BRIDGE HYDRAULIC REPORT

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

Prepared By:

Genesis Group, Inc.

April 1996

BRIDGE HYDRAULICS REPORT

for

SR 29 Crossing York Branch

Bridge No. 050032

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

Prepared for:
Florida Department of Transportation
District 1, Bartow

Prepared by:
Genesis Group, Inc.
April 1996

Engineer of Record: _____
Arthur B. deLaski, P.E.
4/25/96

EXECUTIVE SUMMARY

The proposed project involves the widening of the existing bridge at York Branch on SR 29, Glades County, Florida (Bridge Number 050032). York Branch is a Class III water body according to the FAC 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 SR 29 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 will be required by District One to cover this deviation from FDOT hydraulic design criteria.

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.

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INTRODUCTION

The Florida Department of Transportation proposes improvements to State Road 29 in Glades County. The Roadway Project will include improvements to Bridge Number 050032. This bridge crosses York Branch, a tributary to Linden Pens Marsh. According to Chapter 62-302-600 FAC, York Branch is classified as a Class III waterway.

The roadway bridge improvements are proposed to provide improved public safety. There are no known hydraulic problems at the existing bridge.

This report has been prepared to define the appropriate bridge improvements as related to the hydraulic performance of York Branch.

PRELIMINARY INFORMATION

General Site Location

The proposed project includes the widening and resurfacing of Bridge Number 050032 on State Road 29 in Glades County, Florida. The bridge crosses York Branch and is located in Section 20, Township 41S, Range 30E, approximately 2.3 miles south of State Road 74. Figure 1 identifies the project location.

The existing roadway is a two-lane, two-way facility. The posted speed limit is 55 miles per hour. SR 29 is classified as both an evacuation and emergency access route for Glades County by the Glades County Emergency Management Agency.

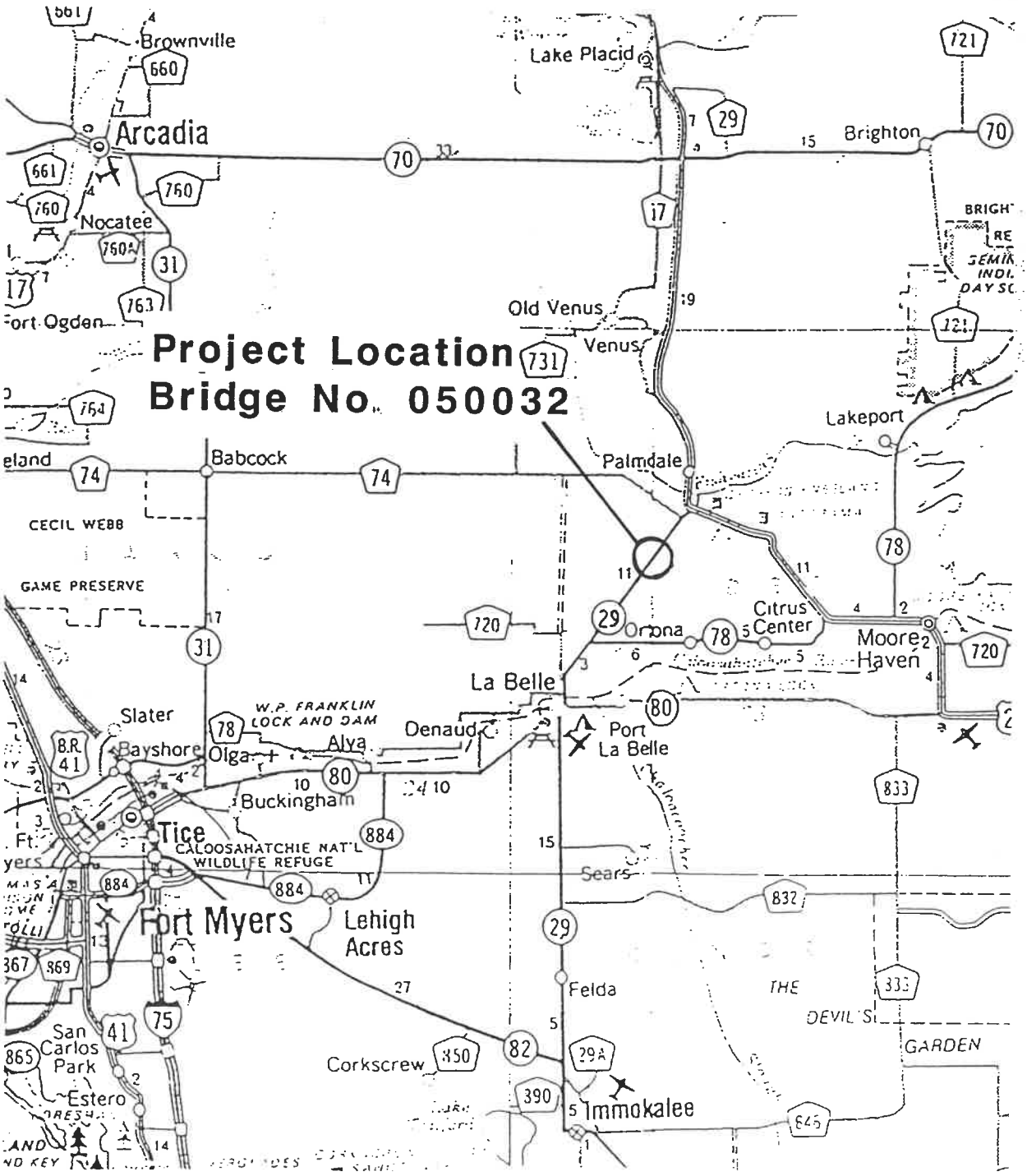

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Figure 1. Project Location Map
Federal Emergency Management Agency

Site Description

The drainage basin for Bridge Number 050032 is classified as agricultural/open space and wetlands. (See Figure 2 - Glades County Future Land Use Map). There are no residences located within the drainage basin or downstream from the bridge.

York Branch is not considered a navigable waterway. A large amount of wetland exists within the basin in the form of swampland. Well defined ponds or lakes are not evident. This waterway is not used as a source of domestic water supply.

York Branch is located within the upper northwest fringe of the Florida Everglades. The topography of the area consists of areas of wetlands (swamp) and low-lying undeveloped woodlands surrounded by relatively flat grasslands and open range. The contributing drainage area to Bridge Number 050032 is approximately 1229 hectares (4.75 square miles) and lies on the northwest side of SR 29. The drainage boundaries were delineated using the Unites States Geological Survey (USGS) quadrangle maps for LaBelle NW and Palmdale, FEMA Flood Insurance Rate Maps for Community #120095 (Figure 4) and an aerial photograph of this area of Glades County (Figure 5).

The terrain slopes to the southeast at an average slope of approximately 0.0008 feet per foot (4.36 feet per mile). This slope, which can be rated as mild, was determined from the USGS quadrangle maps, supplemented by site-specific survey data. SR 29 defines the southeast limits of the drainage basin.

The upper (northern) limit of the basin is at the south side of State Road 74, approximately 5.5 miles west of SR 29 (as measured along SR 74). The lower (southern) limit is Bridge Number 050032 at SR 29. Both the eastern and western limits are defined by subtle ridges which direct runoff into adjacent drainage areas. A local unpaved roadway bisects the basin. Figure 3 identifies the contributing drainage basin.

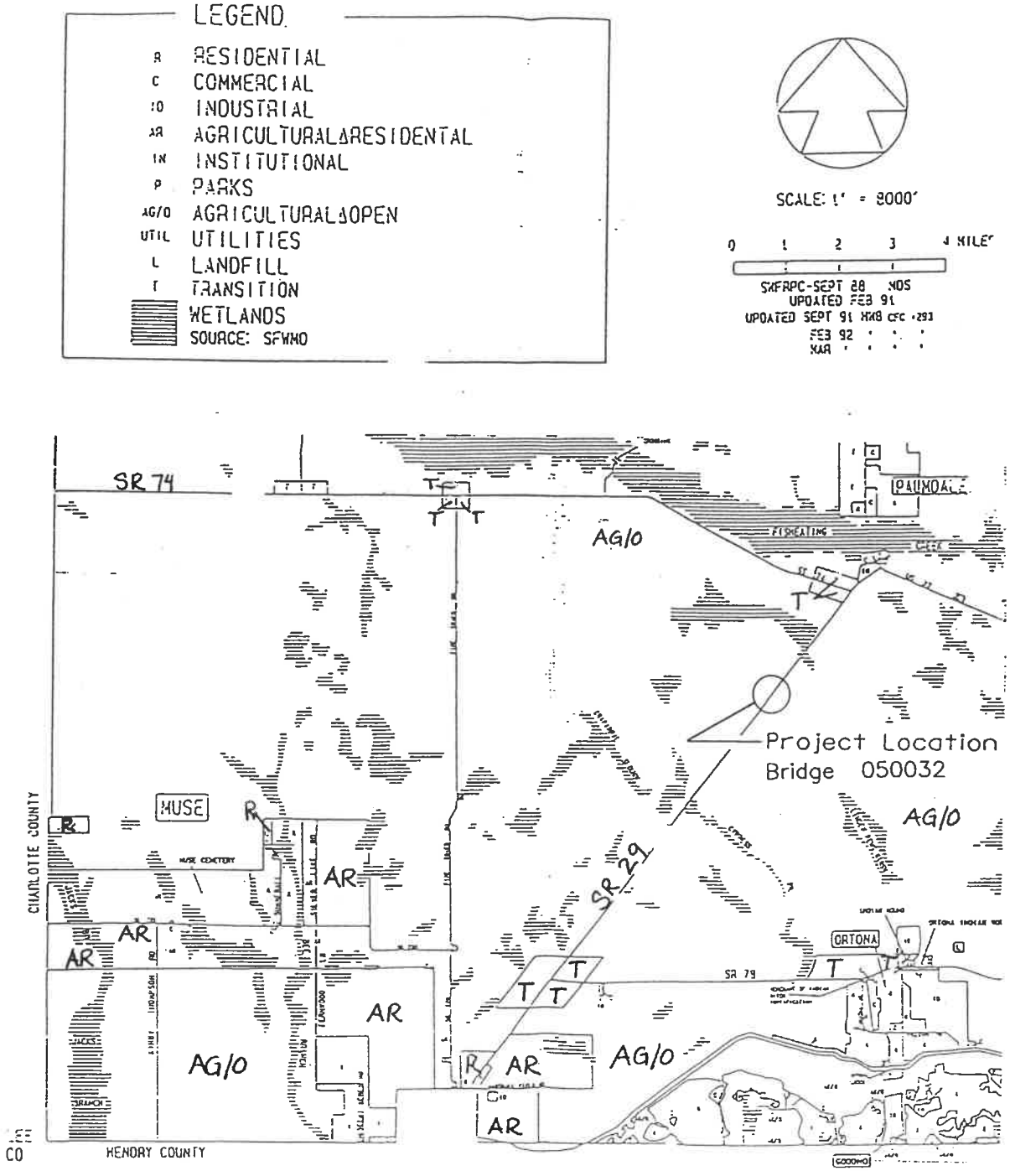

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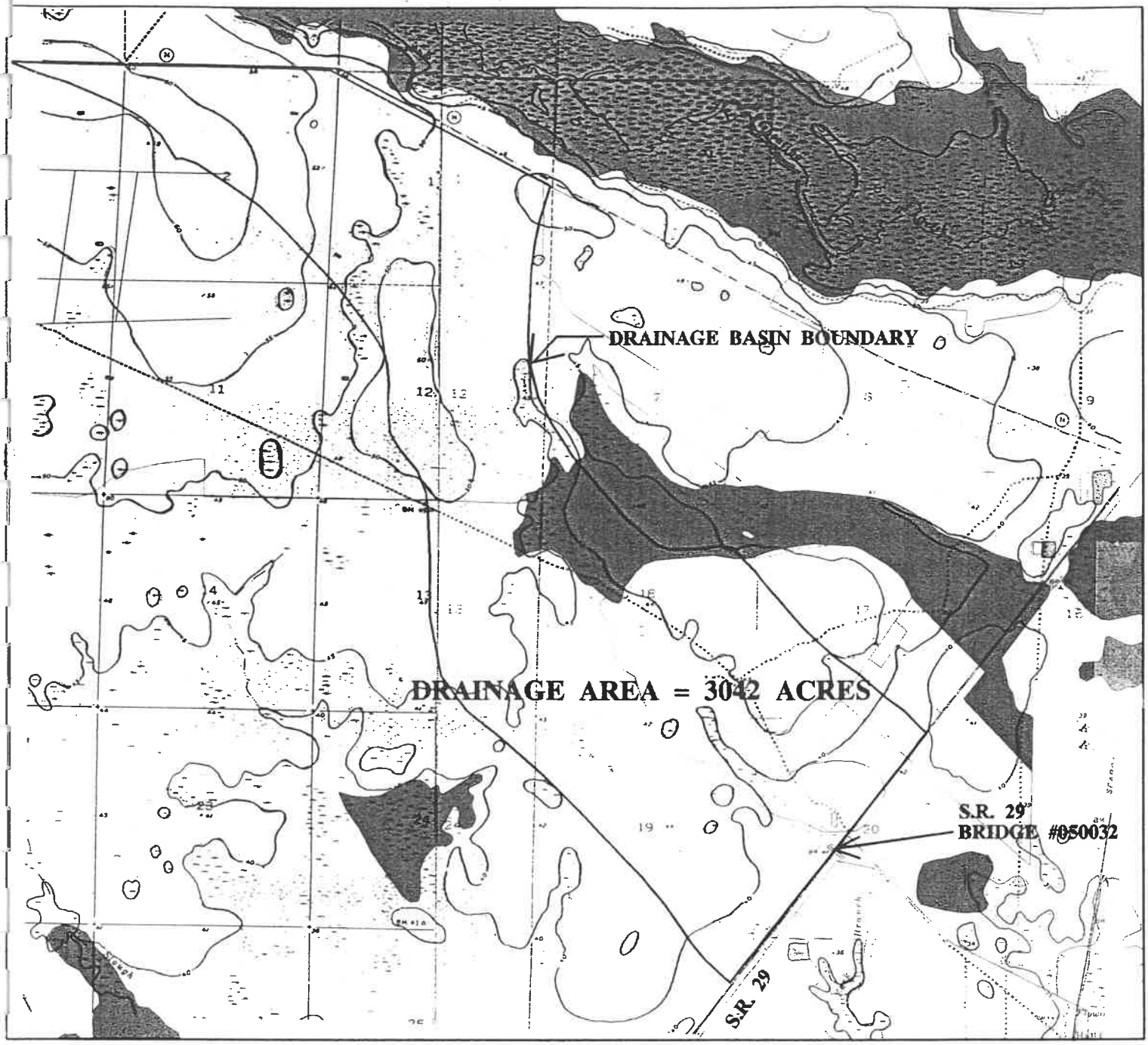
Figure 2. Glades County Future Land Use Map (2010)
SW Florida Regional Planning Council



LEGEND

WATER

WETLANDS

42000 0 42000

GRAPHIC SCALE = 1:42000

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FIGURE 3

DRAINAGE BASIN MAP

ECOLOGIST:	DJD	DATE:	19 JANUARY 1999
GIS TECHNICIAN:	RLH	PROJECT NO:	(FDT1-005-E1B)
CHECKED BY:	RZO	FILE NAME:	BRIDGE32-811.MAP

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Figure 4. Flood Insurance Rate Map
Federal Emergency Management Agency

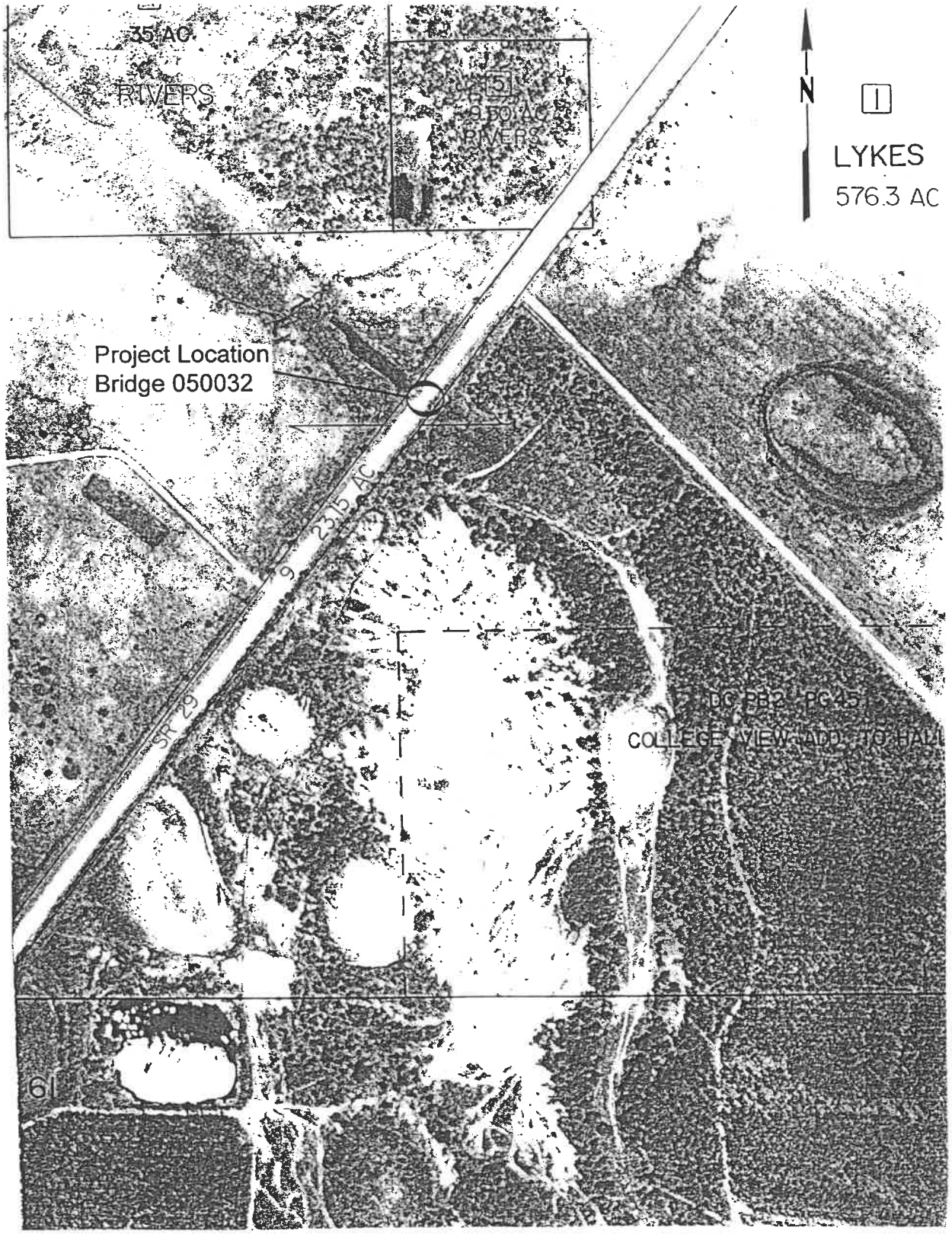

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Figure 5. Aerial Photograph Project Site
Hamrich Aerial Survey

York Branch receives runoff from the contributing areas and flows to the SR 29 crossing. The approach, crossing and departure are aligned approximately perpendicular to the roadway. Downstream of the bridge, York Branch continues in a southeasterly direction to its terminus at Linden Pens Marsh, approximately three miles southeast of Bridge Number 050032.

Channel Stability

A Level One Stream Stability Analysis (HEC 20) was performed for York Branch. The analysis is based on review and interpretation of aerial and USGS Quad Maps, County and FDOT records and a site visit. Documentation of the analysis is included in Appendix A, as well as several photographs of the site.

Based on the results of the analysis, York Branch is considered a stable channel, with overall stability rated as moderate to high. The analysis also suggests that changes to the channel and watershed over the foreseeable future will not be significant. There is no need for a more detailed analysis.

Potential Water Stages

The existing bridge is within an area designated as "Flood Zone A" on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) for Glades County. Flood Zone A is defined by FEMA as an area of maximum flooding with no given base flood elevations (see Figure 4 - Flood Map). In order to approximate the limits of the base flood, the FIRM was overlaid on the USGS quadrangle map. By doing so, the base flood elevation is approximately 11.88 meters (39 ft). Therefore, the base flood elevation of the bridge should be no higher than 11.88 meters (39 ft) in order for the basin to drain properly. Based on the FIRM, York Branch is not a regulatory floodway and a "no rise" certification will not be necessary.

In order to estimate potential water stages at Bridge Number 050032, a review of the historical water stages was performed. Unfortunately, there is no gaging station at this location and limited historic

flood information is available. Correspondence and/or conversation with several agencies were undertaken to determine the history of the crossing. Appendix G contains the results of that effort.

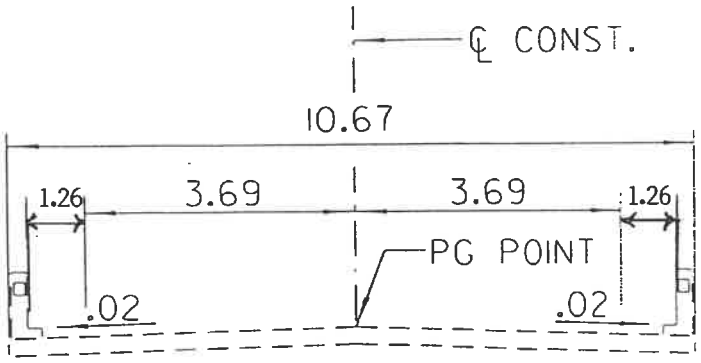
In summary of that research, it has become apparent that there are no recorded instances of overtopping at this bridge. The South Florida Water Management District did not have any information concerning this bridge. There are no "Works of the District" associated with this crossing.

Maintenance of the bridge is performed by the Florida Department of Transportation (FDOT) Maintenance Office in LaBelle, Florida. According to the FDOT staff, SR 29 has overtopped on one occasion (1970). However, the bridge has never been overtopped. The maintenance of the channel at this crossing has been limited to the removal of vegetation within the channel.

York Branch drains a wetland area and discharges into another wetland area. As such, there is little potential for backwater from other water bodies affecting the hydraulic performance of York Branch.

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 10.33 meters (33.9 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, consists 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 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 the year 2013 is 5,508.



BRIDGE NO. 050032

NOTE: Dimensions are in meters

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Figure 6. Existing Bridge
Typical Section

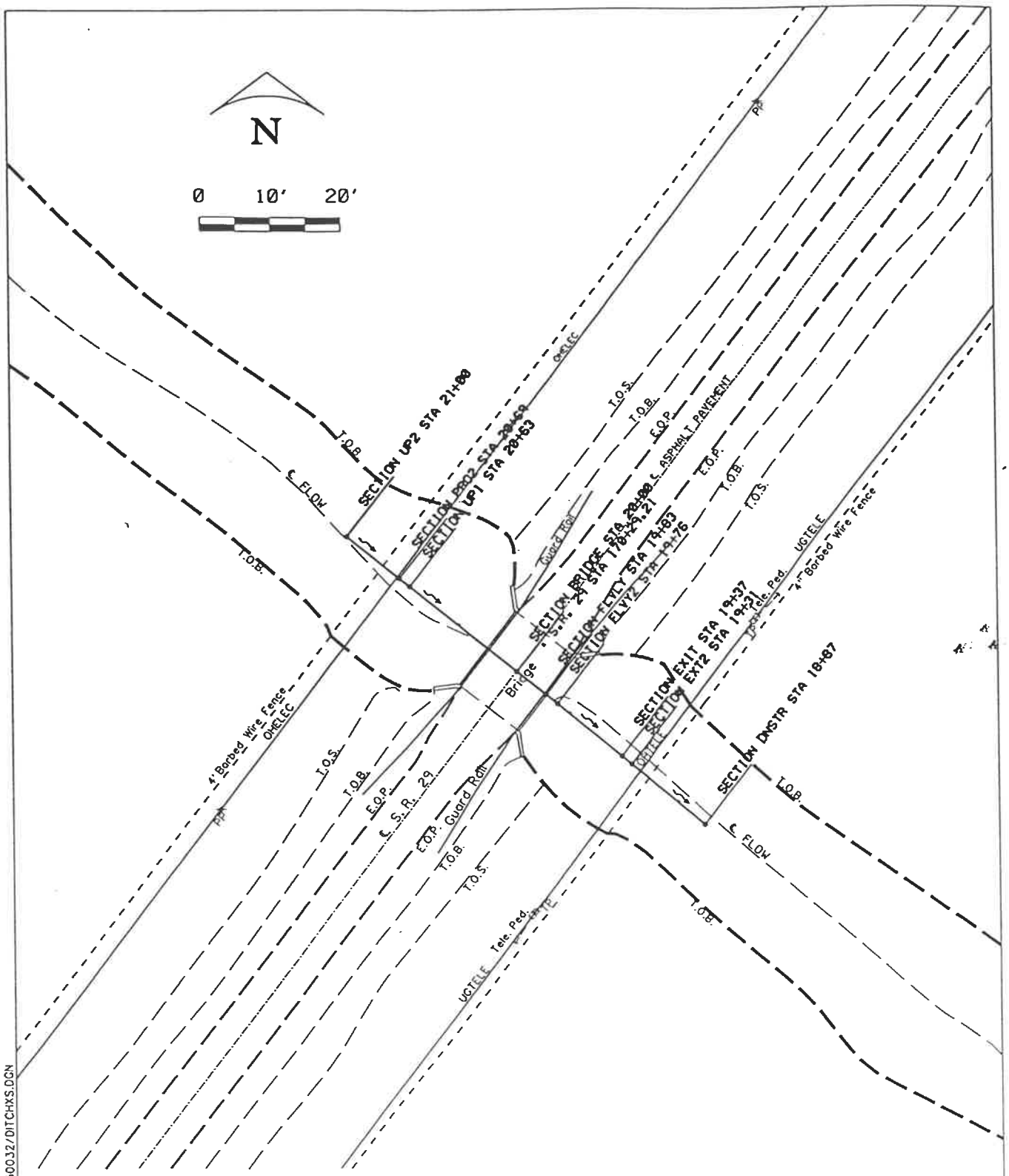

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Figure 7. Cross Section Locations

In : G:/PROJECTS/FDT1/005/50032/DITCHXS.DGN

Historically, the existing structure appears to have been hydraulically adequate. There is no record of the bridge deck or approach roadway structure overtopping and there is no evidence of debris at the existing structure.

There are no other crossings of York Branch apart from this crossing at SR 29.

FINAL DESIGN DATA

Design Flood

State Road 29 is a designated evacuation and emergency access route. The projected average daily traffic (ADT) exceeds 5000. As such, in accordance with the Florida Department of Transportation Drainage Manual, the 50 year storm event is the basis for design.

The hydraulic performance of York Branch at the SR 29 will be analyzed for the 50 year event to insure that applicable FDOT criteria can be met. The existing crossing will be analyzed and compared to the proposed crossing. The applicable FDOT criteria includes:

- Average Stream Velocity: 0.61 - 0.91 meter per second (2 - 3 feet per second)
- Minimum Vertical Clearance: 0.61 meter (2 feet)
- Maximum increase in water surface elevation at approach to bridge (backwater): 0.30 meter (1 foot)

The analysis also includes evaluating the base flood (100 year event) and greatest flood (500 year event).

