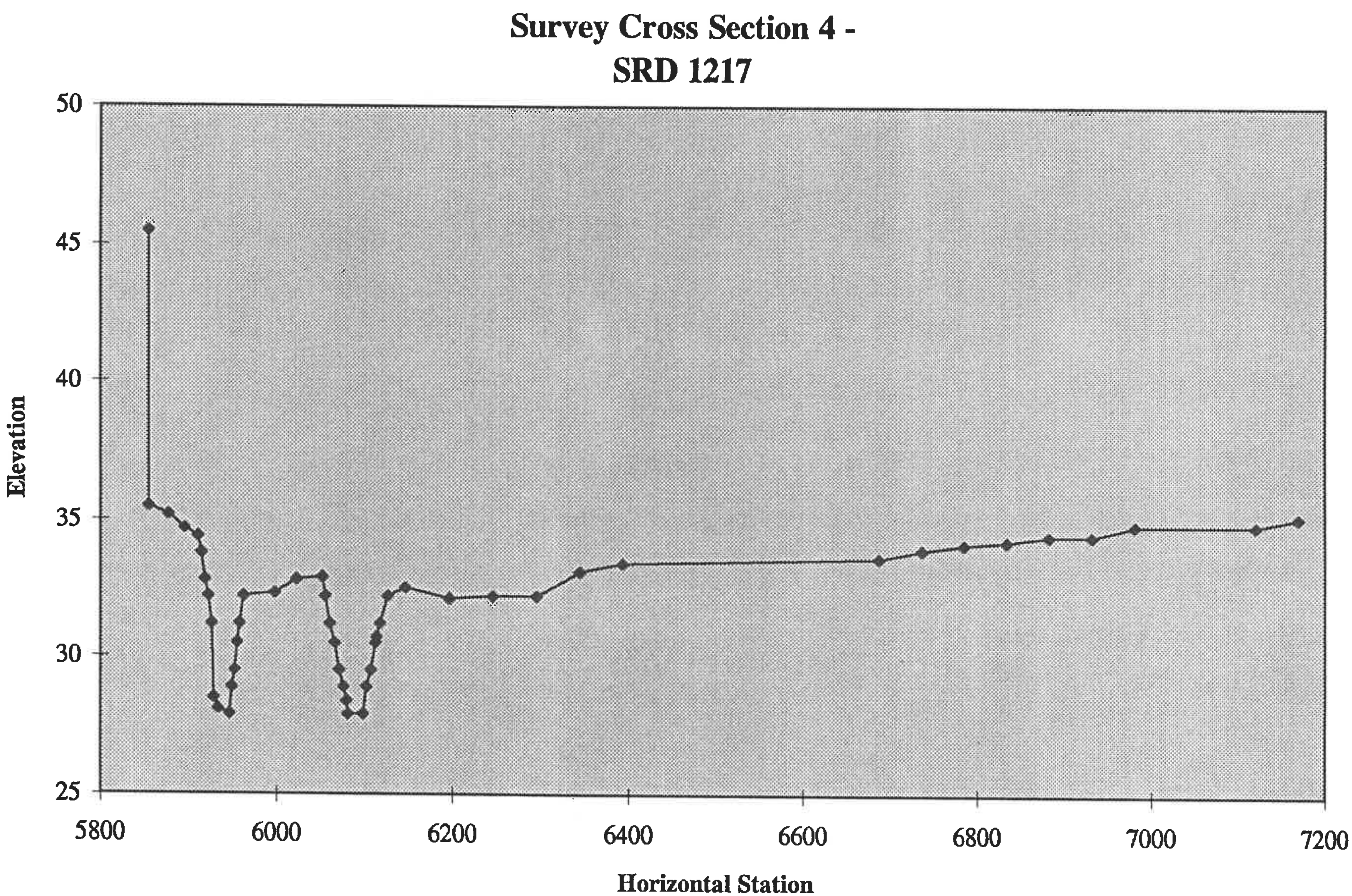
Survey Cross Section 2 - SRD 1083



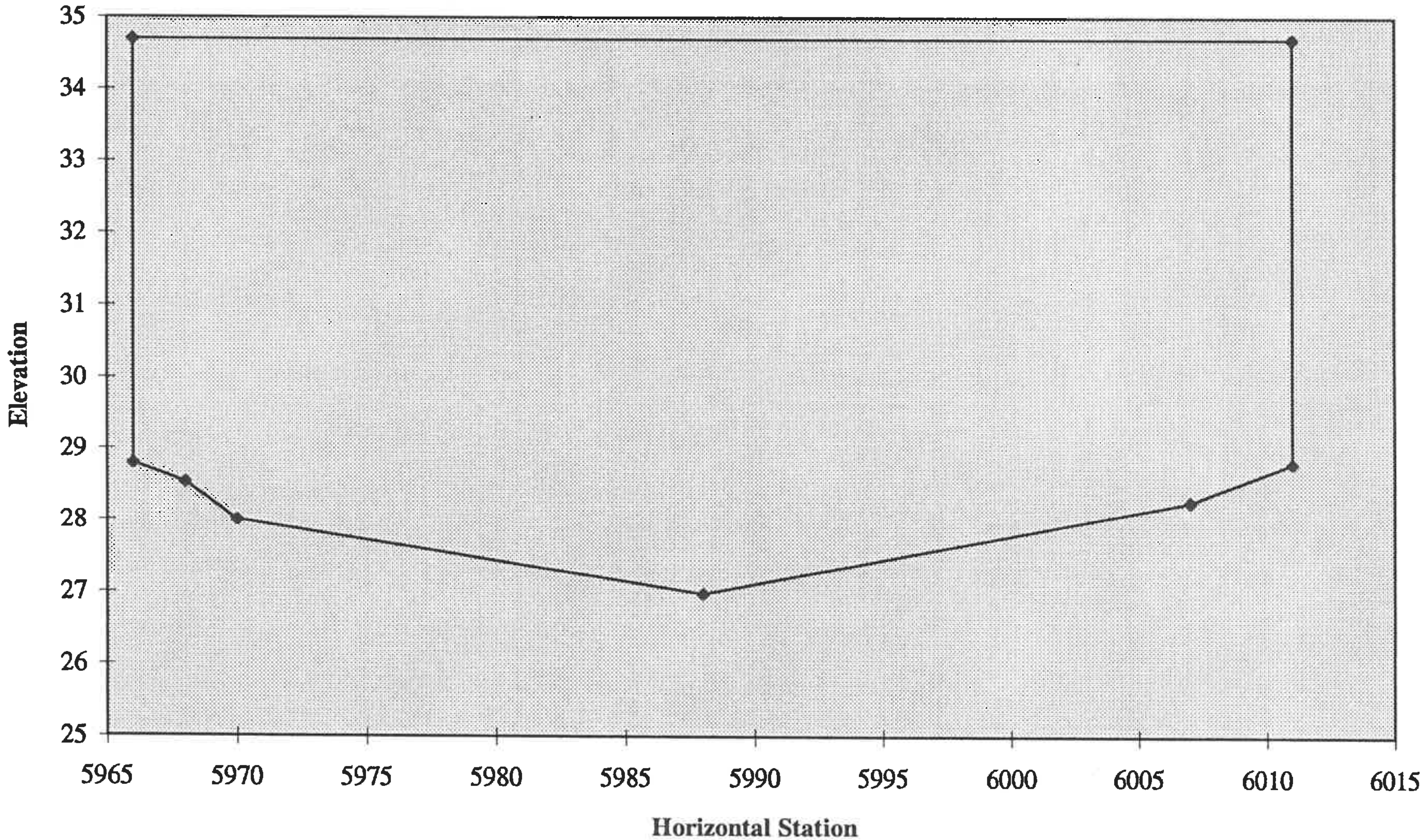

Survey Cross Section 1 -
SRD 1006
45.0
43.0
41.0
39.0
37.0
35.0
33.0
31.0
29.0
27.0
25.0
Elevation
4000
4500
5000
5500
6000
6500
7000
Horizontal Station

Survey Cross Section 3 - SRD 1164




Survey Cross Section 4 -
SRD 1217
Elevation
50
45
40
35
30
25
5800
6000
6200
6400
6600
6800
7000
7200
Horizontal Station

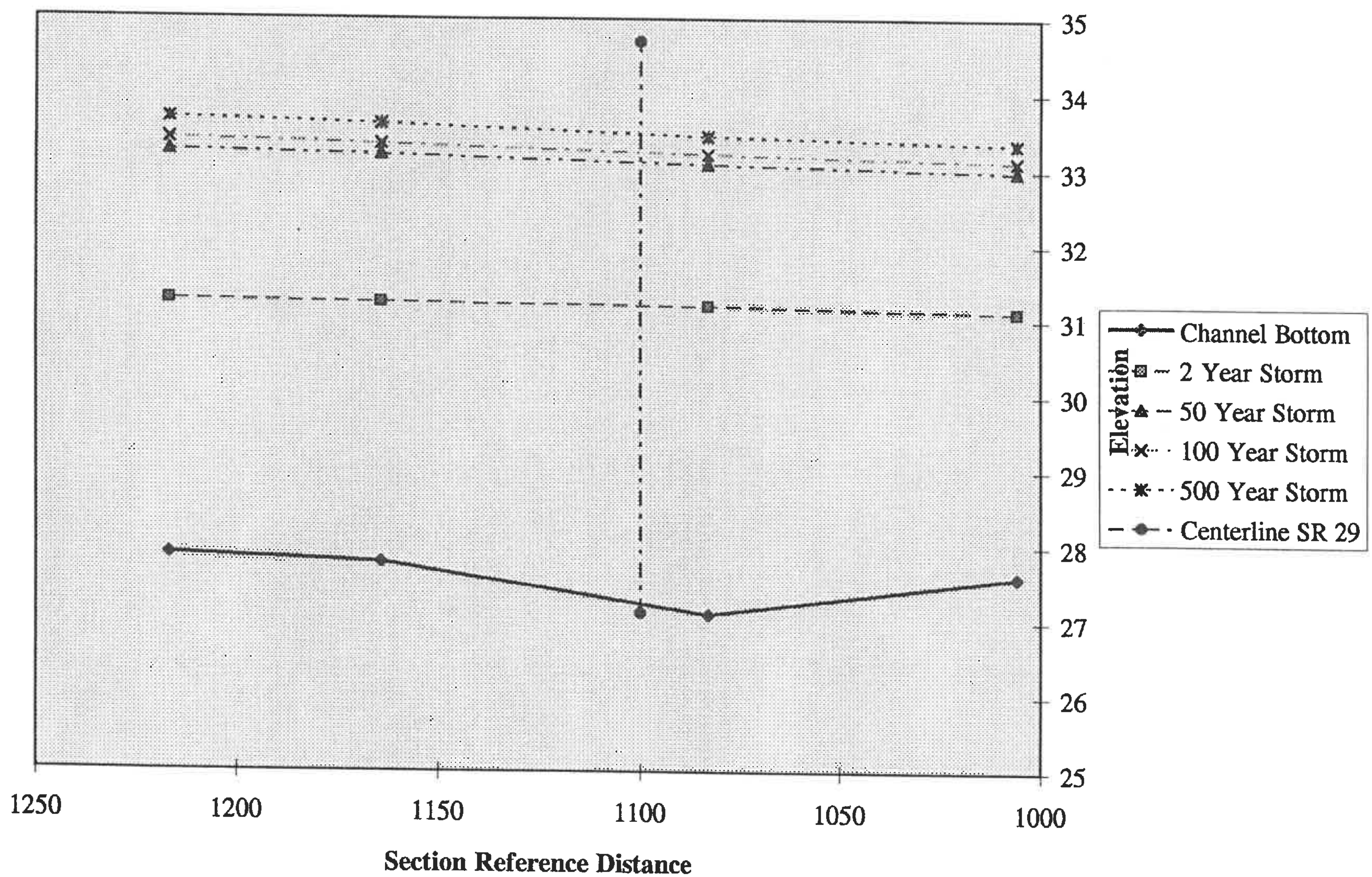
Existing Bridge Cross Section



WSPRO

Open Channel Analysis

Water Surface Profiles



SR 29 - Lone Pine Creek
Bridge No. 050035

No Bridge

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

            *** RUN DATE & TIME: 03-04-96  08:35

   T1          SR 29 - OPEN CHANNEL ANALYSIS
   T2          LONE PINE CREEK @ BR#050035 (SR29OPEN.DAT)
   *
   J3          5  6  3  17  13  14  16  28
   *
   *           2 YEAR  50 YEAR  100 YEAR  500 YEAR
   Q             138    598       685       874
 *** Q-DATA FOR SEC-ID, ISEQ =             1
   *
   *           SLOPE FROM QUAD MAP
   SK          0.0013  0.0013  0.0013  0.0013
   *
   *           SURVEY X-SCT LOCATED 100' DOWNSTREAM OF BRIDGE

 *** START PROCESSING CROSS SECTION - "SURV1"
   XS    SURV1  1006
   GR          4136,45.0  4136,35.0  5000,33.6  5052,33.6  5102,33.5
   GR          5200,33.5  5495,33.5  5594,33.4  5741,33.4  5791,33.3  5840,33.1
   GR          5878,32.8  5903,32.8
   GR          5938,32.7  5953,32.2  5959,31.2  5964,30.5
   GR          5969,29.5  5975,27.9  5988,27.6  6003,27.9
   GR          6007,28.1  6008,28.9  6013,29.5  6017,30.5  6022,31.2
   GR          6037,31.9  6086,32.0  6135,32.1  6184,32.3  6184,32.3
   GR          6234,32.3  6283,32.3  6332,32.2  6430,31.9  6480,31.8
   GR          6529,32.4  6578,33.5  6627,33.6  6725,33.9
   GR          6774,34.0  6823,34.8  6872,35.2  6921,35.3  6970,35.4
   N           0.06  0.15  0.10  0.15  0.06
   SA             5838  5938  6037  6287
   *
   *           SURVEY X-SCT LOCATED @ DOWNSTREAM FACE OF BRIDGE

 *** FINISH PROCESSING CROSS SECTION - "SURV1"
 *** CROSS SECTION "SURV1" WRITTEN TO DISK, RECORD NO. =  1

 --- DATA SUMMARY FOR SECID "SURV1" AT SRD =    1006.  ERR-CODE =      0

      SKEW      IHFNO     VSLOPE        EK        CK
        .0         0. *********        .50       .00

 X-Y COORDINATE PAIRS   (NGP =  45):
           X        Y            X        Y            X        Y            X        Y
      4136.0    45.00       4136.0    35.00       5000.0    33.60       5052.0    33.60
      5102.0    33.50       5200.0    33.50       5495.0    33.50       5594.0    33.40
      5741.0    33.40       5791.0    33.30       5840.0    33.10       5878.0    32.80
      5903.0    32.80       5938.0    32.70       5953.0    32.20       5959.0    31.20
      5964.0    30.50       5969.0    29.50       5975.0    27.90       5988.0    27.60
      6003.0    27.90       6007.0    28.10       6008.0    28.90       6013.0    29.50
      6017.0    30.50       6022.0    31.20       6037.0    31.90       6086.0    32.00
      6135.0    32.10       6184.0    32.30       6184.0    32.30       6234.0    32.30
      6283.0    32.30       6332.0    32.20       6430.0    31.90       6480.0    31.80
      6529.0    32.40       6578.0    33.50       6627.0    33.60       6725.0    33.90
      6774.0    34.00       6823.0    34.80       6872.0    35.20       6921.0    35.30
      6970.0    35.40

  X-Y MAX-MIN POINTS:
```

```
     XMIN        Y          X     YMIN       XMAX        Y          X     YMAX
   4136.0    45.00     5988.0    27.60     6970.0    35.40     4136.0    45.00

 SUBAREA BREAKPOINTS (NSA =  5):
       5838.   5938.   6037.   6287.

 ROUGHNESS COEFFICIENTS (NSA =  5):
         .060     .150     .100     .150     .060

 *** START PROCESSING CROSS SECTION - "SURV2"
   XS    SURV2   1083
   GR         4038,45.0  4038,35.0  5102,33.7
   GR         5151,33.7  5299,33.6  5348,33.6
   GR         5397,33.7  5446,33.7  5495,33.7  5840,33.8
   GR         5889,33.3  5938,32.8
   GR         5968,28.5  5970,28.0  5988,27.0
   GR         6007,28.3  6037,32.0  6086,32.1  6135,32.4  6184,32.4  6233,32.9
   GR         6282,33.0  6331,33.0  6527,33.0
   GR         6576,33.6  6625,33.9  6674,33.8  6723,34.1  6772,34.3
   GR         6821,34.6  6870,34.9  6919,34.9  6968,34.9
   N          0.15    0.06   0.10     0.06  0.15
   SA             5838   5938    6037    6137
   *
   *          SURVEY X-SCT LOCATED IMMEDIATELY UPSTREAM OF BRIDGE

 *** FINISH PROCESSING CROSS SECTION - "SURV2"
 *** CROSS SECTION "SURV2" WRITTEN TO DISK, RECORD NO. =  2

 --- DATA SUMMARY FOR SECID "SURV2" AT SRD =   1083.  ERR-CODE =      0

      SKEW      IHFNO    VSLOPE         EK         CK
        .0         0. *********        .50        .00

 X-Y COORDINATE PAIRS  (NGP =  33):
        X        Y          X        Y          X        Y          X        Y
   4038.0    45.00     4038.0    35.00     5102.0    33.70     5151.0    33.70
   5299.0    33.60     5348.0    33.60     5397.0    33.70     5446.0    33.70
   5495.0    33.70     5840.0    33.80     5889.0    33.30     5938.0    32.80
   5968.0    28.50     5970.0    28.00     5988.0    27.00     6007.0    28.30
   6037.0    32.00     6086.0    32.10     6135.0    32.40     6184.0    32.40
   6233.0    32.90     6282.0    33.00     6331.0    33.00     6527.0    33.00
   6576.0    33.60     6625.0    33.90     6674.0    33.80     6723.0    34.10
   6772.0    34.30     6821.0    34.60     6870.0    34.90     6919.0    34.90
   6968.0    34.90

 X-Y MAX-MIN POINTS:
     XMIN        Y          X     YMIN       XMAX        Y          X     YMAX
   4038.0    45.00     5988.0    27.00     6968.0    34.90     4038.0    45.00

 SUBAREA BREAKPOINTS (NSA =  5):
       5838.   5938.   6037.   6137.

 ROUGHNESS COEFFICIENTS (NSA =  5):
         .150     .060     .100     .060     .150

 *** START PROCESSING CROSS SECTION - "SURV3"
   XS    SURV3    1164
   GR         5855,45.5  5855,35.5  5877,35.2  5912,34.4  5925,33.8
   GR         5938,32.8  5952,32.2  5970,27.8  6002,27.9
   GR         6020,27.9  6032,27.9
```

```
  GR        6047,29.5  6053,32.4  6103,32.4  6152,32.2  6201,32.4
  GR        6250,32.6  6299,32.6  6348,32.4  6397,32.6  6446,32.6
  GR        6495,32.7  6544,33.1  6593,33.5  6642,33.8  6691,33.9
  GR        6740,34.5  6789,34.5  6838,34.5  6887,34.6  6936,34.8
  GR        6985,35.2
  N         0.012    0.06   0.10    0.15   0.06
  SA             5877    5938   6053    6553
  FL        108  5952   83  5972  112
  *
  *         SURVEY X-SCT LOCATED 100' UPSTREAM OF BRIDGE

*** FINISH PROCESSING CROSS SECTION - "SURV3"
*** CROSS SECTION "SURV3" WRITTEN TO DISK, RECORD NO. =  3

--- DATA SUMMARY FOR SECID "SURV3" AT SRD =   1164.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE         EK         CK
       .0         0. *********        .50        .00

X-Y COORDINATE PAIRS  (NGP =  32):
        X       Y             X       Y             X       Y             X       Y
   5855.0   45.50       5855.0   35.50       5877.0   35.20       5912.0   34.40
   5925.0   33.80       5938.0   32.80       5952.0   32.20       5970.0   27.80
   6002.0   27.90       6020.0   27.90       6032.0   27.90       6047.0   29.50
   6053.0   32.40       6103.0   32.40       6152.0   32.20       6201.0   32.40
   6250.0   32.60       6299.0   32.60       6348.0   32.40       6397.0   32.60
   6446.0   32.60       6495.0   32.70       6544.0   33.10       6593.0   33.50
   6642.0   33.80       6691.0   33.90       6740.0   34.50       6789.0   34.50
   6838.0   34.50       6887.0   34.60       6936.0   34.80       6985.0   35.20

 X-Y MAX-MIN POINTS:
     XMIN        Y            X    YMIN        XMAX        Y            X    YMAX
   5855.0   45.50       5970.0   27.80       6985.0   35.20       5855.0   45.50

SUBAREA BREAKPOINTS (NSA =  5):
       5877.   5938.   6053.   6553.

ROUGHNESS COEFFICIENTS (NSA =  5):
         .012    .060    .100    .150    .060

FLOW LENGTH DATA (NFL = 3):
             FLEN       XSTA       FLEN       XSTA       FLEN
             108.      5952.        83.      5972.       112.

*** START PROCESSING CROSS SECTION - "SURV4"
  XS   SURV4    1217
  GR        5855,45.5  5855,35.5  5877,35.2  5895,34.7  5910,34.4
  GR        5914,33.8  5918,32.8  5922,32.2  5926,31.2  5928,28.5
  GR        5933,28.1  5946,27.9  5949,28.9  5952,29.5  5955,30.5
  GR        5958,31.2  5962,32.2  5998,32.3  6022,32.8  6052,32.9
  GR        6055,32.2  6060,31.2  6066,30.5  6071,29.5  6076,28.9
  GR        6079,28.4  6081,27.9  6098,27.9  6102,28.9
  GR        6107,29.5  6113,30.5  6114,30.7  6118,31.2  6127,32.2
  GR        6147,32.5  6197,32.1  6246,32.2  6295,32.2  6344,33.1  6393,33.4
  GR        6687,33.6  6736,33.9  6785,34.1  6834,34.2  6883,34.4
  GR        6932,34.4  6981,34.8  7120,34.8  7169,35.1
  N         0.012  0.10  0.15  0.10  0.06
  SA             5895  5962  6055  6127
  FL        81   5998   54   6079   45
  *
```

```
 EX

*** FINISH PROCESSING CROSS SECTION - "SURV4"
*** CROSS SECTION "SURV4" WRITTEN TO DISK, RECORD NO. =  4

--- DATA SUMMARY FOR SECID "SURV4" AT SRD =    1217.   ERR-CODE =       0

      SKEW      IHFNO     VSLOPE         EK         CK
        .0         0. *********         .50        .00

X-Y COORDINATE PAIRS  (NGP =  49):
        X        Y             X        Y             X        Y             X        Y
   5855.0   45.50        5855.0   35.50        5877.0   35.20        5895.0   34.70
   5910.0   34.40        5914.0   33.80        5918.0   32.80        5922.0   32.20
   5926.0   31.20        5928.0   28.50        5933.0   28.10        5946.0   27.90
   5949.0   28.90        5952.0   29.50        5955.0   30.50        5958.0   31.20
   5962.0   32.20        5998.0   32.30        6022.0   32.80        6052.0   32.90
   6055.0   32.20        6060.0   31.20        6066.0   30.50        6071.0   29.50
   6076.0   28.90        6079.0   28.40        6081.0   27.90        6098.0   27.90
   6102.0   28.90        6107.0   29.50        6113.0   30.50        6114.0   30.70
   6118.0   31.20        6127.0   32.20        6147.0   32.50        6197.0   32.10
   6246.0   32.20        6295.0   32.20        6344.0   33.10        6393.0   33.40
   6687.0   33.60        6736.0   33.90        6785.0   34.10        6834.0   34.20
   6883.0   34.40        6932.0   34.40        6981.0   34.80        7120.0   34.80
   7169.0   35.10

 X-Y MAX-MIN POINTS:
     XMIN        Y             X     YMIN         XMAX        Y             X     YMAX
   5855.0   45.50        5946.0   27.90       7169.0    35.10        5855.0   45.50

SUBAREA BREAKPOINTS (NSA =  5):
       5895.    5962.    6055.    6127.

ROUGHNESS COEFFICIENTS (NSA =  5):
          .012     .100     .150     .100     .060

FLOW LENGTH DATA (NFL = 3):
          FLEN       XSTA       FLEN       XSTA       FLEN
           81.      5998.        54.      6079.        45.


+++ BEGINNING PROFILE CALCULATIONS --    4
******************************2 YEAR STORM**************************************
 XSID:CODE    SRDL     LEW     AREA    VHD     HF      EGL     CRWS        Q      WSEL
       SRD    FLEN     REW        K   ALPH     HO      ERR      FR#      VEL

SURV1:XS    ******   5960.     146.    .01  *****    31.13    28.66     138.    31.11
     1006.  ******   6021.    3827.   1.00  ***** *******      .11      .95

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                                 "SURV2"     KRATIO =  1.40

SURV2:XS       77.   5949.     199.    .01    .07    31.20 *******     138.    31.20
     1083.     77.   6030.    5367.   1.00    .00      .00      .08      .69

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                                 "SURV3"     KRATIO =  1.54