Hydrologic Analysis

The flow in York Branch is fresh water with no tidal influence. The waterway flows all, or most, of the year. There is very little flow in York Branch and it has been noted by local residents that as the stage of the creek rises, there is usually very little increase in flow. The South Florida Water Management District (SFWMD) did not have any information on this particular bridge crossing. However, they did have a rate of runoff for the entire Caloosahatchee River Basin. For a 25 year design event, the SFWMD has determined the discharge rate to be 30.1 CSM (cfs/mi^2). See

documentation in Appendix B. Also, gage data for Fisheating Creek indicate a flow rate of 45 CSM for a drainage basin north of the basin for Bridge 050032. The rate of flow can be estimated through the use of rational regression equations, as developed by FHWA and USGS. The FDOT drainage manual presents both equations, as they apply to specific zones within Florida. As stated in Chapter 5 of the FDOT drainage manual, the USGS regression equations were developed from a more extensive database and are preferred for most situations. The FHWA regression equation results are included for comparison purposes only. (Refer to Appendix B for detailed calculations).

However, direct application of these equations yields extremely high flows for this area. In comparison to 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 was taken into account in order to replicate the existing condition at Bridge 050032. Refer to Appendix B for documentation and analysis. Flows as determined from each equation are summarized in Table 1.

Peak Basin Discharge				
	USGS Regression Equation Region A (with standard error)		FHWA Regression Equation Zone 1	
Storm (yr.)	Flow (m^3/m)	Flow (cfs)*	Flow (m^3/m)	Flow (cfs)
2	169	100	382	226
50	754	446	1570	929
100	865	512	1830	1083
500	1126	666	n/a	n/a

Table 1. Peak Basin Discharge

* Flow rates have been reduced by the standard error (USGS regression equation only).

The FHWA circular entitled "Guide for Selecting Manning's Roughness Coefficients for Natural Channel and Floodplains" (FHWA-TS-84-204) was used to estimate the Manning's "n" factors in the main channel and floodplain. These factors, which account for type of ground cover, channel

geometry and presence of obstructions, are critical analysis components. A Manning's roughness coefficient of 0.10 was used for this analysis (see Appendix B for calculations).

The main channel differs from the floodplain and different "n" factors were used accordingly. Since the floodplain is primarily pasture and scrub brush, an "n" factor of 0.06 was assigned.

Hydraulic Analysis

The hydraulic analysis of York Branch at the SR 29 crossing was performed through the use of FHWA's Bridge Waterways Analysis Model (WSPRO). The model was constructed to simulate the existing performance of York Branch during various storm events. Another model was prepared which imposed the widened bridge at the crossing and the results compared to the existing condition.

The waterway is described through the use of cross-section data. Extensive survey data was collected within the drainage basin. A digital terrain model (DTM) was then developed, allowing cross-sections to be "cut" at any point within the limits of the DTM.

The locations of the cross-sections used in the WSPRO model were established in accordance with the WSPRO modeling guidelines, combined with a review of the USGS quadrangle map, the FIRM, aerial photographs and the site visit. The FIRM shows the channel flowing to the bridge in a generally straight line (slight meandering) perpendicular to SR 29. WSPRO requires cross sections to be perpendicular to the flow. The cross sections were prepared accordingly.

Specifically, the cross section locations consist of:

- Approach — Section located one bridge length upstream of the bridge.
- Full Valley — Section located at the downstream face of bridge. This section does not include any bridge or embankment data.
- Bridge — Section located at the downstream face of bridge, including all geometric information about the bridge.
- Exit — Section located one bridge length downstream of the bridge.

The locations of the sections differ between existing and proposed conditions as the bridge width changes. The creation of the Digital Terrain Model allows the accurate preparation of cross sections at these locations.

The WSPRO model utilizes the slope-conveyance method. This approach, which uses WSPRO's SK Card, determines an initial water surface elevation and computes the water surface profile through the bridge crossing. Since there is no gaging station on York Branch and there is no defined tailwater information for the outfall at Linden Pens Marsh, this approach was chosen. Since the slope on York Branch is small, it was assumed that the stream flows at normal depth. A slope of 0.08%, which represents the approximate actual slope of the channel and surrounding floodplain, was used in the WSPRO model.

The results of the WSPRO analysis are summarized in the following tables. The input and output data for the models is included 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	0.15 / 0.48	11.76 / 38.60	11.82 / 38.80	0 / 0
Existing Bridge	0.84 / 2.76	11.82 / 38.78	11.98 / 39.32	0.16 / 0.54
Widened Bridge	0.84 / 2.76	11.82 / 38.78	12.00 / 39.38	0.18 / 0.60

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	0.14 / 0.45	11.83 / 38.81	11.84 / 38.86	0 / 0
Existing Bridge	0.95 / 3.12	11.84 / 38.84	12.03 / 39.49	0.20 / 0.65
Widened Bridge	0.95 / 3.12	11.84 / 38.84	12.06 / 39.57	0.22 / 0.73

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	0.13 / 0.43	11.83 / 38.81	11.88 / 38.96	0 / 0
Existing Bridge	1.20 / 3.94	11.88 / 38.96	12.16 / 39.90	0.28 / 0.94
Widened Bridge	1.20 / 3.94	11.87 / 38.95	12.20 / 40.02	0.33 / 1.07

Table 4. Greatest Flood Event: Comparison of existing to widened bridge.

The results of the analysis show that the FDOT requirements are not met for either the existing or the widened bridge. The low member elevation is 39.56'. At the modeled 50 year storm, the high water elevation at the existing bridge is 38.78' and at the proposed bridge is 38.78'. There is no change in high water elevation between the existing and proposed widened bridge. A variance will be requested from the FDOT minimum vertical clearance requirements. Conversations with local residents and district FDOT personnel indicate that the bridges on this section of SR 29 have never been overtopped. Our model flow at the 25 year event is 377 cfs or 79 cfs per square mile. The South Florida Water Management District predicts the 25 year flow in this area to be between 30 and 50 cfs per square mile. The average stream velocity and backwater characteristics are consistent with FDOT requirements. The existing structure has a sufficiency rating of 84.0 (see Structure Inventory and Analysis, Appendix C). Based on the historical information, the conservative flow data used, and the negligible increase in water surface elevation, it appears to be more economical to widen the bridge than to replace the existing structure. A final recommendation for either

replacing or widening Bridge Number 050032 will be based on an inspection of the bridge's substructure units by the structural engineer (see Appendix C for existing structure documentation).

Recommended Structure

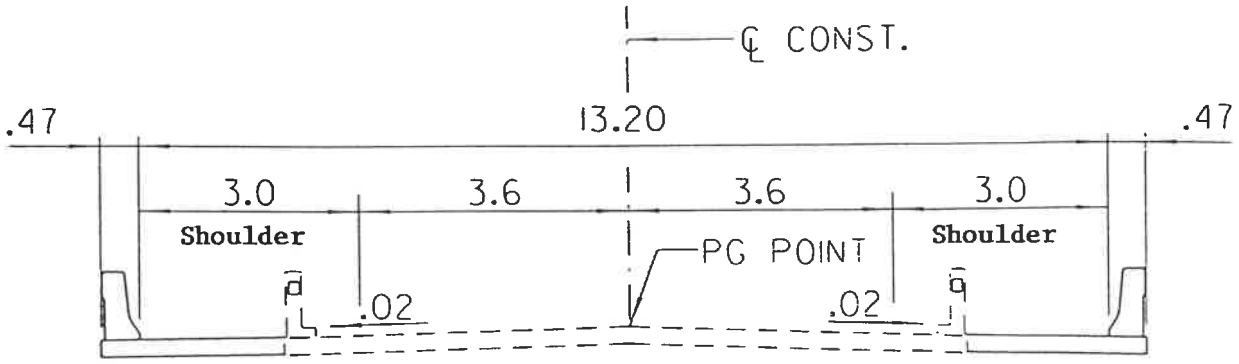
The hydraulic analysis of the widening of Bridge Number 050032 confirms that the structure's hydraulic capability of conveying the 50 year design storm in York Branch will not significantly change due to widening. There is no need for channel modifications or water training devices at this site due to the widened bridge design.

Proposed improvements will include the widening of the existing bridge structure by 1.741 meters (5.71 feet) on each side thus 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.

Scour Analysis

The existing bridge has been routinely inspected by the Florida Department of Transportation. During those inspections, the substructure, piles and channel have been rated as "very good". The inspection reports, which are included in Appendix C, show that the bed elevation has not changed over the past two years. Long term aggradation or degradation is not anticipated.

The underwater investigation (February 1993) identifies the bottom of the channel as mud. The Glades County soil survey indicates that the soils are Floridana Fine Sand, depressional; classified as nearly level and poorly drained. The median diameter (D_{50}) of the soil is estimated to be 0.25 mm and this figure has been used in the scour evaluation at both the existing and proposed bridge (See Appendix B).



BRIDGE NO. 050032

NOTE: Measurements are in meters

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Figure 8. Proposed Bridge
Typical Section

Scour calculations have been prepared and are included in Appendix E. The scour evaluation includes long term degradation, contraction, pier and abutment scour. The methodology is in accordance with procedures defined in FHWA's *Evaluating Scour at Bridges,* HEC 18. The results of the scour analysis are summarized in Table 5.

Estimated Scour Depths and Elevations					
	Bridge Configuration	Channel Bottom Elevation (ft)	Contraction Scour (ft)	Local Pier Scour (ft)	Scoured Elevation of Channel Bottom
100 Year Storm	Existing Bridge	32.50	3.64	2.93	25.93
	Widened Bridge	32.50	3.65	2.93	25.92
500 Year Storm	Existing Bridge	32.50	5.14	3.27	24.09
	Widened Bridge	32.50	5.12	3.24	24.14

Table 5. 100 Year and 500 Year Scour Predictions in feet

Historically, based on inspection reports and a site visit, it appears that scour has not been a problem at this bridge. The scour predictions contained in this report are based on values generated from the WSPRO model for York Branch. It is felt that these predictions are over-stated and that minimal actual scouring will be experienced.

Clear-water versus live-bed contraction scour determinations were based on a comparison of critical and actual stream velocities. This comparison suggests that clear-water scour would occur. This appears logical as the stream is heavily vegetated, which would retard live-bed movement. The presence of clear-water scour requires a ten percent increase in predicted pier scour depths, as suggested in HEC-18 (Chapter 2.6, Page 16).

The proposed bridge widening does not appreciably change the predicted scour depths. The pile tip elevations for the existing bridge are not known. However, as stated earlier, this bridge site is not experiencing significant scour.

The existing bridge and channel do not include any countermeasures against scour, nor are any recommended for the widened bridge. The channel bed, based on inspection data and the Level One Stream Stability Analysis, appears to be stable. The placement of riprap protection at the piles and abutments would require disturbing this stabilized bed and is not recommended.

Economic Analysis

The roadway and bridge improvements proposed for State Road 29 in Glades County, Florida include improvements to several bridges. This report addresses improvements to Bridge Number 050032.

The estimated cost to improve this bridge is $59,200.00. This estimate was prepared by the structural engineer for improvements to Bridge Number 50035. The two existing bridges are identical as are the proposed improvements. Therefore, construction costs should be the same.

The proposed bridge will feature the new standard width of 14.140 meters (47 feet, 1 inch) as opposed to the existing width of 10.668 meters (35 feet), an increase in bridge area of 543.75 square feet. Therefore, the improvements to Bridge Number 050032 would cost approximately $110.00 per square foot.

Alternate bridge selections, such as bridge replacement or culvert installation, were not analyzed. Since both the existing and widened bridges are considered hydraulically adequate, it is obvious that other alternatives would not be economically feasible based on a drainage evaluation.

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 bridge. A detailed cost estimate is included in Appendix F.

Deck Drainage

Runoff from the bridge will be directed to the roadway stormwater collection system. In accordance with FDOT design criteria scuppers are no longer being used on bridges less than 121.92 meters (400 feet) long. The bridge will be provided with a 2% cross-slope and a longitudinal slope of at least 0.30%. The spread associated with Bridge Number 050032 constructed in this manner will be within the allowable FDOT limits. The deck drainage calculations are included in Appendix H.

Permits

Any permits required for this project have not yet been applied for. Permit applications and agency coordination will be the responsibility of Biological Research Associates (BRA). The current schedule includes a delineation of wetlands when flood waters recede (anticipated in the Spring, 1996), followed by pursuit of the applicable permits.

Maintenance of Traffic

Maintenance of traffic will be handled by shifting 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. 050032, SR 29 over York Branch, April 4, 1994

Evaluating Scour at Bridges, Hydraulic Engineer 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 Floodplains

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

York Branch: Upstream View from SR 29 Bridge

York Branch: Upstream View from SR 29 Bridge

Bridge No. 050032: Upstream Elevation and Cover Shot

SITE FIELD REVIEW

Date of Field Review: Feb 28, 1996

Evidence of scour at structure:

1	Abutment tilting / moving in	( ) Yes	(x) No
2	Slopes washing in / sloughing	( ) Yes	(x) No
3	Scour holes near abutments / bents	( ) Yes	(x) No
4	Bed deposits downstream	( ) Yes	(x) No
5	Bridge railing sagging	( ) Yes	(x) No
6	Debris	( ) Yes	(x) No
7	High - water mark	( ) Yes	(x) No ( ) from top of low member
8	Other		( ) Yes ( ) No

Feasibility of adding rip-rap or other scour countermeasures (x) Yes ( ) No

ABUTMENTS

a. Type: (x) Bridge ( ) Bridge culvert
( ) Spill through (x) Vertical wall (x) Wing wall ( ) Sheet piles

b. Foundation	Dimensions (ft)	Embedment (ft)	Current Scour (ft)	Notes:
(Spread footing				No scour was evident during
(Pile cap				site visit.
(Piles				No measurements collected
(Drilled shafts				during site visit

Source of Data: (x) Field Review ( ) Design Plans
( ) As - Built plans ( ) Pile Driving Records
( ) Inspection Reports ( ) Other

c. Location from bank (looking downstream)	Left (ft)	Right (ft)
( ) Set back		
(x) At bank		
( ) In channel		

d. Protection:
1) Countermeasures ( ) Sand - Cement ( ) Rubble ( ) Commercial Block
(x) None ( ) Grouted ( ) Sheet Pile ( ) Other

2) Condition	Good	Fair	Poor
Left			
Right			

e. Other

SITE FIELD REVIEW

Date of Field Review: Feb. 28, 1996

CHANNEL VERTICAL STABILITY

a. Exposed footing		( ) Yes	(x) No	( ) Unknown
b. Exposed piles		( ) Yes	(x) No	( ) Unknown
c. Contraction scour (Encroachment)				
1) Overbank Flow :	Left	( ) Yes	(x) No	( ) feet
(Looking downstream)	Right	( ) Yes	(x) No	( ) feet
2) Relief Bridge:		( ) Yes	(x) No	
3) Roadway Overtopping		( ) Yes	(x) No	
(At Structure)		( ) Unknown	( ) Possible	( ) Partial
4) Bridge Overtopping		( ) Yes	( ) No	
(Low Member)		( ) Unknown	(x) Possible	( ) Partial
d. Long Term :				
1) Aggradation		( ) Yes	(x) No	( ) Unknown
2) Degradation		( ) Yes	(x) No	( ) Unknown

e. Bed Material:

( ) Sand	( ) Sandy Loam
( ) Clay	( ) Sandy Clay Loam
( ) Muck	( ) Clayey Fine Sand
( )Shell	( ) Marl
( ) Coated with organic matter	( ) Limestone
(x) Other Mud	

GEOMORPHOLOGY

a. Alluvial Fan	( ) Yes	(x) No
b. Dam or Reservoir	( ) Yes	(x) No
c. River Form	(x) Straight	( ) Meandering
	( ) Braided	( ) Manmade
d. Instream Mining / Dredging	( ) Yes	(x) No
e. Headcuts or Nickpoints	( ) Yes	(x) No
f. Diversions	( ) Yes	(x) No
g. Channel Straightening	( ) Yes	(x) No

h. Stream size: (x) Small (< 100 feet) ( ) Medium (100 - 500 feet) ( ) Large (> 500 feet)

i. Flow Characteristics: ( ) Intermittent (x) Perennial ( ) Tidal

j. Other: Flood Plain is very wide (> 100X Channel width) Very Mild Slope, Flood plain is highly vegetated

SITE FIELD REVIEW

Date of Field Review: Feb. 28, 1996

OTHER CONSIDERATIONS

a. Sediment Transport (During High Flow) :

1) ( ) Live Bed Condition ( ) Clear Water Condition (x) Unknown

2) Armored Bed ( ) Yes (x) No ( ) Unknown

b. Watershed (x) Agricultural ( ) Forested (x) Swamp ( ) Urban

c. Tidal Influence ( ) Yes (x) 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) feet / second

3) Seiching (wind set up) ( ) Yes (x) No ( ) Possible

4) Distance to coast ( ) miles - shortest distance ( ) miles along thalweg

5) Traffic ( ) Ship ( ) Recreation ( ) Commercial

( ) Barge (x) Snakes & Alligators (x) None

e. Tributaries:

( ) Upstream ( ) Downstream (x) No Factor

Distance to confluence of next stream or waterbody: ( ) feet upstream

( ) feet downstream

f. Observed Stream Velocity: (0) feet / second

g. Estimated Mannings n: Channel (0.1) Overbank (0.06)

ADDITIONAL COMMENTS

a. Photographs: ( ) Upstream Face (x) Upstream Channel

(x) Downstream Face (x) DownstreamChannel

( ) East Abutment ( ) West Abutment

b. Remarks: Water under bridge was not moving. There is heavy vegetation both up and downstream of bridge. Water level at the time of the site visit was 4.3' below the low member.

Reviewers:

SITE FIELD REVIEW

Date of Field Review: Feb. 28, 1996

PIER

a. Type (Typical or Worst Pier)

( ) Concrete Wall (x) Pile Bent ( ) Column

b. Shape (x) Square ( ) Rounded ( ) Sharp Nose ( ) Unknown

c. Width: (2) Feet Length: (37) Feet [Diameter: ( )Feet

d. Foundation (Worst Pier)	Dimensions (L,W,D) (ft)	Embedment	Scour Exposure
( ) Spread Footing			
(x) Pile Cap	37',2',2'		
( ) Piles			
( ) Drilled Shafts			

Source of Data
(x) Field Review ( ) Design Plans
(x) As Built Plans ( ) Pile Driving Records
( ) Inspection Reports ( ) Other

e. Protection

1) Countermeasures ( ) Sand Cement ( ) Rubble ( ) Commercial Block
(x) None ( ) Grouted ( ) Sheet Piles ( ) Other
2) Condition ( ) Fair ( ) Good ( ) Poor

Channel Lateral Stability

a: Bends (x) None
1) Bridge Location ( ) Upstream of Bend ( ) Downstream of Bend ( ) In Bend
2) Channel Migration ( ) Yes (x) No
3) Counter Measures ( ) Yes (x) No Type:

b. Bank Condition:	Upstream	Downstream
1) Eroding	( )	( )
2) Stable	(x)	(x)
3) Vegetated	(x)	(x)
4) Sheet Piles	( )	( )

5) Countermeasures ( ) Yes (x) No
c. Angle of Attack Flood Flow (0°) Normal Flow (0°)
d. Point Bar Under Bridge ( ) Yes (x) No
e. Islands or Bars:
1) Upstream ( ) Yes (x) No
2) Downstream ( ) Yes (x) No
f. Other

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 are to be used to determine the freshwater flow conditions.

The USGS and FHWA have developed regional regression equations for the area of Bridge No. 050032. 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 York Branch Creek. The depressional area shown on the USGS quad maps plus 10% was used as the storage area. Because of the very high flows compared to SFWMD predictions, the final flows used were reduced by the Standard Error for the USGS Regression Equations.

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 3041.5 acres or 4.75 square miles.
2. The slope of the main channel is 0.0008 feet per foot (4.4 feet per mile) and was determined from the USGS Quadrangle Map.
3. The percentage of storage area in the basin has been estimated at 8 acres or 0.26% of the total drainage area according to the SFWMD Geographical Information Systems Map.

USGS REGRESSION EQUATIONS

REGION A

Peak Runoff Equation

		CFS	Percent Error	Adjusted CFS	CFSSM
Q 2 = 93.4*(DA)^0.756*(SL)^0.268*(LK+3)^-0.803	=	174	42.6%	100	21
Q 10 = 274*(DA)^0.708*(SL)^0.248*(LK+3)^-0.738	=	497	44.2%	278	58
Q 25 = 395*(DA)^0.696*(SL)^0.240*(LK+3)^-0.715	=	715	47.3%	377	79
Q 50 = 496*(DA)^0.690*(SL)^0.234*(LK+3)^-0.705	=	892	50.0%	446	94
Q 100 = 609*(DA)^0.685*(SL)^0.227*(LK+3)^-0.695	=	1088	52.9%	512	108
Q 500 = 985*(DA)^0.668*(SL)^0.196*(LK+3)^-0.687	=	1653	59.7%	666	140

Q t	Peak runoff rate for return period of t - years, in cfs		
DA	Drainage area, in square miles	=	4.75
SL	Channel slope, in feet per mile	=	4.36
LK	Lake area, in percent of total	=	0.26

Basin Characteristics	Range of Applicability
Drainage Area	1,170 acres to 3,066 square miles
Slope	0.15 to 0.24 feet per mile
Lake Area	0 to 28.16 %

Note: CFSSM denotes "cubic feet per second per square mile"

Reference: FDOT Drainage Manual, Volume 2A, Chapter 5

Zone 1

FHWA Regression Equations

		Peak Runoff Equation	
Q_{10}	=	0.0214*(A^0.44)*(R^1.164)*(DH^0.785)	= 740
Q_2	=	0.41*Q_{10}	= 303
Q_{50}	=	1.46*(Q_{10}^1.023)	= 1258
Q_{100}	=	1.64*(Q_{10}^1.029)	= 1470

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

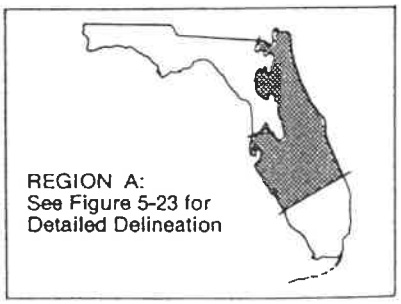
DA = Drainage area, in miles²

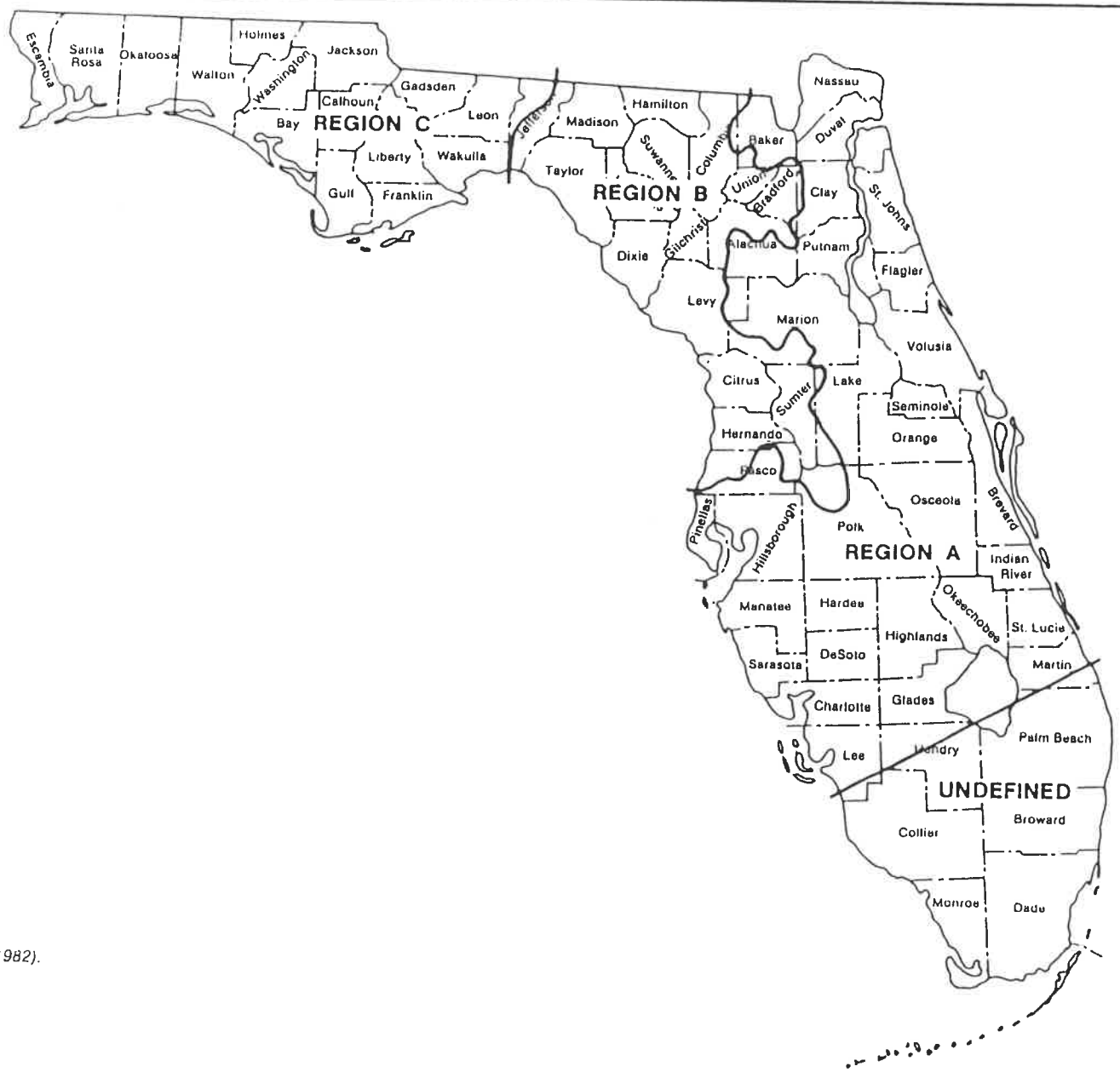
SL = Channel slope between points at 10 and 85 percent of total channel length, in ft/mile (minimum = 0.9)

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 miles^2

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

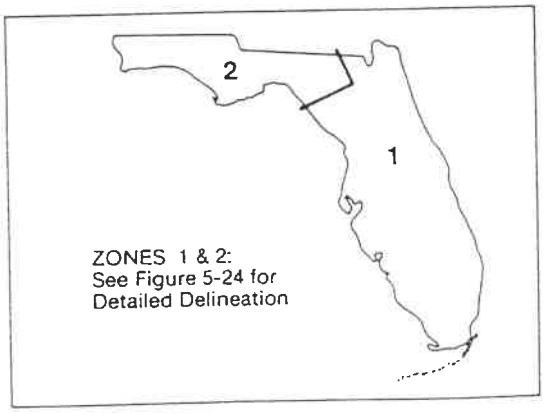
$Q_2 = 0.41\ Q_{10}$ = 2-year peak runoff rate, in cfs

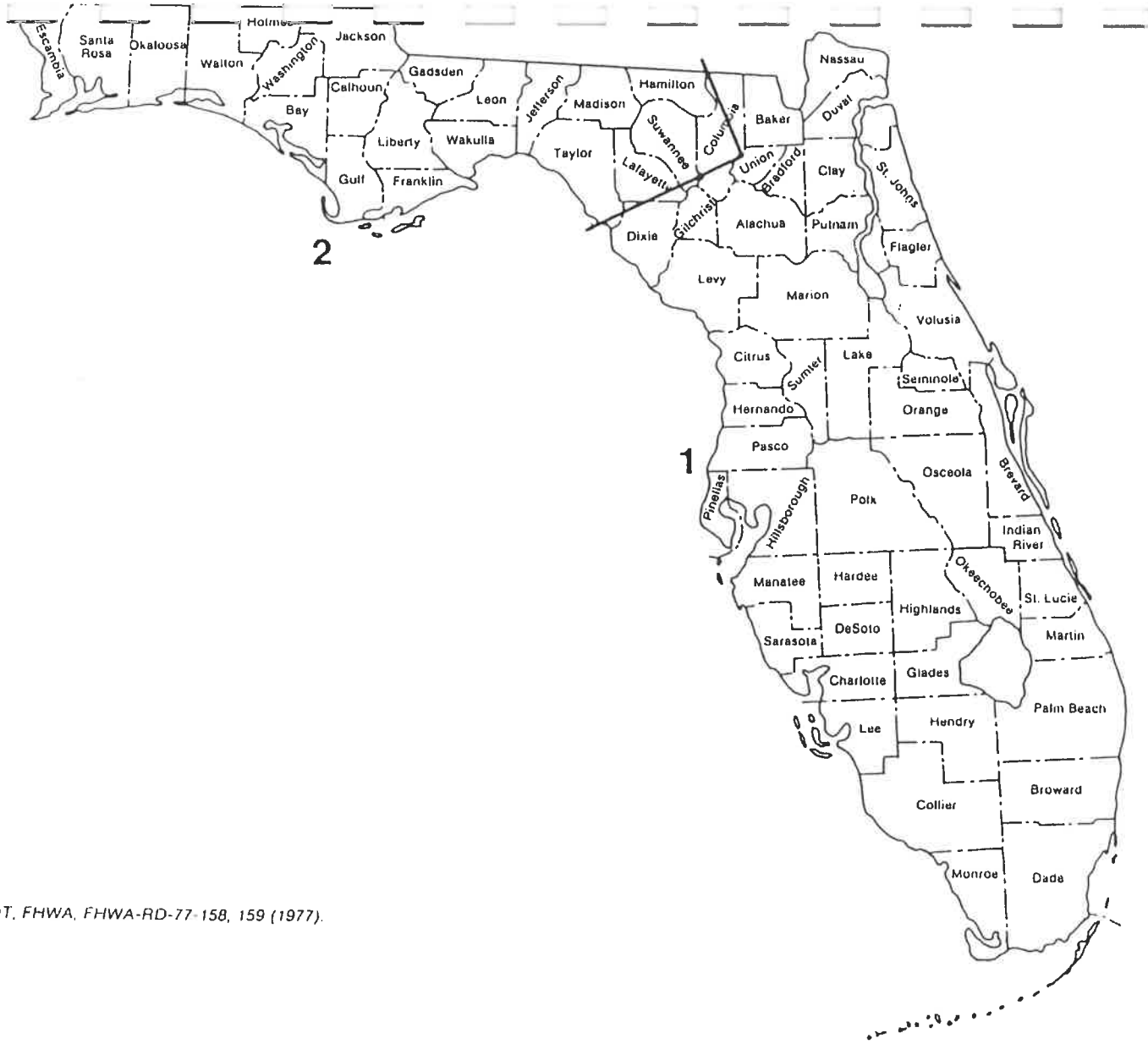
$Q_{50} = 1.46\ Q_{10}^{1.023}$ = 50-year peak runoff rate, in cfs

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

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

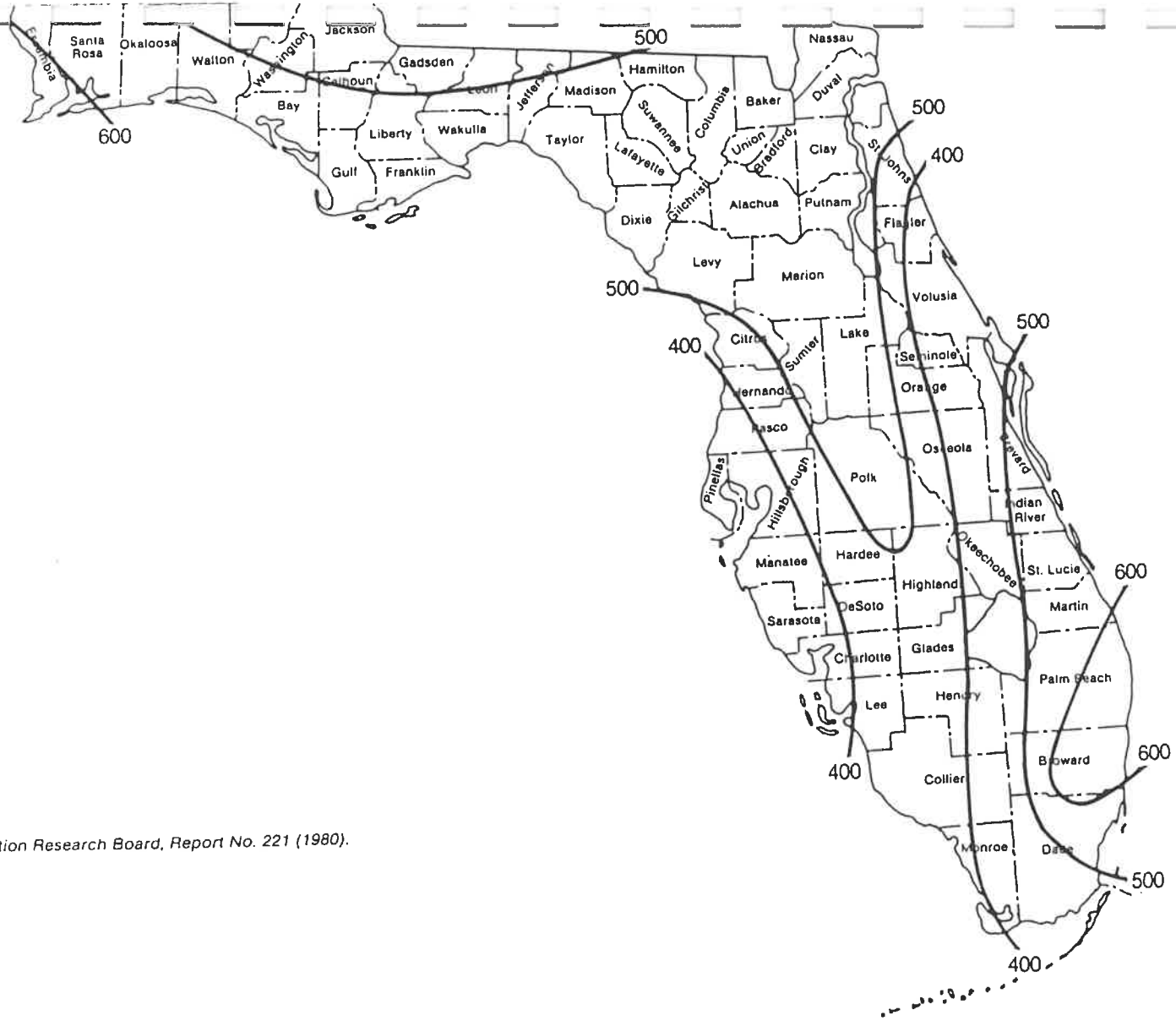
Reference: USDOT, FHWA, FHWA-RD-77-158,159 (1977).





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

GENESIS GROUP, INC.
820 East Park Avenue
Building I, Suite 200
Tallahassee, FL 32301
(904) 224-4400

Project Name: SR29 - York Branch By: CSB Date: 3/1/96
Project Number: FDT1-004 Ck By: Date:
Subject: Sht: of

Length of Channel = 26,000

10% = 2600 elevation 38 ft

85% = 22,100 elevation 53 ft

Slope between 10% & 85% of channel

$$\frac{53-38}{22,100-2600} = 0.00077 \text{ ft/ft}$$

$$= 4.06 \text{ ft/mile}$$

Slope from Contour to Contour

$$\frac{60-37}{26,000} = 0.00088$$

$$= 4.67 \text{ ft/mile}$$

MANNING

Manning's N Value's for York Branch using Cowen's Equation

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

Material Involved	n_o	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:	0.005
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 Obstruction	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:	0.075
Degree of Meandering	m_5	
Minor	1.000	
Appreciable	1.150	
Severe	1.300	
	Enter value:	1.000
	n =	0.10

Stream and Location : York Branch

Reach or Section : Up and Downstream of Bridge No. 050032

Event for which n is assigned: 50 year

1 Is roughness coefficient throughout the reach being considered ?

Yes

If not, n should be assigned for the average condition of the reach ?

2 Is roughness uniformly distributed along the cross section ?

no

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 40' wide, 3' deep & heavily vegetated no velocity

Are present conditions representative of those during the flood ?

No - water appears low

If not, describe the probable conditions during the flood.

Water would be 1-2 ft higher, velocity would still be low.

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

Bank roughness : N/A

Bedrock outcrops : N/A

Isolated boulders : N/A

Vegetation : High

Obstructions : N/A

Meander : Minor

Factor	Describe conditions briefly	Adjustment
Irregularity, n1	Minor	0.005
Variations in channel, n2	gradual	0
Obstructions, n3	negligible	0.004
Vegetation, n4	Very high	0.075
Meander, m	Channel is very straight	1.00
	Weighted n plus adjustments	0.02
	Use n =	0.10

14. Decribe the flood plain. - uncut pasture some scrub woods, relatively dry

Are present conditions representative of those during the flood ? no

If not, describe the probable conditions during the flood. most of flood plain would likely 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 ? Yes

If not, how should the flood plain be divided ?

17 - 23. Computation of n for flood plain.

Adjustment factors without vegetation - density method

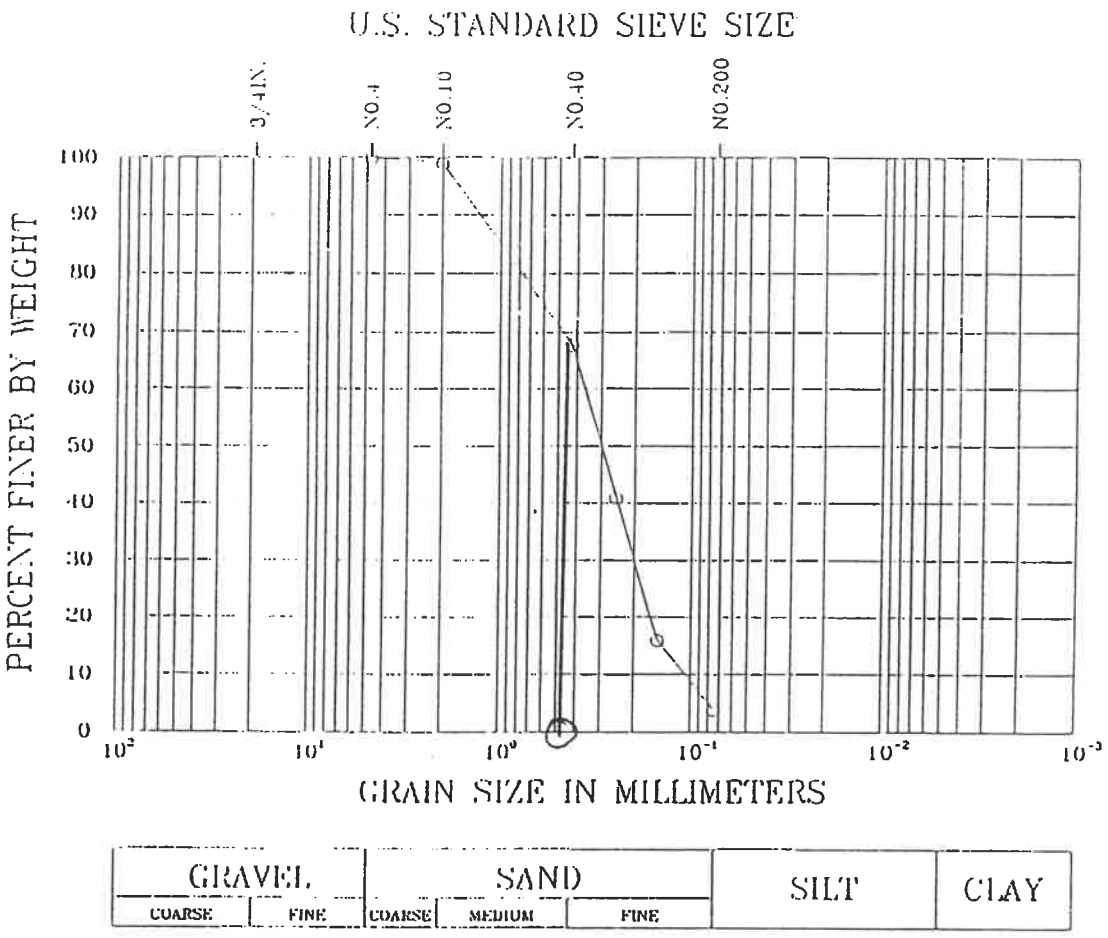
Subsection	Base n nb	Irregularity n1	Obstructions n3	Vegetation n4	Computed n
Pasture	0.02	minor 0.005	0.004	0.025	0.06

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.



LOCATION: SOUTHWEST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

-e-

SOIL CLASSIFICATION: A-3, SP

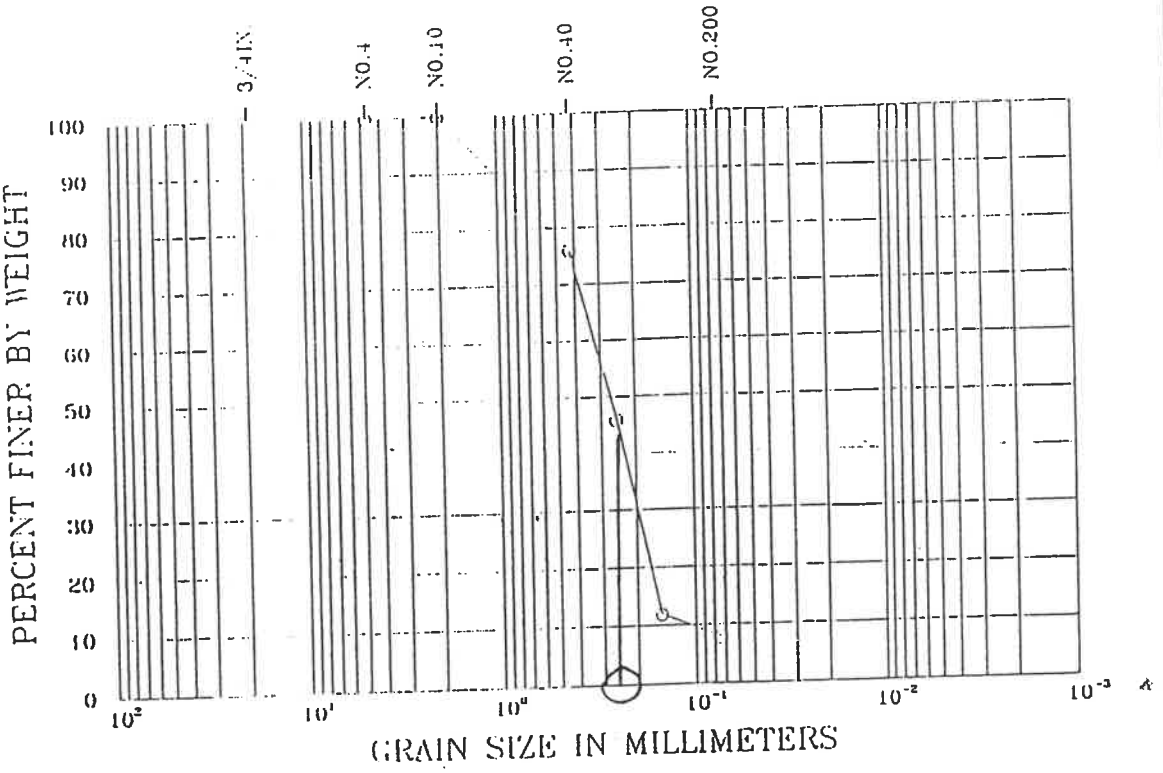
REPRESENTATIVE OF SURFICIAL MATERIAL

STATE PROJECT # 05090-1511
BRIDGE # 050032

CURVE 1

$D_{50} \approx 0.57$mm (SURFICAL)

U.S. STANDARD SIEVE SIZE



LOCATION: STATION 170+16 11m RT OF C.L.
SAMPLE DEPTH: 6.1 m

-o-

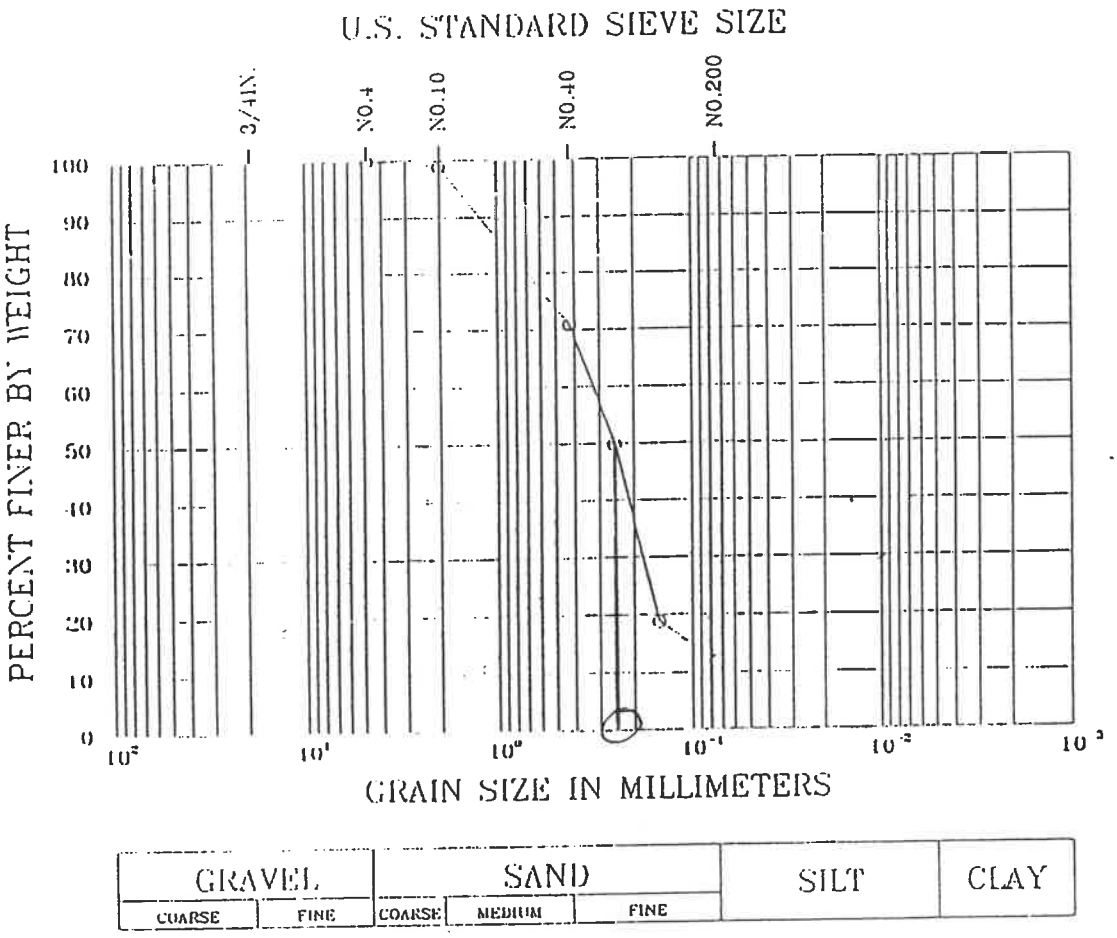
SOIL CLASSIFICATION: A-3-4, SP-SC

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

$D_{50} \approx 0.25$ mm



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

-⊕-

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

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

STATE PROJECT # 05090-1511
BRIDGE # 050032

CURVE 3

$D_{50} \approx 0.25$ mm

CHAPTER 62-302
SURFACE WATER QUALITY STANDARDS

TABLE OF CONTENTS

62-302.100 Findings, Declaration and Intent.

(1) Article II, Section 7 of the Florida Constitution requires abatement of water pollution, and conservation and protection of Florida's natural resources and scenic beauty.

(2) Congress, in Section 101(a)(2) of the Federal Water Pollution Control Act, as amended, declares that achievement by July 1, 1983, of water quality sufficient for the protection and propagation of fish, shellfish, and wildlife, as well as for recreation in and on the water, is an interim goal to be sought wherever attainable. Congress further states, in Section 101(a)(3), that it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited.

(3) The present and future most beneficial uses of all waters of the State have been designated by the Department by means of the classification system set forth in this Chapter pursuant to Subsection 403.061(10), F.S. Water quality standards are established by the Department to protect these designated uses.

(4) Because activities outside the State sometimes cause pollution of Florida's waters, the Department will make every reasonable effort to have such pollution abated.

(5) Water quality standards apply equally to and shall be uniformly enforced in both the public and private sector.

(6) Public interest shall not be construed to mean only those activities conducted solely to provide facilities or benefits to the general public. Private activities conducted for private purposes may also be in the public interest.

(7) The Commission, recognizing the complexity of water quality management and the necessity to temper regulatory actions with the technological progress and the social and economic well-being of people, urges, however, that there be

no compromise where discharges of pollutants constitute a valid hazard to human health.

(8) The Commission requests that the Secretary seek and use the best environmental information available when making decisions on the effects of chronically and acutely toxic substances and carcinogenic, mutagenic, and teratogenic substances. Additionally, the Secretary is requested to seek and encourage innovative research and developments in waste treatment alternatives that might better preserve environmental quality or at the same time reduce the energy and dollar costs of operation.

(9) The criteria set forth in this Chapter are minimum levels which are necessary to protect the designated uses of a water body. It is the intent of this Commission that permit applicants should not be penalized due to a low detection limit associated with any specific criteria.

(10)(a) The Department's rules that were adopted on March 1, 1979 regarding water quality standards are designed to protect the public health or welfare and to enhance the quality of waters of the State. They have been established taking into consideration the use and value of waters of the State for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, and also taking into consideration their use and value for navigation.

(b) Under the approach taken in the formulation of the rules adopted in this proceeding:

1. The Department's rules that were adopted on March 1, 1979 regarding water quality standards are based upon the best scientific knowledge related to the protection of the various designated uses of waters of the State; and

2. The mixing zone, zone of discharge, site specific alternative criteria, exemption, and equitable allocation provisions are designed to provide an opportunity for the future consideration of factors relating to localized situations which could not adequately be addressed in this proceeding, including economic and social consequences, attainability, irretrievable conditions, natural background, and detectability.

(c) This is an even-handed and balanced approach to attainment of water quality objectives. The Commission has specifically recognized that the social, economic and environmental costs may, under certain special circumstances, outweigh the social, economic and environmental benefits if the numerical criteria are enforced statewide. It is for that reason that the Commission has provided for mixing zones, zones of discharge, site specific alternative criteria, exemptions and other provisions in Chapters 62-302, 62-4, and 62-6, F.A.C. Furthermore, the continued availability of the moderating provisions is a vital factor providing a basis for the Commission's determination that water quality standards applicable to water classes in the rule are attainable taking into consideration environmental,

constituents which are discharged from sources into waters of the State.

(10) "Exceptional Ecological Significance" shall mean that a water body is a part of an ecosystem of unusual value. The exceptional significance may be in unusual species, productivity, diversity, ecological relationships, ambient water quality, scientific or educational interest, or in other aspects of the ecosystem's setting or processes.

(11) "Exceptional Recreational Significance" shall mean unusual value as a resource for outdoor recreation activities. Outdoor recreation activities include, but are not limited to, fishing, boating, canoeing, water skiing, swimming, scuba diving, or nature observation. The exceptional significance may be in the intensity of present recreational usage, in an unusual quality of recreational experience, or in the potential for unusual future recreational use or experience.

(12) "Existing Uses" shall mean any actual beneficial use of the water body on or after November 28, 1975.

(13) "Man-induced conditions which cannot be controlled or abated" shall mean conditions that have been influenced by human activities, and

(a) would remain after removal of all point sources,

(b) would remain after imposition of best management practices for non-point sources, and

(c) cannot be restored or abated by physical alteration of the water body, or there is no reasonable relationship between the economic, social and environmental costs and the benefits of restoration or physical alteration.

(14) "Natural Background" shall mean the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department. The establishment of natural background for an altered waterbody may be based upon a similar unaltered waterbody or on historical pre-alteration data.

(15) "Nuisance Species" shall mean species of flora or fauna whose noxious characteristics or presence in sufficient number, biomass, or areal extent may reasonably be expected to prevent, or unreasonably interfere with, a designated use of those waters.

(16) "Nursery Area of Indigenous Aquatic Life" shall mean any bed of the following aquatic plants, either in monoculture or mixed: Halodule wrightii, Halophila spp., Potamogeton spp. (pondweed), Ruppia maritima (widgeon-grass), Sagittaria spp. (arrowhead), Syringodium filiforme (manatee-grass), Thalassia testudinum (turtle grass), or Vallisneria spp. (eel-grass), or any area used by the early-life stages, larvae and post-larvae, of aquatic life during the period of rapid growth and development into the juvenile states.

(17) "Outstanding Florida Waters" shall mean waters designated by the Environmental Regulation Commission as worthy of special protection because of their natural attributes.

(18) "Outstanding National Resource Waters" shall mean waters designated by the Environmental Regulation Commission that are of such exceptional recreational or ecological significance that water quality should be maintained and protected under all circumstances, other than temporary lowering and the lowering allowed under Section 316 of the Federal Clean Water Act.

(19) "Pollution" shall mean the presence in the outdoor atmosphere or waters of the state of any substances, contaminants, noise, or man-made or man-induced alteration of the chemical, physical, biological or radiological integrity of air or water in quantities or levels which are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property, including outdoor recreation.

(20) "Predominantly Fresh Waters" shall mean surface waters in which the chloride concentration at the surface is less than 1,500 milligrams per liter.

(21) "Predominantly Marine Waters" shall mean surface waters in which the chloride concentration at the surface is greater than or equal to 1,500 milligrams per liter.

(22) "Propagation" shall mean reproduction sufficient to maintain the species' role in its respective ecological community.

(23) "Secretary" shall mean the Secretary of the Department of Environmental Protection.

(24) "Shannon-Weaver Diversity Index" shall mean: negative summation (from i=1 to s) of $(n_i/N) \log_2 (n_i/N)$ where s is the number of species in a sample, N is the total number of individuals in a sample, and n_i is the total number of individuals in species i.

(25) "Special Waters" shall mean water bodies designated in accordance with Section 62-302.700, F.A.C., by the Environmental Regulation Commission for inclusion in the Special Waters Category of Outstanding Florida Waters, as contained in Section 62-302.700, F.A.C. A Special Water may include all or part of any water body.

(26) "Surface Water" means water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs shall be classified as surface water when it exits from the spring onto the earth's surface.

(27) "Water quality criteria" shall mean elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

(28) "Water quality standards" shall mean standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, the Florida antidegradation policy, and the moderating provisions contained in this Rule and in F.A.C. Rule 62-4, adopted pursuant to Chapter 403, F.S.