SURV3:XS       81.   5956.     275.    .00    .05    31.25 *******     138.    31.25
     1164.    110.   6051.    8280.   1.00    .00      .00      .05      .50
```

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"SURV4" KRATIO = .61

SURV4:XS	53.	5926.	203.	.01	.03	31.28	*******	138.	31.28
1217.	61.	6119.	5045.	1.01	.00	.00	.08	.68	

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
SURV1:XS	138.	1006.	31.11	146.	.95	.11	3827.	62.
SURV2:XS	138.	1083.	31.20	199.	.69	.08	5367.	81.
SURV3:XS	138.	1164.	31.25	275.	.50	.05	8280.	95.
SURV4:XS	138.	1217.	31.28	203.	.68	.08	5045.	92.

******************************50 YEAR STORM**

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SURV1:XS	******	5854.	759.	.01	*****	33.01	29.91	598.	32.99
1006.	******	6555.	16575.	1.51	*****	*******	.16	.79	
SURV2:XS	77.	5909.	557.	.03	.10	33.12	*******	598.	33.09
1083.	77.	6534.	16083.	1.41	.01	.00	.24	1.07	
SURV3:XS	81.	5933.	823.	.02	.11	33.23	*******	598.	33.22
1164.	109.	6558.	21084.	1.98	.00	.00	.16	.73	
SURV4:XS	53.	5916.	698.	.01	.05	33.29	*******	598.	33.27
1217.	57.	6373.	19604.	1.25	.00	.01	.14	.86	

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
SURV1:XS	598.	1006.	32.99	759.	.79	.16	16575.	702.
SURV2:XS	598.	1083.	33.09	557.	1.07	.24	16083.	625.
SURV3:XS	598.	1164.	33.22	823.	.73	.16	21084.	626.
SURV4:XS	598.	1217.	33.27	698.	.86	.14	19604.	456.

******************************100 YEAR STORM***************************************

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SURV1:XS	******	5836.	847.	.02	*****	33.13	30.08	685.	33.12
1006.	******	6561.	18998.	1.51	*****	*******	.16	.81	
SURV2:XS	77.	5897.	638.	.03	.11	33.25	*******	685.	33.22
1083.	77.	6545.	17771.	1.55	.01	.00	.24	1.07	
SURV3:XS	81.	5931.	912.	.02	.12	33.38	*******	685.	33.36
1164.	109.	6576.	23104.	2.04	.00	.00	.16	.75	
SURV4:XS	53.	5916.	765.	.02	.05	33.43	*******	685.	33.42
1217.	56.	6419.	21514.	1.27	.00	.00	.14	.90	

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
SURV1:XS	685.	1006.	33.12	847.	.81	.16	18998.	725.
SURV2:XS	685.	1083.	33.22	638.	1.07	.24	17771.	648.
SURV3:XS	685.	1164.	33.36	912.	.75	.16	23104.	645.
SURV4:XS	685.	1217.	33.42	765.	.90	.14	21514.	504.

******************************500 YEAR STORM**************************************

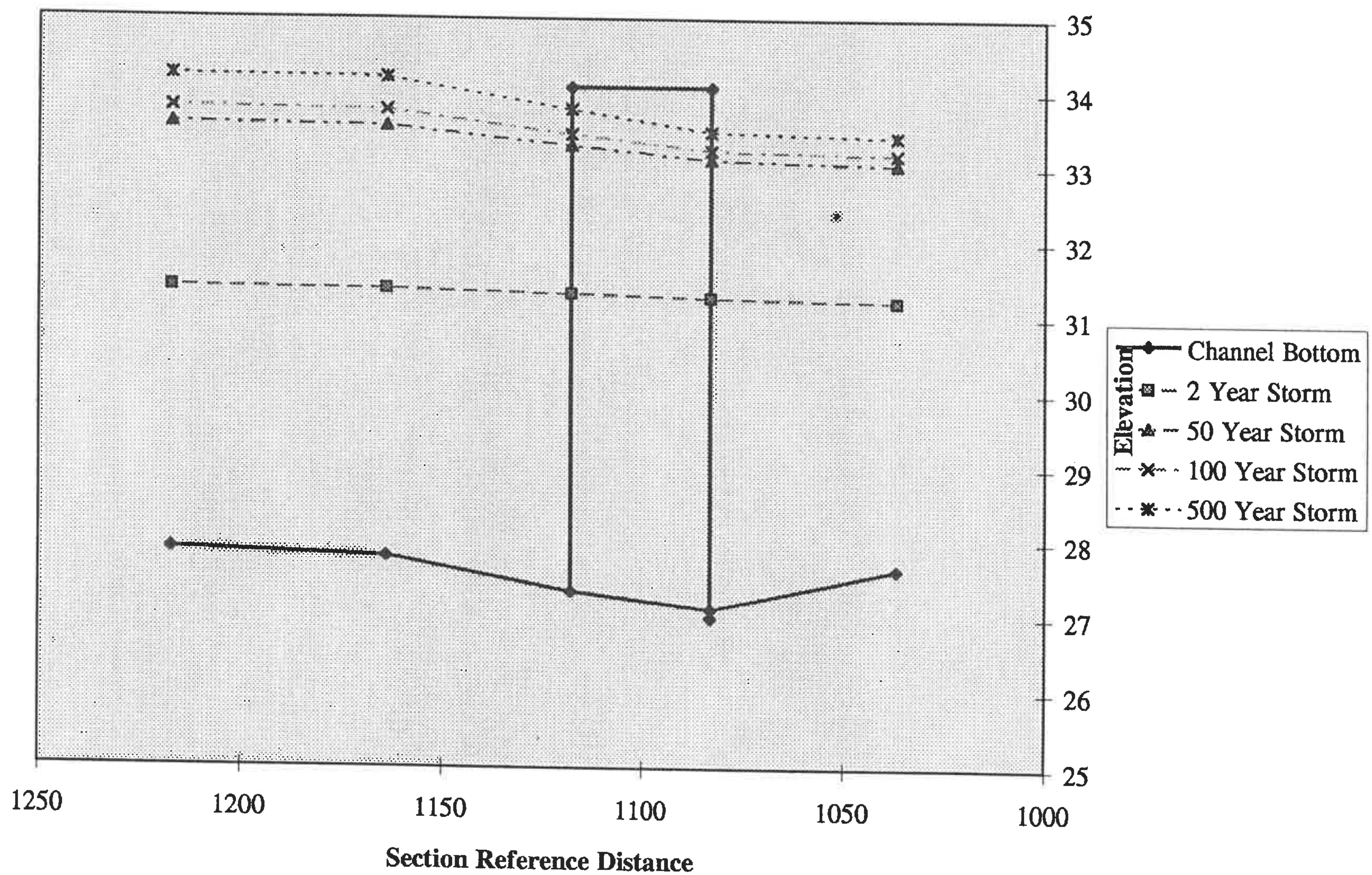
XSID:CODE SRD	SRDL FLEN	LEW REW	AREA K	VHD ALPH	HF HO	EGL ERR	CRWS FR#	Q VEL	WSEL
SURV1:XS	******	5765.	1027.	.02	*****	33.37	30.45	874.	33.35
1006.	******	6571.	24226.	1.50	*****	*******	.16	.85	
SURV2:XS	77.	5873.	800.	.03	.11	33.49	*******	874.	33.46
1083.	77.	6565.	21517.	1.72	.01	.00	.23	1.09	
SURV3:XS	81.	5927.	1086.	.02	.14	33.64	*******	874.	33.62
1164.	109.	6613.	27352.	2.10	.00	.01	.16	.80	
SURV4:XS	53.	5914.	948.	.02	.06	33.70	*******	874.	33.69
1217.	56.	6701.	25232.	1.43	.00	.00	.18	.92	

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
SURV1:XS	874.	1006.	33.35	1027.	.85	.16	24226.	806.
SURV2:XS	874.	1083.	33.46	800.	1.09	.23	21517.	692.
SURV3:XS	874.	1164.	33.62	1086.	.80	.16	27352.	685.
SURV4:XS	874.	1217.	33.69	948.	.92	.18	25232.	787.

WSPRO

Existing Bridge Analysis

Water Surface Profiles



SR 29 - Lone Pine Creek
Bridge No. 050035

Existing Bridge

```
WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME: 03-01-96  15:05

   T1         SR 29 - EXISTING BRIDGE ANALYSIS
   T2         LONE PINE CREEK @ BR#050035 (SR29EXBR.DAT)
   *
   J3         5  6  3  17  13  14  16  28
   *
   *          2 YEAR  50 YEAR  100 YEAR  500 YEAR
   Q            138     598      685       874
 *** Q-DATA FOR SEC-ID, ISEQ =             1
   *
   *          SLOPE FROM QUAD MAP
   SK         0.0012  0.0012  0.0012  0.0012
   *
   *          SURVEY X-SCT LOCATED 100' DOWNSTREAM OF BRIDGE

 *** START PROCESSING CROSS SECTION - "SURV1"
   XT    SURV1  1006
   GR         4126,45.0  4136,35.0  5000,33.6  5052,33.6  5102,33.5
   GR         5200,33.5  5495,33.5  5594,33.4  5741,33.4  5791,33.3  5840,33.1
   GR         5878,32.8  5903,32.8
   GR         5938,32.7  5953,32.2  5959,31.2  5964,30.5
   GR         5969,29.5  5975,27.9  5988,27.6  6003,27.9
   GR         6007,28.1  6008,28.9  6013,29.5  6017,30.5  6022,31.2
   GR         6037,31.9  6086,32.0  6135,32.1  6184,32.3  6184,32.3
   GR         6234,32.3  6283,32.3  6332,32.2  6430,31.9  6480,31.8
   GR         6529,32.4  6578,33.5  6627,33.6  6725,33.9
   GR         6774,34.0  6823,34.8  6872,35.2  6921,35.3  6970,35.4  6980,45.4
   *

 *** FINISH PROCESSING CROSS SECTION - "SURV1"
 *** TEMPLATE CROSS SECTION "SURV1" SAVED INTERNALLY.

 *** START PROCESSING CROSS SECTION - "EXIT "
   XS    EXIT     1037  * * *  0.0012
   GT
   N          0.06  0.15  0.10  0.15  0.06
   SA            5838  5938  6037  6287
   *
   *          SURVEY X-SCT LOCATED @ DOWNSTREAM FACE OF BRIDGE

 *** FINISH PROCESSING CROSS SECTION - "EXIT "
 *** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. =  1

 --- DATA SUMMARY FOR SECID "EXIT " AT SRD =   1037.  ERR-CODE =      0

      SKEW     IHFNO    VSLOPE       EK       CK
        .0        0.     .0012       .50      .00

 X-Y COORDINATE PAIRS  (NGP =  46):
        X        Y         X        Y          X        Y          X        Y
    4126.0   45.04    4136.0   35.04     5000.0   33.64     5052.0   33.64
    5102.0   33.54    5200.0   33.54     5495.0   33.54     5594.0   33.44
    5741.0   33.44    5791.0   33.34     5840.0   33.14     5878.0   32.84
    5903.0   32.84    5938.0   32.74     5953.0   32.24     5959.0   31.24
    5964.0   30.54    5969.0   29.54     5975.0   27.94     5988.0   27.64
    6003.0   27.94    6007.0   28.14     6008.0   28.94     6013.0   29.54
```

```
   6017.0   30.54    6022.0   31.24    6037.0   31.94    6086.0   32.04
   6135.0   32.14    6184.0   32.34    6184.0   32.34    6234.0   32.34
   6283.0   32.34    6332.0   32.24    6430.0   31.94    6480.0   31.84
   6529.0   32.44    6578.0   33.54    6627.0   33.64    6725.0   33.94
   6774.0   34.04    6823.0   34.84    6872.0   35.24    6921.0   35.34
   6970.0   35.44    6980.0   45.44

 X-Y MAX-MIN POINTS:
    XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
   4126.0   45.04    5988.0   27.64    6980.0   45.44    6980.0   45.44

 SUBAREA BREAKPOINTS (NSA =  5):
       5838.   5938.   6037.   6287.

 ROUGHNESS COEFFICIENTS (NSA =  5):
         .060    .150    .100    .150    .060

 *** START PROCESSING CROSS SECTION - "FULLV"
   XS    FULLV   1083
   GR          4028,40.0  4038,35.0  5102,33.7
   GR          5151,33.7  5299,33.6  5348,33.6
   GR          5397,33.7  5446,33.7  5495,33.7  5840,33.8
   GR          5889,33.3  5938,32.8
   GR          5968,28.5  5970,28.0  5988,27.0
   GR          6007,28.3  6037,32.0  6086,32.1  6135,32.4  6184,32.4  6233,32.9
   GR          6282,33.0  6331,33.0  6527,33.0
   GR          6576,33.6  6625,33.9  6674,33.8  6723,34.1  6772,34.3
   GR          6821,34.6  6870,34.9  6919,34.9  6968,34.9  6978,39.9
   N           0.15    0.06    0.10     0.06  0.15
   SA              5838    5938     6037     6137
   *

 *** FINISH PROCESSING CROSS SECTION - "FULLV"
 *** CROSS SECTION "FULLV" WRITTEN TO DISK, RECORD NO. =  2

 --- DATA SUMMARY FOR SECID "FULLV" AT SRD =    1083.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE        EK         CK
        .0         0.      .0012        .50        .00

 X-Y COORDINATE PAIRS  (NGP =  34):
        X        Y          X        Y          X        Y          X        Y
   4028.0   40.00    4038.0   35.00    5102.0   33.70    5151.0   33.70
   5299.0   33.60    5348.0   33.60    5397.0   33.70    5446.0   33.70
   5495.0   33.70    5840.0   33.80    5889.0   33.30    5938.0   32.80
   5968.0   28.50    5970.0   28.00    5988.0   27.00    6007.0   28.30
   6037.0   32.00    6086.0   32.10    6135.0   32.40    6184.0   32.40
   6233.0   32.90    6282.0   33.00    6331.0   33.00    6527.0   33.00
   6576.0   33.60    6625.0   33.90    6674.0   33.80    6723.0   34.10
   6772.0   34.30    6821.0   34.60    6870.0   34.90    6919.0   34.90
   6968.0   34.90    6978.0   39.90

 X-Y MAX-MIN POINTS:
    XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
   4028.0   40.00    5988.0   27.00    6978.0   39.90    4028.0   40.00

 SUBAREA BREAKPOINTS (NSA =  5):
       5838.   5938.   6037.   6137.

 ROUGHNESS COEFFICIENTS (NSA =  5):
```

```
        .150    .060    .100    .060    .150

 *** START PROCESSING CROSS SECTION - "BRDGE"
   BR   BRDGE    1083  34.08
   GR         5967,34.08  5967,28.5  5969,28.4  5977,27.7
   GR         5981,27.4  5985,27.4  5993,27.4  5996,27.1
   GR         6001,27.3  6009,28.2  6010,28.2
   GR         6010,34.08  5967,34.08
   CD         4  35.1  6.0  35.7  45
   PW 1       27.1,2.0  32.7,2.0  32.7,4.0  34.08,4.0
   N          0.10
   *
   *

 *** FINISH PROCESSING CROSS SECTION - "BRDGE"
 *** CROSS SECTION "BRDGE" WRITTEN TO DISK, RECORD NO. =  3

 --- DATA SUMMARY FOR SECID "BRDGE" AT SRD =   1083.  ERR-CODE =      0

      SKEW     IHFNO     VSLOPE        EK         CK
        .0        0.      .0012        .50        .00

 X-Y COORDINATE PAIRS  (NGP =  13):
        X        Y          X        Y          X        Y          X        Y
    5967.0   34.08     5967.0   28.50     5969.0   28.40     5977.0   27.70
    5981.0   27.40     5985.0   27.40     5993.0   27.40     5996.0   27.10
    6001.0   27.30     6009.0   28.20     6010.0   28.20     6010.0   34.08
    5967.0   34.08

  X-Y MAX-MIN POINTS:
     XMIN        Y          X     YMIN      XMAX        Y          X     YMAX
    5967.0   34.08     5996.0   27.10     6010.0   28.20     5967.0   34.08

 ROUGHNESS COEFFICIENTS (NSA =  1):
          .100

 BRIDGE PARAMETERS:
  BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
     4     35.1     34.08 *******   6.00    35.70   45.00

 PIER DATA:   NPW =   4    PPCD = 1.
      PELV  PWDTH        PELV  PWDTH        PELV  PWDTH        PELV  PWDTH
     27.10    2.0       32.70    2.0       32.70    4.0       34.08    4.0

 *** START PROCESSING CROSS SECTION - "ROAD "
   XR   ROAD     1100  60.0
   GR         5338,40.5
   GR         5348,35.5  5397,35.5  5447,35.7  5496,35.6  5545,35.5  5594,35.5
   GR         5644,35.5  5693,35.6  5742,35.5  5791,35.6  5840,35.5  5890,35.5
   GR         5939,35.5  5968,35.6  5988,35.6  6008,35.6  6037,35.5  6086,35.5
   GR         6136,35.5  6185,35.5  6234,35.6  6283,35.5  6332,35.5  6382,35.7
   GR         6431,35.7  6480,35.7  6529,35.7  6579,35.7  6628,35.8  6677,35.8
   GR         6687,40.8
   N          0.012
   *
   *          SURVEY X-SCT LOCATED UPSTREAM OF BRIDGE

 *** FINISH PROCESSING CROSS SECTION - "ROAD "
 *** CROSS SECTION "ROAD " WRITTEN TO DISK, RECORD NO. =  4
```

```
--- DATA SUMMARY FOR SECID "ROAD " AT SRD =   1100.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE        EK         CK
        .0         0.      .0012       .50        .00

X-Y COORDINATE PAIRS   (NGP =   32):
         X        Y             X       Y             X       Y             X       Y
    5338.0    40.50      5348.0    35.50      5397.0    35.50      5447.0    35.70
    5496.0    35.60      5545.0    35.50      5594.0    35.50      5644.0    35.50
    5693.0    35.60      5742.0    35.50      5791.0    35.60      5840.0    35.50
    5890.0    35.50      5939.0    35.50      5968.0    35.60      5988.0    35.60
    6008.0    35.60      6037.0    35.50      6086.0    35.50      6136.0    35.50
    6185.0    35.50      6234.0    35.60      6283.0    35.50      6332.0    35.50
    6382.0    35.70      6431.0    35.70      6480.0    35.70      6529.0    35.70
    6579.0    35.70      6628.0    35.80      6677.0    35.80      6687.0    40.80

X-Y MAX-MIN POINTS:
      XMIN         Y             X    YMIN        XMAX         Y             X    YMAX
    5338.0    40.50      5348.0    35.50      6687.0    40.80      6687.0    40.80

ROUGHNESS COEFFICIENTS (NSA =  1):
        .012

ROAD GRADE DATA:  IPAVE  RDWID  USERCF
                  *****   60.0 *******

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******

*** START PROCESSING CROSS SECTION - "APPR "
  AS    APPR     1163
  GR          5845,40.5  5855,35.5  5877,35.2  5912,34.4  5925,33.8
  GR          5938,32.8  5952,32.2  5970,27.8  6002,27.9
  GR          6020,27.9  6032,27.9
  GR          6047,29.5  6053,32.4  6103,32.4  6152,32.2  6201,32.4
  GR          6250,32.6  6299,32.6  6348,32.4  6397,32.6  6446,32.6
  GR          6495,32.7  6544,33.1  6593,33.5  6642,33.8  6691,33.9
  GR          6740,34.5  6789,34.5  6838,34.5  6887,34.6  6936,34.8
  GR          6985,35.2  6995,40.2
  N           0.012    0.06   0.10    0.15   0.06
  SA              5877     5938    6053    6553
  FL          108  5952   83  5972  112
  BP          5877  5999
  *
  *
  *           SURVEY X-SCT LOCATED 100' UPSTREAM OF BRIDGE

*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =  5

--- DATA SUMMARY FOR SECID "APPR " AT SRD =   1163.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE        EK         CK
        .0         0.      .0012       .50        .00

X-Y COORDINATE PAIRS   (NGP =   33):
         X        Y             X       Y             X       Y             X       Y
    5845.0    40.50      5855.0    35.50      5877.0    35.20      5912.0    34.40
    5925.0    33.80      5938.0    32.80      5952.0    32.20      5970.0    27.80
    6002.0    27.90      6020.0    27.90      6032.0    27.90      6047.0    29.50
```

```
   6053.0   32.40    6103.0   32.40    6152.0   32.20    6201.0   32.40
   6250.0   32.60    6299.0   32.60    6348.0   32.40    6397.0   32.60
   6446.0   32.60    6495.0   32.70    6544.0   33.10    6593.0   33.50
   6642.0   33.80    6691.0   33.90    6740.0   34.50    6789.0   34.50
   6838.0   34.50    6887.0   34.60    6936.0   34.80    6985.0   35.20
   6995.0   40.20

 X-Y MAX-MIN POINTS:
     XMIN        Y          X    YMIN       XMAX        Y          X    YMAX
   5845.0   40.50    5970.0   27.80    6995.0   40.20    5845.0   40.50

 SUBAREA BREAKPOINTS (NSA =  5):
       5877.    5938.    6053.    6553.

 ROUGHNESS COEFFICIENTS (NSA =  5):
         .012     .060     .100     .150     .060

 FLOW LENGTH DATA (NFL = 3):
           FLEN       XSTA       FLEN       XSTA       FLEN
           108.      5952.        83.      5972.       112.

 BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                           5877.   5999. ******* *******

 *** START PROCESSING CROSS SECTION - "REFE "
  XS    REFE    1217
  GR         5845,40.5  5855,35.5  5877,35.2  5895,34.7  5910,34.4
  GR         5914,33.8  5918,32.8  5922,32.2  5926,31.2  5928,28.5
  GR         5933,28.1  5946,27.9  5949,28.9  5952,29.5  5955,30.5
  GR         5958,31.2  5962,32.2  5998,32.3  6022,32.8  6052,32.9
  GR         6055,32.2  6060,31.2  6066,30.5  6071,29.5  6076,28.9
  GR         6079,28.4  6081,27.9  6098,27.9  6102,28.9
  GR         6107,29.5  6113,30.5  6114,30.7  6118,31.2  6127,32.2
  GR         6147,32.5  6197,32.1  6246,32.2  6295,32.2  6344,33.1  6393,33.4
  GR         6687,33.6  6736,33.9  6785,34.1  6834,34.2  6883,34.4
  GR         6932,34.4  6981,34.8  7120,34.8  7169,35.1  7179,40.1
  N          0.012  0.10  0.15  0.10  0.06
  SA             5895  5962  6055  6127
  FL         81   5998   54   6079   45
  *
  HP 1 APPR 33.56   1  33.56

 *** FINISH PROCESSING CROSS SECTION - "REFE "
 *** CROSS SECTION "REFE " WRITTEN TO DISK, RECORD NO. =  6

 --- DATA SUMMARY FOR SECID "REFE " AT SRD =   1217.  ERR-CODE =      0

     SKEW     IHFNO     VSLOPE       EK        CK
       .0        0.     .0012       .50       .00

 X-Y COORDINATE PAIRS  (NGP =  50):
        X        Y          X        Y          X        Y          X        Y
   5845.0   40.50    5855.0   35.50    5877.0   35.20    5895.0   34.70
   5910.0   34.40    5914.0   33.80    5918.0   32.80    5922.0   32.20
   5926.0   31.20    5928.0   28.50    5933.0   28.10    5946.0   27.90
   5949.0   28.90    5952.0   29.50    5955.0   30.50    5958.0   31.20
   5962.0   32.20    5998.0   32.30    6022.0   32.80    6052.0   32.90
   6055.0   32.20    6060.0   31.20    6066.0   30.50    6071.0   29.50
   6076.0   28.90    6079.0   28.40    6081.0   27.90    6098.0   27.90
   6102.0   28.90    6107.0   29.50    6113.0   30.50    6114.0   30.70
```

```
   6118.0    31.20    6127.0    32.20    6147.0    32.50    6197.0    32.10
   6246.0    32.20    6295.0    32.20    6344.0    33.10    6393.0    33.40
   6687.0    33.60    6736.0    33.90    6785.0    34.10    6834.0    34.20
   6883.0    34.40    6932.0    34.40    6981.0    34.80    7120.0    34.80
   7169.0    35.10    7179.0    40.10

 X-Y MAX-MIN POINTS:
     XMIN        Y         X     YMIN      XMAX        Y         X     YMAX
   5845.0    40.50    5946.0    27.90    7179.0    40.10    5845.0    40.50

 SUBAREA BREAKPOINTS (NSA =  5):
       5895.   5962.   6055.   6127.

 ROUGHNESS COEFFICIENTS (NSA =  5):
         .012    .100    .150    .100    .060

 FLOW LENGTH DATA (NFL = 3):
           FLEN       XSTA       FLEN       XSTA       FLEN
            81.      5998.        54.      6079.        45.

***********************************50 YEAR STORM********************************

    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = APPR ;  SRD =    1163.

     WSEL  SA#      AREA         K   TOPW   WETP  ALPH    LEW    REW      QCR
             2        4.       49.    10.    10.                          13.
             3      520.    21029.   115.   116.                        6275.
             4      512.     5169.   500.   500.                        2941.
             5        9.       74.    50.    50.                          23.
    33.56          1045.    26321.   675.   676.  2.09  5928.  6603.    5103.

    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = APPR ;  SRD =    1163.

         WSEL     LEW     REW    AREA        K        Q    VEL
        33.56  5928.1  6602.8  1045.1   26321.     598.    .57

 X STA.      5928.1      5970.5      5975.3      5980.2      5985.0      5989.9
   A(I)            85.4        27.7        28.1        27.6        27.6
   V(I)             .35        1.08        1.06        1.08        1.08

 X STA.      5989.9      5994.7      5999.6      6004.6      6009.6      6014.5
   A(I)            27.4        28.1        28.3        28.0        28.0
   V(I)            1.09        1.06        1.06        1.07        1.07

 X STA.      6014.5      6019.6      6024.6      6029.5      6034.8      6040.7
   A(I)            28.6        28.6        27.9        29.1        30.0
   V(I)            1.05        1.05        1.07        1.03        1.00

 X STA.      6040.7      6049.1      6148.5      6252.8      6377.6      6602.8
   A(I)            35.1       123.4       121.0       128.8       156.4
   V(I)             .85         .24         .25         .23         .19


    CROSS-SECTION PROPERTIES:  ISEQ =  3;  SECID = BRDGE;  SRD =    1083.

     WSEL  SA#      AREA         K   TOPW   WETP  ALPH    LEW    REW      QCR
             1      236.     9553.    43.    53.                        3136.
    33.12           236.     9553.    43.    53.  1.00  5967.  6010.    3136.
```

VELOCITY DISTRIBUTION: ISEQ = 3; SECID = BRDGE; SRD = 1083.

WSEL	LEW	REW	AREA	K	Q	VEL
33.12	5967.0	6010.0	235.9	9553.	598.	2.53

X STA.	5967.0		5972.4		5974.5		5976.5		5978.4		5980.2
A(I)		25.7		10.7		10.6		10.3		10.4	
V(I)		1.16		2.79		2.81		2.91		2.88	
X STA.	5980.2		5982.0		5983.8		5985.6		5987.4		5989.2
A(I)		10.2		10.3		10.1		10.3		10.3	
V(I)		2.94		2.92		2.96		2.89		2.89	
X STA.	5989.2		5991.0		5992.8		5994.5		5996.2		5997.9
A(I)		10.3		10.3		10.1		10.0		10.2	
V(I)		2.91		2.91		2.95		3.00		2.94	
X STA.	5997.9		5999.6		6001.3		6003.1		6005.0		6010.0
A(I)		9.8		10.2		10.2		10.1		25.7	
V(I)		3.04		2.92		2.93		2.95		1.16	

***********************************100 YEAR STORM*******************************

CROSS-SECTION PROPERTIES: ISEQ = 5; SECID = APPR ; SRD = 1163.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	2	6.	96.	13.	13.				25.
	3	545.	22762.	115.	116.				6738.
	4	622.	7149.	500.	500.				3938.
	5	24.	257.	86.	86.				73.
33.78		1198.	30264.	713.	715.	2.10	5925.	6639.	6071.

VELOCITY DISTRIBUTION: ISEQ = 5; SECID = APPR ; SRD = 1163.

WSEL	LEW	REW	AREA	K	Q	VEL
33.78	5925.3	6638.7	1197.8	30264.	685.	.57

X STA.	5925.3		5969.9		5975.1		5980.2		5985.4		5990.7
A(I)		91.4		31.0		30.5		31.1		31.0	
V(I)		.37		1.10		1.12		1.10		1.10	
X STA.	5990.7		5996.0		6001.3		6006.7		6012.0		6017.4
A(I)		31.4		31.5		31.7		31.3		31.3	
V(I)		1.09		1.09		1.08		1.09		1.09	
X STA.	6017.4		6022.8		6028.2		6033.7		6039.8		6048.0
A(I)		31.9		31.9		32.1		33.0		37.3	
V(I)		1.07		1.07		1.07		1.04		.92	
X STA.	6048.0		6131.0		6211.2		6320.0		6425.1		6638.7
A(I)		122.2		118.8		132.3		133.0		153.0	
V(I)		.28		.29		.26		.26		.22	

CROSS-SECTION PROPERTIES: ISEQ = 3; SECID = BRDGE; SRD = 1083.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	241.	9874.	43.	53.				3239.
33.24		241.	9874.	43.	53.	1.00	5967.	6010.	3239.

VELOCITY DISTRIBUTION: ISEQ = 3; SECID = BRDGE; SRD = 1083.

WSEL	LEW	REW	AREA	K	Q	VEL
33.24	5967.0	6010.0	241.1	9874.	685.	2.84

X STA.	5967.0		5972.4		5974.5		5976.5		5978.4		5980.2
A(I)		26.3		11.0		10.8		10.8		10.5	
V(I)		1.30		3.13		3.16		3.19		3.25	

X STA.	5980.2		5982.0		5983.8		5985.5		5987.3		5989.1
A(I)		10.3		10.4		10.2		10.5		10.5	
V(I)		3.32		3.29		3.35		3.27		3.27	

X STA.	5989.1		5990.9		5992.7		5994.5		5996.2		5997.9
A(I)		10.5		10.5		10.4		10.4		10.2	
V(I)		3.26		3.26		3.30		3.30		3.36	

X STA.	5997.9		5999.5		6001.3		6003.1		6004.9		6010.0
A(I)		10.1		10.5		10.4		10.4		26.4	
V(I)		3.41		3.27		3.28		3.30		1.30	

***********************************500 YEAR STORM*******************************

CROSS-SECTION PROPERTIES: ISEQ = 5; SECID = APPR ; SRD = 1163.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	2	14.	247.	22.	22.				61.
	3	595.	26305.	115.	116.				7675.
	4	837.	11724.	500.	500.				6146.
	5	84.	1337.	163.	163.				341.
34.21		1529.	39614.	800.	802.	2.04	5916.	6716.	8403.

VELOCITY DISTRIBUTION: ISEQ = 5; SECID = APPR ; SRD = 1163.

WSEL	LEW	REW	AREA	K	Q	VEL
34.21	5916.1	6716.3	1529.5	39614.	874.	.57

X STA.	5916.1		5968.4		5974.7		5980.7		5986.8		5992.9
A(I)		103.4		40.1		38.2		38.8		38.8	
V(I)		.42		1.09		1.15		1.13		1.13	

X STA.	5992.9		5999.1		6005.3		6011.6		6017.8		6024.1
A(I)		39.3		39.4		39.7		39.2		39.2	
V(I)		1.11		1.11		1.10		1.11		1.11	

X STA.	6024.1		6030.3		6037.0		6045.3		6096.4		6164.4
A(I)		39.5		40.7		44.2		106.5		130.1	

```
  V(I)             1.11      1.07       .99       .41       .34

 X STA.     6164.4    6237.9    6328.2    6409.5    6505.4    6716.3
  A(I)             133.0     147.4     139.0     150.5     142.5
  V(I)               .33       .30       .31       .29       .31


   CROSS-SECTION PROPERTIES:  ISEQ =  3;  SECID = BRDGE;  SRD =    1083.

    WSEL  SA#     AREA       K   TOPW   WETP  ALPH    LEW    REW     QCR
           1      252.  10552.    43.    53.                        3458.
   33.49          252.  10552.    43.    53.  1.00  5967.  6010.   3458.


   VELOCITY DISTRIBUTION:  ISEQ =  3;  SECID = BRDGE;  SRD =    1083.

        WSEL     LEW     REW    AREA       K       Q    VEL
       33.49  5967.0  6010.0   251.8  10552.    874.   3.47

 X STA.     5967.0    5972.4    5974.5    5976.5    5978.4    5980.2
  A(I)              28.1      11.4      11.0      11.2      10.7
  V(I)              1.55      3.82      3.99      3.90      4.07

 X STA.     5980.2    5982.0    5983.8    5985.5    5987.3    5989.1
  A(I)              11.0      10.7      10.7      11.0      11.0
  V(I)              3.97      4.10      4.08      3.98      3.98

 X STA.     5989.1    5990.9    5992.7    5994.4    5996.2    5997.8
  A(I)              10.9      10.9      10.8      10.8      10.6
  V(I)              4.01      4.01      4.06      4.06      4.13

 X STA.     5997.8    5999.5    6001.2    6003.0    6004.9    6010.0
  A(I)              10.7      10.6      10.9      10.8      28.1
  V(I)              4.08      4.13      4.02      4.04      1.55


+++ BEGINNING PROFILE CALCULATIONS --    4
*********************************2 YEAR STORM*************************************

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL   CRWS      Q   WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR    FR#    VEL

EXIT :XS   ******  5959.     151.   .01 *****   31.24  28.72    138.  31.22
     1037. ******  6022.    3982.  1.00 ***** *******    .10    .92

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                              "FULLV"     KRATIO =  1.41

FULLV:FV      46.  5949.     205.   .01   .04   31.28 *******   138.  31.27
     1083.    46.  6031.    5595.  1.00   .00     .00    .08    .67
          <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                              "APPR "     KRATIO =  1.54

APPR :AS      80.  5956.     282.   .00   .04   31.32 *******   138.  31.32
```

```
     1163.    110.   6051.     8594.  1.00    .00      .00      .05      .49
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

  XSID:CODE    SRDL     LEW       AREA    VHD     HF      EGL     CRWS        Q     WSEL
        SRD    FLEN     REW          K  ALPH      HO      ERR      FR#      VEL

 BRDGE:BR       46.   5967.       156.    .02    .04    31.28    28.35     138.    31.27
      1083.     46.   6010.      5042.   1.25    .00      .00      .09      .88

     TYPE PPCD FLOW       C     P/A     LSEL   BLEN   XLAB   XRAB
       4.   1.   1.    .895    .053    34.08 ****** ****** ******

    XSID:CODE     SRD    FLEN     HF    VHD      EGL      ERR        Q     WSEL
   ROAD :RG     1100.         <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

  XSID:CODE    SRDL     LEW       AREA    VHD     HF      EGL     CRWS        Q     WSEL
        SRD    FLEN     REW          K  ALPH      HO      ERR      FR#      VEL

 APPR :AS       45.   5955.       287.    .00    .06    31.38    28.40     138.    31.38
      1163.    130.   6051.      8858.   1.00    .05      .00      .05      .48

       M(G)    M(K)        KQ   XLKQ   XRKQ     OTEL
       .548    .418     5161.  5981.  6024.    31.37

                      <<<<<END OF BRIDGE COMPUTATIONS>>>>>

  ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                              "REFE "     KRATIO =    .61

  XSID:CODE    SRDL     LEW       AREA    VHD     HF      EGL     CRWS        Q     WSEL
        SRD    FLEN     REW          K  ALPH      HO      ERR      FR#      VEL

 REFE :XS       54.   5925.       214.    .01    .02    31.41  *******     138.    31.40
      1217.     61.   6120.      5432.   1.00    .00      .00      .08      .64


      XSID:CODE        Q     SRD     WSEL     AREA      VEL      FR#        K    XSTW
     EXIT :XS       138.   1037.    31.22     151.      .92      .10    3982.     63.
     FULLV:FV       138.   1083.    31.27     205.      .67      .08    5595.     82.
     BRDGE:BR       138.   1083.    31.27     156.      .88      .09    5042.     43.
     ROAD :RG         0.   1100.*****************     1.00************************
     APPR :AS       138.   1163.    31.38     287.      .48      .05    8858.     96.
     REFE :XS       138.   1217.    31.40     214.      .64      .08    5432.     94.


*********************************50 YEAR STORM**********************************

  XSID:CODE    SRDL     LEW       AREA    VHD     HF      EGL     CRWS        Q     WSEL
        SRD    FLEN     REW          K  ALPH      HO      ERR      FR#      VEL

 EXIT :XS    ******   5849.       784.    .01  *****    33.08    29.95     598.    33.06
      1037.  ******   6557.     17261.   1.51  ***** *******      .16      .76

 FULLV:FV       46.   5907.       574.    .02    .06    33.14  *******     598.    33.12
      1083.     46.   6537.     16420.   1.44    .01      .00      .23     1.04
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>
```

```
 APPR :AS       80.  5932.      837.    .02    .11   33.26 *******    598.   33.24
      1163.    109.  6561.    21399.   1.99    .00     .00     .15     .71
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

  XSID:CODE    SRDL    LEW      AREA    VHD     HF     EGL    CRWS       Q    WSEL
        SRD    FLEN    REW         K   ALPH     HO     ERR     FR#     VEL

 BRDGE:BR       46.  5967.      236.    .13    .10   33.25   29.53    598.   33.12
      1083.     46.  6010.     9547.   1.29    .07     .00     .22    2.54

      TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
        4.   1.   1.   .882   .055   34.08 ****** ****** ******

     XSID:CODE    SRD   FLEN    HF   VHD     EGL     ERR        Q    WSEL
   ROAD :RG    1100.       <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

  XSID:CODE    SRDL    LEW      AREA    VHD     HF     EGL    CRWS       Q    WSEL
        SRD    FLEN    REW         K   ALPH     HO     ERR     FR#     VEL

 APPR :AS       45.  5928.     1048.    .01    .14   33.58   29.22    598.   33.56
      1163.     99.  6604.    26404.   2.09    .19     .00     .12     .57

        M(G)   M(K)        KQ  XLKQ  XRKQ     OTEL
        .932   .562    11543. 5989. 6032.    33.55

                     <<<<<END OF BRIDGE COMPUTATIONS>>>>>

  XSID:CODE    SRDL    LEW      AREA    VHD     HF     EGL    CRWS       Q    WSEL
        SRD    FLEN    REW         K   ALPH     HO     ERR     FR#     VEL

 REFE :XS       54.  5915.      881.    .01    .03   33.61 *******    598.   33.60
      1217.     57.  6685.    23131.   1.46    .00     .00     .14     .68


   XSID:CODE       Q    SRD    WSEL      AREA     VEL    FR#        K    XSTW
   EXIT :XS      598.  1037.   33.06      784.     .76    .16   17261.   708.
   FULLV:FV      598.  1083.   33.12      574.    1.04    .23   16420.   630.
   BRDGE:BR      598.  1083.   33.12      236.    2.54    .22    9547.    43.
   ROAD :RG        0.  1100.*****************     1.00*************************
   APPR :AS      598.  1163.   33.56     1048.     .57    .12   26404.   676.
   REFE :XS      598.  1217.   33.60      881.     .68    .14   23131.   770.

*********************************100 YEAR STORM*********************************

  XSID:CODE    SRDL    LEW      AREA    VHD     HF     EGL    CRWS       Q    WSEL
        SRD    FLEN    REW         K   ALPH     HO     ERR     FR#     VEL

 EXIT :XS   ******  5827.      874.    .01 *****   33.20   30.13    685.   33.19
      1037. ******  6563.    19769.   1.50 ***** *******     .16     .78

 FULLV:FV       46.  5894.      655.    .03    .06   33.27 *******    685.   33.24
      1083.     46.  6547.    18136.   1.57    .01     .00     .23    1.05
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 APPR :AS       80.  5930.      926.    .02    .12   33.40 *******    685.   33.38
      1163.    109.  6578.    23425.   2.05    .00     .00     .16     .74
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>
```

```
               <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE    SRDL     LEW      AREA    VHD     HF     EGL     CRWS       Q     WSEL
       SRD    FLEN     REW         K   ALPH     HO     ERR      FR#     VEL

BRDGE:BR       46.   5967.      241.    .16    .11   33.41    29.71    685.    33.24
     1083.     46.   6010.     9885.   1.29    .09     .00      .24    2.84

      TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
        4.   1.   1.   .880    .055   34.08  ****** ****** ******

     XSID:CODE     SRD    FLEN     HF    VHD      EGL      ERR        Q     WSEL
    ROAD :RG     1100.          <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

 XSID:CODE    SRDL     LEW      AREA    VHD     HF     EGL     CRWS       Q     WSEL
       SRD    FLEN     REW         K   ALPH     HO     ERR      FR#     VEL

APPR :AS       45.   5925.     1197.    .01    .16   33.79    29.34    685.    33.78
     1163.    101.   6639.    30237.   2.10    .22     .01      .11     .57

        M(G)    M(K)        KQ   XLKQ   XRKQ     OTEL
        .934    .593    12255.  5990.  6033.    33.77

                        <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE    SRDL     LEW      AREA    VHD     HF     EGL     CRWS       Q     WSEL
       SRD    FLEN     REW         K   ALPH     HO     ERR      FR#     VEL

REFE :XS       54.   5914.     1048.    .01    .03   33.82  *******    685.    33.81
     1217.     55.   6722.    28528.   1.38    .00     .00      .12     .65


    XSID:CODE        Q     SRD     WSEL      AREA      VEL      FR#         K   XSTW
   EXIT :XS       685.   1037.    33.19      874.      .78      .16    19769.   735.
   FULLV:FV       685.   1083.    33.24      655.     1.05      .23    18136.   653.
   BRDGE:BR       685.   1083.    33.24      241.     2.84      .24     9885.    43.
   ROAD :RG         0.   1100.*****************       1.00************************
   APPR :AS       685.   1163.    33.78     1197.      .57      .11    30237.   713.
   REFE :XS       685.   1217.    33.81     1048.      .65      .12    28528.   808.


********************************500 YEAR STORM*********************************

 XSID:CODE    SRDL     LEW      AREA    VHD     HF     EGL     CRWS       Q     WSEL
       SRD    FLEN     REW         K   ALPH     HO     ERR      FR#     VEL

EXIT :XS    ******   5744.     1061.    .02  *****   33.45    30.48    874.    33.43
     1037.  ******   6573.    25217.   1.50  ***** *******      .16     .82

FULLV:FV       46.   5871.      818.    .03    .06   33.52  *******    874.    33.49
     1083.     46.   6567.    21954.   1.74    .01     .00      .23    1.07
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APPR :AS       80.   5927.     1100.    .02    .14   33.66  *******    874.    33.64
     1163.    109.   6616.    27707.   2.10    .00     .01      .16     .79
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>
```

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE SRD	SRDL FLEN	LEW REW	AREA K	VHD ALPH	HF HO	EGL ERR	CRWS FR#	Q VEL	WSEL
BRDGE:BR 1083.	46. 46.	5967. 6010.	252. 10542.	.24 1.29	.13 .15	33.73 .00	30.07 .29	874. 3.47	33.49

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
4.	1.	1.	.879	.057	34.08	******	******	******

XSID:CODE	SRD	FLEN	HF	VHD	EGL	ERR	Q	WSEL
ROAD :RG	1100.	<<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>						

XSID:CODE SRD	SRDL FLEN	LEW REW	AREA K	VHD ALPH	HF HO	EGL ERR	CRWS FR#	Q VEL	WSEL
APPR :AS 1163.	45. 103.	5916. 6716.	1531. 39669.	.01 2.04	.19 .30	34.22 .02	29.59 .10	874. .57	34.21

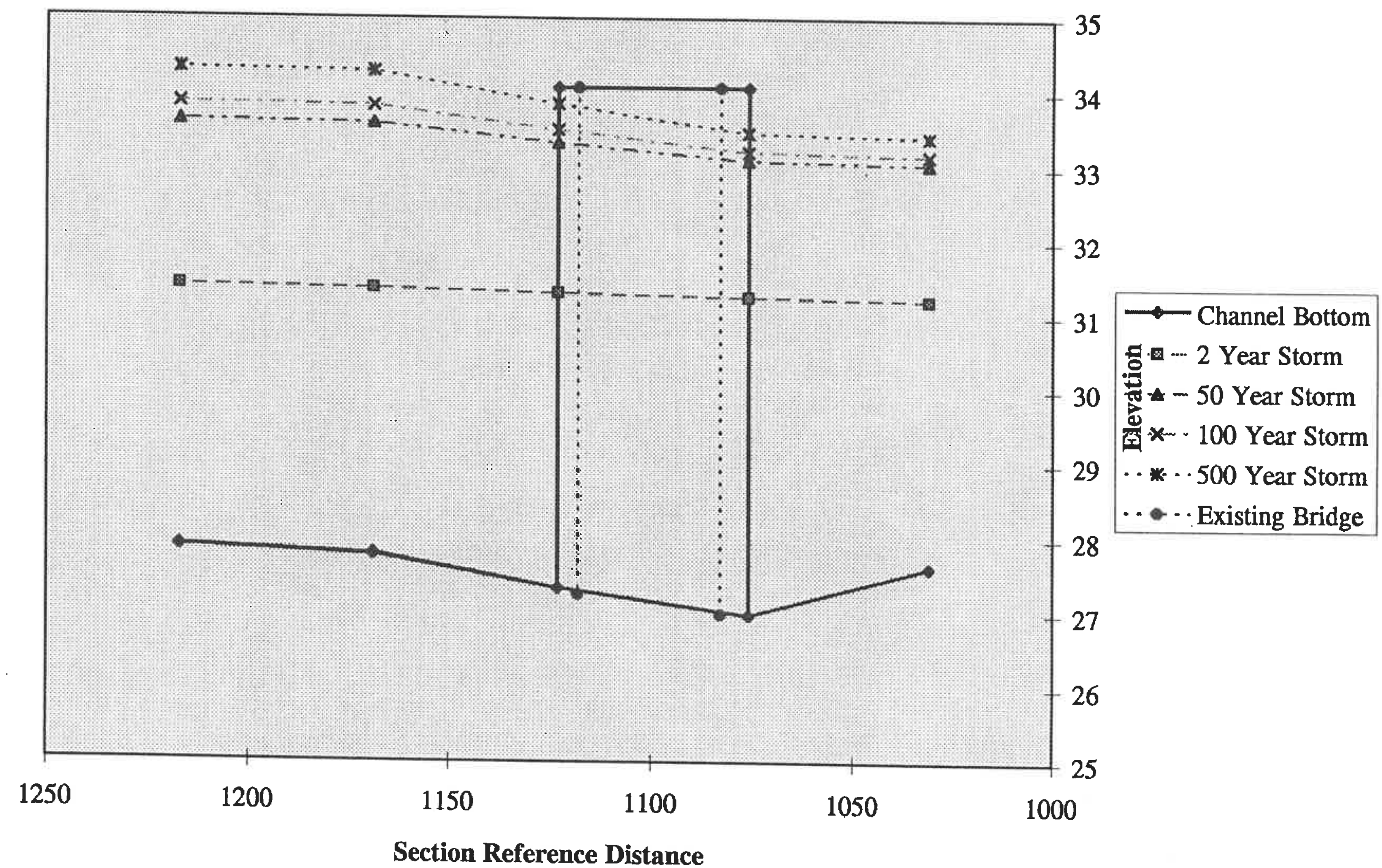
M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.938	.652	13675.	5993.	6036.	34.20

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE SRD	SRDL FLEN	LEW REW	AREA K	VHD ALPH	HF HO	EGL ERR	CRWS FR#	Q VEL	WSEL
REFE :XS 1217.	54. 54.	5911. 6844.	1419. 41414.	.01 1.26	.02 .00	34.25 .00	******* .10	874. .62	34.24

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
EXIT :XS	874.	1037.	33.43	1061.	.82	.16	25217.	829.
FULLV:FV	874.	1083.	33.49	818.	1.07	.23	21954.	696.
BRDGE:BR	874.	1083.	33.49	252.	3.47	.29	10542.	43.
ROAD :RG	0.	1100.******************			1.00************************			
APPR :AS	874.	1163.	34.21	1531.	.57	.10	39669.	800.
REFE :XS	874.	1217.	34.24	1419.	.62	.10	41414.	933.

Water Surface Profiles



SR 29 - Lone Pine Creek
Bridge No. 050035

Proposed Bridge

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME: 03-01-96  16:15

   T1         SR 29 - PROPOSED BRIDGE ANALYSIS
   T2         LONE PINE CREEK @ BR#050035 (SR29PRBR.DAT)
   *
   J3         5  6  3  17  13  14  16  28
   *
   *          2 YEAR  50 YEAR  100 YEAR  500 YEAR
   Q            138      598       685       874
 *** Q-DATA FOR SEC-ID, ISEQ =             1
   *
   *          SLOPE FROM QUAD MAP
   SK         0.0012  0.0012  0.0012  0.0012
   *
   *          SURVEY X-SCT LOCATED 100' DOWNSTREAM OF BRIDGE

 *** START PROCESSING CROSS SECTION - "SURV1"
   XT   SURV1  1006
   GR         4136,45.0  4136,35.0  5000,33.6  5052,33.6  5102,33.5
   GR         5200,33.5  5495,33.5  5594,33.4  5741,33.4  5791,33.3  5840,33.1
   GR         5878,32.8  5903,32.8
   GR         5938,32.7  5953,32.2  5959,31.2  5964,30.5
   GR         5969,29.5  5975,27.9  5988,27.6  6003,27.9
   GR         6007,28.1  6008,28.9  6013,29.5  6017,30.5  6022,31.2
   GR         6037,31.9  6086,32.0  6135,32.1  6184,32.3  6184,32.3
   GR         6234,32.3  6283,32.3  6332,32.2  6430,31.9  6480,31.8
   GR         6529,32.4  6578,33.5  6627,33.6  6725,33.9
   GR         6774,34.0  6823,34.8  6872,35.2  6921,35.3  6970,35.4
   *

 *** FINISH PROCESSING CROSS SECTION - "SURV1"
 *** TEMPLATE CROSS SECTION "SURV1" SAVED INTERNALLY.

 *** START PROCESSING CROSS SECTION - "EXIT "
   XS   EXIT  1031  *  *  *  0.0012
   GT
   N          0.06  0.15  0.10  0.15  0.06
   SA            5838  5938  6037  6287
   *
   *          SURVEY X-SCT LOCATED @ DOWNSTREAM FACE OF BRIDGE

 *** FINISH PROCESSING CROSS SECTION - "EXIT "
 *** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. =  1

 --- DATA SUMMARY FOR SECID "EXIT " AT SRD =   1031.  ERR-CODE =      0

      SKEW      IHFNO    VSLOPE       EK        CK
       .0         0.     .0012       .50       .00

X-Y COORDINATE PAIRS  (NGP =  45):
       X       Y            X       Y             X       Y             X       Y
   4136.0   45.03       4136.0   35.03       5000.0   33.63       5052.0   33.63
   5102.0   33.53       5200.0   33.53       5495.0   33.53       5594.0   33.43
   5741.0   33.43       5791.0   33.33       5840.0   33.13       5878.0   32.83
   5903.0   32.83       5938.0   32.73       5953.0   32.23       5959.0   31.23
   5964.0   30.53       5969.0   29.53       5975.0   27.93       5988.0   27.63
   6003.0   27.93       6007.0   28.13       6008.0   28.93       6013.0   29.53
```

```
   6017.0   30.53    6022.0   31.23    6037.0   31.93    6086.0   32.03
   6135.0   32.13    6184.0   32.33    6184.0   32.33    6234.0   32.33
   6283.0   32.33    6332.0   32.23    6430.0   31.93    6480.0   31.83
   6529.0   32.43    6578.0   33.53    6627.0   33.63    6725.0   33.93
   6774.0   34.03    6823.0   34.83    6872.0   35.23    6921.0   35.33
   6970.0   35.43

 X-Y MAX-MIN POINTS:
     XMIN       Y         X     YMIN       XMAX       Y          X     YMAX
   4136.0   45.03    5988.0   27.63    6970.0   35.43    4136.0   45.03

SUBAREA BREAKPOINTS (NSA =  5):
       5838.   5938.   6037.   6287.

ROUGHNESS COEFFICIENTS (NSA =  5):
          .060    .150    .100    .150    .060

*** START PROCESSING CROSS SECTION - "SURV2"
  XT   SURV2   1083
  GR        4038,45.0  4038,35.0  5102,33.7
  GR        5151,33.7  5299,33.6  5348,33.6
  GR        5397,33.7  5446,33.7  5495,33.7  5840,33.8
  GR        5889,33.3  5938,32.8
  GR        5968,28.5  5970,28.0  5988,27.0
  GR        6007,28.3  6037,32.0  6086,32.1  6135,32.4  6184,32.4  6233,32.9
  GR        6282,33.0  6331,33.0  6527,33.0
  GR        6576,33.6  6625,33.9  6674,33.8  6723,34.1  6772,34.3
  GR        6821,34.6  6870,34.9  6919,34.9  6968,34.9
  *

*** FINISH PROCESSING CROSS SECTION - "SURV2"
*** TEMPLATE CROSS SECTION "SURV2" SAVED INTERNALLY.

*** START PROCESSING CROSS SECTION - "FULLV"
  XS   FULLV  1076   *  *  *   0.0012
  GT
  N         0.15    0.06   0.10     0.06  0.15
  SA             5838   5938    6037    6137
  *

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" WRITTEN TO DISK, RECORD NO. =  2

--- DATA SUMMARY FOR SECID "FULLV" AT SRD =   1076.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK         CK
       .0         0.      .0012        .50        .00

X-Y COORDINATE PAIRS  (NGP =  33):
        X        Y            X        Y           X        Y           X        Y
   4038.0   44.99    4038.0   34.99    5102.0   33.69    5151.0   33.69
   5299.0   33.59    5348.0   33.59    5397.0   33.69    5446.0   33.69
   5495.0   33.69    5840.0   33.79    5889.0   33.29    5938.0   32.79
   5968.0   28.49    5970.0   27.99    5988.0   26.99    6007.0   28.29
   6037.0   31.99    6086.0   32.09    6135.0   32.39    6184.0   32.39
   6233.0   32.89    6282.0   32.99    6331.0   32.99    6527.0   32.99
   6576.0   33.59    6625.0   33.89    6674.0   33.79    6723.0   34.09
   6772.0   34.29    6821.0   34.59    6870.0   34.89    6919.0   34.89
   6968.0   34.89
```

```
 X-Y MAX-MIN POINTS:
     XMIN        Y           X     YMIN       XMAX        Y           X     YMAX
   4038.0    44.99     5988.0    26.99     6968.0    34.89     4038.0    44.99

SUBAREA BREAKPOINTS (NSA =  5):
       5838.    5938.    6037.    6137.

ROUGHNESS COEFFICIENTS (NSA =  5):
        .150     .060     .100     .060     .150

*** START PROCESSING CROSS SECTION - "BRDGE"
  BR   BRDGE  1076
  BL         43  5967  6010
  BD         1.62  35.7
  CD         4  47.1  6.0  35.7  45
  PW 1       27,2.0  32.7,2.0  32.7,4.0  34.7,4.0
  N          0.10
  *
  *          SURVEY X-SCT LOCATED IMMEDIATELY UPSTREAM OF BRIDGE

*** FINISH PROCESSING CROSS SECTION - "BRDGE"
*** CROSS SECTION "BRDGE" WRITTEN TO DISK, RECORD NO. =  3

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =    1076.  ERR-CODE =      0

     SKEW     IHFNO     VSLOPE        EK        CK
       .0        0.      .0012       .50       .00

X-Y COORDINATE PAIRS  (NGP =    9):
       X        Y           X       Y           X       Y           X       Y
   5967.0    34.08     5967.0    28.63     5968.0    28.49     5970.0    27.99
   5988.0    26.99     6007.0    28.29     6010.0    28.66     6010.0    34.08
   5967.0    34.08

 X-Y MAX-MIN POINTS:
     XMIN        Y           X     YMIN       XMAX        Y           X     YMAX
   5967.0    34.08     5988.0    26.99     6010.0    28.66     5967.0    34.08

ROUGHNESS COEFFICIENTS (NSA =  1):
        .100

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      47.1    34.08 *******   6.00    35.70   45.00

DESIGN DATA:     BRLEN  LOCOPT  XCONLT  XCONRT
                  43.0      0.   5967.   6010.

                GIRDEP  BDELEV  BDSLP   BDSTA
                  1.62   35.70 ******* *******

PIER DATA:  NPW =  4     PPCD = 1.
     PELV  PWDTH        PELV  PWDTH        PELV  PWDTH        PELV  PWDTH
    27.00   2.0        32.70   2.0        32.70   4.0        34.70   4.0

*** START PROCESSING CROSS SECTION - "SURV3"
  XT   SURV3     1164
  GR         5855,45.5  5855,35.5  5877,35.2  5912,34.4  5925,33.8
  GR         5938,32.8  5952,32.2  5970,27.8  6002,27.9
  GR         6020,27.9  6032,27.9
```

```
GR          6047,29.5  6053,32.4  6103,32.4  6152,32.2  6201,32.4
GR          6250,32.6  6299,32.6  6348,32.4  6397,32.6  6446,32.6
GR          6495,32.7  6544,33.1  6593,33.5  6642,33.8  6691,33.9
GR          6740,34.5  6789,34.5  6838,34.5  6887,34.6  6936,34.8
GR          6985,35.2
*

*** FINISH PROCESSING CROSS SECTION - "SURV3"
*** TEMPLATE CROSS SECTION "SURV3" SAVED INTERNALLY.

*** START PROCESSING CROSS SECTION - "APPR "
 AS    APPR  1169 *  *  *  0.0012
 GT
 N          0.012    0.06   0.10    0.15   0.06
 SA               5877     5938    6053    6553
 FL         108  5952   83  5972  112
 BP         5877  5999
 *
 *          SURVEY X-SCT LOCATED 100' UPSTREAM OF BRIDGE

*** FINISH PROCESSING CROSS SECTION - "APPR "
*** CROSS SECTION "APPR " WRITTEN TO DISK, RECORD NO. =  4

--- DATA SUMMARY FOR SECID "APPR " AT SRD =   1169.  ERR-CODE =      0

     SKEW     IHFNO     VSLOPE       EK        CK
      .0        0.      .0012       .50       .00

X-Y COORDINATE PAIRS  (NGP =  32):
      X        Y          X        Y          X        Y          X        Y
   5855.0   45.51     5855.0   35.51     5877.0   35.21     5912.0   34.41
   5925.0   33.81     5938.0   32.81     5952.0   32.21     5970.0   27.81
   6002.0   27.91     6020.0   27.91     6032.0   27.91     6047.0   29.51
   6053.0   32.41     6103.0   32.41     6152.0   32.21     6201.0   32.41
   6250.0   32.61     6299.0   32.61     6348.0   32.41     6397.0   32.61
   6446.0   32.61     6495.0   32.71     6544.0   33.11     6593.0   33.51
   6642.0   33.81     6691.0   33.91     6740.0   34.51     6789.0   34.51
   6838.0   34.51     6887.0   34.61     6936.0   34.81     6985.0   35.21

 X-Y MAX-MIN POINTS:
    XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
   5855.0   45.51     5970.0   27.81     6985.0   35.21     5855.0   45.51

SUBAREA BREAKPOINTS (NSA =  5):
       5877.   5938.   6053.   6553.

ROUGHNESS COEFFICIENTS (NSA =  5):
         .012     .060     .100     .150     .060

FLOW LENGTH DATA (NFL = 3):
           FLEN       XSTA       FLEN       XSTA       FLEN
           108.       5952.       83.       5972.      112.

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                          5877.   5999. ******* *******

*** START PROCESSING CROSS SECTION - "REFE "
 XS    REFE     1217
 GR         5855,45.5  5855,35.5  5877,35.2  5895,34.7  5910,34.4
 GR         5914,33.8  5918,32.8  5922,32.2  5926,31.2  5928,28.5
```

```
GR          5933,28.1  5946,27.9  5949,28.9  5952,29.5  5955,30.5
GR          5958,31.2  5962,32.2  5998,32.3  6022,32.8  6052,32.9
GR          6055,32.2  6060,31.2  6066,30.5  6071,29.5  6076,28.9
GR          6079,28.4  6081,27.9  6098,27.9  6102,28.9
GR          6107,29.5  6113,30.5  6114,30.7  6118,31.2  6127,32.2
GR          6147,32.5  6197,32.1  6246,32.2  6295,32.2  6344,33.1  6393,33.4
GR          6687,33.6  6736,33.9  6785,34.1  6834,34.2  6883,34.4
GR          6932,34.4  6981,34.8  7120,34.8  7169,35.1
N           0.012  0.10  0.15  0.10  0.06
SA              5895  5962  6055  6127
FL          81    5998    54    6079    45
*
*** FINISH PROCESSING CROSS SECTION - "REFE "
*** CROSS SECTION "REFE " WRITTEN TO DISK, RECORD NO. =  5

--- DATA SUMMARY FOR SECID "REFE " AT SRD =   1217.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      .0        0.     .0012        .50       .00

X-Y COORDINATE PAIRS  (NGP =  49):
       X        Y          X        Y          X        Y          X        Y
   5855.0   45.50     5855.0   35.50     5877.0   35.20     5895.0   34.70
   5910.0   34.40     5914.0   33.80     5918.0   32.80     5922.0   32.20
   5926.0   31.20     5928.0   28.50     5933.0   28.10     5946.0   27.90
   5949.0   28.90     5952.0   29.50     5955.0   30.50     5958.0   31.20
   5962.0   32.20     5998.0   32.30     6022.0   32.80     6052.0   32.90
   6055.0   32.20     6060.0   31.20     6066.0   30.50     6071.0   29.50
   6076.0   28.90     6079.0   28.40     6081.0   27.90     6098.0   27.90
   6102.0   28.90     6107.0   29.50     6113.0   30.50     6114.0   30.70
   6118.0   31.20     6127.0   32.20     6147.0   32.50     6197.0   32.10
   6246.0   32.20     6295.0   32.20     6344.0   33.10     6393.0   33.40
   6687.0   33.60     6736.0   33.90     6785.0   34.10     6834.0   34.20
   6883.0   34.40     6932.0   34.40     6981.0   34.80     7120.0   34.80
   7169.0   35.10

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
   5855.0   45.50     5946.0   27.90     7169.0   35.10     5855.0   45.50

SUBAREA BREAKPOINTS (NSA =  5):
      5895.   5962.   6055.   6127.

ROUGHNESS COEFFICIENTS (NSA =  5):
        .012    .100    .150    .100    .060

FLOW LENGTH DATA (NFL = 3):
           FLEN       XSTA       FLEN       XSTA       FLEN
            81.      5998.        54.      6079.        45.

********************************50 YEAR STORM*************************************

    CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = APPR ;  SRD =     1169.

     WSEL  SA#      AREA         K   TOPW   WETP  ALPH     LEW     REW        QCR
            2         4.       51.    10.    10.                               14.
            3       522.    21138.   115.   116.                             6304.
            4       519.     5287.   500.   500.                             3002.
            5        10.       82.    52.    52.                               25.
```

```
   33.58          1055.   26558.   677.   678.  2.09  5928.  6605.   5160.

  VELOCITY DISTRIBUTION:  ISEQ =  4;  SECID = APPR ;  SRD =    1169.

       WSEL     LEW     REW    AREA        K        Q     VEL
      33.58  5927.9  6605.1  1054.6  26558.     598.    .57

 X STA.      5927.9     5970.5     5975.3     5980.1     5984.9     5989.8
  A(I)             86.0       27.9       27.4       27.9       27.9
  V(I)              .35       1.07       1.09       1.07       1.07

 X STA.      5989.8     5994.9     5999.8     6004.7     6009.7     6014.7
  A(I)             28.8       28.2       27.7       28.3       28.3
  V(I)             1.04       1.06       1.08       1.06       1.06

 X STA.      6014.7     6019.8     6024.8     6029.8     6035.1     6041.2
  A(I)             28.8       28.8       28.1       29.3       30.6
  V(I)             1.04       1.04       1.06       1.02        .98

 X STA.      6041.2     6057.8     6152.8     6256.8     6383.7     6605.1
  A(I)             47.1      116.5      120.6      133.0      153.2
  V(I)              .64        .26        .25        .22        .20


  CROSS-SECTION PROPERTIES:  ISEQ =  3;  SECID = BRDGE;  SRD =    1076.

    WSEL  SA#     AREA       K   TOPW   WETP  ALPH    LEW    REW     QCR
            1     233.   9439.    43.    52.                        3082.
   33.11          233.   9439.    43.    52.  1.00  5967.  6010.   3082.


  VELOCITY DISTRIBUTION:  ISEQ =  3;  SECID = BRDGE;  SRD =    1076.

       WSEL     LEW     REW    AREA        K        Q     VEL
      33.11  5967.0  6010.0   233.2    9439.     598.   2.56

 X STA.      5967.0     5972.0     5974.0     5975.9     5977.8     5979.6
  A(I)             24.8       10.3       10.4       10.5       10.1
  V(I)             1.21       2.91       2.87       2.86       2.95

 X STA.      5979.6     5981.4     5983.1     5984.8     5986.4     5988.1
  A(I)             10.0       10.0       10.1        9.8        9.9
  V(I)             2.99       2.98       2.96       3.05       3.01

 X STA.      5988.1     5989.7     5991.4     5993.1     5994.9     5996.7
  A(I)              9.9       10.0       10.1       10.0       10.1
  V(I)             3.03       2.99       2.96       2.99       2.95

 X STA.      5996.7     5998.6     6000.6     6002.6     6004.7     6010.0
  A(I)             10.3       10.7       10.6       10.5       25.2
  V(I)             2.91       2.81       2.82       2.85       1.19


*******************************50 YEAR STORM*************************************

  CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = APPR ;  SRD =    1169.
```