Specific Authority: 403.061, 403.062, 403.087, 403.088, 403.504, 403.704, 403.804, 403.805, F.S.
Law Implemented: 373.414, 403.021, 403.061, 403.087, 403.088, 403.101, 403.141, 403.182, 403.502, 403.702, 403.708, F.S.
History: Formerly 17-3.041, Amended 1-28-90, Formerly 17-3.042, Formerly 17-302.300, Amended 12-19-94, Amended 1-23-95.

62-302.400 Classification of Surface Waters, Usage, Reclassification.

(1) All surface waters of the State have been classified according to designated uses as follows:

CLASS I Potable Water Supplies
CLASS II Shellfish Propagation or Harvesting
CLASS III Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife
CLASS IV Agricultural Water Supplies
CLASS V Navigation, Utility and Industrial Use

(2) Classification of a water body according to a particular designated use or uses does not preclude use of the water for other purposes.

(3) The specific water quality criteria corresponding to each surface water classification are listed in Rules 62-302.500 and 62-302.530, F.A.C.

(4) Water quality classifications are arranged in order of the degree of protection required, with Class I water having generally the most stringent water quality criteria and Class V the least. However, Class I, II, and III surface waters share water quality criteria established to protect recreation and the propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

(5) Criteria applicable to a classification are designed to maintain the minimum conditions necessary to assure the suitability of water for the designated use of the classification. In addition, applicable criteria are generally adequate to maintain minimum conditions required for the designated uses of less stringently regulated classifications. Therefore, unless clearly inconsistent with the criteria applicable, the designated uses of less stringently regulated classifications shall be deemed to be included within the designated uses of more stringently regulated classifications.

(6) Any person regulated by the Department or having a substantial interest in this Chapter may seek reclassification of waters of the State by filing a petition with the Secretary in the form required by Rule 62-103.040, F.A.C.

(7) A petition for reclassification shall reference and be accompanied by the information necessary to support the affirmative finding required in this Section to support the proposed reclassification.

(8) All reclassifications of waters of the State shall

be adopted, after public notice and public hearing, only upon an affirmative finding by the Environmental Regulation Commission that:

(a) The proposed reclassification will establish the present and future most beneficial use of the waters; and

(b) Such a reclassification is clearly in the public interest.

(9) Reclassification of waters of the State which establishes more stringent criteria than presently established by this Chapter shall be adopted, only upon additional affirmative finding by the Environmental Regulation Commission that the proposed designated use is attainable, upon consideration of environmental, technological, social, economic, and institutional factors.
Specific Authority: 403.061, 403.087, 403.088, 403.804, F.S.
Law Implemented: 403.021, 403.061, 403.087, 403.088, 403.141, 403.161, 403.182, 403.502, 403.504, 403.702, 403.708, F.S.
History: Formerly 28-5.06, 17-3.06, Amended and Renumbered 3-1-79, Amended 1-1-83, 2-1-83, Formerly 17-3.081, Amended 4-25-93, Formerly 17-302.400.

62-302.500 Minimum Criteria for Surface Waters.

All surface waters of the State shall at all places and at all times be free from:

(1) Domestic, industrial, agricultural, or other man-induced non-thermal components of discharges which, alone or in combination with other substances or in combination with other components of discharges (whether thermal or non-thermal):

(a) Settle to form putrescent deposits or otherwise create a nuisance; or

(b) Float as debris, scum, oil, or other matter in such amounts as to form nuisances; or

(c) Produce color, odor, taste, turbidity, or other conditions in such degree as to create a nuisance; or

(d) Are acutely toxic; or

(e) Are present in concentrations which are carcinogenic, mutagenic, or teratogenic to human beings or to significant, locally occurring, wildlife or aquatic species, unless specific standards are established for such components in Rules 62-302.510 or 62-302.530; or

(f) Pose a serious danger to the public health, safety, or welfare.

(2) Thermal components of discharges which, alone, or in combination with other discharges or components of discharges (whether thermal or non-thermal):

(a) Produce conditions so as to create a nuisance; or

(b) Do not comply with applicable provisions of Rule 62-302.520, F.A.C.

(3) silver in concentrations above 2.3 micrograms/liter in predominately marine waters.
Specific Authority: 403.061, 403.062, 403.087, 403.504, 403.704, 403.804, F.S.

(c) If the Department, pursuant to notice and opportunity for hearing, finds by preponderance of the evidence that a discharge has caused substantial damage, it may require conversion of such discharge to offstream cooling or approved alternate methods. In making determinations regarding such conversions, the Department may consider:

1. The nature and extent of the existing damage;
2. The projected lifetime of the existing discharge;
3. Any adverse economic and environmental (including non-water quality) impacts which would result from such conversion; and
4. Such other factors as may be appropriate.

(2) Heated water sources proposed for future discharges into RBW controlled by the State shall not increase the water temperature by more than the monthly temperature limits prescribed for the particular type and location of the RBW. New sources shall include all expansions, modifications, alterations, replacements, or repairs which result in an increased output of ten percent (10%) or more of the level of energy production which existed on the date this rule became effective. Water temperatures shall be measured by procedures approved by the Florida Department of Environmental Protection (DEP). In all cases where a temperature rise above ambient is allowed and a maximum RBW temperature is also prescribed, the lower of the two limitations shall be the control temperature.

(3) Definitions.

(a) Ambient (natural) temperature of a RBW shall mean the existing temperature of the receiving water at a location which is unaffected by manmade thermal discharges and a location which is also of a depth and exposure to winds and currents which typify the most environmentally stable portions of the RBW.

(b) Coastal waters shall be all waters in the State which are not classified as fresh waters or as open waters.

(c) A cooling pond is a body of water enclosed by natural or constructed restraints which has been approved by the Florida DEP for purposes of controlling heat dissipation from thermal discharges.

(d) An existing heat source is any thermal discharge (a) which is presently taking place, or (b) which is under construction or for which a construction or operation permit has been issued prior to the effective date of this rule.

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(e) Fresh waters shall be all waters of the State which are contained in lakes and ponds, or are in flowing streams above the zone in which tidal actions influence the salinity of the water and where the concentration of chloride ions is normally less than 1500 milligrams per liter.

(f) Open waters shall be all waters in the State extending seaward from the most seaward 18-foot depth contour line (three-fathom bottom depth contour) which is offshore from any island; exposed or submerged bar or reef; or mouth of any embayment or estuary which is narrowed by headlands. Contour lines shall be determined from Coast and Geodetic Survey Charts.

(g) The point of discharge (POD) for a heated water discharge shall be primarily that point at which the effluent physically leaves its carrying conduit (open or closed), and discharges into the waters of the state, or, in the event it is not practicable to measure temperature at the end of the discharge conduit, a specific point designated by the Florida DEP for that particular thermal discharge.

(h) Heated water discharges are the effluents from commercial or industrial activities or processes in which water is used for the purpose of transporting waste heat, and which constitute heat sources of one million British Thermal Units per hour (1,000,000 BTU/HR.), or greater.

(i) Blowdown shall mean the minimum discharge of recirculating cooling water for the purpose of discharging materials contained in the water, the further buildup of which could cause concentrations in amounts exceeding limits established by best engineering practice.

(j) Recirculating cooling water shall mean water which is used for the purpose of removing waste heat and then passed through a cooling system for the purpose of removing such heat from the water and then, except for blowdown, is used again to remove waste heat.

(4) Monthly and Maximum Temperature Limits

(a) Fresh Waters - Heated water with a temperature at the POD more than 5°F higher than the ambient (natural) temperature of any stream shall not be discharged into such stream. At all times under all conditions of stream flow the discharge temperature shall be controlled so that at least two-thirds (2/3) of the width of the stream's surface remains at ambient (natural) temperature. Further, no more than one-fourth (1/4) of the cross-section of the stream at a traverse perpendicular to the flow shall be heated by the discharge. Heated water with a temperature at the POD more than 3°F higher than the ambient (natural) temperature of any lake or reservoir shall not be discharged into such lake or reservoir. Further, no heated water with a temperature above 90°F shall be discharged into any fresh waters in Northern Florida regardless of the ambient temperature of the RBW. In Peninsular Florida, heated waters above 92°F shall not be discharged into fresh waters.

(b) Coastal Waters - Heated water with a temperature at

62-302.530, Criteria for Surface Water Quality Classifications

Parameter	Units	Class I: Potable Water Supply	Class II: Shellfish Propagation or Harvesting	Class III: Recreation, Propagation and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife		Class IV: Agricultural Water Supplies	Class V: Navigation, Utility, and Industrial Use
				Predominantly Fresh Waters	Predominantly Marine Waters		
(1) Alkalinity	Milligrams/L as $CaCO_3$	Shall not be depressed below 20		Shall not be depressed below 20		≤ 600	
(2) Aluminum	Milligrams/L		≤ 1.5		≤ 1.5		
(3) Ammonia (un-ionized)	Milligrams/L as NH_3	≤ 0.02		≤ 0.02			
(4) Antimony	Micrograms/L	≤ 14.0	≤ 4,300	≤ 4,300	≤ 4,300		
(5) (a) Arsenic (total)	Micrograms/L	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50
(5) (b) Arsenic (trivalent)	Micrograms/L measured as total recoverable Arsenic		≤ 36		≤ 36		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(6) Bacteriological Quality (Fecal Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 5 samples taken over a 30 day period.	MPN shall not exceed a median value of 14 with not more than 10% of the samples exceeding 43, nor exceed 800 on any one day.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(11) Biological Integrity	Per cent reduction of Shannon-Weaver Diversity Index	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three Hester-Dendy type artificial substrate samplers of 0.10 to 0.15 m^2 area each, incubated for a period of four weeks.	The Index for benthic macroinvertebrates shall not be reduced to less than 75% of established background levels as measured using organisms retained by a U. S. Standard No. 30 sieve and collected and composited from a minimum of three natural substrate samples, taken with Ponar type samplers with minimum sampling area of 225 cm^2.		
(12) BOD (Biochemical Oxygen Demand)		Shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions.					
(13) Boron	Milligrams/L					$\leq$ 0.75	

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(14) Bromates	Milligrams/L		$\leq$ 100		$\leq$ 100		
(15) Bromine (free molecular)	Milligrams/L		$\leq$ 0.1		$\leq$ 0.1		
(16) Cadmium	Micrograms/L See Note (3).	Cd $\leq$ $e^{(0.7852[\ln H]-3.49)}$;	$\leq$ 9.3	Cd $\leq$ $e^{(0.7852[\ln H]-3.49)}$;	$\leq$ 9.3		
(17) Carbon tetrachloride	Micrograms/L	$\leq$ 0.25 annual avg.; 3.0 max	$\leq$ 4.42 annual avg.	$\leq$ 4.42 annual avg.	$\leq$ 4.42 annual avg.		
(18) Chlorides	Milligrams/L	$\leq$ 250	Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		Not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.		In predominantly marine waters, not increased more than 10% above normal background. Normal daily and seasonal fluctuations shall be maintained.
(19) Chlorine (total residual)	Milligrams/L	$\leq$ 0.01	$\leq$ 0.01	$\leq$ 0.01	$\leq$ 0.01		
(20) (a) Chromium (trivalent)	Micrograms/L measured as total recoverable Chromium See Note (3).	Cr (III) $\leq$ $e^{(0.819[\ln H]+1.561)}$		Cr (III) $\leq$ $e^{(0.819[\ln H]+1.561)}$		Cr (III) $\leq$ $e^{(0.819[\ln H]+1.561)}$	In predominantly fresh waters, $\leq$ $e^{(0.819[\ln H]+1.561)}$.

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(31) Dissolved Oxygen	Milligrams/L	Shall not be less than 5.0. Normal daily and seasonal fluctuations above this level shall be maintained.	Shall not average less than 5.0 in a 24-hour period and shall never be less than 4.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not be less than 5.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not average less than 5.0 in a 24-hour period and shall never be less than 4.0. Normal daily and seasonal fluctuations above these levels shall be maintained.	Shall not average less than 4.0 in a 24-hour period and shall never be less than 3.0.	Shall not be less than 0.3, fifty percent of the time on an annual basis for flows greater than or equal to 250 cubic feet per second and shall never be less than 0.1. Normal daily and seasonal fluctuations above these levels shall be maintained.
(32) Dissolved Solids	Milligrams/L	≤ 500 as a monthly avg.; ≤ 1,000 max					
(33) Fluorides	Milligrams/L	≤ 1.5	≤ 1.5	≤ 10.0	≤ 5.0	≤ 10.0	≤ 10.0
(34) "Free Froms" (see Minimum Criteria in Section 62-302.500, F.A.C.)							

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(35) "General Criteria" (see Section 62-302.510, F.A.C. and individual criteria)							
(36) (a) Halomethanes (Total trihalomethanes) (total of bromoform, chlorodibromomethane, dichlorobromomethane, and chloroform). Individual halomethanes shall not exceed (b)1. to (b)5. below.	Micrograms/L	≤ 100					
(36) (b) 1. Halomethanes (individual): Bromoform	Micrograms/L	≤ 4.3 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.	≤ 360 annual avg.		
(36) (b) 2. Halomethanes (individual): Chlorodibromomethane	Micrograms/L	≤ 0.41 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.	≤ 34 annual avg.		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(49) Odor (also see Color, Minimum Criteria, Phenolic Compounds, etc.)	Threshold odor number		Shall not exceed 24 at 60 degrees C as a daily average.				Odor producing substances: only in such amounts as will not unreasonably interfere with use of the water for the designated purpose of this classification.
(50) (a) Oils and Greases	Milligrams/L	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 5.0	Dissolved or emulsified oils and greases shall not exceed 10.0
(50) (b) Oils and Greases		No undissolved oil, or visible oil defined as iridescence, shall be present so as to cause taste or odor, or otherwise interfere with the beneficial use of waters.					
(51) **Pesticides and Herbicides**							
(51) (a) 2,4,5-TP	Micrograms/L	≤ 10					
(51) (b) 2-4-D	Micrograms/L	≤ 100					
(51) (c) Aldrin	Micrograms/L	≤ .00013 annual avg.; 3.0 max	≤ .00014 annual avg.; 1.3 max	≤ .00014 annual avg.; 3.0 max	≤ .00014 annual avg.; 1.3 max		
(51) (d) Beta-hexachlorocyclo-hexane (b-BHC)	Micrograms/L	≤ 0.014 annual avg.	≤ 0.046 annual avg.	≤ 0.046 annual avg.	≤ 0.046 annual avg.		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(51) (e) Chlordane	Micrograms/L	≤ 0.00058 annual avg.; 0.0043 max	≤ 0.00059 annual avg.; 0.004 max	≤ 0.00059 annual avg.; 0.0043 max	≤ 0.00059 annual avg.; 0.004 max		
(51) (f) DDT	Micrograms/L	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max	≤ 0.00059 annual avg.; 0.001 max		
(51) (g) Demeton	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		
(51) (h) Dieldrin	Micrograms/L	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max	≤ 0.00014 annual avg.; 0.0019 max		
(51) (i) Endosulfan	Micrograms/L	≤ 0.056	≤ 0.0087	≤ 0.056	≤ 0.0087		
(51) (j) Endrin	Micrograms/L	≤ 0.0023	≤ 0.0023	≤ 0.0023	≤ 0.0023		
(51) (k) Guthion	Micrograms/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01		
(51) (l) Heptachlor	Micrograms/L	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max	≤ 0.00021 annual avg.; 0.0038 max	≤ 0.00021 annual avg.; 0.0036 max		
(51) (m) Lindane (g-benzene hexachloride)	Micrograms/L	≤ 0.019 annual avg.; 0.08 max	≤ 0.063 annual avg.; 0.16 max	≤ 0.063 annual avg.; 0.08 max	≤ 0.063. annual avg.; 0.16 max		
(51) (n) Malathion	Micrograms/L	≤ 0.1	≤ 0.1	≤ 0.1	≤ 0.1		
(51) (o) Methoxychlor	Micrograms/L	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03		
(51) (p) Mirex	Micrograms/L	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001		
(51) (q) Parathion	Micrograms/L	≤ 0.04	≤ 0.04	≤ 0.04	≤ 0.04		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(53) (c) 3. Phenolic Compound: Pentachlorophenol	Micrograms/L	≤ 30 max; ≤ 0.28 annual avg; ≤ $e^{(1.005[pH]-5.29)}$	≤ 7.9	≤ 30 max; ≤ 8.2 annual avg; ≤ $e^{(1.005[pH]-5.29)}$	≤ 7.9	≤ 30	
(53) (c) 4. Phenolic Compound: 2,4,6-trichlorophenol	Micrograms/L	≤ 2.1 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	≤ 6.5 annual avg.	
(53) (c) 5. Phenolic Compound: 2,4-dinitrophenol	Milligrams/L	≤ 0.0697 See Note (4).	≤ 14.26 See Note (4).	≤ 14.26 See Note (4).	≤ 14.26 See Note (4).	≤ 14.26 See Note (4).	
(53) (c) 6. Phenolic Compound: Phenol	Milligrams/L	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
(54) Phosphorus (Elemental)	Micrograms/L		≤ 0.1		≤ 0.1		
(55) Phthalate Esters	Micrograms/L	≤ 3.0		≤ 3.0			
(56) Polychlorinated Biphenyls (PCBs)	Micrograms/L	≤ 0.000044 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max	≤ 0.000045 annual avg.; 0.014 max	≤ 0.000045 annual avg.; 0.03 max		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(57) (a) Polycyclic Aromatic Hydrocarbons (PAHs). Total of: Acenaphthylene; Benzo-(a)anthracene; Benzo(a)pyrene; Benzo(b)fluoranthene; Benzo-(ghi)perylene; Benzo(k)fluoranthene; Chrysene; Dibenzo-(a,h)anthracene; Indeno(1,2,3-cd)pyrene; and Phenanthrene	Micrograms/L	≤ 0.0028 annual avg.	≤ 0.031 annual avg.	≤ 0.031annual avg.	≤ 0.031 annual avg.		
(57) (b) 1. (Individual PAHs): Acenaphthene	Milligrams/L	< 1.2 See Note (4).	< 2.7 See Note (4).	< 2.7 See Note (4).	< 2.7 See Note (4).		
(57) (b) 2. (Individual PAHs): Anthracene	Milligrams/L	< 9.6 See Note (4).	< 110 See Note (4).	< 110 See Note (4).	< 110 See Note (4).		
(57) (b) 3. (Individual PAHs): Fluoranthene	Milligrams/L	< 0.3 See Note (4).	< 0.370 See Note (4).	< 0.370 See Note (4).	< 0.370 See Note (4).		

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(67) Total Dissolved Gases	Percent of the saturation value for gases at the existing atmos-pheric and hydrostatic pressures	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value	≤ 110% of saturation value		
(68) Transparency	Depth of the compensation point for photosynthetic activity	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.	Shall not be reduced by more than 10% as compared to the natural background value.		
(69) Trichloroethylene (trichloroethene)	Micrograms/L	≤ 2.7 annual avg., ≤ 3.0 max	≤ 80.7 annual avg.	≤ 80.7 annual avg.	≤ 80.7 annual avg.		
(70) Turbidity	Nephelometric Turbidity Units (NTU)	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions	≤ 29 above natural background conditions
(71) Zinc	Micrograms/L See Note (3).	Zn ≤ $e^{(0.8473[\ln H]+0.7614)}$	≤ 86	Zn ≤ $e^{(0.8473[\ln H]+0.7614)}$	≤ 86	≤ 1,000	≤ 1,000

Notes: (1) "Annual avg." means the maximum concentration at average annual flow conditions (see Section 62-4.020(1), F.A.C.); (2) "Max" means the maximum not to be exceeded at any time; (3) "ln H" means the natural logarithm of total hardness expressed as milligrams/L of $CaCO_3$. For metals criteria involving equations with hardness, the hardness shall be set at 25 mg/L if actual hardness is < 25 mg/L and set at 400 mg/L if actual hardness is > 400 mg/L; (4) Criteria are protective of human health not of aquatic life.

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, Amended 1-23-95, 1-15-96.

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.

12. Columbia County - none.
13. Dade County - none.
14. DeSoto County

Class I

Horse Creek - From the northern border of Section 14, T38S, R23E, southward to Peace River.
Prairie Creek - Headwaters to Charlotte County Line.

15. Dixie County

Class II

Coastal Waters - From an east-west line through Stuart Point southward to the County line, excluding the mouth of the Suwannee River and its passes.

16. Duval County

Class II

Ft. George River and Simpson Creeks - Ft. George Inlet north to Nassau Sound.
Intracoastal Waterway and Tributaries - Confluence of Nassau and Amelia Rivers south to Flashing Marker 73 thence eastward along Ft. George River to Ft. George Inlet and includes Garden Creek.
Nassau River and Creek - From the mouth of Nassau Sound, (a line connecting the northeastermost point of Little Talbot Island to the southeastermost tip of Amelia Island westerly to a north-south line through Seymore Point.
Pumpkinhill 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.
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

southern shoreline of Seahorse Key to its easternmost point, then northeastward to the southernmost point of Atsena Otie Key, then northward along the eastern shoreline of Atsena Otie Key to its northeasternmost point, then northward to the southernmost point of Dog Island, northwestward to the westernmost point of Scale Key, northwestward to the boundary marker piling, then northward to the point of beginning:

d) the mouth of the Withlacoochee River.

39. Liberty County - none.
40. Madison County - none.
41. Manatee County

Class I

Manatee River - From Rye Bridge Road to the sources thereof, including but not limited to the following tributaries: the East Fork of the Manatee River, the North Fork of the Manatee River, Boggy Creek, Gilley Creek, Poley Branch, Corbit Branch, Little Deep Branch, Fisher Branch, Ft.Crawford Creek, Webb Branch, Clearwater Branch, Craig Branch, and Guthrey Branch.

Lake Evers (Ward Lake) and Braden River - City of Bradenton Water Treatment Dam to SR 675, excluding upland cut irrigation or drainage ditches and including the following tributaries:

	Tributary	Upstream Limit(s)
a.	Rattlesnake Slough	Lockwood Ridge Road in Section 28, Township 35 South, Range 18 East.
b.	Cedar Creek	
	West Branch	Whitfield Avenue in Section 27,Township 35 South, Range 18 East.
	Central Branch	Country Club Way in Section 34, Township 35 South, Range 18 East.
	East Branch	To a point where an east-west line lying 1200 feet south of the section line between Sections 23 and 26 (Township 35 South, Range 18 East) crosses the tributary.
c.	Cooper Creek	
	West Branch (Foley Branch)	South Boundary of Section 1, Township 36 South, Range 18 East.
	East Branch	East Boundary of Section 31, Township 35 South, Range 19 East.
d.	Nonsense Creek	To a point where an east-west line lying 800 feet North of the section line between Sections 14 and 23 (Township 35 South, Range 18 East) crosses the creek.

e.	Hickory Hamock	To a point where an east-west line lying 1000 feet South of the section line between Sections 17 and 20 (Township 35 South, Range 19 East) crosses the creek.
f.	Wolf Slough	East Boundary of Section 16, Township 35 South, Range 19 East.
g.	Unnamed Tributary 1	To a point where an east-west line lying 2300 feet south of the section line between Sections 21 and 28 (Township 35 South, Range 19 East) crosses the tributary.
h.	Unnamed Tributary 2	East Boundary of Section 14, Township 35 South, Range 19 East.
i.	Unnamed Tributary 3	West Boundary of Section 25, Township 35 South, Range 19 East.
j.	Unnamed Tributary 4	To a point where a north-south line lying 200 feet East of the section line between Sections 23 and 24 (Township 35 South, Range 19 East) crosses the tributary.

Class II

Gulf and Coastal Waters of Tampa Bay - (Including, but not limited to Terra Ceia Bay, Perico Bayou, Palma Sola Bay, and Sarasota Bay),excluding waters northward of a line from the southern shore of the mouth of Little Redfish Creek northwesterly through the red marker(approximately one nautical mile away) to the county line; Manatee River upstream of a line from Emerson Pt. to Mead Pt.

Gulf Waters - North of 27° 31' N. Lat.

42. Marion County - none
43. Martin County

Class I

Lake Okeechobee.

Class II

Great Pocket - St. Lucie River to Peck's Lake.

Indian River - N. Martin County Line south to the mouth of St. Lucie Inlet, east of the Intracoastal Waterway Channel centerline.

Loxahatchee River - West of the Florida East Coast Railroad Bridge including Southwest, Northwest, and North Forks.

44. Monroe County

Class II

Monroe County Coastline - From Collier and Dade County Lines southward to and including that part of Florida Bay within Everglades National Park.

45. Nassau County

Class II

through Upper and Lower Myakka Lakes to Manhattan Farms (north line of Section 6 T39S, R20E).

Class II

Lemon Bay - From a line eastward from the northern shore of the mouth of Forked Creek south to Charlotte County Line.

Myakka River - From the western line of sectin 35, T39S, R20E south to Charlotte County Line.

Sarasota Bay - West of the Intracoastal Waterway Channel centerline.

59. Seminole County - none.
60. Sumter County - none.
61. Suwannee County - none.
62. Taylor County

Class V

Fenholloway River. Repealed effective December 31, 1997.

63. Union County - none.
64. Volusia County

Class II

Indian River North, Indian River Lagoon, and Mosquito Lagoon From an east-west line through Intracoastal Waterway Channel Marker 57 south to S. Volusia County Line.

Indian River - North of County Line.

65. Wakulla County

Class II

Coastal Waters and Tributaries - From Jefferson County Line westward with the exception of Spring Creek and the portion of King Bay (Dickerson Bay) west and north of a line from the westernmost tip of Porter Island south to Hungry Point, and Walker Creek north of a line from Live Oak Point southwest across the Creek to the closest tip of Shell Point.

66. Walton County

Class II

Choctawhatchee Bay and Tributaries - Except waters north of a line from Alaqua Point to Wheeler Point.

67. Washington County

Class I

Econfina Creek.

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 3-21-68; Formerly 28-5.21; Amended 3-4-71, 7-13-78, 3-5-80, 7-26-81, 1-1-83, 2-1-83, 4-1-84, 9-12-85, 4-26-87, 4-26-89, 1-28-90; Formerly 17-3.161; Amended 3-31-91, 9-26-91, 4-25-93; Formerly 17-302.600; Amended 1-23-95, 2-27-95.

62-302.700 Special Protection, Outstanding Florida Waters, Outstanding National Resource Waters.

(1) It shall be the Department policy to afford the highest protection to Outstanding Florida Waters and Outstanding National Resource Waters. No degradation of water quality, other than that allowed in Rule 62-4.242(2) and (3), F.A.C., is to be permitted in Outstanding Florida Waters and Outstanding National Resource Waters, respectively, notwithstanding any other Department rules that allow water quality lowering.

(2) A complete listing of Outstanding Florida Waters and Outstanding National Resources Waters is provided in subsections (9) and (10). Outstanding Florida Waters generally include the following surface waters (unless named as Outstanding National Resource Waters):

(a) waters in National Parks, Preserves, Memorials, Wildlife Refuges and Wilderness Areas;

(b) waters in the State Park System and Wilderness Areas;

(c) waters within areas acquired through donation, trade, or purchase under the Environmentally Endangered Lands Bond Program, Conservation and Recreation Lands Program, Land Acquisition Trust Fund Program, and Save Our Coast Program;

(d) rivers designated under the Florida Scenic and Wild Rivers Program, federal Wild and Scenic Rivers Act of 1968 as amended, and Myakka River Wild and Scenic Designation and preservation Act;

(e) waters within National Seashores, National Marine Sanctuaries, National Estuarine Research Reserves, and certain National Monuments;

(f) waters in Aquatic Preserves created under the provisions of Chapter 258, Florida Statutes;

(g) waters within the Big Cypress National Preserve;

(h) Special Waters as listed in Rule 62-302.700(9)(i); and

(i) Certain Waters within the Boundaries of the National Forests.