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	2	6.	100.	13.	13.				26.
	3	547.	22874.	115.	116.				6768.
	4	629.	7283.	500.	500.				4004.
	5	25.	275.	88.	88.				77.
33.80		1208.	30532.	716.	717.	2.10	5925.	6641.	6137.

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = APPR ; SRD = 1169.

WSEL	LEW	REW	AREA	K	Q	VEL
33.80	5925.1	6641.0	1207.8	30532.	685.	.57

X STA.	5925.1		5969.7		5974.9		5980.2		5985.5		5990.8
A(I)		91.0		31.3		31.8		31.2		31.2	
V(I)		.38		1.09		1.08		1.10		1.10	

X STA.	5990.8		5996.1		6001.5		6006.7		6012.1		6017.5
A(I)		31.6		31.7		31.1		31.9		31.9	
V(I)		1.08		1.08		1.10		1.07		1.08	

X STA.	6017.5		6023.0		6028.4		6033.9		6040.3		6049.0
A(I)		32.0		32.0		32.2		34.2		38.9	
V(I)		1.07		1.07		1.06		1.00		.88	

X STA.	6049.0		6134.3		6214.1		6324.4		6426.7		6641.0
A(I)		124.7		118.8		135.6		130.6		154.2	
V(I)		.27		.29		.25		.26		.22	

CROSS-SECTION PROPERTIES: ISEQ = 3; SECID = BRDGE; SRD = 1076.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	238.	9760.	43.	52.				3185.
33.23		238.	9760.	43.	52.	1.00	5967.	6010.	3185.

VELOCITY DISTRIBUTION: ISEQ = 3; SECID = BRDGE; SRD = 1076.

WSEL	LEW	REW	AREA	K	Q	VEL
33.23	5967.0	6010.0	238.4	9760.	685.	2.87

X STA.	5967.0		5972.0		5974.0		5976.0		5977.8		5979.6
A(I)		25.4		10.9		10.6		10.4		10.3	
V(I)		1.35		3.16		3.23		3.30		3.31	

X STA.	5979.6		5981.4		5983.1		5984.8		5986.5		5988.1
A(I)		10.4		10.2		10.0		10.2		10.0	
V(I)		3.29		3.36		3.42		3.35		3.41	

X STA.	5988.1		5989.7		5991.4		5993.1		5994.9		5996.7
A(I)		10.2		10.0		10.3		10.2		10.4	
V(I)		3.35		3.42		3.32		3.36		3.31	

X STA.	5996.7		5998.6		6000.5		6002.6		6004.7		6010.0
A(I)		10.5		10.6		10.8		11.1		25.8	

```
 V(I)               3.26        3.24        3.17        3.09        1.33


******************************50 YEAR STORM************************************

   CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = APPR ;  SRD =    1169.

    WSEL   SA#      AREA          K    TOPW    WETP   ALPH     LEW     REW       QCR
             2       14.       259.     22.     22.                                64.
             3      598.     26509.    115.    116.                              7729.
             4      849.     12006.    500.    500.                              6279.
             5       88.      1432.    165.    165.                               364.
   34.24           1549.     40207.    803.    804.   2.03   5916.   6718.      8565.

   VELOCITY DISTRIBUTION:  ISEQ =  4;  SECID = APPR ;  SRD =    1169.

        WSEL      LEW      REW     AREA          K         Q     VEL
       34.24  5915.6   6718.3   1548.7     40207.      874.    .56

 X STA.      5915.6      5968.4      5974.7      5980.8      5986.9      5993.1
  A(I)             104.5        40.6        38.7        39.3        39.3
  V(I)               .42        1.08        1.13        1.11        1.11

 X STA.      5993.1      5999.2      6005.6      6011.8      6018.2      6024.6
  A(I)              39.0        40.1        39.5        40.4        40.4
  V(I)              1.12        1.09        1.11        1.08        1.08

 X STA.      6024.6      6030.9      6037.6      6046.0      6103.9      6169.7
  A(I)              40.0        40.9        44.2       118.2       128.4
  V(I)              1.09        1.07         .99         .37         .34

 X STA.      6169.7      6245.8      6332.3      6414.6      6506.9      6718.3
  A(I)             137.4       143.7       142.0       146.6       145.4
  V(I)               .32         .30         .31         .30         .30

   CROSS-SECTION PROPERTIES:  ISEQ =  3;  SECID = BRDGE;  SRD =    1076.

    WSEL   SA#      AREA          K    TOPW    WETP   ALPH     LEW     REW       QCR
             1      249.     10411.     43.     53.                              3394.
   33.47            249.     10411.     43.     53.   1.00   5967.   6010.      3394.


   VELOCITY DISTRIBUTION:  ISEQ =  3;  SECID = BRDGE;  SRD =    1076.

        WSEL      LEW      REW     AREA          K         Q     VEL
       33.47  5967.0   6010.0    248.7     10411.      874.   3.51

 X STA.      5967.0      5972.1      5974.1      5976.0      5977.8      5979.6
  A(I)              27.1        10.9        11.1        10.8        10.8
  V(I)              1.61        3.99        3.95        4.03        4.05

 X STA.      5979.6      5981.4      5983.1      5984.8      5986.5      5988.1
  A(I)              10.6        10.7        10.5        10.5        10.7
  V(I)              4.11        4.09        4.17        4.15        4.10
```

```
 X STA.      5988.1      5989.8      5991.4      5993.1      5994.9      5996.7
   A(I)            10.6        10.4        10.7        10.6        10.8
   V(I)            4.13        4.20        4.08        4.12        4.06

 X STA.      5996.7      5998.6      6000.5      6002.6      6004.6      6010.0
   A(I)            10.9        11.0        11.3        11.2        27.5
   V(I)            3.99        3.96        3.88        3.91        1.59


 +++ BEGINNING PROFILE CALCULATIONS --   4

*********************************2 YEAR STORM************************************

  XSID:CODE   SRDL    LEW      AREA   VHD     HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW         K  ALPH     HO     ERR     FR#     VEL

 EXIT :XS   ******  5959.      151.   .01 *****   31.23   28.69    138.   31.22
      1031. ******  6022.     3982.  1.00 ***** *******     .10     .92

  ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                                "FULLV"     KRATIO =  1.41

 FULLV:FV      45.  5949.      205.   .01    .04   31.27 *******    138.   31.26
      1076.    45.  6031.     5597.  1.00    .00     .00     .08     .67
            <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

  ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                                "APPR "     KRATIO =  1.52

 APPR :AS      93.  5956.      280.   .00    .04   31.32 *******    138.   31.31
      1169.   110.  6051.     8534.  1.00    .00     .00     .05     .49
            <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

               <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

  XSID:CODE   SRDL    LEW      AREA   VHD     HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW         K  ALPH     HO     ERR     FR#     VEL

 BRDGE:BR      45.  5967.      154.   .02    .04   31.27   28.39    138.   31.26
      1076.    45.  6010.     4940.  1.29    .00     .00     .10     .90

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.   1.   1.   .879   .055   34.08    43.  5967.  6010.

  XSID:CODE   SRDL    LEW      AREA   VHD     HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW         K  ALPH     HO     ERR     FR#     VEL

 APPR :AS      46.  5955.      287.   .00    .06   31.39   28.41    138.   31.38
      1169.   132.  6051.     8859.  1.00    .06     .00     .05     .48

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .548   .419    5155.  5982.  6025.   31.37

                        <<<<<END OF BRIDGE COMPUTATIONS>>>>>

  ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                                "REFE "     KRATIO =   .62

 XSID:CODE   SRDL    LEW      AREA   VHD     HF     EGL    CRWS       Q    WSEL
```

```
         SRD    FLEN     REW          K  ALPH      HO      ERR      FR#      VEL

 REFE :XS        48.   5925.      215.   .01     .02    31.41 *******     138.    31.41
     1217.       61.   6120.     5452.  1.00     .00      .00      .08      .64

    XSID:CODE        Q     SRD     WSEL      AREA      VEL      FR#          K    XSTW
     EXIT :XS     138.   1031.    31.22      151.      .92      .10      3982.     63.
     FULLV:FV     138.   1076.    31.26      205.      .67      .08      5597.     82.
     BRDGE:BR     138.   1076.    31.26      154.      .90      .10      4940.     43.
     APPR :AS     138.   1169.    31.38      287.      .48      .05      8859.     96.
     REFE :XS     138.   1217.    31.41      215.      .64      .08      5452.     95.


*********************************50 YEAR STORM**********************************

  XSID:CODE     SRDL     LEW       AREA    VHD      HF      EGL     CRWS        Q     WSEL
        SRD     FLEN     REW          K   ALPH      HO      ERR      FR#      VEL

 EXIT :XS     ******   5849.      784.    .01  *****    33.07    29.94     598.    33.06
     1031.    ******   6557.    17257.   1.51  ***** *******      .16      .76

 FULLV:FV        45.   5907.      574.    .02     .06    33.13 *******     598.    33.11
     1076.       45.   6537.    16416.   1.44     .01      .00      .23     1.04
             <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 APPR :AS        93.   5932.      829.    .02     .11    33.25 *******     598.    33.23
     1169.      109.   6560.    21203.   1.98     .00      .00      .16      .72
             <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

                <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

  XSID:CODE     SRDL     LEW       AREA    VHD      HF      EGL     CRWS        Q     WSEL
        SRD     FLEN     REW          K   ALPH      HO      ERR      FR#      VEL

 BRDGE:BR        45.   5967.      233.    .13     .10    33.24    29.59     598.    33.11
     1076.       45.   6010.     9434.   1.31     .07      .00      .22     2.57

     TYPE PPCD FLOW        C     P/A    LSEL    BLEN    XLAB    XRAB
       4.    1.   1.    .875    .056   34.08     43.   5967.   6010.

  XSID:CODE     SRDL     LEW       AREA    VHD      HF      EGL     CRWS        Q     WSEL
        SRD     FLEN     REW          K   ALPH      HO      ERR      FR#      VEL

 APPR :AS        46.   5928.     1076.    .01     .14    33.62    29.23     598.    33.61
     1169.      100.   6610.    27104.   2.10     .24      .00      .11      .56

       M(G)    M(K)       KQ   XLKQ    XRKQ     OTEL
       .931    .568   11674.  5990.   6033.    33.59

                        <<<<<END OF BRIDGE COMPUTATIONS>>>>>

  XSID:CODE     SRDL     LEW       AREA    VHD      HF      EGL     CRWS        Q     WSEL
        SRD     FLEN     REW          K   ALPH      HO      ERR      FR#      VEL

 REFE :XS        48.   5915.      915.    .01     .03    33.65 *******     598.    33.64
     1217.       56.   6694.    24189.   1.45     .00      .00      .13      .65

    XSID:CODE        Q     SRD     WSEL      AREA      VEL      FR#          K    XSTW
```

EXIT :XS	598.	1031.	33.06	784.	.76	.16	17257.	708.
FULLV:FV	598.	1076.	33.11	574.	1.04	.23	16416.	630.
BRDGE:BR	598.	1076.	33.11	233.	2.57	.22	9434.	43.
APPR :AS	598.	1169.	33.61	1076.	.56	.11	27104.	683.
REFE :XS	598.	1217.	33.64	915.	.65	.13	24189.	780.

*********************************100 YEAR STORM*********************************

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	5827.	874.	.01	*****	33.20	30.11	685.	33.18
1031.	******	6563.	19764.	1.50	*****	*******	.16	.78	
FULLV:FV	45.	5894.	655.	.03	.06	33.26	*******	685.	33.24
1076.	45.	6547.	18131.	1.57	.01	.00	.23	1.05	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
APPR :AS	93.	5931.	917.	.02	.12	33.39	*******	685.	33.37
1169.	109.	6576.	23213.	2.04	.00	.00	.16	.75	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	45.	5967.	239.	.17	.11	33.40	29.77	685.	33.23
1076.	45.	6010.	9772.	1.31	.10	.00	.25	2.87	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
4.	1.	1.	.873	.057	34.08	43.	5967.	6010.

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APPR :AS	46.	5924.	1234.	.01	.16	33.85	29.36	685.	33.84
1169.	102.	6657.	31216.	2.11	.29	.01	.11	.56	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.933	.600	12414.	5991.	6034.	33.81

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
REFE :XS	48.	5914.	1093.	.01	.03	33.88	*******	685.	33.87
1217.	55.	6731.	30068.	1.35	.00	.00	.11	.63	

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
EXIT :XS	685.	1031.	33.18	874.	.78	.16	19764.	735.
FULLV:FV	685.	1076.	33.24	655.	1.05	.23	18131.	653.
BRDGE:BR	685.	1076.	33.23	239.	2.87	.25	9772.	43.
APPR :AS	685.	1169.	33.84	1234.	.56	.11	31216.	733.
REFE :XS	685.	1217.	33.87	1093.	.63	.11	30068.	817.

```
*********************************500 YEAR STORM*********************************

 XSID:CODE   SRDL    LEW     AREA   VHD     HF     EGL    CRWS      Q    WSEL
       SRD   FLEN    REW        K  ALPH     HO     ERR     FR#    VEL

 EXIT :XS  ******  5745.    1060.   .02  *****   33.44   30.48    874.   33.42
     1031. ******  6573.   25213.  1.50  ***** *******     .16    .82

 FULLV:FV      45.  5871.     818.   .03    .06  33.51 *******    874.   33.48
     1076.     45.  6567.   21947.  1.74    .01    .00     .23   1.07
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 APPR :AS      93.  5927.    1090.   .02    .14  33.65 *******    874.   33.63
     1169.    109.  6614.   27466.  2.10    .00    .01     .16    .80
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===220 FLOW CLASS 1 (4) SOLUTION INDICATES POSSIBLE PRESSURE FLOW.
          WS3,WSIU,WS1,LSEL =    33.48      34.11      34.29      34.08

 ===245 ATTEMPTING FLOW CLASS 2 (5) SOLUTION.

 ===250 INSUFFICIENT HEAD FOR PRESSURE FLOW.
                    YU/Z,WSIU,WS = 1.04      34.32      34.53

 ===270 REJECTED FLOW CLASS 2 (5) SOLUTION.

           <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD     HF     EGL    CRWS      Q    WSEL
       SRD   FLEN    REW        K  ALPH     HO     ERR     FR#    VEL

 BRDGE:BR      45.  5967.     249.   .25    .13  33.73   30.14    874.   33.48
     1076.     45.  6010.   10427.  1.30    .16    .00     .29   3.51

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.   1.   1.   .876   .058   34.08    43.  5967.  6010.

 XSID:CODE   SRDL    LEW     AREA   VHD     HF     EGL    CRWS      Q    WSEL
       SRD   FLEN    REW        K  ALPH     HO     ERR     FR#    VEL

 APPR :AS      46.  5914.    1590.   .01    .19  34.30   29.60    874.   34.29
     1169.    105.  6722.   41498.  2.01    .39    .00     .10    .55

      M(G)   M(K)      KQ   XLKQ   XRKQ    OTEL
      .937   .664  13968.  5994.  6037.   34.27

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD     HF     EGL    CRWS      Q    WSEL
       SRD   FLEN    REW        K  ALPH     HO     ERR     FR#    VEL

 REFE :XS      48.  5911.    1491.   .01    .02  34.32 *******    874.   34.32
     1217.     53.  6863.   44160.  1.24    .00    .00     .09    .59

   XSID:CODE        Q    SRD    WSEL    AREA     VEL    FR#       K   XSTW
   EXIT :XS      874.  1031.   33.42   1060.     .82    .16  25213.   829.
```

FULLV:FV	874.	1076.	33.48	818.	1.07	.23	21947.	696.
BRDGE:BR	874.	1076.	33.48	249.	3.51	.29	10427.	43.
APPR :AS	874.	1169.	34.29	1590.	.55	.10	41498.	808.
REFE :XS	874.	1217.	34.32	1491.	.59	.09	44160.	952.

Appendix E

Stream Stability and Scour Analysis

HEC - 20

Level One Stream Stability Analysis

Step 1: Define Stream Characteristics

Stream Characteristics

Lone Pine Creek is a small stream with an average width ranging from 10 - 15 meters (30 - 50 feet). The bed material is Floridana Fine Sand, Depressional (see Soil Survey Appendix B) and has a low relief valley setting. As shown in Figure 5, the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map (FIRM), the flood plain for this creek is very wide (>10X channel width). Natural levees are not apparent and the stream is incised. Tree cover and vegetation on the channel banks is in the range of 50-90 percent. Lone Pine Creek is a sinuous, equiwidth channel which is not braided or anabranched.

Step 2: Evaluate Land Use Changes

Land Use Changes

The Future Land Use Map for Glades County, Figure 4, indicates that there will not be any changes in the land use surrounding Lone Pine Creek.

Step 3: Assess Overall Stability

Overall Stability

Based on the interpretation of observed data and identified stream characteristics, a preliminary assessment of stream stability would indicate Lone Pine Creek to be stable.

Steps 4 & 5: Evaluate Lateral & Vertical Stability

Vertical and Lateral Stability

There is no apparent bank erosion in the vicinity of the SR 29 bridge and Bridge Inspection Reports indicate that there has not been any significant amounts of aggradation or degradation of the channel bottom (see Underwater Bridge Inspection Report, Appendix C). These observations confirm Lone Pine Creek is a vertically and laterally stable channel.

Step 6: Evaluate Channel Response to Change

Evaluation of the present and historical channel and watershed conditions, it appears that the channel has not changed due to previous impacts and will not be greatly effected by the proposed widening of SR 29.

Conclusion:

Based on the qualitative assessments resulting from a Level One Analysis (HEC-18), it can be concluded that in the vicinity of the SR 29 crossing, Lone Pine Creek is a stable channel. There is no need for a more detailed analysis.

HEC - 18

Evaluating Scour at Highway Structures

A HEC-18 Scour Analysis was performed on the existing and proposed structures on SR 29 crossing Lone Pine Creek. The 100 year and 500 year frequency floods were used to estimate the most severe scour conditions at this location.

Water surface profiles were developed for these flood events by FHWA's WSPRO (Appendix D). Water surface elevations and velocities produced by this model were used in the scour calculations.

Four types of scour were estimated for the floods at Bridge No. 050035: aggradation/degradation, contraction, pier and abutment scour. Underwater Inspection Reports, changes in land use, up and downstream controls were evaluated to predict the long term bed elevation change. Contraction, pier and abutment scour values were computed using the method of analysis and equations found in HEC-18. The scour analysis variables used in the equations were taken from the WSPRO output, geotechnical and hydrologic information at the site.

The total scour predictions have been plotted on a cross section of the stream and flood plain at Bridge No. 050035. The differences in scour predictions for the existing and proposed bridges has been emphasized.

Existing Channel Bottom Elevation prior to Storm Event
27.11 feet

Estimated Scour Estimates (English)								
	Contraction		Pier		Abutment		Existing Bridge Channel Bottom Scour Elev.	Proposed Bridge Channel Bottom Scour Elev.
	Existing	Proposed	Existing	Proposed	Existing	Proposed		
50 Year Storm	8.70	8.68	3.09	3.12	9.29	8.78	**15.32**	15.30
100 Year Storm	9.76	9.74	3.29	3.26	9.71	9.29	**14.06**	**14.10**
500 Year Storm	12.03	12.01	3.57	3.61	10.84	10.23	**11.51**	**11.49**

Existing Channel Bottom Elevation prior to Storm Event
8.263 meters

Estimated Scour Estimates (Metric)								
	Contraction		Pier		Abutment		Existing Bridge Channel Bottom Scour Elev.	Proposed Bridge Channel Bottom Scour Elev.
	Existing	Proposed	Existing	Proposed	Existing	Proposed		
50 Year Storm	2.651	2.646	0.943	0.952	2.832	2.676	4.669	4.665
100 Year Storm	2.974	2.970	1.003	0.995	2.960	2.832	4.286	4.298
500 Year Storm	3.668	3.661	1.087	1.101	3.304	3.118	3.508	3.501

Contraction Scour Conditions at SR29

Case 1.a
The river channel width becomes narrower either due to the bridge abutments projecting into the channel or the bridge being located at a narrowing reach of the river, see Figure E-2.

Determine if flow upstream is transporting bed material:
Check V_c at approach:

$$V_c = 11.52 * y_1^{1/6} * D_{50}^{1/3}$$
$$D_{50} = 0.16 \text{ mm}$$
$$D_{50} = 0.00052493 \text{ ft}$$

If $V_{appr} < V_c$, Clear Water Contraction Scour exists.
If $V_{appr} > V_c$, Live Bed Contraction Scour exists.

Existing Bridge	A_{appr}	$TOPW_{appr}$	y_1	V_{appr}	V_c	Scour Type
50 Year	1032	615	1.68	0.57	1.01	**Clear Water**
100 Year	1167	615	1.90	0.57	1.03	**Clear Water**
500 Year	1432	615	2.33	0.57	1.07	**Clear Water**
Proposed Bridge						
50 Year	1041	615	1.69	0.57	1.01	**Clear Water**
100 Year	1176	615	1.91	0.57	1.04	**Clear Water**
500 Year	1447	615	2.35	0.56	1.07	**Clear Water**

Scour Calculations

Existing Bridge

HEC-18 SCOUR ANALYSIS

Design Frequency: 50 year
Bridge Configuration: Existing Bridge

Clear Water Contraction Scour:

** *Requires Input*

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

Q=	598 cfs	**Discharge at bridge section
D_{50}=	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
D_m=	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
W_1=	41 ft	**Bottom width of bridge less pier widths or overbank width, ft
A_{APPR}=	1032 ft^2	**Area at approach
$TOPW_{APPR}$=	615 ft	**Topwidth of approach
y_1=	1.68 ft	**Average depth at the bridge before scour, ft
y_2=	10.38 ft	**Depth of flow in the bridge opening, ft
y_s=	8.70 ft	**Contraction scour depth.
	2.65 m	

Local Scour at Piers:

$y_s/y_1 = 2.0 * K_1 * K_2 * K_3 * (a/y_1)^{0.65} * Fr^{0.43}$

		**Select conveyance tube with highest velocity
Area tube=	9.8 ft^2	**Conveyance tube area (from WSPRO)
v_1=	3.04 ft/sec	**Velocity of conveyance tube
top width=	1.7 ft	**Top width of tube
y_1=	5.765 ft	Flow depth directly upstream of the pier: Area tube/top width
Fr=	0.223	Froude's Number: $Fr = v_1/(g*y_1)^{0.5}$
K_1=	1.1	**Correction for pier shape
		$K_1 = 1$ for circular cylinder or group of cylinders
		$K_1 = 1.1$ for square nose
K_2=	1.2	**Correction for angle of attack of flow (see HEC-18)
K_3=	1.1	**Correction factor for bed condition (see HEC-18)
a=	1 ft	**Width of pier
y_s=	2.81 ft	**Local Scour at Piers**
y_s=	0.86 m	
y_s=	3.09 ft	Correction for Clear Water Scour: $y_s * 1.1$
y_s=	0.94 m	HEC-18, Ch. 2.6, p.16

Abutment Scour

Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5928.1	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5970.5	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.92	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	27.43 cfs	Flow in left overbank obstructed by left abut.
A_e =	78.35 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	38.90 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$$y_s/y_a = 2.27\, K_1\, K_2\, (a'/y_a)^{0.43}\, Fr^{0.61} + 1$$

** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	K_1 = 1.0
		Vertical Abutment with Wingwalls	K_1 = 0.82
		Spill-Through Abutment	K_1 = 0.55
K_2 =	1.03	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	117	$\theta < 90^\circ$ if embankment points downstream; $\theta > 90^\circ$ if embankment points upstream	
a' =	38.90 ft	** Length of abutment projected normal to flow.	
A_e =	78.35 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.35 ft/sec	Q_e/A_e	
Q_e =	27.43 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	2.01 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.04	** Froude Number of approach flow upstrea $V_e/(gy_a)^{0.5}$	
y_s =	4.06 ft	Scour depth.	
	1.24 m		

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	25.7 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.16 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment.
$TOPW_{tube}$ #1	5.40 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	4.76 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	38.90 ft	** Length of abutment projected normal to flow.
y_1 =	4.76 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	8.17	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation: NOT APPLICABLE

$y_s/y_1 = 4\ Fr_1^{0.33}$

***** *Requires Input***

V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel.
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6009.6	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6014.5	Right edge of conveyance tube.
# tubes	10	# of tubes completely obstructed.
#Tubes =	10.92	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	326.46 cfs	Flow in right overbank obstructed by right abutment.
A_e =	734.66 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	592.8 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27 K_1 K_2 (a'/y_a)^{0.43} Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.
		Vertical Abutment $K_1 = 1.0$
		Vertical Abutment with Wingwalls $K_1 = 0.82$
		Spill-Through Abutment $K_1 = 0.55$
K_2 =	0.95	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$
θ =	63	$\theta < 90°$ if embankment points downstream $\theta > 90°$ if embankment points upstream
a' =	592.80 ft	** Length of abutment projected normal to flow.
A_e =	734.66 ft^2	** Flow area of the approach cross section obstructed by the embankment.
V_e =	0.44 ft/sec	Q_e / A_e
Q_e =	326.46 cfs	** Flow obstructed by the abutment and approach embankment.
y_a =	1.24 ft	** Average depth of flow on the floodplain.
Fr_e =	0.07	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$
y_s =	7.43 ft 2.27 m	Scour depth.

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	25.7 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.16 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.00 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.14 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	592.80 ft	** Length of abutment projected normal to flow.
y_1 =	5.14 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	115.33	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** *Requires Input*
V_{abut} =	1.16 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	5.14 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.090	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	9.294 ft 2.833 m	Scour depth.

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

	DEPTH	**WIDTH**
Total scour at Piers:	**11.79 ft**	**7.88 ft**
Total Scour at Right Abutment:	**9.29 ft**	**26.02 ft**
Total Scour at Left Abutment:	**4.06 ft**	**11.37 ft**

HEC-18 SCOUR ANALYSIS

Design Frequency: 100 year
Bridge Configuration: Existing Bridge

Clear Water Contraction Scour:

*** Requires Input*

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

Q=	685 cfs	**Discharge at bridge section
D_{50}=	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
D_m=	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
W_1=	41 ft	**Bottom width of bridge less pier widths or overbank width, ft
A_{APPR}=	1167 ft^2	**Area at approach
$TOPW_{APPR}$=	615 ft	**Topwidth of approach
y_1=	1.90 ft	**Average depth at the bridge before scour, ft
y_2=	11.66 ft	**Depth of flow in the bridge opening, ft
y_s=	9.76 ft	**Contraction scour depth.
	2.97 m	

Local Scour at Piers:

$y_s/y_1=2.0*K_1*K_2*K_3*(a/y_1)^{0.65}*Fr^{0.43}$

		**Select from WSPRO conveyance tube with highest velocity
Area tube=	10.1 ft^2	**Conveyance tube area (from WSPRO)
v_1=	3.41 ft/sec	**Velocity of conveyance tube
top width=	1.6 ft	**Top width of tube
y_1=	6.312 ft	Flow depth directly upstream of the pier: Area tube/top width
Fr=	0.239	Froude's Number: $Fr=v_1/(g*y_1)^{0.5}$
K_1=	1.1	**Correction for pier shape
		$K_1=1$ for circular cylinder or group of cylinders
		$K_1=1.1$ for square nose
K_2=	1.2	**Correction for angle of attack of flow (see HEC-18)
K_3=	1.1	**Correction factor for bed condition (see HEC-18)
a=	1 ft	**Width of pier
y_s=	2.99 ft	**Local Scour at Piers**
y_s=	0.91 m	
y_s=	3.29 ft	Correction for Clear Water Scour: $y_s * 1.1$
y_s=	1.00 m	HEC-18, Ch. 2.6, p.16

Abutment Scour

Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5925.3	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5969.9	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.93	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	32.02 cfs	Flow in left overbank obstructed by left abutment.
A_e =	85.00 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	41.7 ft	Length of abutment projected in ** ***Requires Input*** WSPRO output.

Froehlich's Equation

$$y_s/y_a = 2.27\, K_1 K_2 (a'/y_a)^{0.43}\, Fr^{0.61} + 1$$

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	K_1 = 1.0
		Vertical Abutment with Wingwalls	K_1 = 0.82
		Spill-Through Abutment	K_1 = 0.55
K_2 =	1.03	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	117	$\theta < 90^o$ if embankment points downstream; $\theta > 90^o$ if embankment points upstream	
a' =	41.70 ft	** Length of abutment projected normal to flow.	
A_e =	85.00 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.38 ft/sec	Q_e/A_e	$V_e/(gy_a)^{0.5}$
Q_e =	32.02 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	2.04 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.05	** Froude Number of approach flow upstream of the abutment. =	
y_s =	4.25 ft 1.30 m	Scour depth.	

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	26.3 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.3 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.40 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	4.87 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	41.70 ft	** Length of abutment projected normal to flow.
y_1 =	4.87 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	8.56	** The ratio for a PPLICABLE
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation:

$y_s/y_1 = 4 Fr_1^{0.33}$			** ***Requires Input***
V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6006.7	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6012	Right edge of conveyance tube.
# tubes	11	# of tubes completely obstructed.
#Tubes =	11.38	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	389.67 cfs	Flow in right overbank obstructed by right abutment.
A_e =	868.69 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	628.7 ft	Length of abutment projected in ** ***Requires Input*** WSPRO output.

Froehlich's Equation

$$y_s/y_a = 2.27 K_1 K_2 (a'/y_a)^{0.43} Fr^{0.61} + 1$$

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	K_1 = 1.0
		Vertical Abutment with Wingwalls	K_1 = 0.82
		Spill-Through Abutment	K_1 = 0.55
K_2 =	0.95	** Coefficient for angle of embankment to flow.	
		$K_2 = (\theta/90)^{0.13}$	
θ =	63	$\theta < 90^o$ if embankment points downstream	
		$\theta > 90^o$ if embankment points upstream	
a' =	628.70 ft	** Length of abutment projected normal to flow.	
A_e =	868.69 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.45 ft/sec	Q_e/A_e	$V_e/(gy_a)^{0.5}$
Q_e =	389.67 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	1.38 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.07	** Froude Number of approach flow upstream of the abutment. =	
y_s =	7.96 ft	Scour depth.	
	2.43 m		

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	26.4 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.3 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.10 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.18 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	628.70 ft	** Length of abutment projected normal to flow.
y_1 =	5.18 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	121.45	** The ratio for abutment length projection. If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq. If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** ***Requires Input***
V_{abut} =	1.3 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	5.18 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.101	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	9.707 ft 2.959 m	Scour depth.

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

	DEPTH	**WIDTH**
Total scour at Piers:	**13.05 ft**	**8.38 ft**
Total Scour at Right Abutment:	**9.71 ft**	**27.18 ft**
Total Scour at Left Abutment:	**4.25 ft**	**11.90 ft**

HEC-18 SCOUR ANALYSIS

Design Frequency: 500 year
Bridge Configuration: Existing Bridge

Clear Water Contraction Scour:

** *Requires Input*

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

$Q=$	874 cfs	**Discharge at bridge section
$D_{50}=$	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
$D_m=$	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
$W_1=$	41 ft	**Bottom width of bridge less pier widths or overbank width, ft
$A_{APPR}=$	1432 ft^2	**Area at approach
$TOPW_{APPR}=$	615 ft	**Topwidth of approach
$y_1=$	2.33 ft	**Average depth at the bridge before scour, ft
$y_2=$	14.36 ft	**Depth of flow in the bridge opening, ft
$y_s=$	12.03 ft	**Contraction scour depth.
	3.67 m	

Local Scour at Piers:

ys/y1=2.0*K1*K2*K3*(a/y1)^0.65*Fr^0.43

		**Select from WSPRO conveyance tube with highest velocity
Area tube=	10.6 ft^2	**Conveyance tube area (from WSPRO)
$v_1=$	4.13 ft/sec	**Velocity of conveyance tube
top width=	1.7 ft	**Top width of tube
$y_1=$	6.235 ft	Flow depth directly upstream of the pier: Area tube/top width
$Fr=$	0.291	Froude's Number: $Fr=v_1/(g*y_1)^{0.5}$
$K_1=$	1.1	**Correction for pier shape
		$K_1=1$ for circular cylinder or group of cylinders
		$K_1=1.1$ for square nose
$K_2=$	1.2	**Correction for angle of attack of flow (see HEC-18)
$K_3=$	1.1	**Correction factor for bed condition (see HEC-18)
$a=$	1 ft	**Width of pier
$y_s=$	3.24 ft	**Local Scour at Piers**
$y_s=$	0.99 m	
$y_s=$	3.57 ft	Correction for Clear Water Scour: $y_s * 1.1$
$y_s=$	1.09 m	HEC-18, Ch. 2.6, p.16

Abutment Scour
Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5916.1	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5968.4	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.97	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	42.53 cfs	Flow in left overbank obstructed by left abutment.
A_e =	100.30 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	50.9 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\, K_1 K_2 (a'/y_a)^{0.43}\, Fr^{0.61} + 1$ **** *Requires Input***

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	$K_1 = 1.0$
		Vertical Abutment with Wingwalls	$K_1 = 0.82$
		Spill-Through Abutment	$K_1 = 0.55$
K_2 =	1.03	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	117	$\theta < 90^o$ if embankment points downstream $\theta > 90^o$ if embankment points upstream	
a' =	50.90 ft	** Length of abutment projected normal to flow.	
A_e =	100.30 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.42 ft/sec	Q_e / A_e	
Q_e =	42.53 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	1.97 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.05	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$	
y_s =	4.54 ft	Scour depth.	
	1.38 m		

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	28.1 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.55 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.40 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.20 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	50.90 ft	** Length of abutment projected normal to flow.
y_1 =	5.20 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	9.78	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation:

NOT APPLICABLE

$y_s/y_1 = 4\ Fr_1^{0.33}$			** ***Requires Input***
V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. *V_{abut}* can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	**REMARKS**
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6005.3	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6011.6	Right edge of conveyance tube.
# tubes	12	# of tubes completely obstructed.
#Tubes =	12.25	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	535.50 cfs	Flow in right overbank obstructed by right abutment.
A_e =	1161.73 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	706.3 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\ K_1 K_2 (a'/y_a)^{0.43}\ Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	$K_1 = 1.0$
		Vertical Abutment with Wingwalls	$K_1 = 0.82$
		Spill-Through Abutment	$K_1 = 0.55$
K_2 =	0.95	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	63	$\theta < 90^\circ$ if embankment points downstream $\theta > 90^\circ$ if embankment points upstream	
a' =	706.30 ft	** Length of abutment projected normal to flow.	
A_e =	1161.73 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.46 ft/sec	Q_e / A_e	
Q_e =	535.50 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	1.64 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.06	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$	
y_s =	9.01 ft 2.75 m	Scour depth.	

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	28.1 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.55 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.10 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.51 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	706.30 ft	** Length of abutment projected normal to flow.
y_1 =	5.51 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	128.19	** The ratio for abutment length projection. If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq. If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** *Requires Input*
V_{abut} =	1.55 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	5.51 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.116	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	10.837 ft 3.303 m	Scour depth.

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

	DEPTH	**WIDTH**
Total scour at Piers:	**15.60 ft**	**9.08 ft**
Total Scour at Right Abutment:	**10.84 ft**	**30.34 ft**
Total Scour at Left Abutment:	**4.54 ft**	**12.70 ft**

Scour Calculations

Proposed Bridge

HEC-18 SCOUR ANALYSIS

Design Frequency: 50 year
Bridge Configuration: Proposed Bridge

Clear Water Contraction Scour:

** *Requires Input*

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

Q=	598 cfs	**Discharge at bridge section
D_{50}=	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
D_m=	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
W_1=	41 ft	**Bottom width of bridge less pier widths or overbank width
A_{APPR}=	1041 ft^2	**Area at approach
$TOPW_{APPR}$=	615 ft	**Topwidth of approach
y_1=	1.69 ft	**Average depth at the bridge before scour, ft
y_2=	10.38 ft	**Depth of flow in the bridge opening, ft
y_s=	8.68 ft	**Contraction scour depth.
	2.65 m	

Local Scour at Piers:

$y_s/y_1 = 2.0*K_1*K_2*K_3*(a/y_1)^{0.65}*Fr^{0.43}$

		**Select conveyance tube with highest velocity
Area tube=	9.8 ft^2	**Conveyance tube area (from WSPRO)
v_1=	3.05 ft/sec	**Velocity of conveyance tube
top width=	1.6 ft	**Top width of tube
y_1=	6.125 ft	Flow depth directly upstream of the pier: Area tube/top width
Fr=	0.217	Froude's Number: $Fr=v_1/(g*y_1)^{0.5}$
K_1=	1.1	**Correction for pier shape
		$K_1=1$ for circular cylinder or group of cylinders
		$K_1=1.1$ for square nose
K_2=	1.2	**Correction for angle of attack of flow (see HEC-18)
K_3=	1.1	**Correction factor for bed condition (see HEC-18)
a=	1 ft	**Width of pier
y_s=	2.84 ft	**Local Scour at Piers**
y_s=	0.87 m	
y_s=	3.12 ft	Correction for Clear Water Scour: $y_s * 1.1$
y_s=	0.95 m	HEC-18, Ch. 2.6, p.16

Abutment Scour

Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5927.9	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5970.5	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.92	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	27.44 cfs	Flow in left overbank obstructed by left abut.
A_e =	79.12 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	39.10 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\ K_1 K_2 (a'/y_a)^{0.43}\ Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	K_1 = 1.0
		Vertical Abutment with Wingwalls	K_1 = 0.82
		Spill-Through Abutment	K_1 = 0.55
K_2 =	1.03	** Coefficient for angle of embankment to flow.	
		$K_2 = (\theta/90)^{0.13}$	
θ =	117	$\theta < 90^o$ if embankment points downstream	
		$\theta > 90^o$ if embankment points upstream	
a' =	39.10 ft	** Length of abutment projected normal to flow.	
A_e =	79.12 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.35 ft/sec	Q_e/A_e	
Q_e =	27.44 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	2.02 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.04	** Froude Number of approach flow upstr $V_e/(gy_a)^{0.5}$	
y_s =	4.07 ft	Scour depth.	
	1.24 m		

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	24.8 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.21 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment.
$TOPW_{tube}$ #1	5.00 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	4.96 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	39.10 ft	** Length of abutment projected normal to flow.
y_1 =	4.96 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	7.88	** The ratio for abutment length projection.
		If L/y_1 > 25 Bridge not skewed to flow. Use HIRE eq.
		If L/y_1 < 25 HIRE eq not appropriate.

Hire Computation: NOT APPLICABLE

$y_s/y_1 = 4\ Fr_1^{0.33}$

***** Requires Input***

V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel.
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	**REMARKS**
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6009.7	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6014.7	Right edge of conveyance tube.
# tubes	10	# of tubes completely obstructed.
#Tubes =	10.94	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	327.11 cfs	Flow in right overbank obstructed by right abutment.
A_e =	742.60 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	595.1 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27 K_1 K_2 (a'/y_a)^{0.43} Fr^{0.61} + 1$ — ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape. Vertical Abutment $K_1 = 1.0$ Vertical Abutment with Wingwalls $K_1 = 0.82$ Spill-Through Abutment $K_1 = 0.55$
K_2 =	0.95	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$
θ =	63	$\theta < 90°$ if embankment points downstream $\theta > 90°$ if embankment points upstream
a' =	595.10 ft	** Length of abutment projected normal to flow.
A_e =	742.60 ft^2	** Flow area of the approach cross section obstructed by the embankment.
V_e =	0.44 ft/sec	Q_e/A_e
Q_e =	327.11 cfs	** Flow obstructed by the abutment and approach embankment.
y_a =	1.25 ft	** Average depth of flow on the floodplain.
Fr_e =	0.07	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$
y_s =	7.43 ft 2.26 m	Scour depth.

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	598 cfs	Total discharge Input to WSPRO
q_{tube} =	29.9 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	25.2 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.19 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.30 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	4.75 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	595.10 ft	** Length of abutment projected normal to flow.
y_1 =	4.75 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	125.16	** The ratio for abutment length projection.

If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.

If $L/y_1 < 25$ HIRE eq not appropriate.

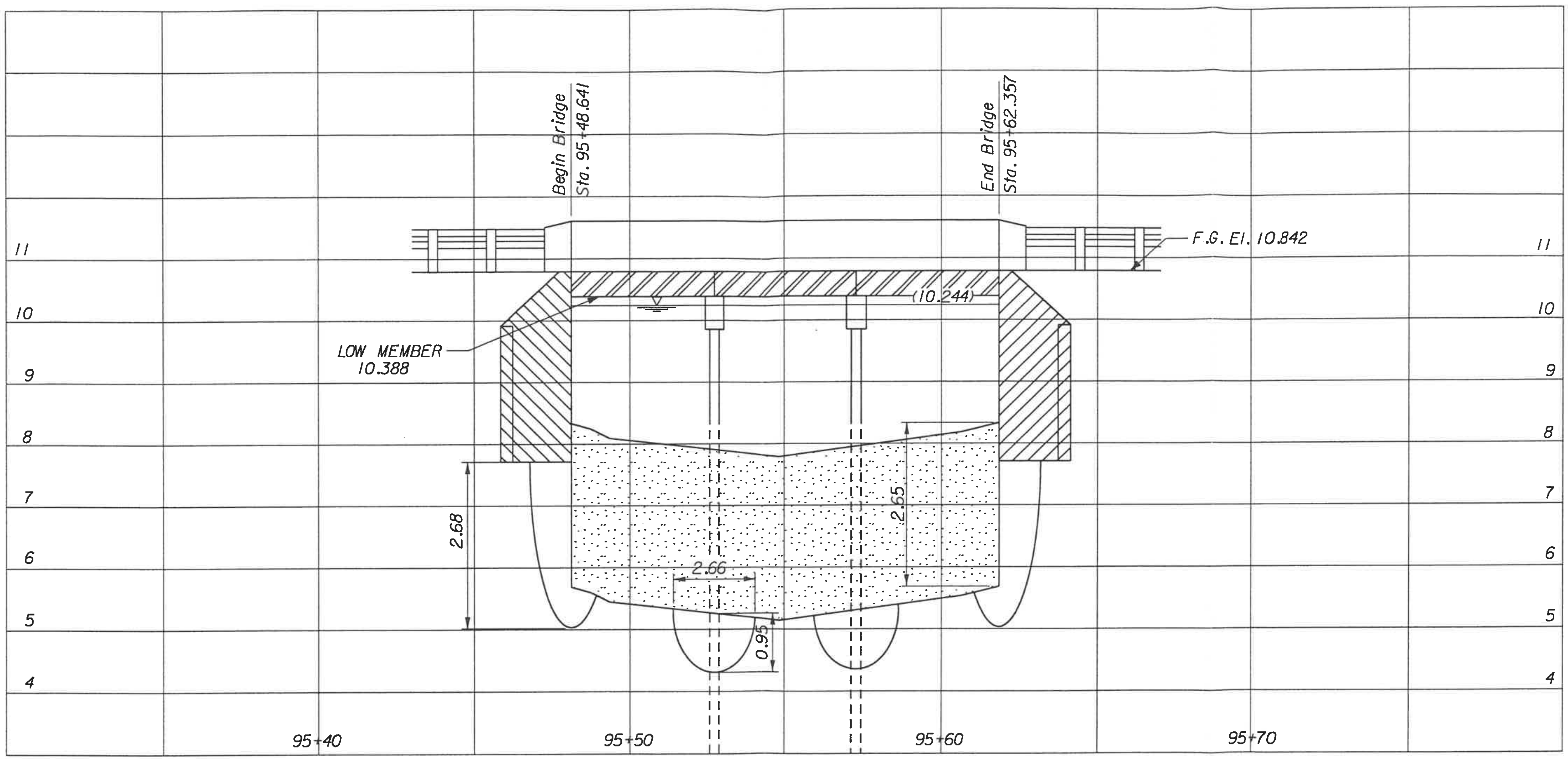
Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** *Requires Input*
V_{abut} =	1.19 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	4.75 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.096	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	8.782 ft 2.677 m	Scour depth.

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

	DEPTH	**WIDTH**
Total scour at Piers:	**11.81 ft**	**7.95 ft**
Total Scour at Right Abutment:	**8.78 ft**	**24.59 ft**
Total Scour at Left Abutment:	**4.07 ft**	**11.38 ft**



50 YEAR STORM
SCOUR PROFILE
N.T.S.

PROPOSED BRIDGE
OVER
LONE PINE CREEK

JMI
ENGINEERS

HEC-18 SCOUR ANALYSIS

Design Frequency: 100 year
Bridge Configuration: Proposed Bridge

Clear Water Contraction Scour:

***** Requires Input***

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

$Q=$	685 cfs	**Discharge at bridge section
$D_{50}=$	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
$D_m=$	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
$W_1=$	41 ft	**Bottom width of bridge less pier widths or overbank width, ft
$A_{APPR}=$	1176 ft^2	**Area at approach
$TOPW_{APPR}=$	615 ft	**Topwidth of approach
$y_1=$	1.91 ft	**Average depth at the bridge before scour, ft
$y_2=$	11.66 ft	**Depth of flow in the bridge opening, ft
$y_s=$	9.74 ft	**Contraction scour depth.
	2.97 m	

Local Scour at Piers:

$y_s/y_1=2.0*K_1*K_2*K_3*(a/y_1)^{0.65}*Fr^{0.43}$

		**Select from WSPRO conveyance tube with highest velocity
Area tube=	10 ft^2	**Conveyance tube area (from WSPRO)
$v_1=$	3.42 ft/sec	**Velocity of conveyance tube
top width=	1.7 ft	**Top width of tube
$y_1=$	5.882 ft	Flow depth directly upstream of the pier: Area tube/top width
$Fr=$	0.248	Froude's Number: $Fr=v_1/(g*y_1)^{0.5}$
$K_1=$	1.1	**Correction for pier shape
		$K_1=1$ for circular cylinder or group of cylinders
		$K_1=1.1$ for square nose
$K_2=$	1.2	**Correction for angle of attack of flow (see HEC-18)
$K_3=$	1.1	**Correction factor for bed condition (see HEC-18)
$a=$	1 ft	**Width of pier
$y_s=$	2.97 ft	**Local Scour at Piers**
$y_s=$	0.90 m	
$y_s=$	3.26 ft	Correction for Clear Water Scour: $y_s * 1.1$
$y_s=$	0.99 m	HEC-18, Ch. 2.6, p.16

Abutment Scour

Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5928.1	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5969.7	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.94	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	32.03 cfs	Flow in left overbank obstructed by left abutment.
A_e =	85.54 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	41.9 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\, K_1 K_2 (a'/y_a)^{0.43}\, Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	$K_1 = 1.0$
		Vertical Abutment with Wingwalls	$K_1 = 0.82$
		Spill-Through Abutment	$K_1 = 0.55$
K_2 =	1.03	** Coefficient for angle of embankment to flow.	
		$K_2 = (\theta/90)^{0.13}$	
θ =	117	$\theta < 90^\circ$ if embankment points downstream	
		$\theta > 90^\circ$ if embankment points upstream	
a' =	41.90 ft	** Length of abutment projected normal to flow.	
A_e =	85.54 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.37 ft/sec	Q_e / A_e	
Q_e =	32.03 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	2.04 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.05	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$	
y_s =	4.25 ft	Scour depth.	
	1.30 m		

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	25.4 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.35 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.00 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.08 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	41.90 ft	** Length of abutment projected normal to flow.
y_1 =	5.08 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	8.25	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation: NOT APPLICABLE

$y_s/y_1 = 4\ Fr_1^{0.33}$			** ***Requires Input***
V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6006.7	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6012.1	Right edge of conveyance tube.
# tubes	11	# of tubes completely obstructed.
#Tubes =	11.39	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	390.07 cfs	Flow in right overbank obstructed by right abutment.
A_e =	877.54 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	631 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\, K_1 K_2 (a'/y_a)^{0.43} Fr^{0.61} + 1$ **** *Requires Input***

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	$K_1 = 1.0$
		Vertical Abutment with Wingwalls	$K_1 = 0.82$
		Spill-Through Abutment	$K_1 = 0.55$
K_2 =	0.95	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	63	$\theta < 90^\circ$ if embankment points downstream $\theta > 90^\circ$ if embankment points upstream	
a' =	631.00 ft	** Length of abutment projected normal to flow.	
A_e =	877.54 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.44 ft/sec	Q_e / A_e	
Q_e =	390.07 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	1.39 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.07	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$	
y_s =	7.95 ft 2.42 m	Scour depth.	

Hydraulic variables for **Hire Eq.**

	Values	REMARKS
Q =	685 cfs	Total discharge Input to WSPRO
q_{tube} =	34.25 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	25.8 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.33 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.30 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	4.87 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	631.00 ft	** Length of abutment projected normal to flow.
y_1 =	4.87 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	129.62	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

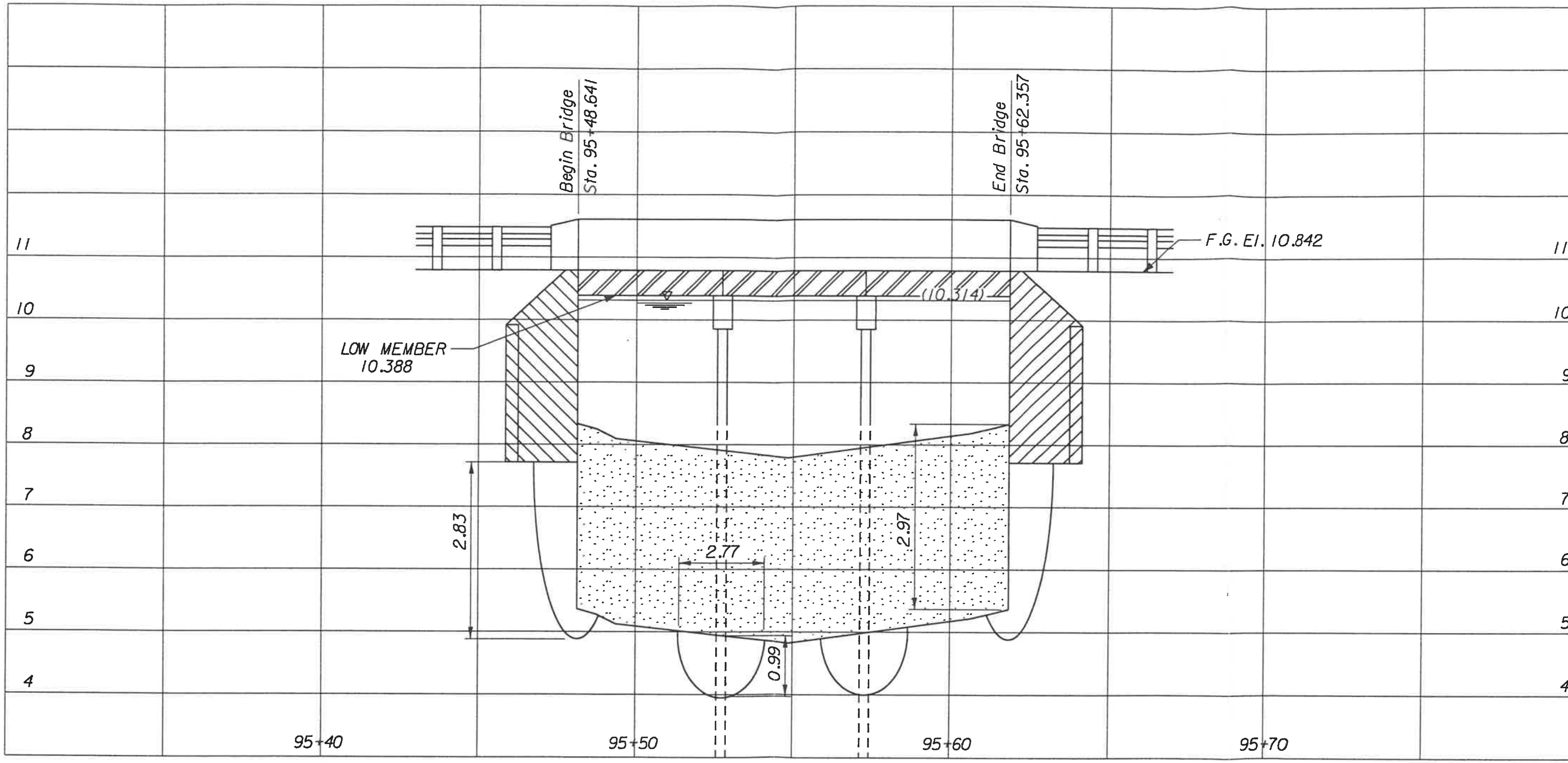
Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** ***Requires Input***
V_{abut} =	1.33 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	4.87 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.106	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	9.291 ft	Scour depth.
	2.832 m	

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

	DEPTH	WIDTH
Total scour at Piers:	**13.01 ft**	**8.31 ft**
Total Scour at Right Abutment:	**9.29 ft**	**26.02 ft**
Total Scour at Left Abutment:	**4.25 ft**	**11.90 ft**



100 YEAR STORM SCOUR PROFILE

N.T.S.