(3) Each water body demonstrated to be of exceptional recreational or ecological significance may be designated as a Special Water.

(4) The following procedure shall be used in designating an Outstanding National Resource Water as well as any Special Water:

(a) Rulemaking procedures pursuant to Chapter 120, F.S., and Chapter 62-1, F.A.C., shall be followed;

(b) At least one fact-finding workshop shall be held in the affected area;

(c) All local county or municipal governments and state legislators whose districts or jurisdictions include all or part of the water shall be notified at least 60 days prior to the workshop in writing by the Secretary;

(d) A prominent public notice shall be placed in a newspaper of general circulation in the area of the proposed water at least 60 days prior to the workshop; and

(e) An economic impact analysis, consistent with Chapter

	Area (5-14-86)	Nassau
2.	Anastasia State Recreation Area (as mod. 4-19-88)	St. Johns
3.	Avalon State Recreation Area (4-19-88; as mod. 8-8-94)	St. Lucie
4.	Bahia Honda State Park (as mod. 5-14-86)	Monroe
5.	Bear Creek State Recreation Area (12-1-82)	Gadsden
6.	Big Lagoon State Recreation Area (12-1-82; as mod. 5-14-86, 8-8-94)	Escambia
7.	Big Talbot Island State Park (5-14-86; as mod. 4-19-88, 8-8-94)	Duval
8.	Bill Baggs Cape Florida State Recreation Area	Dade
9.	Blackwater River State Park	Santa Rosa
10.	Blue Spring State Park	Volusia
11.	Bulow Creek State Park (5-14-86; as mod. 4-19-88)	Flagler/Volusia
12.	Caladesi Island State Park	Pinellas
13.	Cayo Costa State Park (12-1-82; as mod. 5-14-86, 4-19-88, 10-4-90, 8-8-94)	Lee
14.	Collier-Seminole State Park	Collier
15.	Dead Lakes State Recreation Area	Gulf
16.	DeLeon Springs State Recreation Area (5-14-86); as mod. 10-4-90)	Volusia
17.	Delnor-Wiggins Pass State Recreation Area (12-1-82)	Collier
18.	Don Pedro Island State Recreation Area (5-14-86); as mod. 4-19-88)	Charlotte
19.	Dr. Julian G. Bruce St. George Island State Park (12-1-82)	Franklin
20.	Edward Ball Wakulla Springs State Park (4-19-88)	Wakulla
21.	Falling Waters State Recreation Area	Washington
22.	Faver-Dykes State Park	St. Johns
23.	Florida Caverns State Park (as mod. 8-8-94)	Jackson
24.	Fort Clinch State Park (as mod. 4-19-88; 8-8-94)	Nassau
25.	Fort Cooper State Park (12-1-82)	Citrus
26.	Fort Pierce Inlet State Recreation Area (12-1-82; as mod. 5-14-86)	St. Lucie
27.	Fred Gannon Rocky Bayou State Recreation Area	Okaloosa
28.	Gamble Rogers Memorial State Recreation Area at Flagler Beach	Flagler
29.	Gasparilla Island State Recreation Area (5-14-86; as mod. 4-19-88, 10-4-90)	Lee
30.	Grayton Beach State Recreation Area (as mod. 4-19-88)	Walton
31.	Guana River State Park (5-14-86; as mod. 4-19-88)	St. Johns
32.	Henderson Beach State Recreation Area (5-14-86)	Okaloosa
33.	Highlands Hammock State Park (as mod. 8-8-94)	Highlands/Hardee
34.	Hillsborough River State Park	Hillsborough
35.	Homosassa Springs State Wildlife Park (10-4-90)	Citrus
36.	Honeymoon Island State Recreation Area (12-1-82; as mod. 5-14-86)	Pinellas
37.	Hontoon Island State Park	Volusia/Lake
38.	Hugh Taylor Birch State Recreation Area	Broward
39.	Ichetucknee Springs State Park	Columbia/Suwannee
40.	John D. MacArthur Beach State Park (12-1-82)	Palm Beach
41.	John Pennekamp Coral Reef State Park (as mod. 5-14-86, 4-19-88)	Monroe
42.	John U. Lloyd Beach State Recreation Area	Broward
43.	Jonathan Dickinson State Park	Martin
44.	Lake Arbuckle State Park (5-14-86)	Polk
45.	Lake Griffin State Recreation Area	Lake
46.	Lake Kissimmee State Park	Polk
47.	Lake Louisa State Park (12-1-82)	Lake
48.	Lake Manatee State Recreation Area (12-1-82)	Manatee
49.	Lake Rousseau State Recreation Area (12-1-82)	Citrus/Levy/ Marion
50.	Lake Talquin State Recreation Area (12-1-82; as mod. 5-14-86)	Leon
51.	Little Manatee River State Recreation Area (12-1-82)	Hillsborough
52.	Little Talbot Island State Park	Duval
53.	Long Key State Recreation Area	Monroe
54.	Lovers Key State Recreation Area (5-14-86)	Lee
55.	Manatee Springs State Park (as mod. 10-4-90)	Levy
56.	Mike Roess Gold Head Branch State Park (as mod. 5-14-86, 4-19-88; 8-8-94)	Clay
57.	Myakka River State Park	Manatee/Sarasota

	as mod. 5-14-86, 10-4-90, 8-8-94)	Martin/St. Lucie
17.	St. Lucie Inlet State Preserve (12-1-82)	Martin
18.	Waccasassa Bay State Preserve (12-1-82; as mod. 4-19-88)	Levy
19.	Weedon Island State Preserve (12-1-82)	Pinellas
20.	William Beardall Tosohatchee State Reserve (12-1-82)	Orange

(f) Waters within Areas Acquired through Donation, Trade, or Purchase Under the Environmentally Endangered Lands Bond Program, Conservation and Recreation Lands Program, Land Acquisition Trust Fund Program, and Save Our Coast Program

	Program Area	County
1.	Andrews Tract (5-14-86; as mod. 4-19-88; 8-8-94)	Levy
2.	Apalachicola Bay (8-8-94)	Franklin
3.	Barefoot Beach (12-1-82)	Collier
4.	Beker Tracts (10-4-90)	Manatee
5.	Big Bend Coastal Tract (4-19-88; as mod. 10-4-90)	Dixie/Taylor
6.	Big Shoals (4-19-88)	Hamilton
7.	B.M.K. Ranch (8-8-94)	Lake/Orange
8.	Bower Tract (5-14-86; as mod. 4-19-88)	Hillsborough
9.	Caravelle Ranch (8-8-94)	Putnam
10.	Carlton Half-Moon Ranch (8-8-94)	Sumter
11.	Catfish Creek (8-8-94)	Polk
12.	Chassahowitzka Swamp (5-14-86; as mod. 4-19-88, 8-8-94)	Hernando/Citrus
13.	Coupon Bight (10-4-90; as mod. 8-8-94)	Monroe
14.	Crystal River (10-4-90)	Citrus
15.	Curry Hammock (8-8-94)	Monroe
16.	Deering Hammock/Estate (5-14-86); as mod. 4-19-88, 8-8-94)	Dade
17.	East Everglades (5-14-86)	Dade
18.	Econfina River (8-8-94)	Taylor
19.	Emerson Point (8-8-94)	Manatee
20.	Escambia Bay Bluffs (5-14-86)	Escambia
21.	Estero Bay (8-8-94)	Lee
22.	Florida First Magnitude Springs (8-8-94)	Levy
23.	Ft. George Island (10-4-90)	Duval
24.	Ft. Mose (8-8-94)	St. Johns
25.	Ft. San Luis (5-14-86; as mod. 8-8-94)	Leon
26.	Gateway (5-14-86)	Pinellas
27.	Gills Tract (8-8-94)	Pasco
28.	Green Turtle Beach (4-19-88)	St. Lucie

29.	Guana River (5-14-86; as mod. 4-19-88)	St. Johns
30.	Homosassa Reserve/Walker Tract (8-8-94)	Citrus
31.	Indian River North Beach (5-14-86)	Indian River
32.	ITT/Hammock (5-14-86)	Dade
33.	Josslyn Island (10-4-90)	Lee
34.	Levy County Forest/Sandhills (8-8-94)	Levy
35.	Letchworth Mounds (8-8-94)	Jefferson
36.	Lower Econlockhatchee (8-8-94)	Seminole
37.	Martin County Tracts (5-14-86)	Martin
38.	Mashes Sands (5-14-86)	Wakulla
39.	Miami Rockridge Pinelands (8-8-94)	Dade
40.	Milton to Whiting Field (8-8-94)	Santa Rosa
41.	North Beach (5-14-86)	Broward
42.	North Key Largo Hammock (5-14-86; as mod. 4-19-88, 10-4-90, 8-8-94)	Monroe
43.	Placid Lakes (8-8-94)	Highlands
44.	Point Washington (8-8-94)	Walton
45.	Port Bougainville (10-4-90)	Monroe
46.	Rainbow River/Springs (8-8-94)	Marion
47.	Rookery Bay (10-4-90; as mod. 8-8-94)	Collier
48.	Rotenberger (as mod. 4-19-88; 8-8-94)	Palm Beach
49.	Saddle Blanket Lakes Scrub (8-8-94)	Polk
50.	Save Our Everglades (10-4-90; as mod. 8-8-94)	Collier
51.	Sea Branch (8-8-94)	Martin
52.	Seminole Springs/Woods (8-8-94)	Lake
53.	Snake Warrior Island (Oaks of Miramar) (8-8-94)	Broward
54.	Spring Hammock (4-19-88; as mod. 10-4-90)	Seminole
55.	Spruce Creek (4-19-88; as mod. 8-8-94)	Volusia
56.	St. Martins River (8-8-94)	Citrus
57.	Stark Tract (10-4-90)	Volusia
58.	Stoney-Lane (10-4-90)	Citrus
59.	Surfside Additions (5-14-86)	St. Lucie
60.	Three Lakes/Prairie Lakes (as mod. 8-8-94)	Osceola
61.	Topsail Hill (8-8-94)	Walton
62.	Upper Black Creek (8-8-94)	Clay
63.	Volusia Water Recharge Area	Volusia
64.	Wacissa/Aucilla Rivers (10-4-90)	Jefferson/Taylor
65.	Wekiva River Buffers (8-8-94)	Seminole
66.	Westlake (5-14-86; as mod. 4-19-88)	Broward
67.	Wetstone/Berkovitz (8-8-94)	Pasco

	(as mod. 8-8-94)	Palm Beach
25.	Matlacha Pass	Lee
26.	Mosquito Lagoon	Volusia/Brevard
27.	Nassau River-St. Johns River Marshes	Nassau/Duval
28.	North Fork, St. Lucie	St. Lucie/Martin
29.	Oklawaha River (10-4-90)	Marion
30.	Pellicer Creek	St. Johns/Flagler
31.	Pine Island Sound	Lee
32.	Pinellas County	Pinellas
33.	Rainbow Springs (4-19-88)	Marion
34.	Rocky Bayou State Park	Okaloosa
35.	Rookery Bay (12-1-82; as mod. 11-24-87, 7-11-91)	Collier
36.	St. Andrews State Park	Bay
37.	St. Joseph Bay	Gulf
38.	St. Martins Marsh (as mod. 8-8-94)	Citrus
39.	Terra Ceia (5-22-86)	Manatee
40.	Tomoka Marsh	Volusia/Flagler
41.	Wekiva River (12-1-82)	Lake/Orange/ Seminole
42.	Wekiva River Addition, except that portion of the St. Johns River between Interstate Highway 4 and the Wekiva River confluence (12-28-88).	Lake/Seminole/ Volusia
43.	Yellow River Marsh	Santa Rosa

(i) Special Waters

1. Apalachicola River except for the following areas:
   a. From a point 50 feet north of the northern boundary of the Jackson County Port Authority Slip, and including the slip itself, downstream to a point about four-tenths of a mile downstream, and specifically identified by navigation mile 103 on the 1982 U.S. Geological Survey Quadrangle Map of Sneads, Florida; and
   b. From 850 feet downstream of the U.S. Army Corps of Engineers Blountstown Navigation Gage in Calhoun County, north to a point approximately 2,700 feet upstream of the Gage, and specifically identified by the line passing through 30°25'45" N. Lat. and 85°1'35" W. Long.; and 30°25'38" N. Lat. and 85°1'20" W. Long. (12-11-84).
2. Aucilla River
3. Blackwater River
4. Butler Chain of Lakes - consisting of Lake Butler, Lake Down, Wauseon Bay, Lake Louise, Lake Palmer (also known as Lake Isleworth), Lake Chase, Lake Tibet, Lake Sheen, Pocket Lake, Fish Lake, and the waterways which connect these lakes (3-1-84), and Lake Blanche and its

connecting waterway (2-18-87).
5. Chassahowitzka River System including: Potter, Salt, Baird, Johnson, Crawford, Ryle, and Stevenson Creeks, and other tributaries to the Chassahowitzka River; but excluding artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in Rule 62-312.020(3), F.A.C. (1-5-93).
6. Chipola River
7. Choctawhatchee River
8. Clermont Chain of Lakes - consisting of Lake Louisa (also known as Lake Louise), Lake Susan, Lake Crescent, Lake Minnehaha, Lake Winona, Lake Palatlakaha, Lake Hiawatha, Lake Minneola, Lake Wilson, Lake Cook, Cherry Lake, Lake Hunt, Lake Stewart, Lake Lucy, Lake Emma, and the waterways that interconnect Clermont Chain of Lakes (5-28-86).
9. Crooked Lake in Polk County including the area known as Little Crooked Lake and the connecting waterway between these waterbodies; less however, artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in Section 62-312.020(3), F.A.C. (4-9-87).
10. Crystal River, including Kings Bay (2-1-83).
11. Econlockhatchee River System - consisting of the Econlockhatchee River and the following tributaries:
    a. Little Econlockhatchee River upstream to Michaels Dam in Jay Blanchard Park; and
    b. Mills Creek upstream to Mills Lake; and
    c. Southerly branch of Mills Creek upstream to Fort Christmas Road in Section 2, Township 22 South, Range 32 East; and
    d. Silcox Branch (branch of Mills Creek) upstream to Lake Pickett; and
    e. Long Branch upstream to the eastern section line of Section 34, Township 22 South, Range 32 East; and
    f. Hart Branch upstream to the Old Railroad Grade in Section 18, Township 23 Soputh, Range 32 East; and
    g. Cowpen Branch upstream to the southernmost bifurcation of the creek in Section 20, Township 23 South, Range 32 East; and
    h. Green Branch upstream to the western section line of Section 29, Township 23 South, Range 32 East; and
    i. Turkey Creek upstream to Weewahootee Road in Section 5, Township 24 South, Range 32 East, and to the west section lines of Section 5, Township

Lake Powell as bounded by the following described line: Begin at the Northwest corner of Section 26, Township 2 South, Range 18 West; thence East to the Northwest corner of Section 29, Township 2 South, Range 17 West; thence South to the Northwest corner of the SW1/4 of Section 29, Township 2 South, Range 17 West; thence East to the West line of Section 27, Township 2 South, Range 17 West, thence South to the mean high water line of the Gulf of Mexico; thence meander Northwest along the mean high water line to the West line of Section 35, Township 2 South, Range 18 West; thence North to the point of beginning (8-18-91).

18. Lemon Bay Estuarine System - from Boca Grande Causeway northward to approximately two thousand feet northwest of the mouth of Alligator Creek, specifically identified as the East line of Section 31, Township 39 South, Range 19 East, including Placida Harbor, Gasparilla Pass, Kettle Harbor, Bocilla Lagoon, Bocilla Pass, Knight Pass, Stump Pass, Lemon Bay, Buck Creek upstream to County Road 775, Oyster Creek upstream to County Road 775, Ainger (Rock) Creek upstream to County Road 775, and Godfrey (Godfried, Gottfried) Creek upstream to County Road 775; but excluding:
    a. Alligator Creek, Forked Creek, Lemon Creek, and all other tributaries; and
    b. Artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in Section 62-312.020(3), F.A.C. (4-29-86).
19. Little Manatee River - from its mouth to the western crossing of the river by S.R. 674, including Hayes, Mill and Bolster Bayous, but excluding South Fork, Ruskin Inlet and all other tributaries (10-1-82).
20. Lochloosa Lake (including Little Lochloosa Lake, Lochloosa Lake Right Arm, and Lochloosa Creek upstream to County Road 20A) (12-15-87).
21. Myakka River between State Road 771 (El Jobean Bridge) and the Charlotte - Sarasota County line, except for artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in Rule 62-312.020(3), F.A.C. (4-19-88).
22. Ochlockonee River
23. Oklawaha River between the eastern line of Section 36, Township 15 South, Range 23 East, and Eureka Lock and Dam, including Turkey Creek, Strouds

Creek, Dead River (the water body so named near Gores Landing), Cedar Creek, and Fish Creek, but excluding Marshall Swamp, the Dead River (the water body so named exiting Marshall Swamp), and all other tributaries (12-20-89).

24. Orange Lake up to the U.S. Highway 301 bridge, the River Styx up to Camps Canal, and Cross Creek (4-9-87).
25. Perdido River
26. Rainbow River, including Indian Creek, but excluding all other tributaries (1-17-85).
27. Santa Fe River System - consisting of the Santa Fe River, Lake Santa Fe, Little Lake Santa Fe, Santa Fe Swamp, Olustee Creek, and the Ichetucknee River below S.R. 27, but excluding all other tributaries (8-16-84).
28. Sarasota Bay estuarine system - generally extending from Venice north to the Hillsborough - Manatee County line and specifically described as follows: Commence at the northern tip of Anna Maria Island and follow a line running to the southern tip of Egmont Key until intersecting the boundary between Hillsborough and Manatee Counties; thence run easterly and northeasterly along the county boundary until intersecting the Intracoastal Waterway; thence proceed southerly until intersecting a line between the southern tip of Mullet Key and the western tip of Snead Island; thence proceed southeasterly along said line to the western tip of Snead Island; thence to De Soto Point; and thence westerly and southerly including all of the Sarasota Bay estuarine system southward to the northernmost U.S. Highway Business Route 41 bridge over the Intracoastal Waterway in Venice, including Anna Maria Sound, Passage Key Inlet, Perico Bayou, Palma Sola Bay, Longboat Pass, Sarasota Bay, New Pass, Big Sarasota Pass, Roberts Bay, Little Sarasota Bay, Dryman Bay, Blackburn Bay, Lyons Bay, Venice Inlet, Dona Bay upstream to the U.S. Highway 41 bridge, and Roberts Bay upstream to the U.S. Highway 41 bridge; less however, the following areas:
    a. All tributaries, including Palma Sola Creek, Bowlees Creek, Whitaker Bayou, Hudson Bayou, Phillippi Creek, Catfish Creek, North Creek, South Creek, Shakett Creek, Curry Creek; and
    b. A circle 1500 feet in radius from the mouth of Whitaker Bayou; and
    c. A circle 1500 feet in radius from the mouth of Phillippi Creek; and
    d. Artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the

g. Shady (Brook, Panasoffkee) Creek downstream of State Road 468, including Warm Spring Hammock; and
h. Lake Tsala Apopka;
i. but excluding all other tributaries and artificial waterbodies, defined as any waterbody created by dredging, or excavation, or by the filling in of its boundaries, including canals as defined in Rule 62-312.020(3), F.A.C. (4-10-89).

(j) Waters within Rivers Designated Under the Florida Scenic and Wild Rivers Program, federal Wild and Scenic Rivers Act of 1968 as amended, and Myakka River Wild and Scenic Designation and Preservation Act

River Segment	County
1. Loxahatchee National Wild and Scenic River Segment (5-14-86)	Martin/ Palm Beach
2. Myakka Florida Wild and Scenic River Segment (5-14-86)	Sarasota
3. Wekiva Florida Scenic and Wild River Segment (12-1-82)	Lake/Seminole

(k) Waters within National Preserves

National Preserve	County
1. Big Cypress National Preserve as mod. 5-14-86, 4-19-88, 8-8-94)	Collier/Dade/ Monroe
2. Timucuan Ecological and Historic Preserve (8-8-94)	Duval

(l) Waters within National Marine Sanctuaries

Marine Sanctuary	County
1. Key Largo	Monroe
2. Looe Key (12-1-82)	Monroe

(m) Waters within National Estuarine Research Reserves

National Estuarine Research Reserve	County
1. Apalachicola (12-1-82; as mod. 5-14-86, 4-19-88)	Franklin/Gulf
2. Rookery Bay (as mod. 5-14-86, 4-19-88)	Collier

(n) Certain Waters within the Boundaries of the National Forests

National Forest	County
1. Apalachicola	Wakulla/Leon/ Franklin
a. Sopchoppy River (9-1-82)	
b. Big Dismal Sink (9-1-82)	
2. Ocala	Putnam/Marion/ Lake
a. Alexander Springs (9-1-82)	
b. Alexander Springs Creek (9-1-82)	
c. Juniper Springs (9-1-82)	
d. Juniper Creek (9-1-82)	
e. Salt Springs (9-1-82)	
f. Salt Springs Run (9-1-82)	
g. Lake Dorr (9-1-82)	
h. Lake Kerr (9-1-82)	
i. Little Lake Kerr (9-1-82)	
3. Osceola	Baker/Columbia
a. Deep Creek (9-1-82)	
b. Robinson Creek (9-1-82)	
c. Middle Prong - St. Marys River (9-1-82)	
d. Ocean Pond (9-1-82)	
e. Falling Creek (9-1-82)	

(10) Outstanding National Resource Waters:
(a) The Commission designates the following waters as Outstanding National Resource Waters:
1. Biscayne National Park, as described in the document entitled "Outstanding National Resource Waters Boundary Description and Map for Biscayne National Park", dated June 15, 1989, herein adopted by reference.
2. Everglades National Park, as described in the document entitled "Outstanding National Resource Waters Boundary Description and Map for Everglades National Park", dated June 15, 1989, herein adopted by reference.
(b) It is the intent of the Commission that water bodies designated as Outstanding National Resource Waters shall be protected and maintained to the extent required by the federal Environmental Protection Agency. Therefore, the designations set forth in Rule 62-302.700(10)(a) shall not be effective until the Florida Legislature enacts legislation specifically authorizing protection and maintenance of Outstanding National Resource Waters to the extent required by the federal Enviromental Protection Agency pursuant to 40 CFR 131.12.
(c) It is also the intent of the Commission to utilize the Surface Water Improvement and Management Act planning rprocess, as outlined in Section 373.451, F.S. and Chapter 62-43, F.A.C., to establish the numerical standards for water quality parameters appropriate for Everglades and Biscayne National Parks status as Outstanding National Resource Waters.
(d) The baseline for defining the existing ambient water quality (Rule 62-4.242(2)(c)) in Outstanding National Resource Water is a five year period from March 1, 1976 to March 1, 1981, unless otherwise indicated.
Specific Authority: 403.061, 403.087, 403.088, 403.804, 403.805, F.S.

all factors and follow all procedures required by generally accepted scientific principles for such an assessment, such as analysis of existing water and sediment quality, potential transformation pathways, the chemical form of the compound in question, indigenous species, bioaccumulation and bioconcentration rates, and existing and potential rates of human consumption of fish, shellfish, and water. If the results of the assessments of health risk and aquatic toxicity differ, the more stringent result shall govern.

4. The demonstration shall include information indicating that one or more assumptions used in the risk assessment on which the existing criterion is based are inappropriate at the site in question and that the proposed assumptions are more appropriate or that physical or chemical characteristics of the site alter the toxicity or bioavailability of the compound. Such a variance of assumptions, however, shall not be a ground for a proposed alternative criterion unless the assumptions characterize a factor specific to the site, such as bioaccumulation rates, rather than a generic factor, such as the cancer potency and reference dose of the compound. Man-induced pollution that can be controlled or abated shall not be deemed a ground for a proposed alternative criterion.

5. The petition shall include all information required for the Department to complete its economic impact statement for the proposed criterion.

6. For any alternative criterion more stringent than the existing criterion, the petition shall include an analysis of the attainability of the alternative criterion.

7. No later than 180 days after receipt of a complete petition or after a petitioner requests processing of a petition not found to be complete, the Department shall notify the petitioner of its decision on the petition. The Department shall publish in the Florida Administrative Weekly either a notice of rulemaking for the proposed alternative criterion or a notice of the denial of the petition, as appropriate, within 30 days after notifying the petitioner of the decision. A denial of the petition shall become final within 14 days unless timely challenged under Section 120.57, F.S.

(d) The provisions of this subsection do not apply to criteria contained in Rule 62-302.500, F.A.C., or criteria that apply to:

1. Bacteriological Quality
2. Biological Integrity
3. B.O.D.
4. Chlorides
5. Color
6. Detergents
7. Dissolved Oxygen
8. Dissolved Solids
9. Nutrients
10. Odor
11. Oils and Greases

12. Radioactive Substances
13. Specific Conductance
14. Substances in concentrations that injure, are chronically toxic to, or produce adverse physiological or behavioral response in humans, animals, or plants
15. Substances in concentrations that result in the dominance of nuisance species
16. Total Dissolved Gases
17. Transparency
18. Turbidity
19. Any criterion or maximum concentration based on or set forth in Rule 62-4.244(3)(b), F.A.C.

(e) Despite any failure of the Department to meet a deadline set forth in this subsection (4), the grant of an alternative criterion shall not become effective unless approved as a rule by the Commission.

(f) Nothing in this rule shall alter the rights afforded to affected persons by Chapter 120, F.S.

(5) The Department shall modify permits of existing sources affected in a manner consistent with the Secretary's Order.

(6) Additional relief from criteria established by this Chapter may be provided through exemption pursuant to Section 62-103.100, Florida Administrative Code, or variances as provided for by Section 62-1.57, Florida Administrative Code.

Specific Authority: 403.061, 403.062, 403.087, 403.504, 403.704, 403.804, 403.805, F.S.

Law Implemented: 403.021, 403.061, 403.087, 403,088, 403.141, 403.161, 403.201, 403.502, F.S.

History: Formerly 17-3.05(4), Amended 3-1-79, 10-2-80, 2-1-83, Formerly 17-3.031, Amended 6-17-92, Formerly 17-302.800.

JR
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 & 1110879

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.

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.

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/66I
Reuben Ohanian/66I
Dave Snyder/JMI, Tally

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 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

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 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 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	PREF	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

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.