PROPOSED BRIDGE OVER LONE PINE CREEK

JMI ENGINEERS

HEC-18 SCOUR ANALYSIS

Design Frequency: 500 year
Bridge Configuration: Proposed Bridge

Clear Water Contraction Scour:

** *Requires Input*

$y_2 = (Q^2/(120 \cdot D_m^{2/3} * W^2))^{3/7}$

Q=	874 cfs	**Discharge at bridge section
D_{50}=	0.16 mm	**Median grain size at bridge
	0.000524934 ft	
D_m=	0.000656168 ft	**Effective mean grain size, ft. Taken as 1.25 times the median grain size (D_{50})
W_1=	41 ft	**Bottom width of bridge less pier widths or overbank width, ft
A_{APPR}=	1447 ft^2	**Area at approach
$TOPW_{APPR}$=	615 ft	**Topwidth of approach
y_1=	2.35 ft	**Average depth at the bridge before scour, ft
y_2=	14.36 ft	**Depth of flow in the bridge opening, ft
y_s=	12.01 ft	**Contraction scour depth.
	3.66 m	

Local Scour at Piers:

ys/y1=2.0*K1*K2*K3*(a/y1)^0.65*Fr^0.43

		**Select from WSPRO conveyance tube with highest velocity
Area tube=	10.4 ft^2	**Conveyance tube area (from WSPRO)
v_1=	4.2 ft/sec	**Velocity of conveyance tube
top width=	1.6 ft	**Top width of tube
y_1=	6.500 ft	Flow depth directly upstream of the pier: Area tube/top width
Fr=	0.290	Froude's Number: $Fr=v_1/(g*y_1)^{0.5}$
K_1=	1.1	**Correction for pier shape
		K_1=1 for circular cylinder or group of cylinders
		K_1=1.1 for square nose
K_2=	1.2	**Correction for angle of attack of flow (see HEC-18)
K_3=	1.1	**Correction factor for bed condition (see HEC-18)
a=	1 ft	**Width of pier
y_s=	3.29 ft	**Local Scour at Piers**
y_s=	1.00 m	
y_s=	3.61 ft	Correction for Clear Water Scour: y_s * 1.1
y_s=	1.10 m	HEC-18, Ch. 2.6, p.16

Abutment Scour

Left Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	**REMARKS**
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	5915.6	Left edge of conveyance tube #1.
X-sta. 2	5967	Station of left edge of bridge (edge of obstruction)
X-sta. 3	5968.4	Right edge of conveyance tube beyond bridge.
	0	Number of tubes completely obstructed.
#Tubes =	0.97	Number of approach section conveyance tubes which are obstructed by left abutment.
Q_e =	42.54 cfs	Flow in left overbank obstructed by left abutment.
A_e =	101.37 ft^2	Left abutment; area of conveyance. Determined from WSPRO output.
a' =	51.4 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27 K_1 K_2 (a'/y_a)^{0.43} Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.
		Vertical Abutment — $K_1 = 1.0$
		Vertical Abutment with Wingwalls — $K_1 = 0.82$
		Spill-Through Abutment — $K_1 = 0.55$
K_2 =	1.03	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$
θ =	117	$\theta < 90°$ if embankment points downstream; $\theta > 90°$ if embankment points upstream
a' =	51.40 ft	** Length of abutment projected normal to flow.
A_e =	101.37 ft^2	** Flow area of the approach cross section obstructed by the embankment.
V_e =	0.42 ft/sec	Q_e / A_e
Q_e =	42.54 cfs	** Flow obstructed by the abutment and approach embankment.
y_a =	1.97 ft	** Average depth of flow on the floodplain.
Fr_e =	0.05	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$
y_s =	4.53 ft	Scour depth.
	1.38 m	

Hydraulic variables for **Hire Eq.**

	Values	REMARKS
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	27.1 ft^2	Area of conveyance tube #1, adjacent to left abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.61 ft/s	Mean velocity of conveyance tube #1, adjacent to left abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.10 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.31 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	51.40 ft	** Length of abutment projected normal to flow.
y_1 =	5.31 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	9.67	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

Hire Computation: NOT APPLICABLE

$y_s/y_1 = 4\ Fr_1^{0.33}$ ***** Requires Input***

V_{abut} =	N/A	ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	N/A	ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	N/A		** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	N/A	ft	Scour depth.

Right Abutment:

Hydraulic variables for **Froehlich's Eq.**

	Values	REMARKS
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube. Defined as the total discharge divided by 20.
X-sta. 1	6005.6	Left edge of conveyance tube beyond bridge.
X-sta. 2	6010	Station of right edge of bridge (edge of obstruction)
X-sta. 3	6011.8	Right edge of conveyance tube.
# tubes	12	# of tubes completely obstructed.
#Tubes =	12.29	Number of approach section conveyance tubes which are obstructed by right abutment.
Q_e =	537.09 cfs	Flow in right overbank obstructed by right abutment.
A_e =	1179.06 ft^2	Right abutment; area of conveyance. Determined from WSPRO output.
a' =	708.3 ft	Length of abutment projected into flow. Determined from WSPRO output.

Froehlich's Equation

$y_s/y_a = 2.27\, K_1 K_2 (a'/y_a)^{0.43}\, Fr^{0.61} + 1$ ** *Requires Input*

K_1 =	0.82	** Coefficient for abutment shape.	
		Vertical Abutment	$K_1 = 1.0$
		Vertical Abutment with Wingwalls	$K_1 = 0.82$
		Spill-Through Abutment	$K_1 = 0.55$
K_2 =	0.95	** Coefficient for angle of embankment to flow. $K_2 = (\theta/90)^{0.13}$	
θ =	63	$\theta < 90^\circ$ if embankment points downstream $\theta > 90^\circ$ if embankment points upstream	
a' =	708.30 ft	** Length of abutment projected normal to flow.	
A_e =	1179.06 ft^2	** Flow area of the approach cross section obstructed by the embankment.	
V_e =	0.46 ft/sec	Q_e / A_e	
Q_e =	537.09 cfs	** Flow obstructed by the abutment and approach embankment.	
y_a =	1.66 ft	** Average depth of flow on the floodplain.	
Fr_e =	0.06	** Froude Number of approach flow upstream of the abutment. = $V_e/(gy_a)^{0.5}$	
y_s =	9.01 ft 2.74 m	Scour depth.	

Hydraulic variables for **Hire Eq.**

	Values	**REMARKS**
Q =	874 cfs	Total discharge Input to WSPRO
q_{tube} =	43.7 cfs	Discharge per equal conveyance tube.
A_{tube} #1 =	27.5 ft^2	Area of conveyance tube #1, adjacent to right abutment. Read directly from WSPRO. **(Bridge X-Sec.)**
V_{tube} =	1.59 ft/s	Mean velocity of conveyance tube #1, adjacent to right abutment. Read from WSPRO. **(Bridge X-Sec.)**
$TOPW_{tube}$ #1	5.40 ft	Difference between left and right station of conveyance tube 1, from WSPRO.
y_1 =	5.09 ft	Average depth of conveyance tube 1. $A_{tube}/TOPW_{tube}$ of conveyance tube 1.

Hire Equation

Check L/y_1 ratio:

$L/y_1 \sim a'/y_1$		Check for validity of equation.
a' =	708.30 ft	** Length of abutment projected normal to flow.
y_1 =	5.09 ft	** $A_{tube}/TOPW_{tube}$ of conveyance tube #1
a' / y_1 =	139.08	** The ratio for abutment length projection.
		If $L/y_1 > 25$ Bridge not skewed to flow. Use HIRE eq.
		If $L/y_1 < 25$ HIRE eq not appropriate.

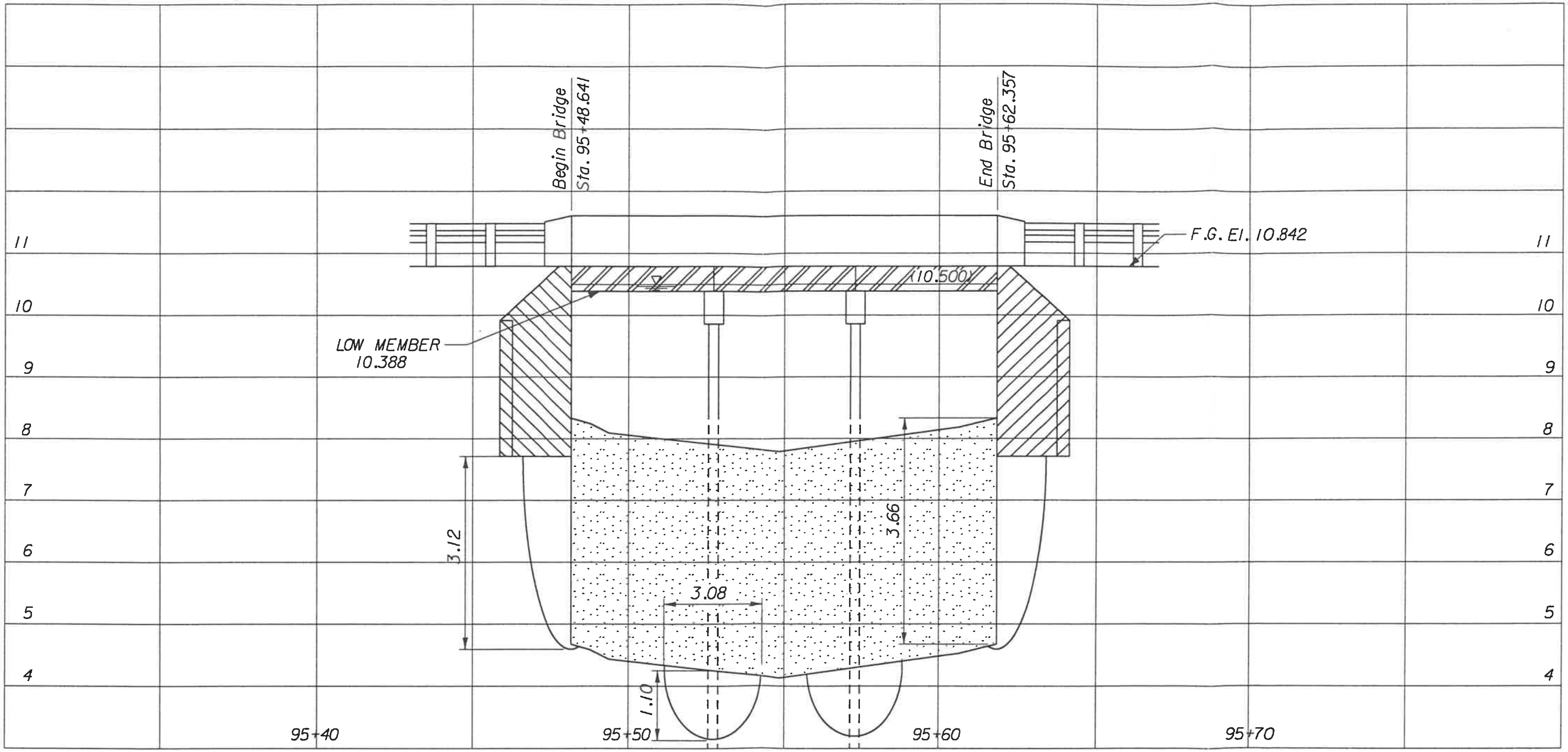
Hire Computation:

$y_s/y_1 = 4\ Fr_1^{0.33}$		** ***Requires Input***
V_{abut} =	1.59 ft/s	** Velocity through bridge adjacent to abutment, ft/s. V_{abut} can be determined directly from WSPRO.
y_1 =	5.09 ft	** Depth of flow at the abutment on the overbank or in the main channel
Fr_1 =	0.124	** Froude Number based on the velocity and depth in the bridge opening adjacent to the abutment.
y_s =	10.233 ft	Scour depth.
	3.119 m	

Total Scour:

Assume that the width of the scour hole is equal to 2.8 * y_s. (HEC-18 Manual)

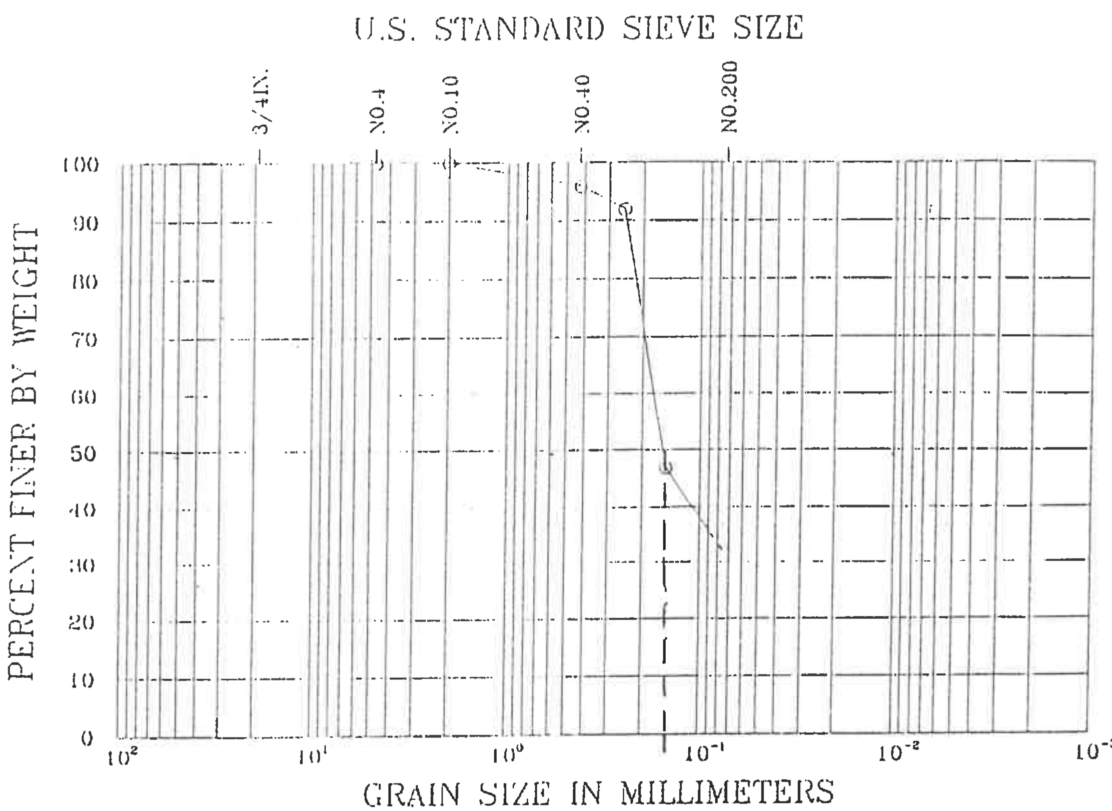
	DEPTH	**WIDTH**
Total scour at Piers:	**15.62 ft**	**9.20 ft**
Total Scour at Right Abutment:	**10.23 ft**	**28.65 ft**
Total Scour at Left Abutment:	**4.53 ft**	**12.70 ft**



500 YEAR STORM
SCOUR PROFILE
N.T.S.

PROPOSED BRIDGE
OVER
LONE PINE CREEK

JMI
ENGINEERS



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

LOCATION: STATION 95+39 10m LT OF C.L.
SAMPLE DEPTH: 10.21 m

-o-

SOIL CLASSIFICATION: A-2-4, SC

STATE PROJECT # 05090-1511
BRIDGE # 050035

THIS CURVE REPRESENTS MATERIAL
0.0 m to 3.5 m and 4.6 m to 8.0 m
BENEATH CHANNEL BOTTOM

CURVE 2

D_{50} = 0.16 (from 0 - 11.58 feet)

DATE OF INSPECTION: 2/8/93

DATE: 2/8/93

FIXED AND MOVEABLE UNDERWATER BRIDGE INSPECTION REPORT

BRIDGE NO.	LOCAL NAME	S.R. NO.	TOPSIDE INSP.	DIVER INSP.
050035	LONG PINE	29	JED	~~BGH~~/MIW/AMB

FIXED SPAN COMPONENTS

G3.00 (60)	Substructure Overall Rating	8
G3.01	Piling / Shafts	8
G3.02	Footings/Caissons	N
G3.03	Columns/Wall Piers	
G3.04	Intermediate Caps (Bent & Pier)	
G3.05	Bracing/Struts/Web Walls	
G3.06	Abutments/End Bents	
G3.07	Slope Protection/ Slopes	N

CHANNEL - MAJOR FEATURE

G5.00 (61)	Channel & Channel Protection Overall	N
G5.01	Fender System	
G6.06	Fishing Walks	
G5.03	Embankments/ Slopes/Bulkheads	
G5.04	Degradation/ Aggregation	
G5.05	Alignment	
G5.06	Flow	
	Obstruction	N

MOVEABLE SPAN ELEMENTS

G13.01	Piling/Shafts	N
G13.02	Footings/Caissons	
G13.03	Caps(Bent, Pier)	
G13.04	Columns/Piers(Wall/ Pivot/Rest/Bascule	
G9.07	Submarine Cable	
G13.00	Substructure Overall Rating	N

WATER/SCOUR CONDITIONS

SCOUR CRITICAL: NO
TYPE:
1. GENERAL
2. LOCAL
3. AGGREGATION/DEGRADATION

TIDAL: NO

WATER TYPE: 2
1. FRESH/CLEAR
2. FRESH/TANNIC
3. SALT
4. BRACKISH
5. STAGNANT

(K9)WATER QUALITY: O
0. NO DATA AVAILABLE
1. GOOD
2. FAIR
3. POOR
N. NOT APPLICABLE

K(10)WATER DEPTH:
AVERAGE 4 FT.
MAXIMUM 5 FT.

(K11)BOTTOM MATERIAL:
1. MUD
2. SAND
3. MARINE GROWTH/CORAL
4. ROCK
5. GRAVEL
6. OTHER

TOTAL MAN HOURS: 2

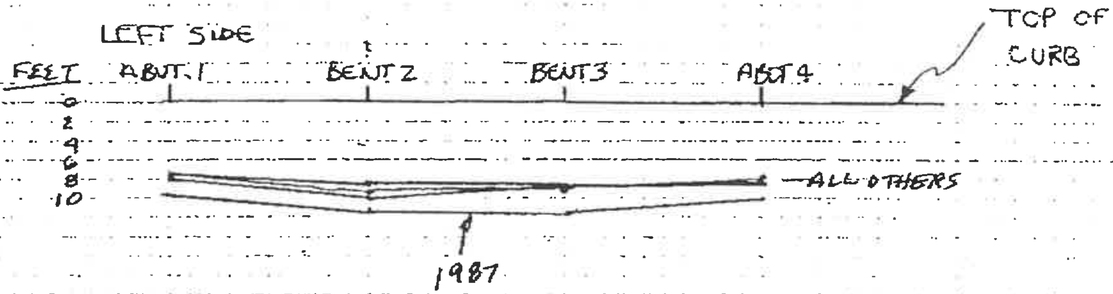
ITEMS INSPECTED:
CONCRETE PILES 1 THRU 5 OF BENTS 2 AND 3.

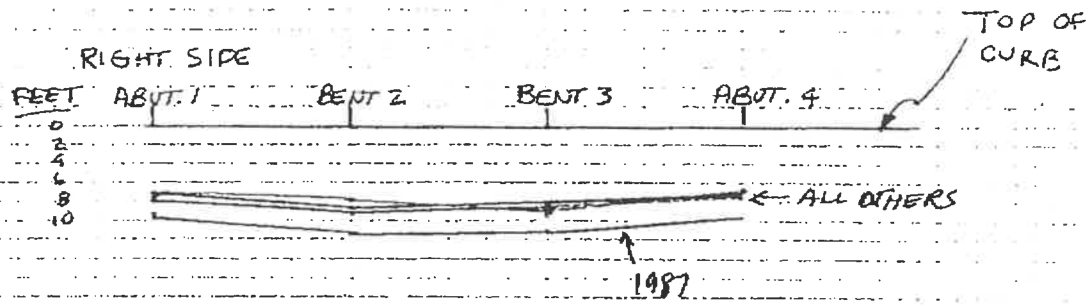
COMMENTS:
THE UNDERWATER INSPECTION OF CONCRETE PILES EXHIBIT MODERATE TO HEAVY MATRIX LOSS WITH NO SIGNIFICANT CRACKS OR SPALLS.

RECOMMENDATIONS:

Post-it® Fax Note 7671	Date 11-6	# of pages ▶ 2
To PAULA COULLIETT	From LYNDON SCHMIDT	
Co./Dept.	Co. FDOT	
Phone # 385-7450	Phone # 813-744-6050	
Fax # 904-385-3545	Fax #	

Note: No report of scour for divers. Channel profile did not change significantly over the years (1987 measurements may be in error).





050035

Channel Profile

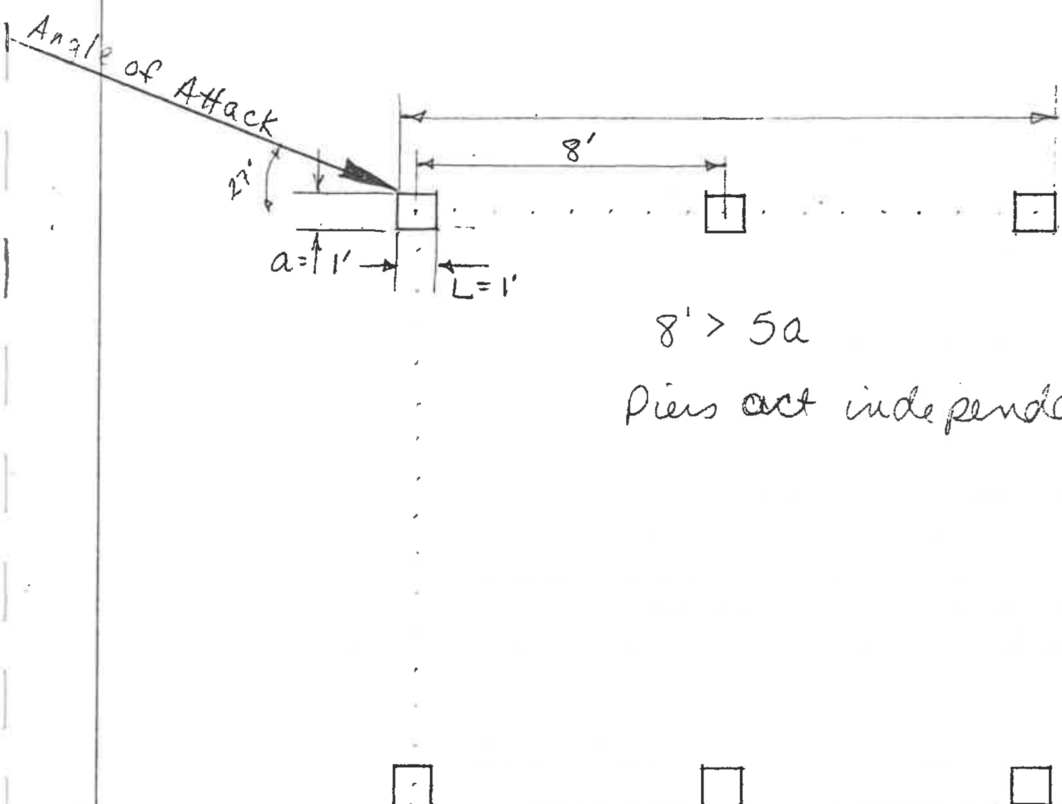
SCALE: 1" = 20' for WATERWAY MEASUREMENTS

KEY
- 6-15-82
- 9-6-83 Not plotted due to no change
- 06/11/85 RWH
- JMS 05-14-87
- RWN & MB 12-21-88 no significant change
- GDD & BLM 5-9-90 " " "
- JED 8-25-92
- 5-4-94 RWS

G

JMI ENGINEERS	Project: SR29-	Page No.: 1 of 2
	Bridge # 050035	Designed by: DNC Date: 12/95
	Job No.: 9523	Checked by: ______ Note No.: ______

K_2 = Correction Angle of attack of flow



8' > 5a

Piers act independantly

$$K_2 = (\cos\theta + L/a \sin\theta)^{0.65} \quad ; \theta = \text{angle of attack}$$

$$K_2 = (\cos 27° + 1/1 \sin 27)^{0.65}$$

$$K_2 = 1.2$$

JMI ENGINEERS

Project: SR 29

Bridge # 050035

Job No.: 9523

Page No.: 2 of 2

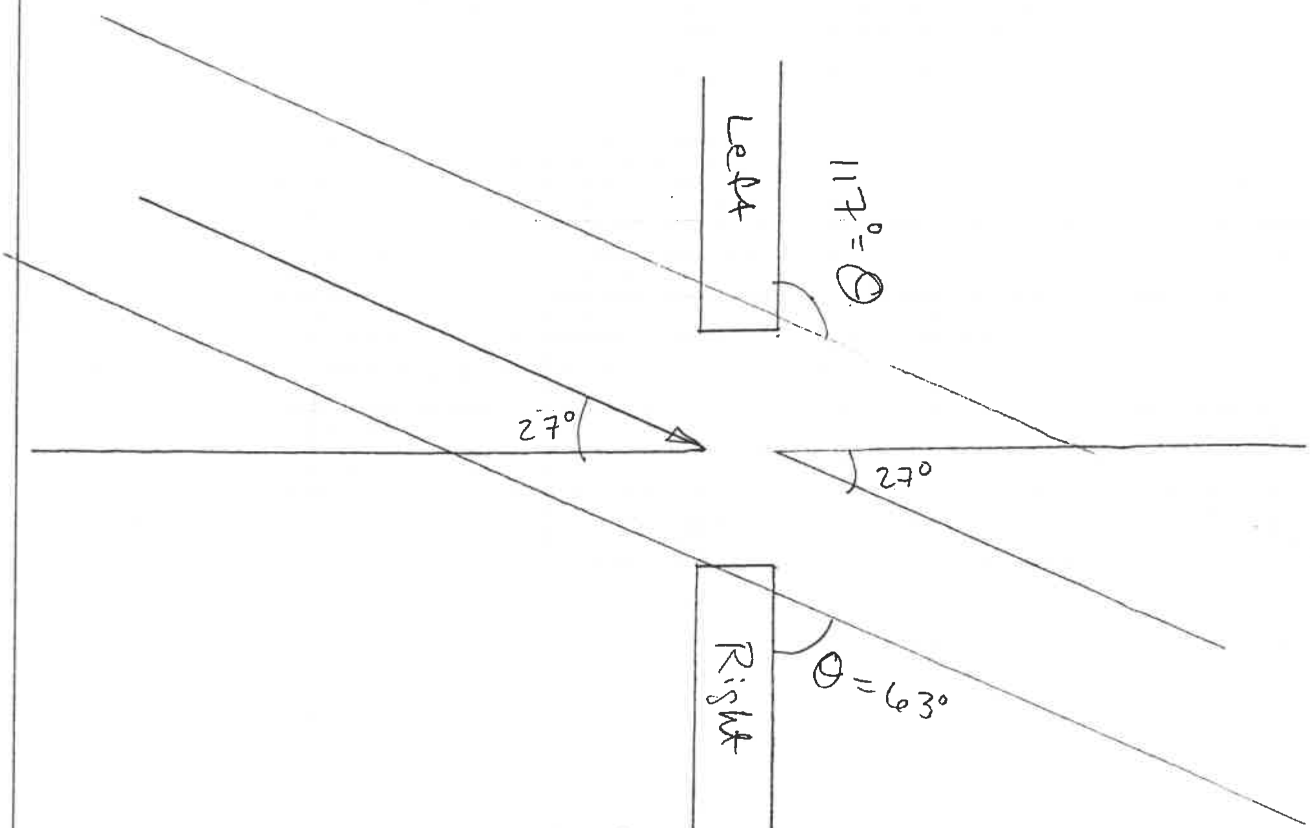
Designed by: PNC Date: 12/95

Checked by: Note No.:

Abutment Scour

Bridge Limits	5967	6010
Approach BP	5976	6019

K_2 = Angle of Embankment to Flow



3. The Manning's n ratio can be significant for a condition of dune bed in the main channel and a corresponding plane bed, washed out dunes or antidunes in the contracted channel. However, Laursen's equation does not correctly account for the increase in transport that will occur as the result of the bed planing out (which decreases resistance to flow, increases the velocity and the transport of bed material at the bridge). That is, Laursen's equation indicates a decrease in scour for this case, whereas in reality, there would be an increase in scour depth. In addition, at flood flows, a plane bedform will usually exist upstream and through the bridge waterway, and the values of Manning's n will be equal. Consequently, the n value ratio is not recommended or presented in the recommended Equation 16.

4. W_1 and W_2 are not always easily defined. In some cases, it is acceptable to use the top width of the main channel to define these widths. Whether top width or bottom width is used, it is important to be consistent so that W_1 and W_2 refer to either bottom widths or top widths.

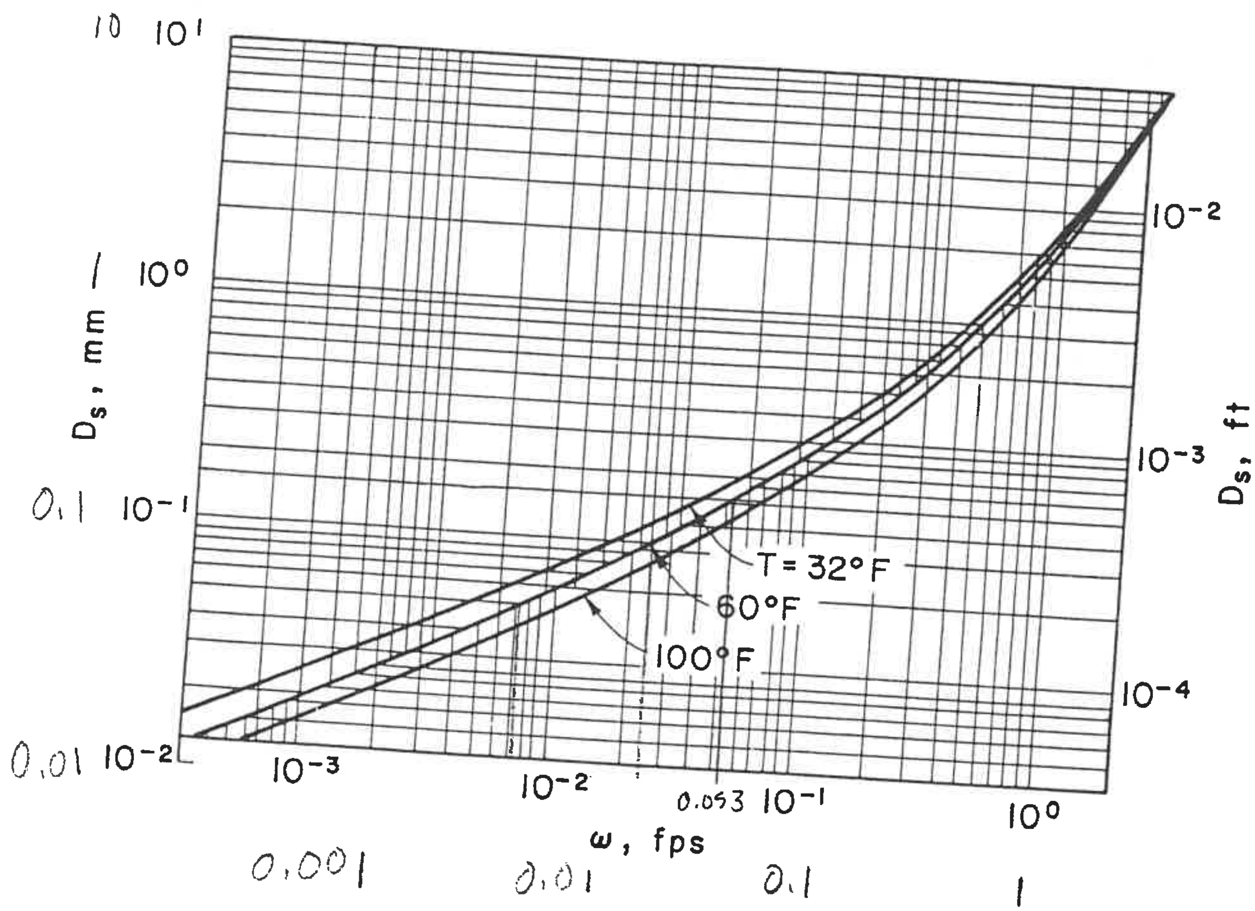


Figure 3. Fall Velocity of Sand-Sized Particles.

Appendix F

Economic Analysis

An economic analysis was completed for the widening of Bridge No. 050035 on SR 29. Since the existing and widened bridge are both hydraulically adequate it is not necessary to compare any replacement alternatives. The following calculations show how the cost for widening the bridge was determined. A more detailed cost analysis will be included in the Bridge Development Report.

Preliminary Cost Estimate
Bridge No. 050035 Widening

	Quantity	Unit Cost	Total Cost
Concrete (Superstructure)	30 yd^3	$450 /yd^3	$13,500
12 ft Additional width 45 ft Length 1.5 ft Depth of structure			
Concrete (Substructure)	20 yd^3	$525 /yd^3	$10,500
End Bents - 2 Total (incl. wingwalls) 24 ft Additional Length 3 ft Additional Height 3 ft Additional Width Intermediate Bents - 2 Total 12 ft Length 2 ft Width 2 ft Height			
Reinforcing Steel	12,150 lb	$0.60 /lb	$7,300
Superstructure: Assume 8% of Concrete Weight 30 yd^3 * 150 lb/ft^3 * 27 ft^3/yd^3 Substructure: Assume 3% of Concrete Weight 20 yd^3 * 150 lb/ft^3 * 27 ft^3/yd^3			
Piles - Driven and Furnished	520 lf	$45 /lf	$23,400
8 piles @ 50 ft 4 piles @ 30 ft			
Barrier Wall	90 lf	$50 /lf	$4,500

Estimated Cost of Bridge Widening: $59,200

Appendix G

Correspondence

SR 29 - LONE PINE CREEK
GLADES COUNTY
CORRESPONDENCE LIST

Glades County:

Planning Department	(941) 946-2140
Public Works	(941) 946-0771
Town Hall	(941) 946-0711
Emergency Management	(941) 946-1217

FDOT, District 1:

Maintenance, LaBelle (Talbert Melton)	(941) 674-4027
Bridge Inspection (Dist. 7, Lyndon Schmidt)	(813) 744-6022

FL Game & Freshwater Fish Commission (Steve Martin)	(941) 648-3203
SFWMD (Ernie Galago)	(800) 432-2045 ext.6556
Fax	(407) 687-6442
NRCS (SCS) (Dan Rutledge)	(941) 674-4160

DATE: October 27, 1995 **PROJECT NO:** 9523

TIME: 2:00 P.M. **CALL PLACED BY:** **PAULA**

FIRM CALLED: Glades County Emergency Management Agency **TELEPHONE #** (813) 946-1217

SPOKE WITH:

Subject: SR 29 as emergency access route or evacuation route

SR 29 is considered both an evacuation and emergency access route for Glades County.

MEMORANDUM OF MEETING

DATE: October 30, 1995

PROJECT NO.: SR29, 9523

TIME: 2:00 p.m.

ATTENDEES: JMI, Genesis, FDOT

PLACE: FDOT District 5
Bartow, FL

Topic: Bridge Deck Drainage

Answer: No scuppers, treatment of attenuation of deck drainage. Drainage is to sheet flow off the bridge. [Mike Finch, Dist. Drainage Engineer]

Topic: Current water surface elevation at bridge 35, SR29.

Answer: The water level is 2 - 21/2 feet below the bent. There was evidence that it had been higher. [Tim Neldner, Genesis]

Topic: Right of Way

Answer: There is 150 feet of Right of Way on SR29. [Art DeLaski, Genesis]

Topic: FDOT current bridge requirements.

Answer: District 5 sticks closely with the 2-3 ft/sec and 2 ft freeboard design requirements for bridges. Checklist developed by Cynthia Skogsberg and Tim Polk is used to review BHR. [Mike Finch]

Topic: Date of Submittal

Answer: BHR to be submitted around Dec. 1.

Topic: Location of bridge 35.

Answer: Bridge 35 is located in section 11. It is also locaed in the SFWMD.

To Dave Snyder

From Art deL.
GGI

MINUTES OF MEETING

W.P.I. No.: 1110459, 1110874
State Project No.: 04010-1507, 05090-1511
Description: Bridge Nos. 040001, 050031, 32, 33, 35, 941
County DeSoto, Glades
Project Name: S.R. 29 and S.R. 31

Date: October 30, 1995

Attendees:

John Previte,	FDOT District 1, Project Manager
Arthur de Laski,	Genesis Group, Inc.
Reuben Ohanian	Genesis Group, Inc.
Tim Neldner	Genesis Group Inc.
David Snyder,	JMI Engineers
Paula Coulliette	JMI Engineers
Sherry Swinford	Permits, FDOT District 1
Mike Finch	Drainage, FDOT District 1

Meeting was called to order at 10:05 a.m. by John Previte at 2:00 p.m.

Tim described the results of his field visit that morning at the four bridges on SR 29 and SR 31. The water was still high (to the tree line) at SR 31. We will wait until Spring before having the agencies look at the wetland delineation areas. The water at the SR 29 bridges seemed to be within their banks. The permits will be under the general permit, meaning that no more than .5 acres will be disturbed. A concern was expressed about the SR 31 situation. Dave Snyder indicated that a longer temporary bridge was a solution that had been used on some of our other projects to minimize disturbance of wetlands.

Mike Finch was given a schedule and asked if we were going to meet this schedule. He indicated that he had a checklist and example reports that we could have as a guide. No attenuation will be required and on ponds will be used on these projects.

Please provide comments.

DATE: November 6, 1995 **PROJECT NO:** 9523

TIME: 10:07 AM **CALL PLACED BY:** PAULA

FIRM CALLED: FL Game & Freshwater Fish Commission **TELEPHONE #** (941) 648-3203

SPOKE WITH: Receptionist for Steve Martin

Subject: SR 29 Historic Flood Records (Fisheating Creek Wildlife Management Area)

The Florida Game & Freshwater Fish Commission patrols this area but does not manage it, therefore does not keep any flood records. They suggest calling the Water Management Area.

TELEPHONE CONVERSATION

DATE:	November 6, 1995	**PROJECT NO:**	9523
TIME:	04:30 PM	**CALL PLACED BY:**	PAULA
FIRM CALLED:	FDOT Maintenance LaBelle	**TELEPHONE #**	(941) 674-4027
SPOKE WITH:	Talbert Melton		

Subject: SR 29 Historic Flood Records

They have no records of this bridge ever overtopping. According to Robert Crawford (FDOT Maintenance), there was an occasion in 1970 where approximately 1 mile of roadway south of this structure was underwater, however the bridge over Lone Pine Creek was no overtopped.

During recent flooding (Autumn 1995), water levels came up high but did not overtop SR 29 in any location.

Maintenance is periodically trying to clean out the vegetation in the channels at these bridge locations.

Mr. Melton thinks that Lone Pine Creek runs into Deadmans Branch.

JMI ENGINEERS

FAX

Date: November 6, 1995

Number of pages including cover sheet: 1

To:

Ernest Gallego
South Florida Water
Management District
Phone: 1-800-432-2045 ext. 6556
Fax phone: (407) 687-6442

From:

Paula N. Coulliette
JMI Enginers
Tallahassee, Florida
Phone: (904) 385-7450
Fax phone: (904) 385-3545

REMARKS: ☐ Urgent ☐ For your review ☒ Reply ASAP ☐ Please comment

JMI Engineers is working on a Bridge Hydraulics Report for Bridge Number 050035 on SR 29 over Lone Pine Creek. This bridge is located in Section 11, Township 42S, Range 29E in Glades County, approximately 2.2 miles north of SR 78. According to the Glades County map, the land to the west of SR 29 is occupied by the Fisheating Creek Wildlife Management Area. In order to perform an accurate hydraulic analysis of the existing bridge, it is necessary that we obtain as much hydrologic information about the area as possible. Any information the South Florida Water Management District has regarding the following would be very helpful for this analysis. This information includes but is not limited to:

- historic flood events in this area, (rainfall data, flow data, etc)
- high water marks at this bridge site or nearby bridges, and
- any existing or future water management practices planned for this area.

Thank you very much for your assistance. I look forward to receiving any information you have for this location.

1424 Piedmont Drive East, Suite 100, Tallahassee, FL 32312 — Tel: 904-385-7450 — Fax: 904-385-3545
San Diego, CA Chicago, IL Paris, France Bangkok,Thailand

TELEPHONE CONVERSATION
MEMORANDUM

DATE: November 16, 1995 **PROJECT NO:** 9523

TIME: 1:00 ~~AM~~/PM **CALL ~~PLACED~~/RECIEVED BY:** Paula

FIRM CALLED: Genesis Group **TELEPHONE #** (941) 648-3203

SPOKE WITH: Rueben Ohanian

Subject: D_{50} - Project Schedule, Conditions at SR 29 - Bridge 050035

Rueben spoke with John Previte regarding the geotechnical work needed for the BHR. John indicated that due to some problems with the rigging, they would be hiring a sub-geotech to get this information. Since the deadline for the initial BHR submittal is Dec. 4, John said that he would work withus on the deadline. The D_{50} is necessary to determine scour depths.

He also mentioned that Genesis has a GIS Department who is able to provide him with a drainage area for the bridge. Since all of these bridges are basically located within swamplands, this is a much more accurate way of determining this parameter. He said that he would request this information for Bridge No. 050035 also. Joyce McKinley is in charge of this department at Genesis.

		Project/Proposal
cc:	DFS	9523

GENESIS GROUP, INC.
3910 US Highway 301 N., Suite 140
Tampa, Florida 33619
(813) 620-4500 • (813) 620-4980 Fax

FAX TRANSMITTAL

Date: 11/17/95
To: Paula Coulette, JMI ✓
Michael Finch, DOT
Ms. Terry Puckett, DOT

Fax No.:

From: Reuben Ohanian
Project: S.R. 29 & S.R. 31
Project No.:

Re: Record of Telephone Conversation

You should receive 2 page(s) including this one. If you do not receive all pages, please call (813) 620-4500.

Message:

RECORD OF TELEPHONE CONVERSATION

DATE: November 17, 1995

FROM: Reuben Ohanian, E.I. R.O.

TO: John Previte, Project Manager

RE: S.R. 29 & S.R. 31 B.H.R. Reports
W.P.I. Nos. 1110459 & 1110874
State Project Nos: 04019-1517 & 05090-1511

Per our several conversations, we were informed by you that, due to the heavy workload, the FDOT Geotechnical Department will be subbing out the geotechnical work to a consulting firm and the BHR of S.R. 29 & S.R. 31 due date of December 4th may not be valid since there will be a delay in getting the test results.

The GGI office will be waiting to hear from you the date that the test results will be available and based on that, a new submittal date will be established.

xc: Art de Laski, Genesis
Paula Coulette, JMI
Michael Finch, District Drainage Engineer
Terry Pucket

TELEPHONE CONVERSATION
MEMORANDUM

DATE: November 22, 1995 **PROJECT NO:** 9523

TIME: 9:00 AM/~~PM~~ **CALL ~~PLACED~~/RECIEVED BY:** Paula

FIRM CALLED: Genesis Group **TELEPHONE #** (813) 644-4500

SPOKE WITH: Regina

Subject: SR 29, Bridge 050035, Drainage Area

Genesis is ordering the GIS information for Glades County. They did not have it on file. Regina will call today for it and request a rush on the information. Once they receive it she will be able to delineate the drainage basin, determine the wet areas, etc.

cc: DFS Project/Proposal 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: December 12, 1995 **PROJECT NO:** 9523

TIME: 10:00 AM/~~PM~~ **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: FDOT, District 1 **TELEPHONE #** (941) 519-2300

SPOKE WITH: Maverick Marshall

Subject: Hydraulic Analysis of Bridge #050035, SR 29

I spoke with Maverick regarding the procedure used to analyze the above referenced bridge. Our conversation included the discussion of the following:

- Channel location and stream type
- Calculation of storm flow from regression equations
- Location and definition of cross sections used in WSPRO
- Slope conveyance method of analysis, SK
- Application for variance in hydraulic requirements (free board)

Maverick concurred with the approach to this project which has been documented fully in the BHR. He recommended following the procedures located in the Plans Preparation Manual, Vol.1, Ch.23.4 to apply for a variance. [State specifically what criteria we are not meeting and why. Explain debris potential and risk associated with this variance],

		Project/Proposal
cc:	DFS	9523

JMI ENGINEERS

DATE: December 21, 1995

TO: Mike Peterson, P.E.
District Design Engineer

FROM: Paula N. Coulliette
JMI Engineers, Inc.

COPIES: Mike Finch, P.E., District Drainage Engineer
David F. Snyder, P.E.

SUBJECT: Design Variation

RE: W.P.I No. 1110874
State Project No. 05010-1511
Glades County

This project proposes the widening of Bridge No. 050035 on SR 29 in Glades County. The structure is being widened to improve public safety and modernize the existing bridge to current FDOT Geometric Standards. Bridge No. 050035 received an efficiency rating of 83.7 with no significant deficiencies (Bridge Inspection, 05/94). An underwater inspection confirmed the same.

During the preparation of the Bridge Hydraulics Report, it became evident that the minimum 2 foot vertical clearance during the design storm is not being met at the existing bridge. Since this is a widening project and the low member elevation is not changing, the 2 foot vertical clearance will not be met by the proposed bridge either. This letter requests that a variance be granted by District One for this design requirement.

The design criteria given in the FDOT Drainage Manual, Vol. 1, Ch. 4, states specifically:

1424 Piedmont Drive East, Suite 100, Tallahassee, FL 32312 — Tel: 904-385-7450 — Fax: 904-385-3545
San Diego, CA Chicago, IL Paris, France Bangkok,Thailand

4.6.1 Vertical Clearance

Minimum vertical clearance requirements are as follows:

1. To allow debris to pass without causing damage, the clearance between the design flood stage and the low member of bridges shall be a minimum of 2 feet. This standard does not apply to culverts and bridge-culverts.

The table below documents the water surface elevations computed by the hydraulic program, WSPRO, used to model the creek.

Estimated Vertical Clearances from WSPRO (in feet)			
Bridge Configuration	Low Member Elevation	Design Water Surface Elevation	Vertical Clearance
Existing Bridge	34.70	33.35	1.35
Proposed Bridge	34.70	33.38	1.32

The existing and proposed bridges both provide some amount of vertical clearance during the design storm. A visit to the project site shortly after a season of historic flood events (Fall 1995), showed no evidence of a debris problem at this bridge.

Since the existing bridge is hydraulically adequate with the exception of the substandard vertical clearance, widening appears to be a viable alternative. In order to provide the required 2 foot of vertical clearance, the low member would have to be raised a minimum of 0.65 feet. Raising the low member would not be feasible without a complete bridge replacement having an approximate cost of $150,000. The cost of widening the bridge is approximately $50,000, or about one-third the cost of the replacement. A final recommendation on widening versus replacement will rest on a structural evaluation of the actual existing condition of the bridge which was built in 1948.

We would appreciate your approval of the design variation for a substandard vertical clearance as soon as possible so that we may continue with the project schedule as planned. Thank you for your assistance in this matter.

Sincerely,

Paula N. Coulliette

Paula N. Coulliette

Enclosure

DFS
PCV

JMI ENGINEERS

RECEIVED
DEC 28 1995
DOT DESIGN DEPT.
BARTOW, FLA

1P-handle w/consultant

Post-it® Fax Note 7671	Date 1/4/96	# of pages 2
To Dave Snyder	From Art deLaski	
Co./Dept.	Co.	
Phone # Hi - Dave	Phone #	
Fax # Holly	Fax #	

DATE: December 21, 1995

TO: Mike Peterson, P.E.
District Design Engineer

FROM: Paula N. Coulliette
JMI Engineers, Inc.

COPIES: Mike Finch, P.E., District Drainage Engineer
David F. Snyder, P.E.

SUBJECT: Design Variation

RE: W.P.I No. 1110874
State Project No. 05010-1511
Glades County

APPROVED BY:
J.M. PETERSON
DISTRICT DESIGN ENGR
DATE: 1/5/96

This project proposes the widening of Bridge No. 050035 on SR 29 in Glades County. The structure is being widened to improve public safety and modernize the existing bridge to current FDOT Geometric Standards. Bridge No. 050035 received an efficiency rating of 83.7 with no significant deficiencies (Bridge Inspection, 05/94). An underwater inspection confirmed the same.

During the preparation of the Bridge Hydraulics Report, it became evident that the minimum 2 foot vertical clearance during the design storm is not being met at the existing bridge. Since this is a widening project and the low member elevation is not changing, the 2 foot vertical clearance will not be met by the proposed bridge either. This letter requests that a variance be granted by District One for this design requirement.

The design criteria given in the FDOT Drainage Manual, Vol. 1, Ch. 4, states specifically:

FAX COVER SHEET

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

District One Office
801 N. Broadway Avenue
Post Office Box 1249
Bartow, FL 33830
941-519-2676 Fax 941.534.7039

Date: January 4, 1996

To: Arthur B. de Laski, P.E. 813-620-4500 Fax 813.620.4980
Manager of Transportation Services
Genesis Group, Inc.
3910 U.S. Highway 301 North
Suite 140
Tampa, FL 33619

From: John Previte, Project Manager

Re: W.P.I. Nos. 1110459, 1110874
State Project Nos. 04010-1507, 05090-1511
SR 31 at Bridge No. 040001 in DeSoto County
SR 29 at Bridge Nos. 050031, 32, 33, 35, and 941 in Glades County

No. of pages including this cover sheet 2

Message:

Design Variance (existing substandard clearance at Bridge # 050035) approved by District Design Engineer.

TELEPHONE CONVERSATION

DATE:	27/12/95	**PROJECT NO:**	9523
TIME:	09:57	**CALL PLACED BY:**	PAULA
FIRM CALLED:	FDOT Bridge Inspection Dept.	**TELEPHONE #**	(813) 744-6050
SPOKE WITH:	Richard Semple	**CC:**	

Subject: Pile Driving Records

There are no pile driving records on file with the Bridge Inspection Department nor As-Built quantities to determine pile depths. They do have waterway measurements and plan and elevation views of the bridge and Mr. Semple will send these to us.

FLORIDA DEPARTMENT OF TRANSPORTATION

LAWTON CHILES
GOVERNOR

BEN G. WATTS
SECRETARY

December 27, 1995

Paula Coulliette
J. M. I. Engineering
1424 Peidmont Drive East, Suite 300
Tallahassee, Florida 32312

Dear Paula:

Enclosed you will find what little substructure information we have. Hopefully this will be of some benefit.

If you need additional information, please let us know.

Sincerely,

Richard C Semple

Richard C. Semple

RECEIVED JAN 2 1996

RECYCLED PAPER

DFS ✓

Genesis Group, Inc.

3910 US Highway 301 N., Suite 140
Tampa, Florida 33619
(813) 620-4500 • (813) 620-4980 Fax

Letter of Transmittal

Date: January 3, 1996
To: Dave Snyder
JMI Engineers, Inc.
1424 Piedmont Drive East, Suite 100
Tallahassee, Florida 32312

From: Arthur B. de Laski, P.E.
Project No: FDT1-005
Re: Sr. 29 & S.R. 31

We are sending you: [x] Attached [ ] Under Separate cover via

[ ] Shop Drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications
[ ] Copy of Letter [ ] Change Order [ ] Other

Copies	Date	No.	Description
1			Particle Size Distribution Curves and Environmental Classification for S.R. # 29
			See Appendix B.

These are transmitted as checked below:

[ ] For Your Information [x] For Your Use [ ] Call Me [ ] For Signature
[ ] For Approval [ ] As Requested [ ] Return [ ] For Review and Comment

RECEIVED JAN 8 1996

Copy To: File

TELEPHONE CONVERSATION
MEMORANDUM

DATE: January 9, 1996 **PROJECT NO:** 9523

TIME: 02:17 ~~AM~~/PM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Biological Research **TELEPHONE #** (813) 664-4500

SPOKE WITH: Heidi

Subject: Permit Applications for SR 29, Bridge #050035

According to Tim Neldner, there will not be any delineation made for this project until spring 1996 when the flood waters return to a more normal level. At that time, we will apply for the necessary permits for this bridge widening.

Project/Proposal

cc: FILE 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/02/96 **PROJECT NO:** 9523

TIME: 08:48 AM **CALL ~~PLACED~~/RECEIVED BY:** Paula

FIRM CALLED: FDOT Drainage **TELEPHONE #** (941) 519-2300

SPOKE WITH: Maverick Marshall

Subject: Preliminary Comments on BHR for Bridge No. 050035

Maverick telephoned to confirm his initial comment stated in a telephone call on 1/31/96 regarding the lake area (LK) used in the USGS regression equations. Since this drainage basin contains approximately 10% wetland storage area, this percentage was used in the USGS regression equations to calculate the peak runoff. However, Maverick pointed out that the equations were developed based on the blue lake areas shown on the USGS quad. maps. This is what should be used as the lake area in the equations, not the storage area.

I told Maverick that this would definitely have a major effect on this bridge and probably would not accurately represent the conditions at this site. Maverick is aware that this change in lake area (10%), would have a drastic effect on the hydraulics at the existing bridge. He stated that after Mike Finch confirmed the use of the blue areas on the quad. map he recalculated the flows that would occur at this bridge and found them to be more than doubled.

Project/Proposal

cc: BHR 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/06/96 **PROJECT NO:** 9523

TIME: 09:43 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: SFWMD **TELEPHONE #** (941) 278-7396

SPOKE WITH: Permitting Dept., Surface Waters

Subject: Runoff Equations

Specific runoff equations have been developed for areas located within the SFWMD. Information concerning the procedure for estimating sheet flow runoff in the Suth Florida Water Management District is found in the Management and Storage of Surface Waters (MSSW) Permit Information Manual Volume IV.

A copy of the related appendices is being sent and local equations are being faxed.

Project/Proposal

cc: File, Dave S. 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/06/96 **PROJECT NO:** 9523

TIME: 04:51 PM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: USGS **TELEPHONE #** (813) 243-5800 ext. 125

SPOKE WITH: Kathy Hammett

Subject: USGS Regression Equations and Lake Area

I called Kathy per the suggestion of Maverick Marshall. From a technical standpoint, the variables in the regression equations are drainage area (DA), slope (SL), and lake area (LK) as defined in the Technique for Estimating Magnitude and Frequency of Floods on Natural-Flow Streams in Florida by Wayne C. Bridges.

The equations were developed based on the lake area being the blue shaded area on the USGS quad. maps. How they are used varies. She has seen the lake area include other areas than the blue areas. This is a judgment call for the design engineer, the permitting or regulatory agency.

Kathy mentioned the standard error of estimates and range of possible values the USGS equations would give.

cc: File Project/Proposal 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/06/96 **PROJECT NO:** 9523

TIME: 05:04 PM **CALL ~~PLACED~~/RECEIVED BY:** Paula

FIRM CALLED: SFWMD **TELEPHONE #** (941) 278-7396

SPOKE WITH: Clayton Miller

Subject: Deck Drainage

There is not a problem with the additional deck drainage sheet flowing off the bridge into the existing drainage ditches. They are primarily concerned with water quality. We have slowed the runoff by taking off the bridge, over the grassed shoulder and into the existing ditches. He agrees that it is not practical to provide any more treatment than this.

In regards to permitting, he advised us to look into a Noticed General Permit rather than a General Permit.

He will also be faxing the runoff equations developed by the SFWMD. However, they encourage people not to use them because the values they give are too high.

Project/Proposal

cc: File 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/07/96 **PROJECT NO:** 9523

TIME: 09:23 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Glades Co. Emergency Management **TELEPHONE #** (941) 946-1217

SPOKE WITH: Ken Howard, Director

Subject: Flooding on SR29

I called Mr. Howard about the flooding which occurred around June 23, 1995 (per Art de Laski). He stated that the road was never completely closed during this time. There was an area where the water was over the road, however the road was still passible. A Florida Highway Patrol first noticed the water on the road and notified the EMA, who notified the Glades Co. Road Department who put up barricades and warnings for travelors.

Mr. Howard stated that this area was located about 5 miles south of the intersection of SR 29 and US 27. He said that it was not at a bridge, it was only the roadway. The water receded in about 24 hours.

Mr. Howard stated that all this information was his own personal experience. This past year was unusual due to several tropical storms, hurricanes, etc. and there were a lot of areas flooded which usually don't. In the last 7-10 years, he does not remember SR 29 ever overtopping. The EMA does not have detailed records of flooding and road closures. Since this is a state road, he recommended contacting the FDOT Maintenance.

He mentioned contacting Tommy Greenwood, Director of the Glades County Road Department for possibly more information. (941) 946-0771

cc: File, Dave, Art

Project/Proposal 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/07/96 **PROJECT NO:** 9523

TIME: 10:19 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Glades Co.Maintenance **TELEPHONE #** (941) 946-0771

SPOKE WITH: Tommy Greenwood

Subject: Flooding on SR29

The County Maintenance Department does not have any information on this road because it is a state road. He does not have any personal recollection of flooding on SR 29 either.

He suggested calling Talbert Melton or Wally Thalen.