FLORIDA DEPARTMENT OF TRANSPORTATION

LAWTON CHILES
GOVERNOR

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:

Corrosion Series Test Results

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

Environmental Classififcation

Substructure:	Extremely Aggressive
Superstructure:	Slightly Aggressive
Location:	Inland

Bridge No. 050941

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:

Corrosion Series Test Results

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

Environmental Classifications

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

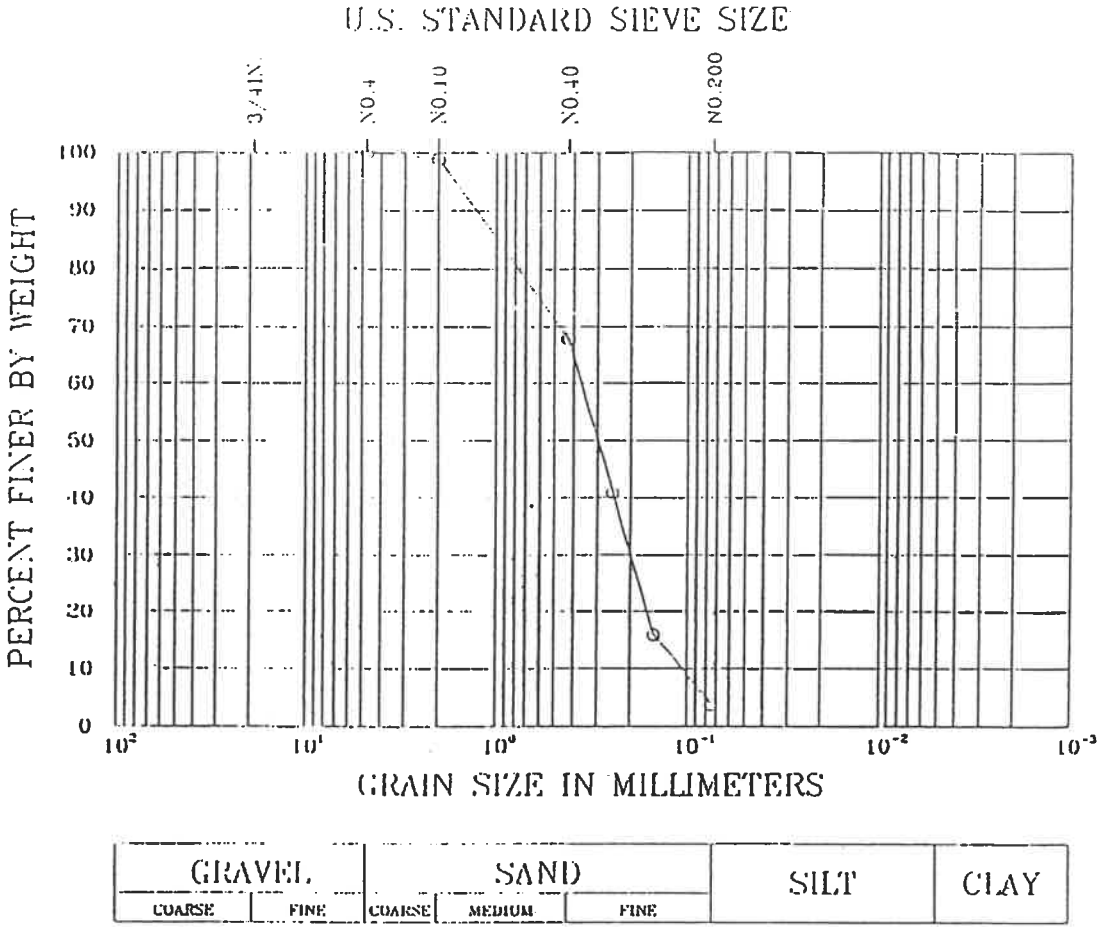
The results contained in this letter are based on the information obtained from our preliminary analysis. We should receive a copy of all the final test results and associated borings by January 4, 1995 and will begin evaluating the data and prepare a preliminary geotechnical structures report. This 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

SPN: 050901541
WPI: 1110874
Particle Size Distribution Curves and
Environmental Classification
Br. Nos. 050031, 050032, 050035, and
Br. No. 050941

APPENDIX B - GRAIN SIZE DISTRIBUTION CURVES
BRIDGE NO. 050032



LOCATION: SOUTHWEST QUADRANT
SAMPLE DEPTH: GRAB SAMPLE

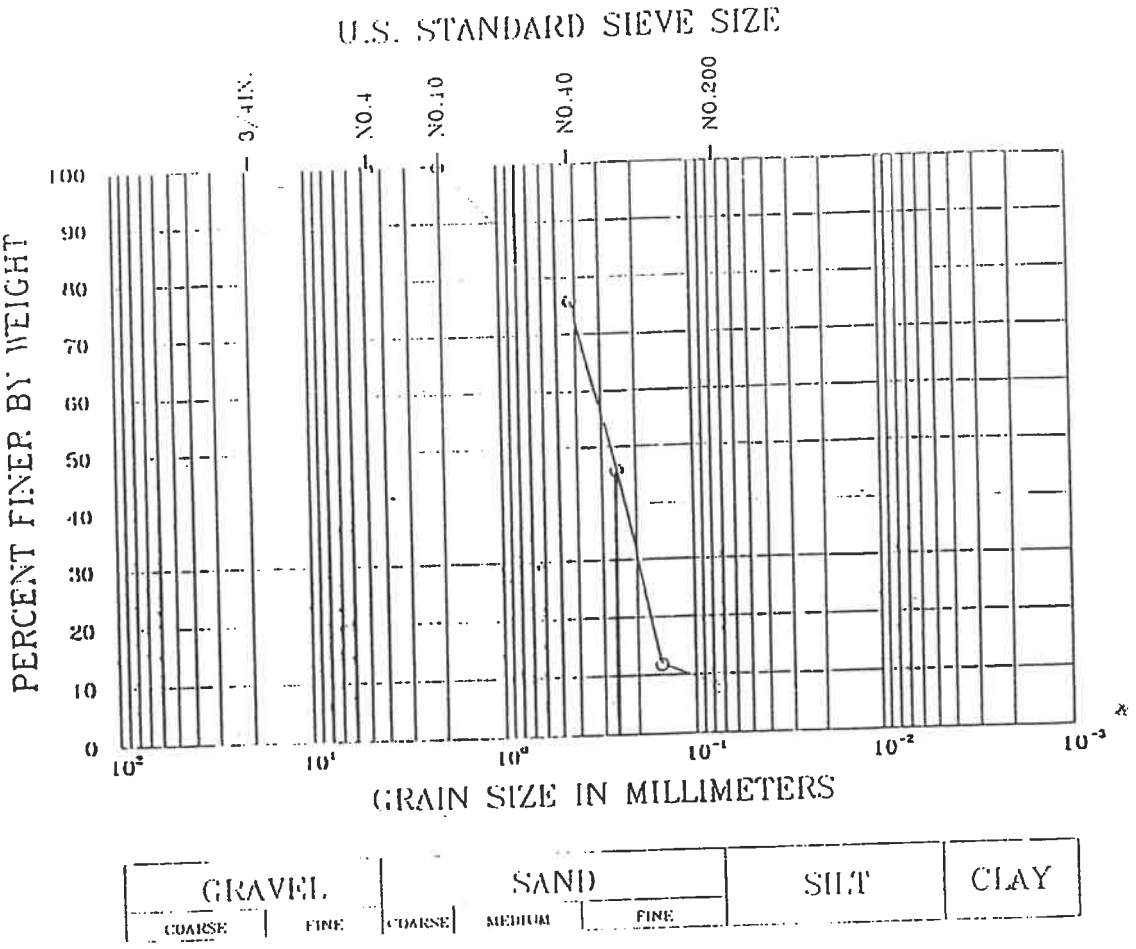
-e-

SOIL CLASSIFICATION: A-3, SP

REPRESENTATIVE OF SURFICIAL MATERIAL

STATE PROJECT # 05090-1511
BRIDGE # 050032

CURVE 1



LOCATION: STATION 170+16 11m RT OF C.L.

SAMPLE DEPTH: 6.4 m

-o-

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

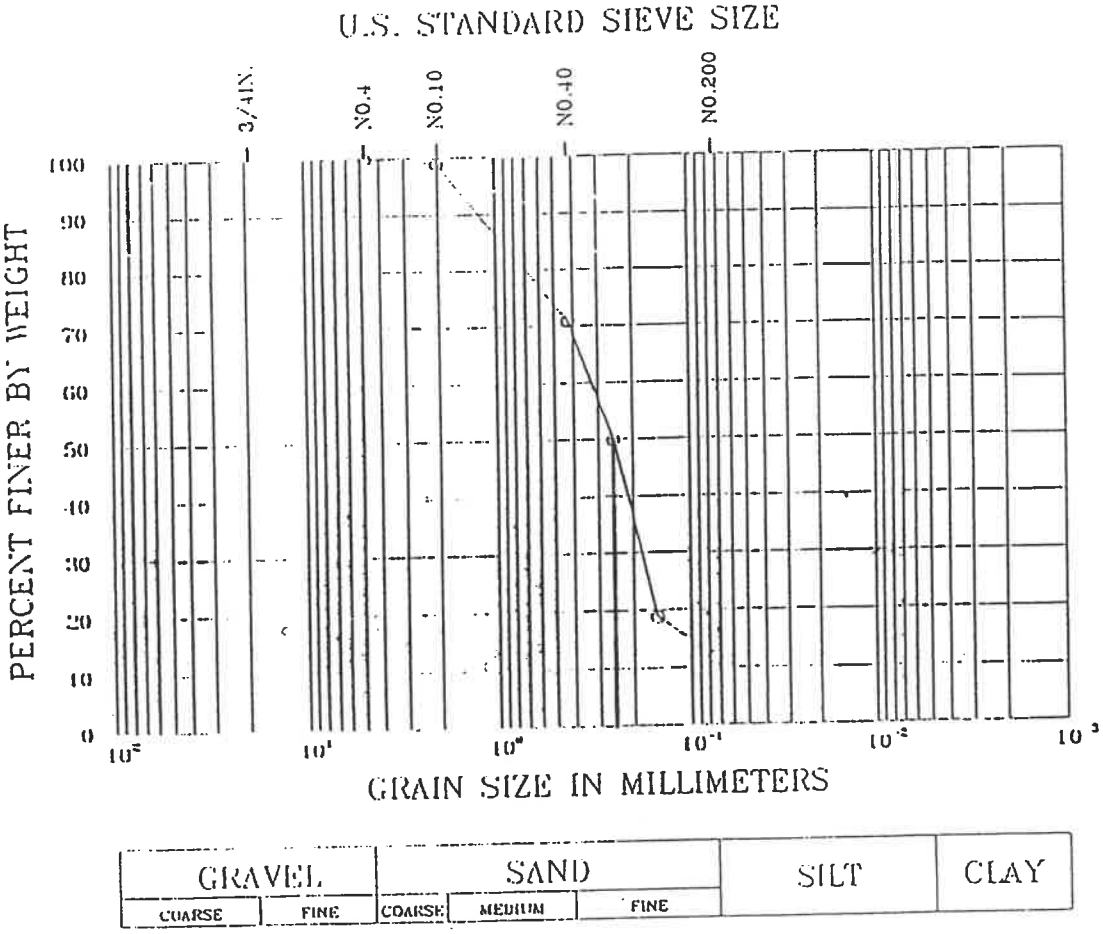
STATE PROJECT # 05090-1511

BRIDGE # 050032

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

CURVE 2

$D_{50} \approx 0.25$ mm



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

STATE PROJECT # 05090-1511
BRIDGE # 050032

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

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

CURVE 3

$D_{50} \approx 0.25$ mm

SFWMD, Permit Application Manual, Vol. IV
Appendix 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.

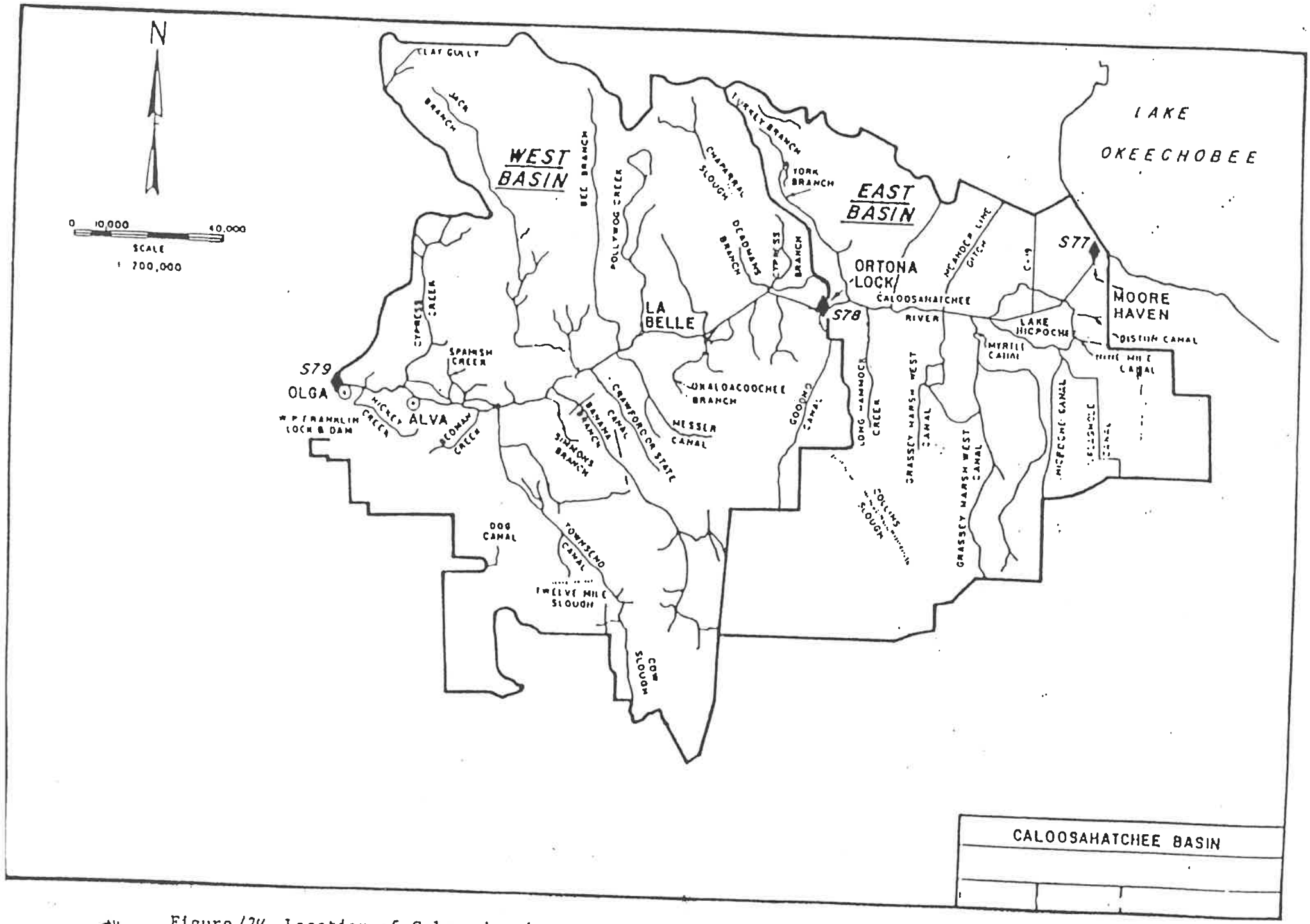


Figure 24 Location of Caloosahatchee Basin ..

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: Sandy

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	---	---	---	---
---	431	187	94	332	146	391	105	12	---	---	---	---
	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	---	---	---	---

AL 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	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								
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

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						
1933	09/06/33	6460.00		8.60						0
1934	08/09/34	920.00								0
1935	09/07/35	1480.00					6.30	09/22/34	(33.49)	0
1936	06/16/36	5800.00	-5	6.42						0
1937	07/01/37	3010.00		8.10						0
1938	08/01/38	1730.00		6.98						0
1939	10/17/38	3230.00		6.30						0
1940	09/12/40	3090.00		7.14						0
1941	04/10/41	2790.00		6.92						0
1942	02/26/42	3260.00					6.85	07/15/41	(34.04)	0
1943	09/15/43	2240.00		7.04						0
1944	10/06/43	3620.00		6.74						0
1945	09/17/45	8980.00	- 20	7.30						0
1946	10/13/45	2500.00		9.18						0
1947	09/19/47	16400.00	- 100 - 200	6.62						0
1948	09/24/48	14500.00	- 100	11.06						0
1949	08/29/49	5300.00		10.52						0
1950	10/01/49	4500.00		7.86						0
1951	09/05/51	1430.00		7.60						0
1952	10/03/51	31400.00	- 500 +	6.42						0
1953	08/30/53	6200.00		12.44						0
1954	10/10/53	7620.00	- 10				7.77	10/21/52	(34.96)	0
1955	08/01/55	644.00		8.53						0
1956	09/09/56	258.00		6.07						0
1957	08/25/57	3800.00	- 2 +	5.11						0
1958	08/13/58	3230.00	- 2 +	6.70						0
1959	06/20/59	6220.00		6.48						0
1960	09/13/60	7250.00	- 10	7.16						0
1961	10/11/60	2350.00		8.19						0
1962	09/23/62	6420.00		6.70						0
1963	09/24/63	1680.00		7.39						0
1964	09/15/64	3870.00	- 2 +	5.87						0
1965	09/02/65	1600.00		6.76						0
1966	10/03/65	3470.00		5.84						0
1967	10/04/66	1520.00		6.66						0
1968	06/11/68	3650.00		5.76						0
1969	06/22/69	2100.00		6.74						0
1970	03/27/70	7460.00	- 10	6.05						0
1971	09/17/71	2440.00		7.79						0
1972	06/22/72	2630.00		6.20						0
1973	08/09/73	1700.00		6.28						0
1974	07/03/74	8390.00	- 20	5.86						0
1975	08/24/75	1260.00		8.02						0
1976	08/02/76	3910.00		5.88						0
1977	09/10/77	1010.00		6.77						0
				5.32						0

Freshwater Cr

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

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Appendix C
Existing Structure Documentation

FAX COVER SHEET

Fla. Dept. of Transportation
1st/7th District Structures &
Facilities Office

Tel: (813)744-6050
Fax: (813)744-8251

To Charles Savering

Company Name Genesis

Fax Number 904-681-3600

From: Lyndon Schmidt

Message: 94 Bridge Inspection report for Bridge # 650032
93 Diving Report

Not much significant information relating to Bridge Hydraulics

Number of pages (including cover): 8

Date sent: 2-14-96

Time sent: 9:00 AM

If there are any problems receiving this transmission please call:

FLORIDA DEPARTMENT OF TRANSPORTATION

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

BRIDGE INSPECTION REPORT

CONTENTS OF REPORT

A. Condensed Inspection Report
B. Comprehensive Report of Deficiencies
* C. Evaluation of Previous Corrective Action
D. Required Maintenance Repair and Rehabilitation
* E. Methods, Quantities and Costs of Contract Corrective Action
* F. Field Preparation
* G. Fracture Critical Inspections
* H. Scour Evaluation
* I. Load Rating Analysis
* J. BMIS Report

* This section is not included in this report.

REPORT IDENTIFICATION

Bridge No.: 050032 Bridge Name: York Branch

Location: 2 miles South of CR 74 Section No. 05090

US R.

S.R. 29

M.P. 9.361

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 05/10/94 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. Foxon, SIICO				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 TRANSPORTATION

CONDENSED INSPECTION REPORT
FIXED SPANS

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

BRIDGE NUMBER 050032 INSPECTION DATE 05/10/94

DECK COMPONENT			SUPERSTRUCTURE COMPONENT			SUBSTRUCTURE COMPONENT		
BMIS NO.	ELEMENT TITLE	NCR **	BMIS NO.	ELEMENT TITLE	NCR **	BMIS NO.	ELEMENT TITLE	NCR **
G1.00 (58)	Deck Overall Rating	7	G2.00 (59)	Superstructure Overall Rating	6	G3.00 (60)	Substructure Overall Rating	6
G1.01	Deck(Top)/Surfacing	*7	G2.01	Bearings	N	G3.01	Piling/Shafts	6
G1.02	Deck(Underside)	7	G2.02	Beams/Stringers/Box& Plate Girders/Flat Slabs/Arches	8	G3.02	Footings/Caissons	N
G1.03	Expansion Joints	N	G2.03	Floor Beams	N	G3.03	Columns/Wall Piers	N
G1.04	Construction Joints	N	G2.04	Main Girders	N	G3.04	Intermediate Caps (Bent & Pier)	6
G1.05	Drainage System	8	G2.05	Diaphragms/Sway Bracing	N	G3.05	Bracing/Struts/Web Walls	N
G1.06	Curbs/Medians/Sidewalks	N	G2.06	Lateral Bracing	N	G3.06	Abutements/End Bents	6
G1.07	Handrails/Barriers/Parapets	8	G2.07	Upper Chords	N	G3.07	Slope Protection/Slope	N
			G2.08	Lower Chords	N			
			G2.09	Verticals	N			
			G2.10	Diagonals	N	NON-STRUCTURAL FEATURES		
			G2.11	Portals	N	BMIS NO.	ELEMENT TITLE	NCR **
			G2.12	Fracture Critical Members	N	G6.01	Lighting Systems	N
APPROACH ROADWAY MAJOR FEATURE			CHANNEL- MAJOR FEATURE			G6.02	Signs	N
BMIS NO.	ELEMENT TITLE	NCR **	BMIS NO.	ELEMENT TITLE	NCR **	G6.03	Striping (Roadway Reflective)	3
G4.00	Approach Roadway Overall Rating	8	G5.00 (61)	Channel and Channel Protection Overall Rating	8	G6.04	Reflectors	4
G4.01	Approach Slabs	N	G5.01	Fender System	N	G6.05	Utility Attachements	N
G4.02	Retaining Walls/Approach Slopes/Embankments/Shoulder	8	G5.02	Navigation Lights and Aids	N	G6.06	Fishing Walks	N
G4.03	Roadway-Bridge Transition	7	G5.03	Embankments/Slopes/ Bulkheads	8	G6.07	Attenuators	N
G4.04	Guardrails	8	G5.04	Degradation/Aggregation	8	G6.08	Traffic Control and Monitoring Systems	N
G4.05	Roadway Alignment	8	G5.05	Alignment	7	G6.09	Deck Cleanness	3
			G5.06	Flow	*7	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.: 050032
County Section No.: 05090
State Road No.: 29
US Road No.:

Location: 2 miles South of CR 74
Inspection Date: 05/10/94
Inspector: R.W. Seichko, E-II
Mile Post No.: 9.361

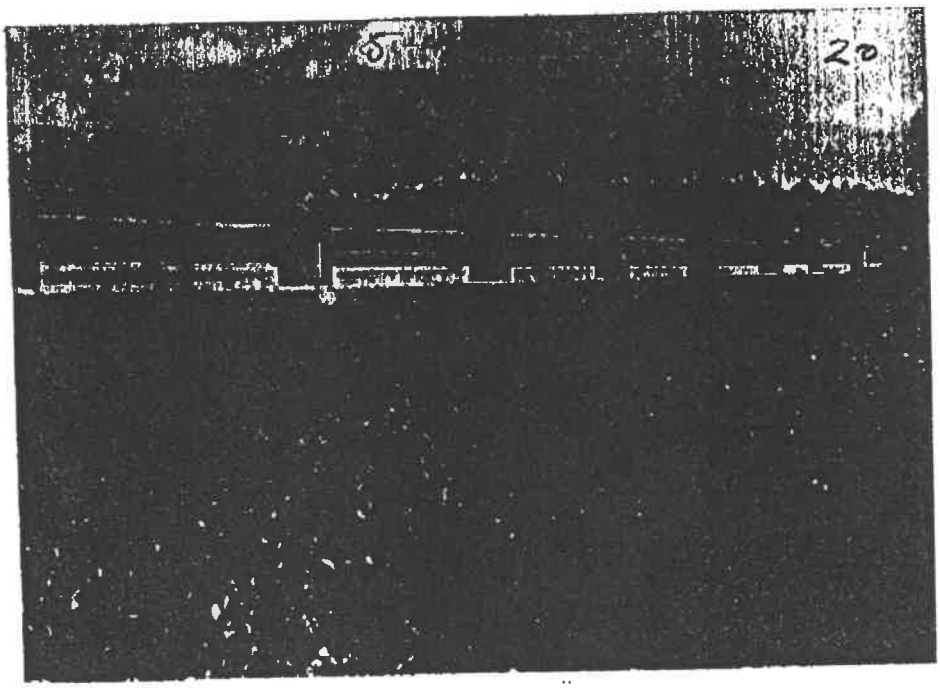
B. COMPREHENSIVE REPORT OF DEFICIENCIES

G1.01 DECK(TOP)/SURFACING
The asphalt overlay is cracking transversely over the bents.

G5.06 FLOW
There is heavy vegetation on both side of the strutural.

Note: Due to the present water lever and heavy vegetation, the above water inspection team was unable to inspect the underside of the structure. See photo on page 4.

Bridge 050032
Date 05/04/94



Insufficient Freeboard
Heavy vegetation on both sides and under the structure.

Bridge Number: 050032

Inspection Date: 05/10/94

Waterway Measurements

	LEFT		RIGHT	
	Dist.	Bent No.	Dist.	Bent No.
Distance from Top of bridgerail to water at time of inspection:	2.8	2		

Distance from Top of bridgerail to mudline

"-" Sign Denotes Degradation

	Left				Right			
Bent No.	Original	Previous	Present	Difference	Original	Previous	Present	Difference
Abut.1	9.2	6.4	6.4	0	8.4	6.1	6.1	0
Bent 2	10.6	8.0	8.0	0	10.2	8.0	8.0	0
Bent 3	10.8	8.5	8.5	0	10.2	7.9	7.9	0
Abut. 4	10.2	7.2	7.2	0	9.7	6.3	6.3	0
				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.: 050032
County Section No.: 05090
State Road No.: 29
US Road No.:

Location: 2 miles South of CR 74
Inspection Date: 05/10/94
Inspector: R.W. Seichko, E-II
Mile Post No.: 9.361

D. Required Maintenance Repair and Rehabilitation

STATE FORCES

G5.06 FLOW

Activity: 805 SF Clean-Vegetation or Debris Removal
Number of Units: 400

Repair Description:
remove heavy vegetation from both sides of structure.

COMMENTS:

DATE OF INSPECTION: 2/9/93

DATE: 2/16/93

FIXED AND MOVEABLE
UNDERWATER BRIDGE INSPECTION REPORT

BRIDGE NO. 050032 | LOCAL NAME YORK BRANCH. | S.R. NO. | TOPSIDE INSP. JEO | DIVER INSP. ~~ROR~~/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 | TIDAL: NO | WATER TYPE: 2 | (K9)WATER QUALITY: 0 | K(10)WATER DEPTH: AVERAGE 4- FT. MAXIMUM 5 FT. | (K11)BOTTOM MATERIAL: 1

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

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

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

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

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

TOTAL MAN HOURS:

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

RECOMMENDATIONS:

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.