Project/Proposal

cc: File, Dave, Art 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/07/96 **PROJECT NO:** 9523

TIME: 10:29 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: FDOT Maintenance **TELEPHONE #** (941) 674-4027

SPOKE WITH: Talbert Melton

Subject: Flooding on SR29

I asked Mr. Melton specifically about June 1995 when Ken Howard recalls there was a need for barricades on a portion of SR 29 where water was coming onto the roadway. He does not remember ever having to take barricades out there. He said that the water frequently comes up and will quickly runoff the roadway. At times they have gone out and driven fluorescent painted stakes at the edge of the pavement, however they have not had to drive stakes in a while.

He also spoke with field superintendent Robert Crawford who would actually gone out into the field. Mr. Crawford does not remember water over the road or bridges. He did not take barricades out during this event.

The other field superintendent, Wally Thalen, was out of the office but will call when he gets in.

Project/Proposal

cc: File, Dave, Art 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/07/96 **PROJECT NO:** 9523

TIME: 11:40 AM **CALL ~~PLACED~~/RECEIVED BY:** Paula

FIRM CALLED: FDOT Maintenance **TELEPHONE #** (941) 674-4027

SPOKE WITH: Wallace Thalen

Subject: Flooding on SR29

The area of flooding during June 1995 was at a 36" cross drain located between bridges 050033 and 050035. It is approximately 0.5 - 0.6 miles south of bridge 050033. This is the area that they have the most problems with. During June the water was up to the edge of pavement. It lacked only a few inches to overtop the road. You could not pull off the highway.

Water flows 'real good' through bridge 050035. It washes sand up on the east side of the highway. He does not remember the water level ever coming up to the bridge.

Project/Proposal

cc: File, Dave, Art 9523

MEMORANDUM

State of Florida Department of Transportation

Date: February 16, 1996

To: J. R. Previte, Project Manager

From: Michael B. Finch, District Drainage Engineer MBF

Copies To: Maverick Marshall

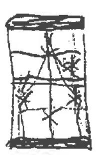
Subject: W.P.I. No. 1110874
State Project No. 05090-1511
S.R. 29, Bridge No. 050035
Reply to Response dated February 13, 1996

We find that the swamp or marsh areas, per the Bridges Report, were "Not Significant" and therefore, do not appear in the final prediction equation. As an example, the slope parameter was omitted from the Region B equations due to significance. Therefore, it is not advisable to define marsh areas as lakes to reduce the predicted discharge.

Additionally, comparisons with the Rational equation are not valid, i.e., use of the Rational Method for a large, rural marsh. Recognizing the degree of standard error of the USGS equation, it is interesting that the discharges (when the lake areas are from the quad. maps) compare well with the FHWA eqn discharges vs the preferred LK = 10.23% discharges. The eqn's are region specific and have adjustment factor accordingly, i.e., even with 0% lakes for Region A, the discharge is still reduced by a 3^{-x} component.

In summary, there is insufficient justification for this deviation.

Quad Map 100 year ± 50% error



MBF:de

N-Value a SA Card

Equations

A different Model?

Manipulations

DA LK SL 10 SW

TELEPHONE CONVERSATION

DATE:	February 22, 1995	**PROJECT NO:**	9523
TIME:	11:00 AM	**CALL PLACED BY:**	PAULA
FIRM CALLED:	USGS	**TELEPHONE #**	(904) 942-9500 ext. 3058
SPOKE WITH:	Marvin Franklin		

Subject: USGS Quad. Maps, Regression Equations, Gage information

I called Marvin in order to better understand the above subjects. Regarding the quad. Maps, there are several swamp areas within the Lone Pine Creek drainage basin which are completely bordered with inside tick marks. He said that this delineation indicates a depressional area.

Marvin said that any time he is doing work close to a boundary area, he becomes very leery of the USGS equations because the drainage basin might actually act like the bordering area.

He suggested to take out any areas that look like no-contributing areas from the drainage area. His gut feeling about this area is that there are no major flows. He said there could be high water but most likely the flow and velocity area low.

He suggested checking the gage information around this basin and determine a CFSM. If all gage information gives similar CFSM's then this should be used as representative of the area. The Fisheating Creek data provided by the Altamonte Springs office compares the flood flows using the log-Pearson Type III analysis, the regression equations, and a weighted or best estimate which considers both the gage and regression equations. Marvin suggested taking the log-Pearson flow values for each storm event and dividing them by the drainage area to determine the CFSM.

TELEPHONE CONVERSATION

DATE:	February 22, 1996	**PROJECT NO:**	9523
TIME:	03:43 PM	**CALL PLACED BY:**	PAULA
FIRM CALLED:	FDOT Maintenance LaBelle	**TELEPHONE #**	(941) 674-4027
SPOKE WITH:	Receptionist		

Subject: Maintenance crew's tenure with FDOT/LaBelle

Talbert Melton - 40 years with FDOT, first in Ft. Myers, then Bartow. He has been with LaBelle maintenance since 1970, or 26 years.

Robert Crawford - 23 years, 4 months in LaBelle.

Wally Thalen - 31 years in LaBelle.

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/23/96 **PROJECT NO:** 9523

TIME: 09:11 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Glades Co. Schools **TELEPHONE #** (941) 946-0323 ext.13

SPOKE WITH: Norman (Sonny) Hughes, Dir. of Transportation

Subject: Flooding on SR 29

Mr. Hughes has been with the Glades Co. School Department for 29 years. Glades Co. School buses travel SR 29 from LaBelle to Palmdale and are not allowed to drive on roads which have water overtopping them. He said that during the period of time he has been with Glades Co., SR 29 has never been blocked for the school buses. He said that there have been other roads which have been blocked but not SR 29.

Project/Proposal

cc: FILE, DFS 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/23/96 **PROJECT NO:** 9523

TIME: 10:01 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Glades Co. **TELEPHONE #** (941) 946-0533

SPOKE WITH: Jerry Harris, Building Director

Subject: Flooding on SR 29

Mr. Harris is the former Glades Co. Emergency Management Director (1978-1995). He also has been the FEMA Flood Program Administrator since 1982. He was born and raised in Clewiston and considers himself a "Sawgrass Mugrat".

Speaking with Mr. Harris about flooding on SR 29, he mentioned that the only location where they have had trouble on this road is at Chaparral Slough. He recalls that the water has come up very high at this location, enough to damage the roadway base, but has not overtopped the roadway.

He said that during heavy rains water will spread out on both sides of SR 29, and sheetflow across the floodplain approximately 200 square miles. He said that all the water in this area is trying to reach the Caloosahatchee River regardless of the direction it travels.

Project/Proposal

cc: FILE, DFS 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/26/96 **PROJECT NO:** 9523

TIME: 11:59 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: Glades Co. **TELEPHONE #** (941) 675-0124

SPOKE WITH: David Whiddon, Former Road Department Superintendent

---

Subject: Flooding on SR29

Mr. Whiddon was with the road department from 1980-93, prior to Tommy Greenwood. He has lived in Glades County all his life, 48 years.

To his knowledge, SR 29 has never overtopped. He stated that the land to the west of SR 29, north of SR 78 approximately 3-4 miles stays wet for most of the year.

He warned that if the flow was increased through SR 29, this could cause increased flooding at SR 78. He said that the residents on Marshall Field Road get mad every year because of flooding. If we increase the risk of flooding for these residents, he said for us to expect a lawsuit.

He said that during heavy rains, the water already comes up to the edge of pavement on SR 78.

cc: File, Dave, Art

Project/Proposal 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/23/96 **PROJECT NO:** 9523

TIME: 10:35 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: USGS, Water Resources Division, Miami **TELEPHONE #** (305) 594-0655

SPOKE WITH: Carolyn Price

Subject: Gage information on Caloosahatchee at Ortuna Locks

I asked Carolyn for the drainage area for this gage station since it was not included in the information she sent to me. She stated that there was no drainage area for this station. She stated that nothing in south Florida has drainage areas determined.

Project/Proposal

cc: FILE, DFS 9523

TELEPHONE CONVERSATION
MEMORANDUM

DATE: 02/23/96 **PROJECT NO:** 9523

TIME: 11:00 AM **CALL PLACED/~~RECEIVED~~ BY:** Paula

FIRM CALLED: FDOT, Dist. 3 **TELEPHONE #** (904) 638-0250

SPOKE WITH: Tim Polk, Dist. Drainage Engineer

Subject: SR 29 - Hydrology

After confirmation that SR 29 is on the border of the defined area of the USGS regression equations, I asked Tim what method he suggested using for the area which was not defined. He stated that he would also look at the SCS Unit hydrograph method and the SFWMD calculations for a storm duration of 24 - 72 hours. He also stated that he would use the Rational Method with a C value of 0.10 - 0.15. Although this is clearly not applicable, none of the equations are truly applicable for this site.

He also mentioned that looking at a similar basin in the area is a good idea. When doing this it is important to look at the soil survey and quadrangle maps. It is important to describe the similarities and differences in order to develop a feel for the relative discharges on the drainage basin in question, whether they are higher or lower.

Once all the data has been collected, compare the output. Determine the range of values and try to decide if what actually occurs in the drainage basin in question is closer to the upper or lower limit.

He mentioned that an important argument is that other hydraulic engineers have also used swamp or wetland areas as lake areas when determining the hydrology of nearby basins. Although this is technically not correct, this method has been reviewed and approved by the district in previous reports.

Project/Proposal

cc: FILE, DFS 9523

MEMORANDUM OF CONVERSATION

DATE: February 29, 1996 **PROJECT NO:** 9523

TIME: 10:15 AM **INTERVIEWER:** Paula

SPOKE WITH: Milford Thomas, Lykes Brothers Ranch, SR 29

Subject: Flooding along SR29

We spoke to Mr. Thomas as he pulled his cow trailor into the cow pen located alongside Lone Pine Creek at bridge 050035. He said that he has worked in this area for 25 years. He knows that the water has gotten high at this location but the backwater from the creek has never flooded the road or the cow pen. He stated that the water does rise but it doesn't move well at this bridge. There is a marshy area downstream. He stated that the water gets very high at Chapparel Slough.

cc: FILE, DFS

Project/Proposal 9523

MEMORANDUM OF MEETING

DATE: February 29, 1996

TIME: 10:30 am

PROJECT NO.: SR29, 9523-01

ATTENDEES: Art de Laski, Genesis
Chick Savering, Genesis
Catherine Bradley, Genesis
Paula Coulliette, JMI
Jerry Washington, JMI
John Previte, FDOT
Mike Finch, FDOT
Maverick Marshall, FDOT

PLACE: Bridge 050035, SR 29

The purpose of this meeting was to discuss the flows calculated and observed at the proposed widened bridges on SR 29. The USGS equations for Region A were initially used, however, given the comparison between flow rates determined by the SFWMD, gage data, etc. and the regression equations, it appears as though direct application of the regression equations are inappropriate for this location.

The following resolutions were suggested:

Do not include all of the water storage area as lake area. Maverick suggested that we determine the depressional areas (from quad. map) which retain flood waters. Try to determine the elevation at which there would be no more storage and use this area as lake area.

Maverick also mentioned that we should look at the standard error of the USGS equations and base our flows on the lower end of the values. Check to insure that these values correlate with the known rates of discharge for this area.

There have been numerous observations that the water level at this site will rise, however there is very little movement through the bridges. The survey crew, project managers, and hydraulic engineers working on this project have all noted high water at these locations without significant flow through the bridge. Many residents have also made similar statements.

There was a consensus to use a similar approach when determining flood flow with all of the bridges on this project.

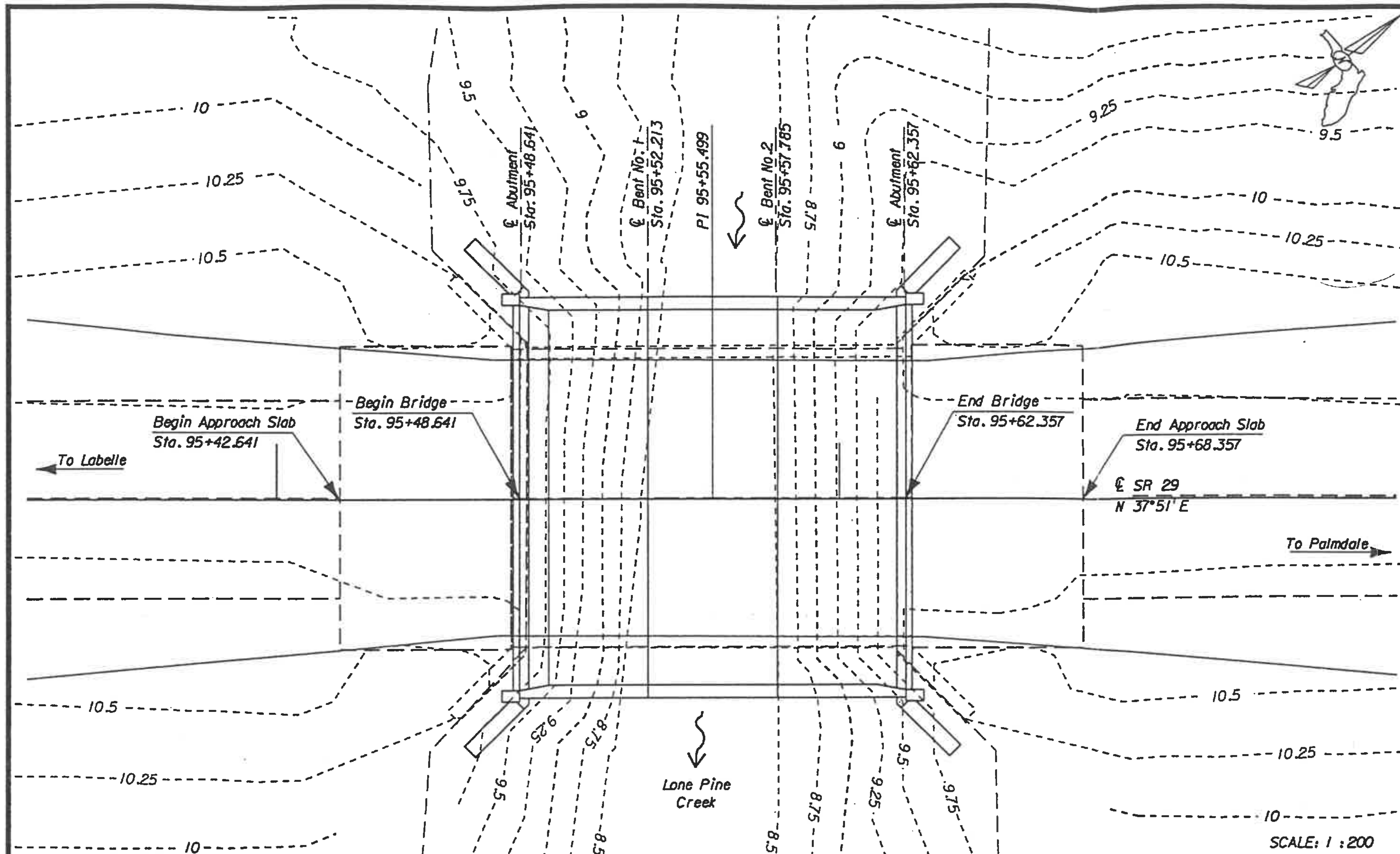
Appendix H

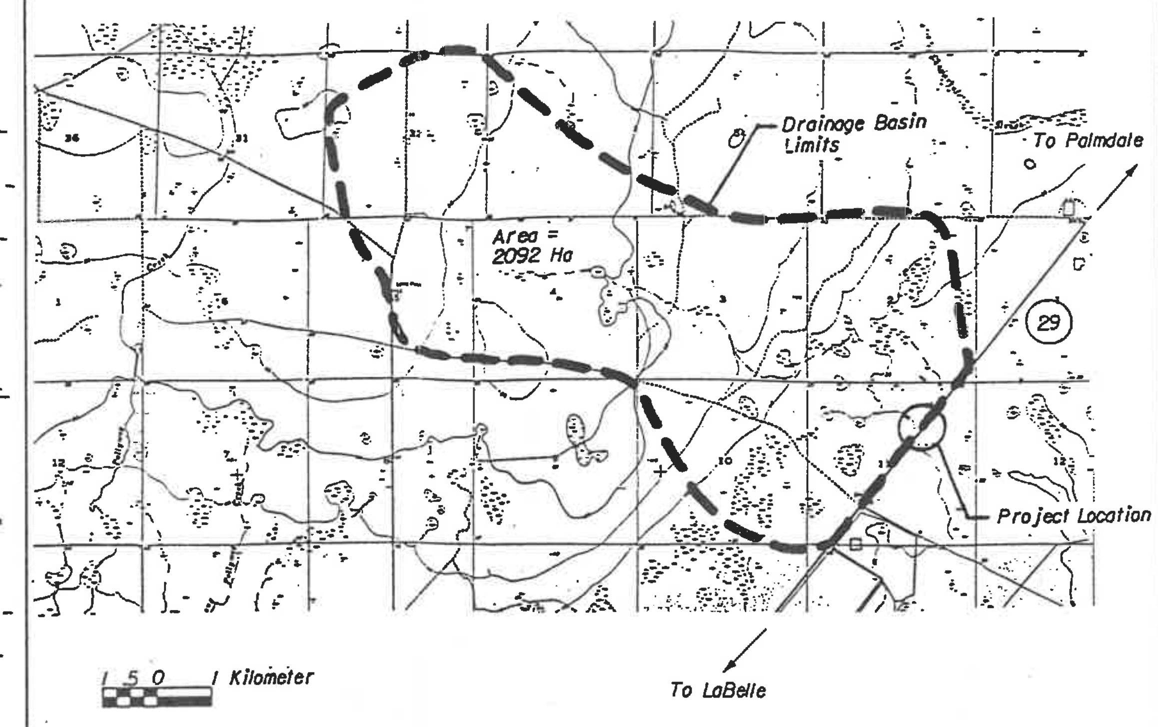
Bridge Hydraulics Recommendation Sheet

& Deck Drainage Calculations

STATE PROJ. NO.	SHEET NO.
05090-1511	

BRIDGE NO. 050035





EXISTING STRUCTURES

(REFERENCE)	(1)	(2)	(3)	(4)	ASSUMED CONFIGURATION
FOUNDATION	0.305 Piles	N/A	N/A	N/A	0.305 Piles
OVERALL LENGTH	13.716				13.716
SPAN LENGTH	4.572				4.572
TYPE CONSTRUCTION	Flat Slab				Flat Slab
AREA OF OPENING @ H.W.	21.924				21.924
ROADWAY WIDTH	10.868				14.351
ELEV. LOW MEMBER	10.576				10.388

HYDRAULIC DESIGN DATA

NOTE: The hydraulic data is shown for informational purposes only to indicate the flood discharges and water surface elevations which may be anticipated in any given year. This data was generated using highly variable factors determined by a study of the watershed. Many judgments and assumptions are required to establish these factors. The resultant hydraulic data is sensitive to changes, particularly antecedent conditions, urbanization, channelization and land use. Users of this data are cautioned against the assumption of precision which cannot be obtained.

DEFINITIONS:
Design Flood: The flood utilized to assure a desired level of hydraulic performance.
Base Flood: The flood having a 1% chance of being exceeded in any year. (100 Year Frequency)
Overtopping Flood: The flood which causes flow over the highway, over a watershed divide or thru emergency relief structures.
Greatest Flood: The most severe flood which can be predicted where overtopping is not practicable.

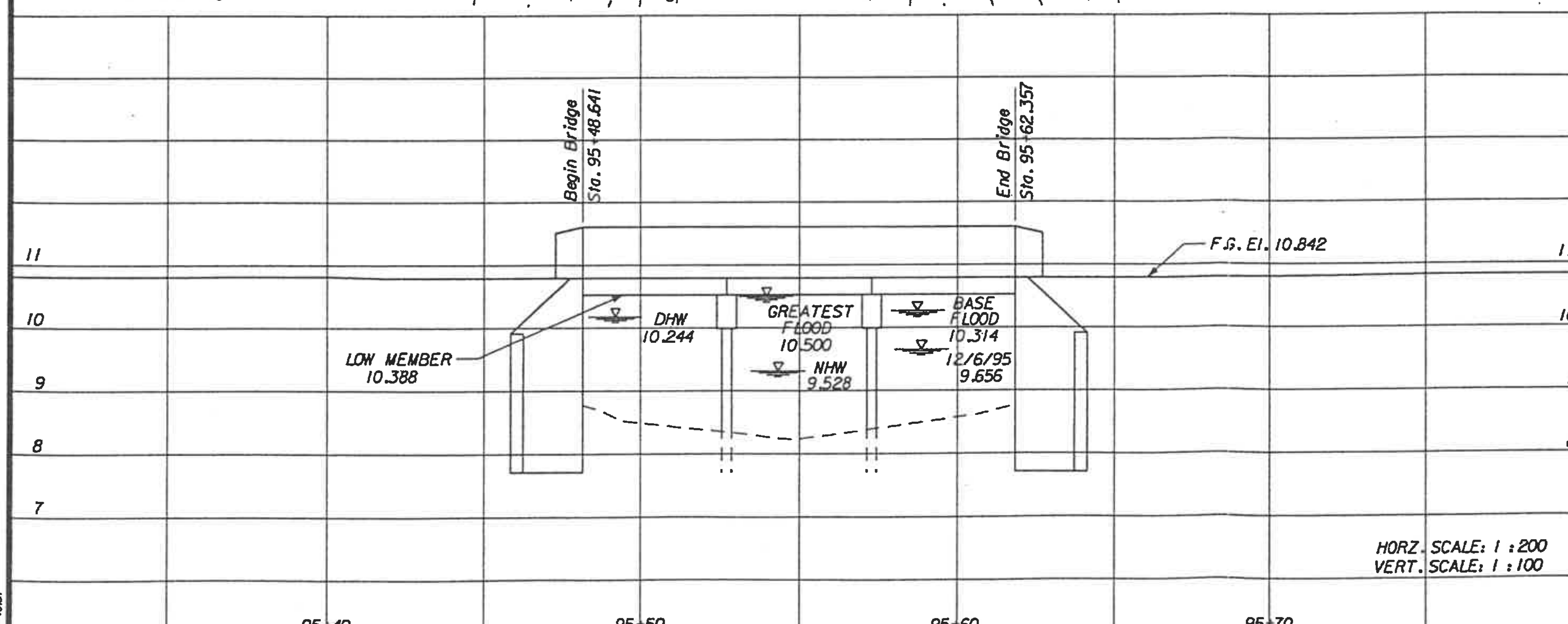
WATER SURFACE ELEVATIONS: N.H.W.(Non-Tidal) 9.528 M.H.W. N/A M.L.W. N/A

FLOOD DATA:	MAX. EVENT OF RECORD	DESIGN FLOOD	BASE FLOOD	☐ OVERTOPPING FLOOD ☒ GREATEST FLOOD
STAGE ELEV. NGVD (M)	UNKNOWN	10.244	10.314	10.452
DISCHARGE (CM/M)	UNKNOWN	1016	1164	1485
AVERAGE VELOCITY (M/S)	UNKNOWN	0.783	0.875	1.070
EXCEEDANCE PROB. (%)	UNKNOWN	2%	1%	0.2%
FREQUENCY (YR.)	UNKNOWN	50	100	500

HYDRAULIC RECOMMENDATIONS

1. BEGIN BRIDGE STATION 95+48.641 END BRIDGE STATION 95+62.357 SKEW ANGLE 0°
2. CHANNEL SECTION: ℄ STATION 95+55.499 BOTTOM WIDTH 13.716 ELEV. 8.230 SIDE SLOPE 0
3. LIMITS OF CHANNEL EXCAVATION: RT. N/A LT. N/A
4. CLEARANCE: NAVAGATION: HORIZ. N/A VERT. N/A ABOVE EL. N/A DRIFT: HORIZ. 4.166 VERT. 0.144 ABOVE EL. 10.244
5. SCOUR PREDICTION: BASE FLOOD: Contraction El. 5.294 m, Pier El. 4.303 m
GREATEST FLOOD: Contraction El. 4.603 m, Pier El. 3.505 m
6. SLOPE PROTECTION: NONE
7. DECK DRAINAGE: RUNOFF WILL SHEET FLOW OFF BRIDGE INTO EXISTING ROADSIDE DRAINAGE DITCHES.
8. OTHER:

REMARKS:



FILE: f:\jmi\seeqd.dgn DATE: 23-Mar-95 10:37

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

REVISIONS

JMI ENGINEERS, INC.
1424 Piedmont Drive East
Tallahassee, Florida 32312
Tel: 904-385-7450 Fax: 904-385-3545

FLORIDA DEPARTMENT OF TRANSPORTATION

BRIDGE HYDRAULIC RECOMMENDATIONS S.R.29 BRIDGE

DECK DRAINAGE CALCULATIONS
SR 29 - BRIDGE NUMBER 050035

625-040-001-b
DRAINAGE MANUAL
CHAPTER 3, STORM DRAINS
October 1, 1992
Page 1-3-6.0

3.9 SPREAD STANDARDS

For sections with design speeds greater than 45 mph, and for sections having full width shoulders 6 feet or greater, or a parking lane, spread resulting from a rainfall intensity of 4.0 inches per hour shall not encroach on the travel lanes.

For sections with design speeds 45 mph and less, and without full width shoulders, spread resulting from a rainfall intensity of 4.0 inches per hour shall not exceed one-half the travel lane adjacent to the gutter.

Gutter Flow Capacity Calculations:

$$Q_g = \frac{0.56}{n} S_x^{5/3} s^{1/2} T^{8/3}$$

(Eq. 12-3, FDOT Drainage Manual, Vol. 2B)

$n =$	0.016	concrete deck
$S_x =$	0.02	ft/ft cross slope
$s =$	0.03%	(0.0003 ft/ft min. longitudinal slope
$T =$	10	spread = shoulder width

$$Q_g = \frac{0.56}{0.016} (0.02)^{5/3} (0.0003)^{1/2} (10)^{8/3}$$

Qg = 0.415 cfs Bridge deck gutter flow

<u>Runoff Quantity from Bridge Deck</u>

Bridge Deck Drainage Area:

$$A = 1/2 \times l \times w$$
$$A = 1/2 \times (45) \times (47.1)$$
$$A = 1059.7 \ ft^2$$
$$A = 0.024 \ ac$$

Assume no contribution from adjacent roadway.

$$Q_b = c\ i\ A$$

c = 0.95 for asphalt pavement
i = 4.0 inches/hour
A = 0.024 ac

$$Q_b = (0.95)(4.0)(0.024)$$

$$\mathbf{Q_b = 0.091 \ cfs}$$

<u>Conclusion:</u>

Flow from bridge deck (Q_b) < Capacity of Gutter Flow (Q_g)
0.0912 < 0.415

Spread resulting from a rainfall intensity of 4.0 inches/hour will not encroach on travel lanes.

<u>Check Spread of Bridge Deck Runoff:</u>

$$0.0912 \quad \frac{0.56}{0.016} \quad (0.02)^{5/3}\ (0.0003)^{1/2}\ (T)^{8/3}$$

T = 5.667 ft

T < 10'

3.9 SPREAD STANDARDS

For sections with design speeds greater than 45 mph, and for sections having full width shoulders 6 feet or greater, or a parking lane, spread resulting from a rainfall intensity of 4.0 inches per hour shall not encroach on the travel lanes.

For sections with design speeds 45 mph and less, and without full width shoulders, spread resulting from a rainfall intensity of 4.0 inches per hour shall not exceed one-half the travel lane adjacent to the gutter.

3.10 CONSTRUCTION AND MAINTENANCE CONSIDERATIONS

The design of storm drain systems shall be consistent with the standard construction and maintenance practices of the Department. Standard details for inlets, manholes, junction boxes, end treatments, and other miscellaneous drainage details are provided in the standard index drawings. Specifications are provided in the Standard Specifications for Road and Bridge Construction. In the event standard index drawings are not suitable for a specific project need, a detailed design shall be developed and included in the plans; and, as appropriate, special provisions shall be provided for inclusion with the project specifications. Proper design shall also consider maintenance concerns of adequate physical access for cleaning and repair.

3.10.1 Pipe Size and Length

The minimum pipe size for trunk lines and laterals is 15 inches.

The 15 inch minimum pipe size does not apply to connections from stormwater management facilities. The pipe size for these connections shall be the size required to convey the permitted discharge.

The maximum pipe lengths without maintenance access structures are as follows:

15" pipe	100 feet
18" pipe	300 feet
24" to 36" pipe	400 feet
42" and larger and all box culverts	500 feet

Table 12-1
MANNING'S n VALUES FOR STREET AND PAVEMENT GUTTERS

Type of Gutter or Pavement	Range of Manning's n
Concrete gutter, troweled finish	0.012
Asphalt pavement:	
Smooth texture	0.013
Rough texture	0.016
Concrete gutter with asphalt pavement:	
Smooth	0.013
Rough	0.015
Concrete pavement:	
Float finish	0.014
Broom finish	0.016
For gutters with small slope, where sediment may accumulate, increase above values of n by	0.002

Note: Estimates are by the Federal Highway Administration.

Reference: USDOT, FHWA, HDS-3 (1961).