NATIONAL BRIDGE INVENTORY - - - - - - - STRUCTURE INVENTORY AND APPRAISAL 07/11/94

********** IDENTIFICATION **********

(1) STATE NAME - FLORIDA CODE 12
(2) STRUCTURE NUMBER # 950032
(3) INVENTORY ROUTE (ON/UNDER) ON = 1310000290
(5) STATE HIGHWAY DEPARTMENT DISTRICT 01
(3) COUNTY CODE 042 (4) PLACE CODE 00000
(6) FEATURES INTERSECTED - YORK BRANCH
(7) FACILITY CARRIED - SR 29
(9) LOCATION - 2 MILES SOUTH OF C-74
(11) MILEPOINT 009.361
(16) LATITUDE 26 0 53.3' (17) LONGITUDE 081 0 20.4'
(98) BORDER BRIDGE STATE CODE 000 % SHARE 00 %
(99) BORDER BRIDGE STRUCTURE NO. # #

********** STRUCTURE TYPE AND MATERIAL *********

(43) STRUCTURE TYPE MAIN: MATERIAL - CONCRETE
TYPE - SLAB CODE 101
(44) STRUCTURE TYPE APPR: MATERIAL - OTHER
TYPE - OTHER CODE 000
(45) NUMBER OF SPANS IN MAIN UNIT 003
(46) NUMBER OF APPROACH SPANS 0000
(107) DECK STRUCTURE TYPE - CAST IN PLACE CONC CODE 1
(108) WEARING SURFACE / PROTECTIVE SYSTEM:
A) TYPE OF WEARING SURFACE - BITUMINOUS CODE 6
B) TYPE OF MEMBRANE - NONE CODE 0
C) TYPE OF DECK PROTECTION - NONE CODE 0

********** AGE AND SERVICE **********

(27) YEAR BUILT 1948
(106) YEAR RECONSTRUCTED 0000
(42) TYPE OF SERVICE: ON - HIGHWAY
UNDER - WATERWAY CODE 15
(28) LANES: ON STRUCTURE 02 UNDER STRUCTURE 00
(29) AVERAGE DAILY TRAFFIC 002063
(30) YEAR OF ADT 1991 (109) TRUCK ADT 10 %
(19) BYPASS, DETOUR LENGTH 15 MI

********** GEOMETRIC DATA **********

(48) LENGTH OF MAXIMUM SPAN 0015 FT
(49) STRUCTURE LENGTH 000045 FT
(50) CURB OR SIDEWALK: LEFT 00.0 FT RIGHT 00.0 FT
(51) BRIDGE ROADWAY WIDTH CURB TO CURB 032.4 FT
(52) DECK WIDTH OUT TO OUT 035.0 FT
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 040 FT
(33) BRIDGE MEDIAN - NO MEDIAN CODE 0
(34) SKEW 00 DEG (35) STRUCTURE FLARED NO
(10) INVENTORY ROUTE MIN VERT CLEAR 99 FT 99 IN
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR 32.4 FT
(53) MIN VERT CLEAR OVER BRIDGE RDWY 99 FT 99 IN
(54) MIN VERT UNDERCLEAR REF - NOT A FI 00 FT 00 IN
(55) MIN LAT UNDERCLEAR RT REF - NOT A FI 99.9 FT
(56) MIN LAT UNDERCLEAR LT 00.0 FT

********** NAVIGATION DATA **********

(38) NAVIGATION CONTROL - BRIDGE HAS NO NA CODE 0
(111) PIER PROTECTION - NAVIGATION PROTECTI CODE 1
(39) NAVIGATION VERTICAL CLEARANCE 000 FT
(116) VERT-LIFT BRIDGE NAV VERT CLR 000 FT
(40) NAVIGATION HORIZONTAL CLEARANCE 0000 FT

****

SUFFICIENCY RATING = 084.0
STATUS = NO SIGNIFICANT DEFICIENCY

********** CLASSIFICATION ********** CODE

(112) NBIS BRIDGE LENGTH YES
(104) HIGHWAY SYSTEM - STRUCTURE IS NOT ON NHS 0
(26) FUNCTIONAL CLASS - RURAL MINOR ARTERIAL 06
(100) DEFENSE HIGHWAY - NOT A DEFENSE HIGHWAY 0
(101) PARALLEL STRUCTURE - NONE EXISTS N
(102) DIRECTION OF TRAFFIC - TWO WAY TRAFFIC 2
(103) TEMPORARY STRUCTURE - NOT APPLICABLE N
(110) DESIGNATED NATIONAL NETWORK - NOT PART OF N 0
(20) TOLL - ON FREE ROAD 3
(21) MAINTAIN - STATE HIGHWAY AGENCY 01
(22) OWNER - STATE HIGHWAY AGENCY 01
(37) HISTORICAL SIGNIFICANCE - NOT ELIGIBLE FOR 5

********** CONDITION ********** CODE

(58) DECK 7
(59) SUPERSTRUCTURE 8
(60) SUBSTRUCTURE 6
(61) CHANNEL & CHANNEL PROTECTION 8
(62) CULVERTS N

********** LOAD RATING AND POSTING ******** CODE

(31) DESIGN LOAD - H 15 2
(64) OPERATING RATING - HS-20 TRU 246
(66) INVENTORY RATING - HS-20 TRU 228
(70) BRIDGE POSTING - EQ OR GT LEGAL LOAD NO P 5
(41) STRUCTURE OPEN, POSTED OR CLOSED - A
DESCRIPTION - OPEN, NO RESTRICTION

********** APPRAISAL ********** CODE

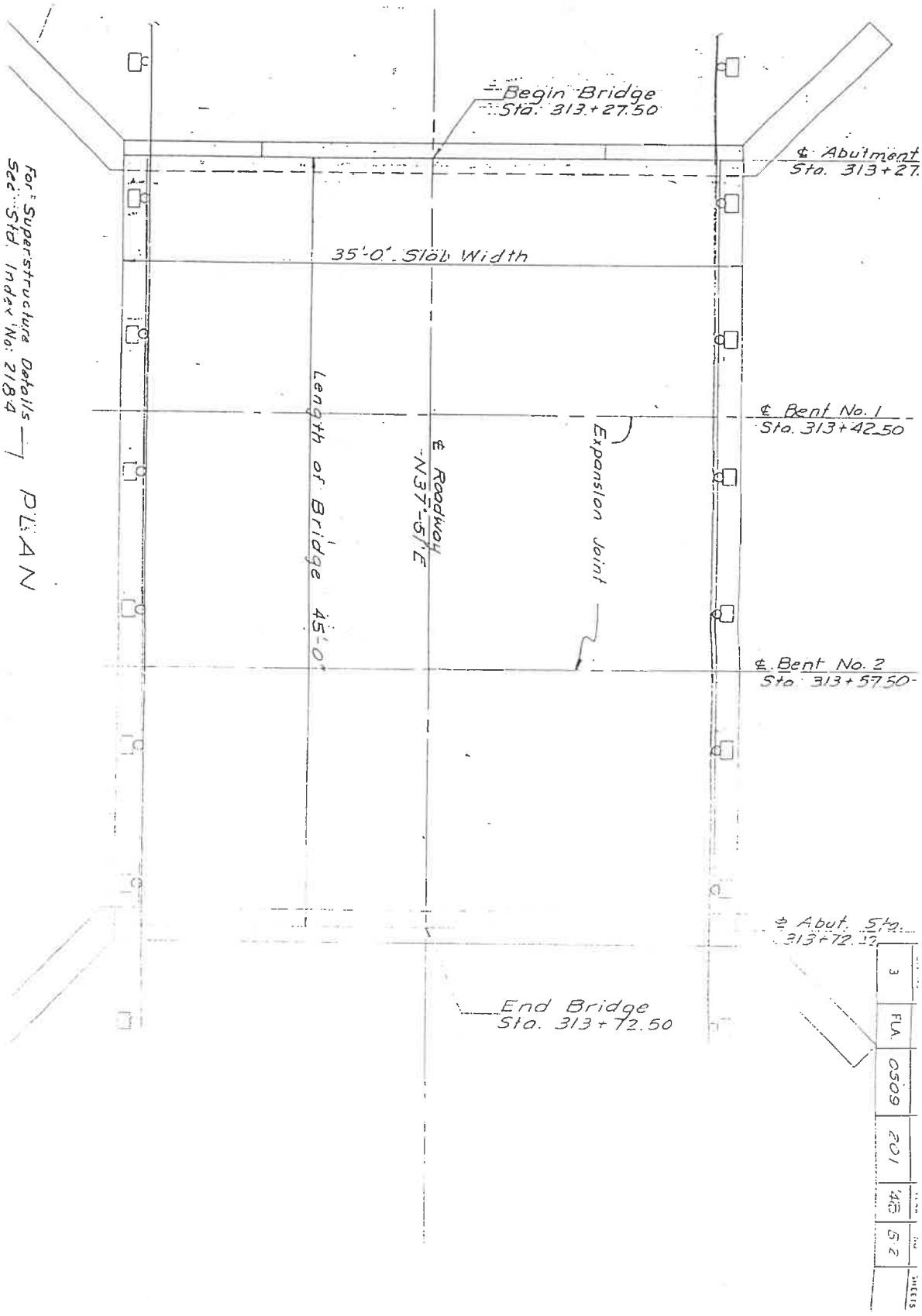
(67) STRUCTURAL EVALUATION 6
(68) DECK GEOMETRY 4
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N
(71) WATERWAY ADEQUACY 8
(72) APPROACH ROADWAY ALIGNMENT 8
(36) TRAFFIC SAFETY FEATURES 1111
(113) SCOUR CRITICAL BRIDGES 6

********** PROPOSED IMPROVEMENTS **********

(75) TYPE OF WORK - REPLACE STRUCTURE (POO CODE 311
(76) LENGTH OF STRUCTURE IMPROVEMENT 000045 FT
(94) BRIDGE IMPROVEMENT COST $ 264,000
(95) ROADWAY IMPROVEMENT COST $ 29,000
(96) TOTAL PROJECT COST $ 454,000
(97) YEAR OF IMPROVEMENT COST ESTIMATE 20
(114) FUTURE ADT 005508
(115) YEAR OF FUTURE ADT 2013

********** INSPECTIONS **********

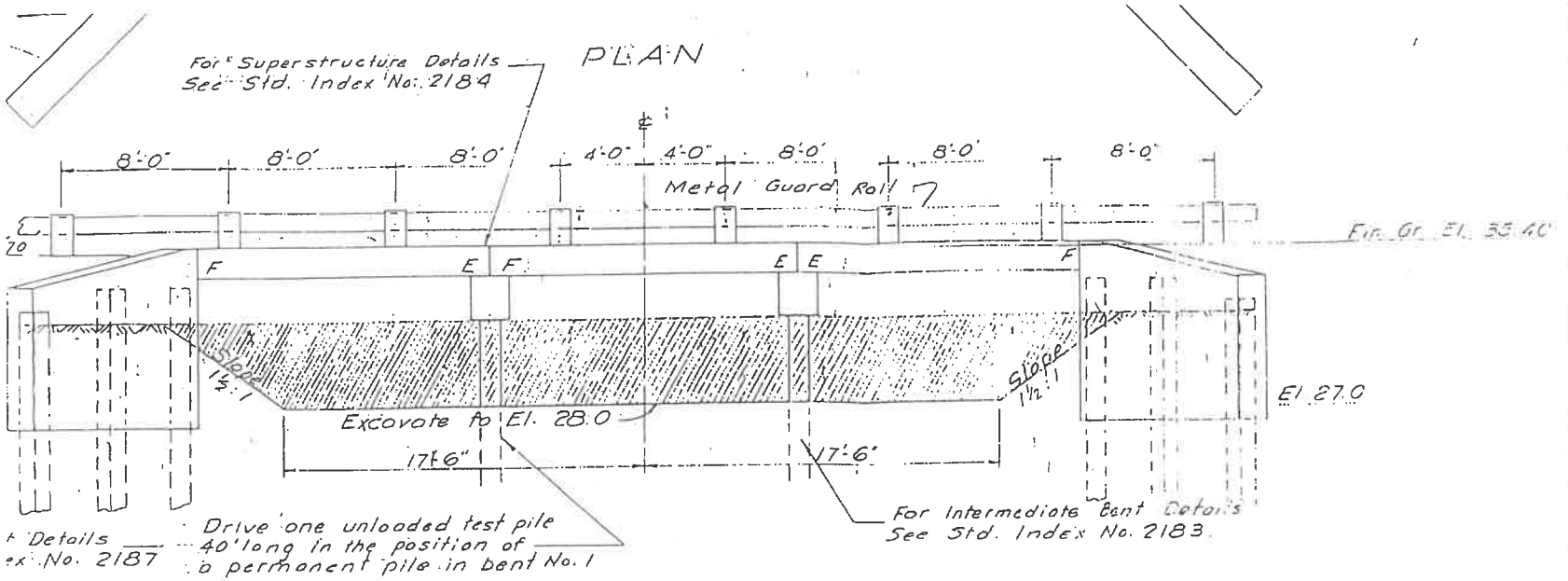
(90) INSPECTION DATE 94/05 (91) FREQUENCY 24 MO
(92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
A) FRACTURE CRIT DETAIL - NO MO A)
B) UNDERWATER INSP - YES 24 MO B) 89 07
C) OTHER SPECIAL INSP - NO MO C)



For Superstructure Details —
See Std. Index No. 21840

PLAN

3	FLA.	0509	201	142	57	SHEETS



ELEVATION
BRIDGE AT STATION
313 + 50

GENERAL PLANS & ELEVATIONS

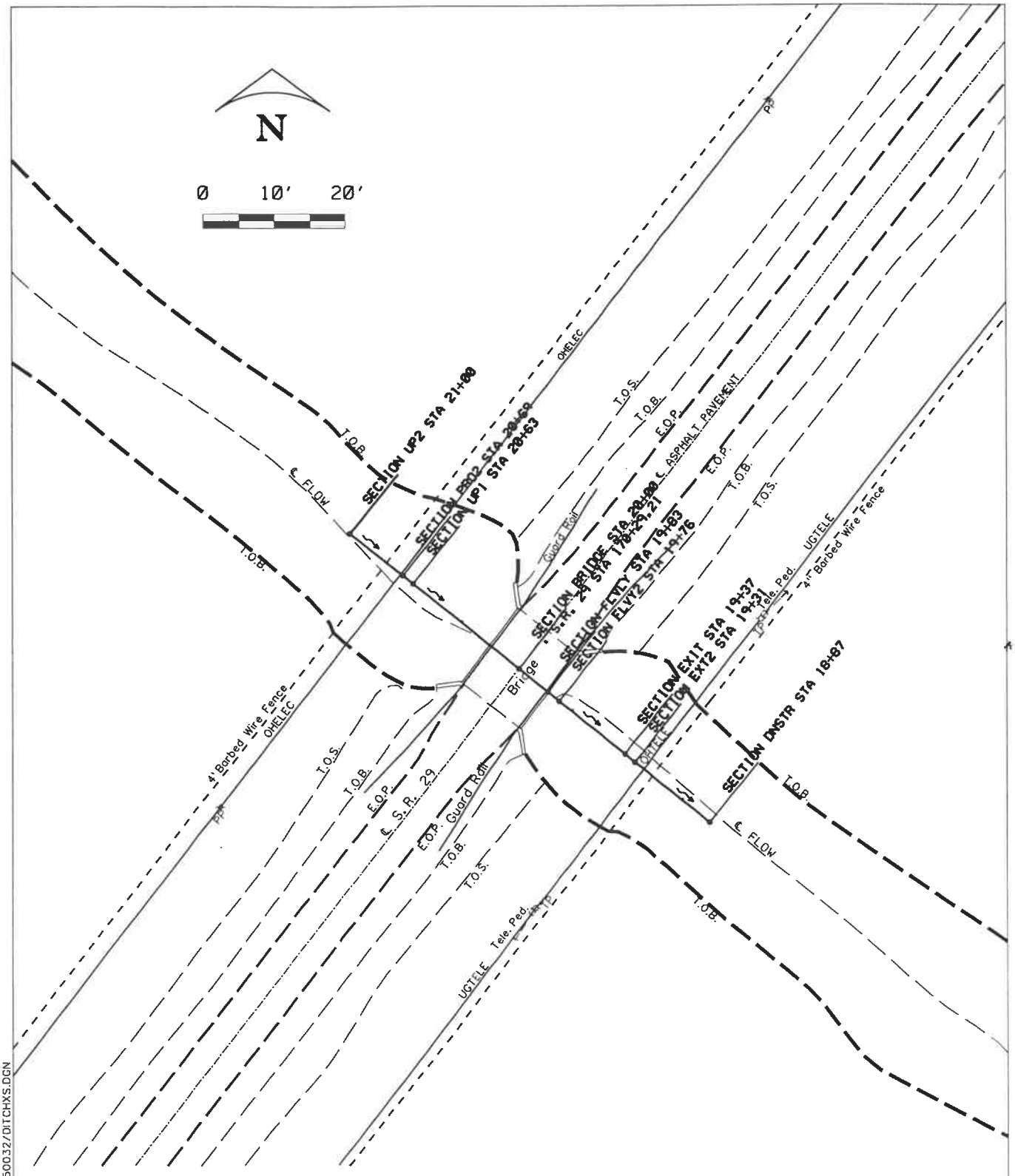
STATE OF FLORIDA
STATE ROAD DEPARTMENT

BRIDGES AT STATIONS
162+00 213+00 313+50

ROAD NO.	COUNTY	SECTION	JOB NO
29	GLADES	0509	201

REVISIONS				Names	Dates	Approved by
Names	Dates	Descriptions	Designed by			
			Checked by			
			Drawn by	W.M.J.	8-47	Bridge Engineer
			Checked by	T.W.J.	8-47	
			Quantities by			State Highway Engineer
			Checked by			Drawing No. 2-5 / Index No. 2182

Appendix D
WSPRO Analysis



GENESIS Group, Inc.

Figure D1. Cross Section Locations

fn. • G:/PROJECTS/FDT1/005/50032/DITCHXS.DGN

LOCATION OF CROSS SECTIONS USED IN WSPRO

EXISTING BRIDGE

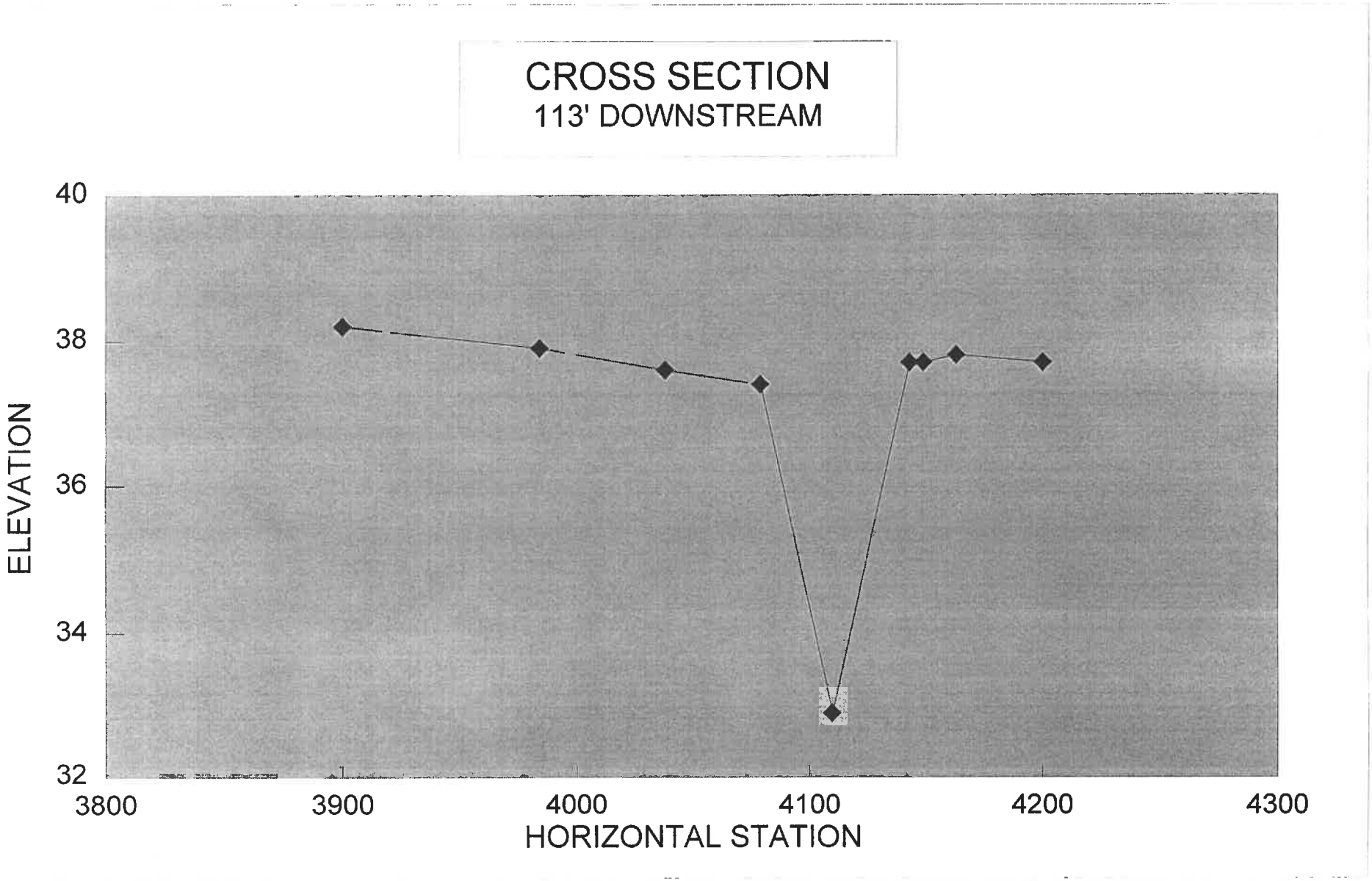
Station CL of Existing Bridge	2000 ft
Width of Existing Bridge	35 ft
Length of Existing Bridge	45 ft

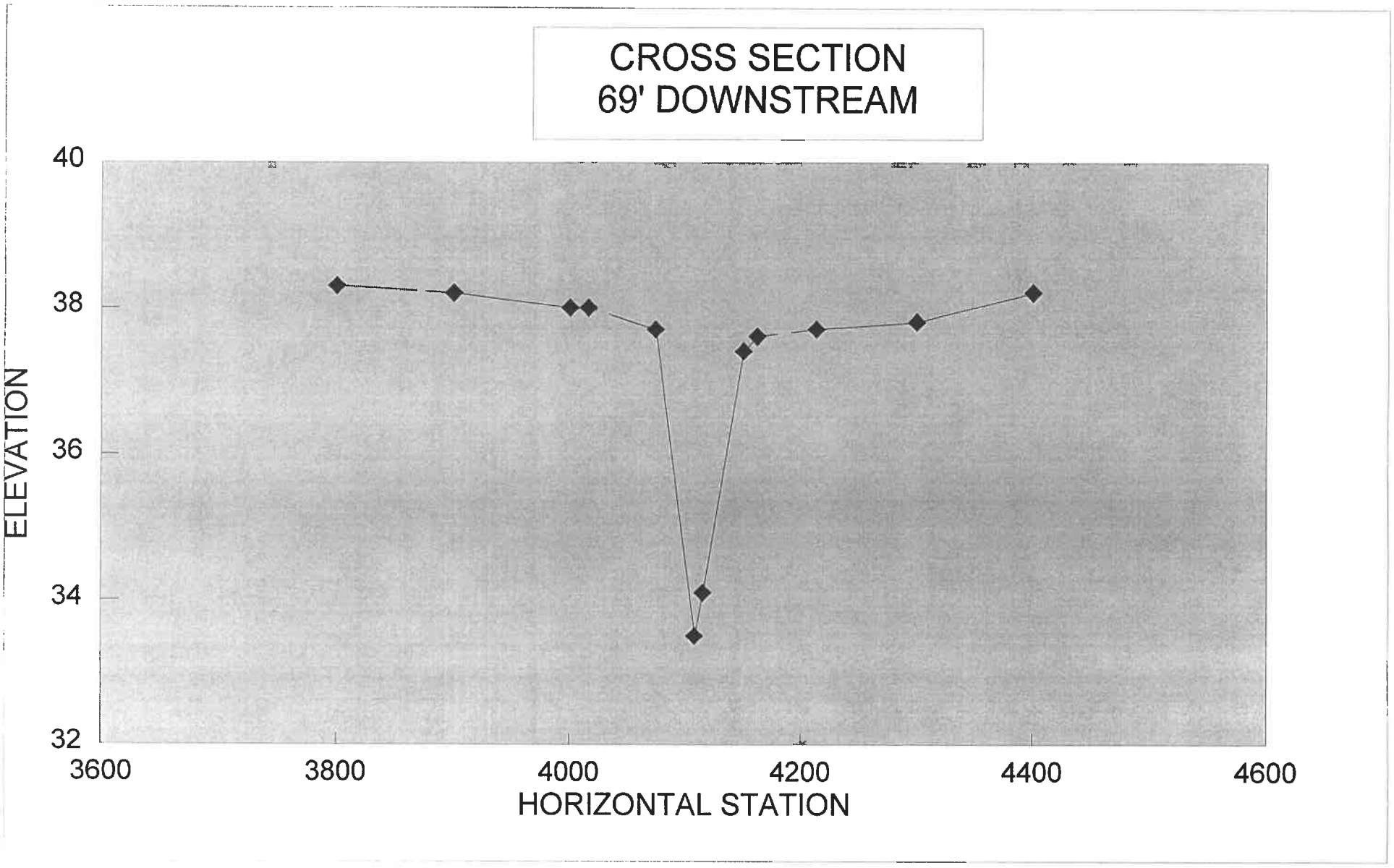
Station of **EXIT** Section:	2000 - 45 - 35/2 = 1937
Station of **FULLY** Section:	2000 - 35/2 = 1983
Station of **APPR** Section:	1983 + 35 + 45 = 2063

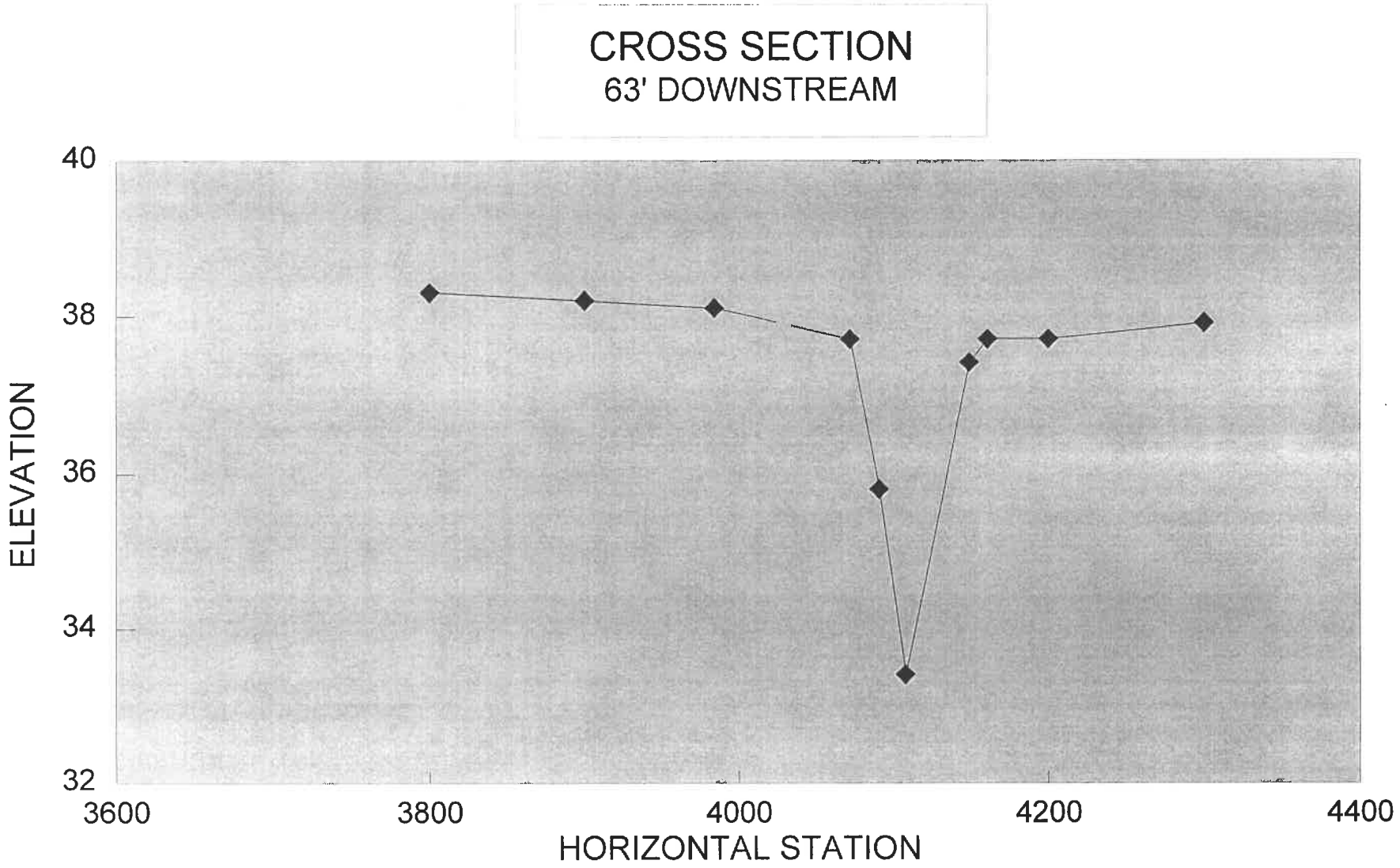
PROPOSED BRIDGE

Station of CL of Proposed Bridge	2000 ft
Width of Proposed Bridge	47 ft
Length of Proposed Bridge	45 ft

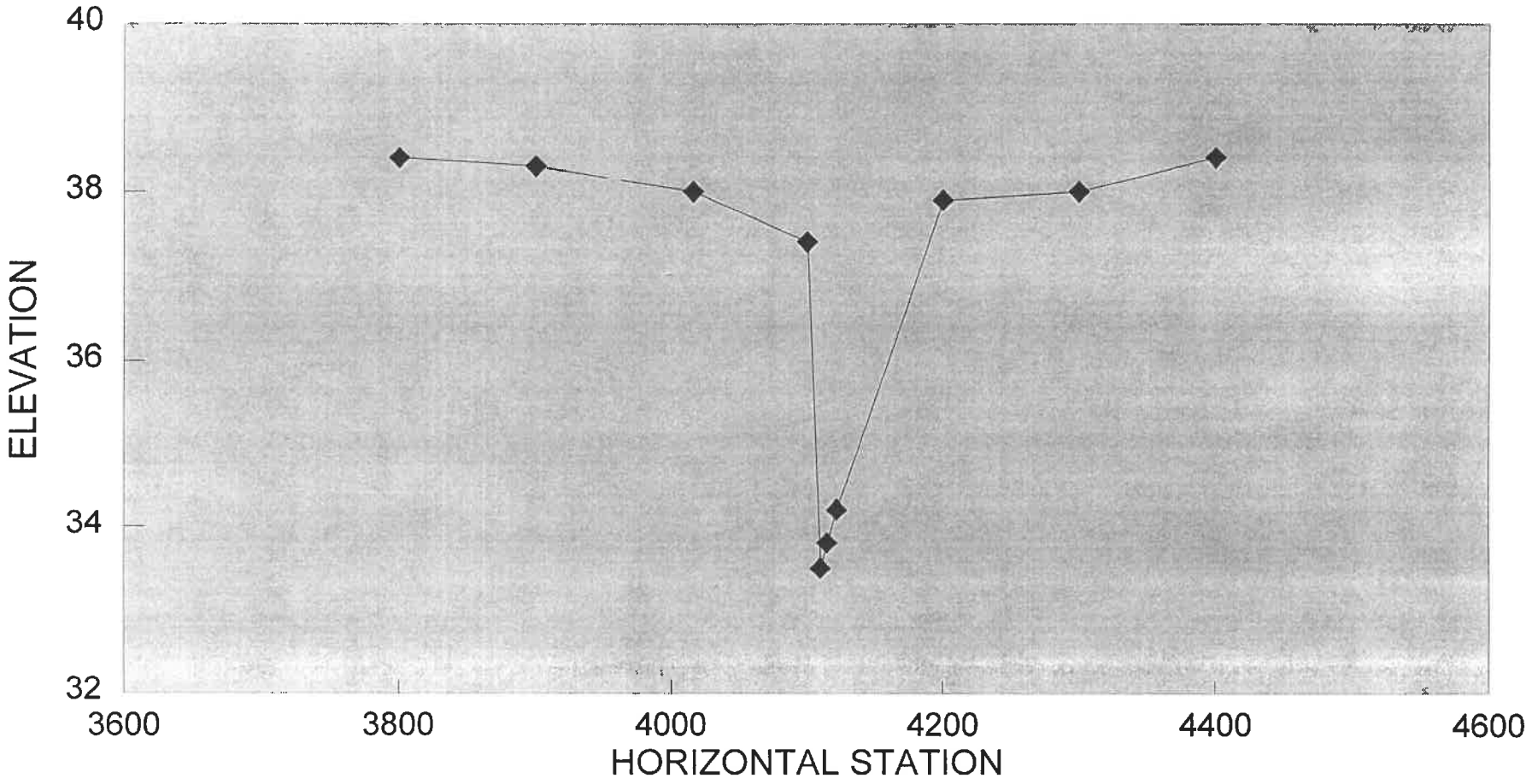
Station of **EXIT** Section:	2000 - 45 - 47/2 = 1931
Station of **FULLY** Section:	2000 - 47/2 = 1976
Station of **APPR** Section:	2000 + 45 + 47/2 = 2069


CROSS SECTION
113' DOWNSTREAM
40
38
36
34
32
ELEVATION
3800
3900
4000
4100
4200
4300
HORIZONTAL STATION

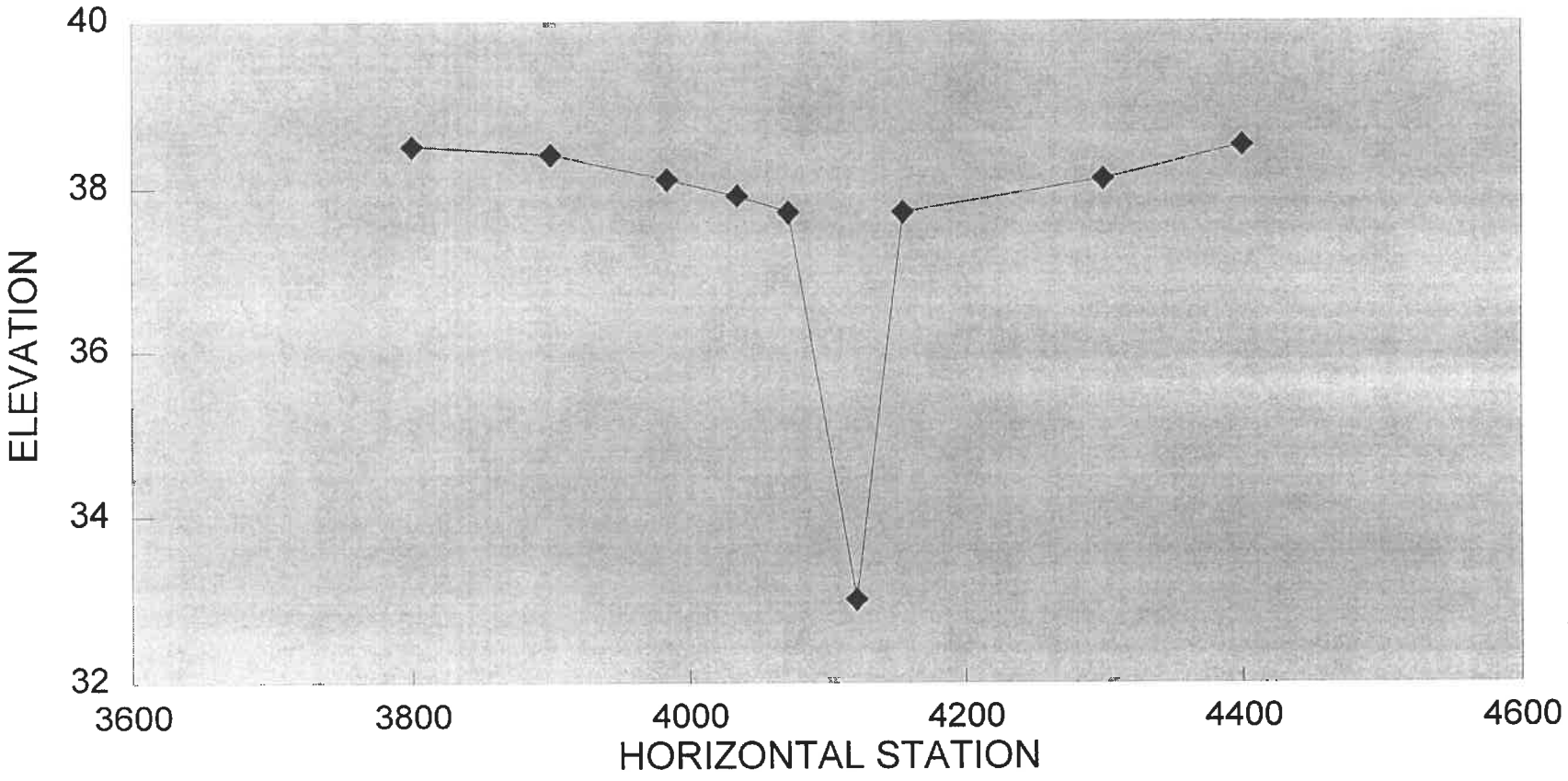

CROSS SECTION
69' DOWNSTREAM
ELEVATION
40
38
36
34
32
3600
3800
4000
4200
4400
4600
HORIZONTAL STATION

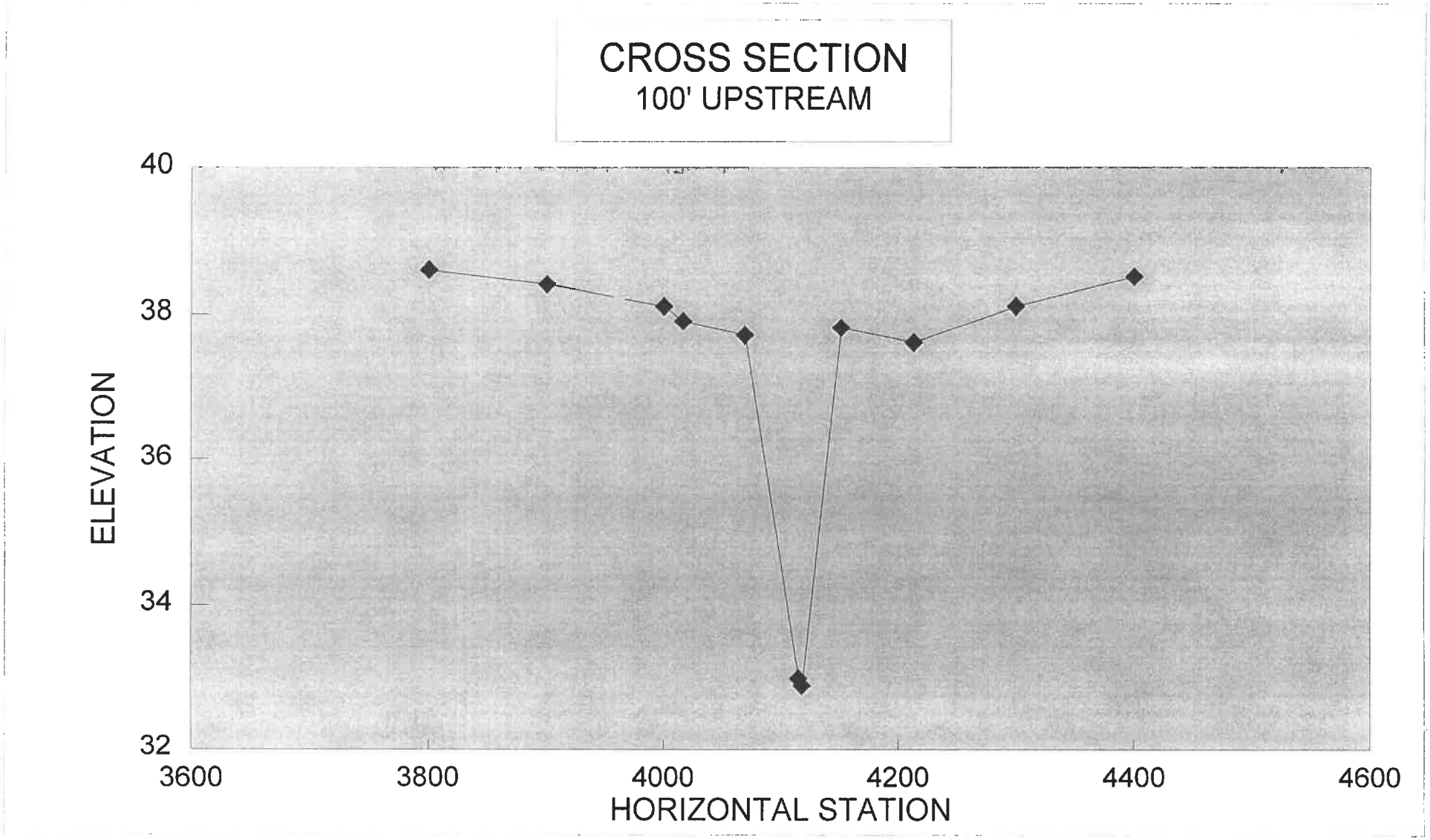

CROSS SECTION
63' DOWNSTREAM
40
38
36
34
32
ELEVATION
3600
3800
4000
4200
4400
HORIZONTAL STATION

CROSS SECTION
24' DOWNSTREAM

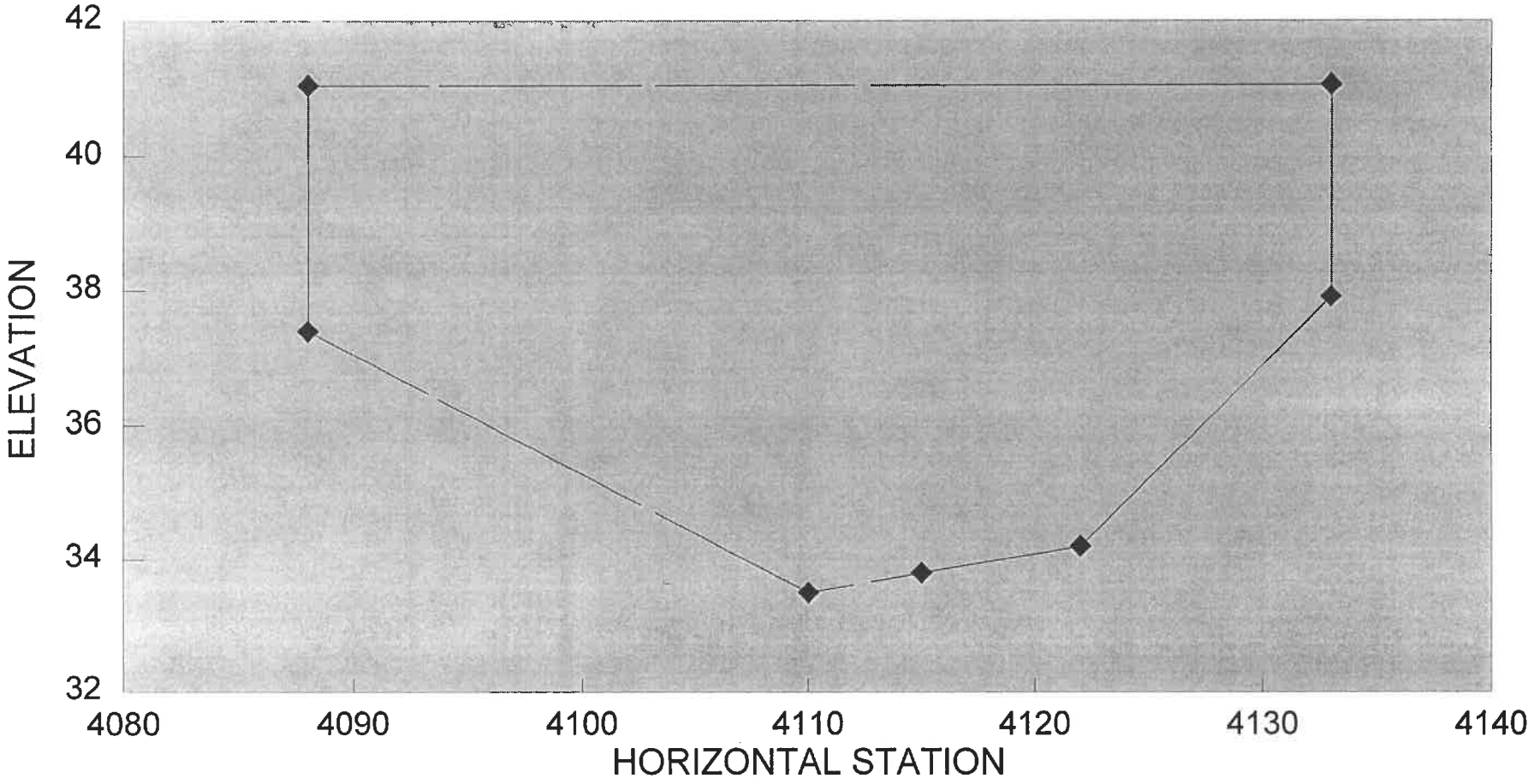


CROSS SECTION
63' UPSTREAM




CROSS SECTION
100' UPSTREAM
ELEVATION
40
38
36
34
32
3600
3800
4000
4200
4400
4600
HORIZONTAL STATION

CROSS SECTION
Existing Bridge



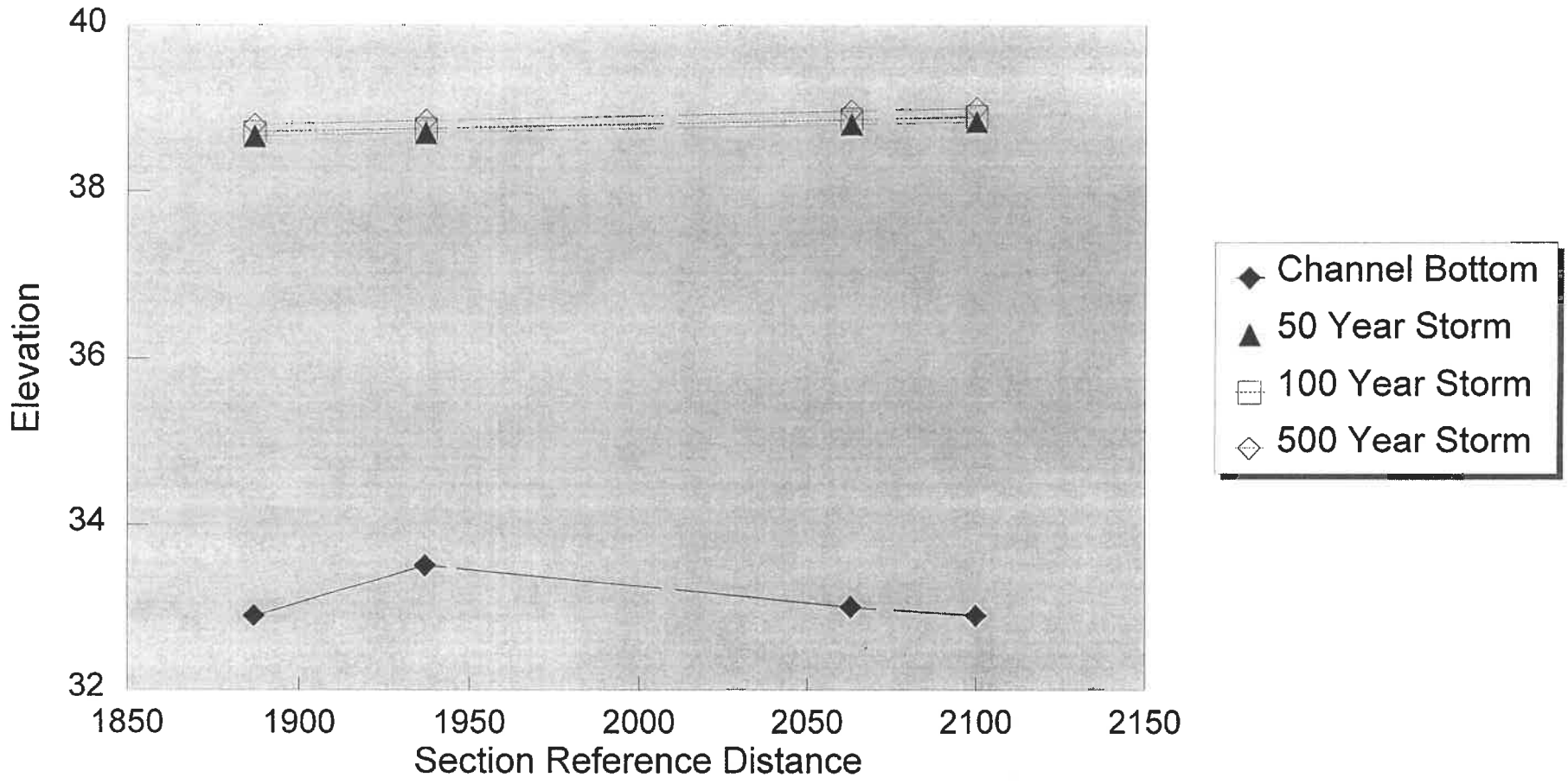
WSPRO

Open Channel Analysis

SR 29 York Branch
Bridge No. 050032

Water Surface Profiles

S.R. 29 - York Branch, Natural Conditions



```
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

            *** RUN DATE & TIME: 04-15-96  17:34

   *F
   T1 SR 29 - OPEN CHANNEL ANALYSIS
   T2 BR# 50032, YORK BRANCH
   T3 PRE-DEVELOPMENT CONDITIONS
   *  2 YEAR   50 YEAR   100 YEAR   500 YEAR
   Q    100    446        512         666
 *** Q-DATA FOR SEC-ID, ISEQ =             1
   *  SLOPE FROM QUAD MAP
   SK 0.0008  0.0008  0.0008  0.0008
   *
   *  CROSS SECTION LOCATED 113' DOWNSTREAM OF BRIDGE
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PRE-DEVELOPMENT CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:34

 *** START PROCESSING CROSS SECTION - "DNSTR"
   XS   DNSTR 1887
   GR 1100,45.0 1101,39.0 3700,38.4 3800,38.2 3900,38.2 3984,37.9
   GR 4038,37.6 4079,37.4 4110,32.9 4143,37.7
   GR 4149,37.7 4163,37.8 4200,37.7 4300,37.8 4400,38.3 6999,39.0 7000,45.0
   N  0.06   0.10  0.06
   SA     4079    4143
   *  EXIT CROSS SECTION LOCATED 63' DOWNSTREAM (EXISTING)

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

 --- DATA SUMMARY FOR SECID "DNSTR" AT SRD =   1887.  ERR-CODE =       0

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

 X-Y COORDINATE PAIRS  (NGP =  17):
        X       Y          X       Y          X       Y          X       Y
    1100.0   45.00     1101.0   39.00     3700.0   38.40     3800.0   38.20
    3900.0   38.20     3984.0   37.90     4038.0   37.60     4079.0   37.40
    4110.0   32.90     4143.0   37.70     4149.0   37.70     4163.0   37.80
    4200.0   37.70     4300.0   37.80     4400.0   38.30     6999.0   39.00
    7000.0   45.00

  X-Y MAX-MIN POINTS:
      XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
    1100.0   45.00     4110.0   32.90     7000.0   45.00     1100.0   45.00

 SUBAREA BREAKPOINTS (NSA =  3):
        4079.   4143.

 ROUGHNESS COEFFICIENTS (NSA =  3):
          .060    .100    .060
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)
```

```
        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PRE-DEVELOPMENT CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:34

*** START PROCESSING CROSS SECTION - "EXIT "
  XS   EXIT     1937
  GR 1100,45.0 1101,39.0 3700,38.4 3800,38.3 3900,38.2 3984,38.1
  GR 4072,37.7 4091,35.8 4108,33.4 4149,37.4 4161,37.7
  GR 4200,37.7 4300,37.9 4400,38.3 4500,38.5 4600,38.5 6999,39.0 7000,45.0
  N  0.06    0.10  0.06
  SA     4072       4149
  *  CROSS SECTION LOCATED 63' UPSTREAM

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

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   1937.  ERR-CODE =      0

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

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
   1100.0   45.00    1101.0   39.00    3700.0   38.40    3800.0   38.30
   3900.0   38.20    3984.0   38.10    4072.0   37.70    4091.0   35.80
   4108.0   33.40    4149.0   37.40    4161.0   37.70    4200.0   37.70
   4300.0   37.90    4400.0   38.30    4500.0   38.50    4600.0   38.50
   6999.0   39.00    7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   1100.0   45.00    4108.0   33.40    7000.0   45.00    1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4072.   4149.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PRE-DEVELOPMENT CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:34

*** START PROCESSING CROSS SECTION - "UP1  "
  XS   UP1      2063
  GR 1100,45.0 1101,39.0 3700,38.6 3800,38.5 3900,38.4 3984,38.1 4035,37.9
  GR 4074,37.7 4121,33.0 4155,37.7 4200,37.4 4300,38.1 4400,38.5 4500,38.7
  GR 4600,38.7 6999,39.0 7000,45.0
  N  0.06     0.10    0.06
  SA     4074        4155
  *  CROSS SECTION LOCATED 100' UPSTREAM

*** FINISH PROCESSING CROSS SECTION - "UP1  "
*** CROSS SECTION "UP1  " WRITTEN TO DISK, RECORD NO. =  3

--- DATA SUMMARY FOR SECID "UP1  " AT SRD =   2063.  ERR-CODE =      0

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

```
X-Y COORDINATE PAIRS  (NGP =  17):
      X      Y          X      Y          X      Y          X      Y
   1100.0   45.00    1101.0   39.00    3700.0   38.60    3800.0   38.50
   3900.0   38.40    3984.0   38.10    4035.0   37.90    4074.0   37.70
   4121.0   33.00    4155.0   37.70    4200.0   37.40    4300.0   38.10
   4400.0   38.50    4500.0   38.70    4600.0   38.70    6999.0   39.00
   7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   1100.0   45.00    4121.0   33.00    7000.0   45.00    1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4074.   4155.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PRE-DEVELOPMENT CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:34

*** START PROCESSING CROSS SECTION - "UP2  "
  XS   UP2   2100
  GR 1100,45.0 1101,39.0 3700,38.7 3800,38.6 3900,38.4 4000,38.1 4016,37.9
  GR 4069,37.7 4115,33.0 4118,32.9 4151,37.8 4213,37.6
  GR 4300,38.1 4400,38.5 4500,38.6 4600,38.7 6999,39.0 7000,45.0
  N  0.06   0.10  0.06
  SA     4069       4151
  EX

*** FINISH PROCESSING CROSS SECTION - "UP2  "
*** CROSS SECTION "UP2  " WRITTEN TO DISK, RECORD NO. =  4

--- DATA SUMMARY FOR SECID "UP2  " AT SRD =    2100.  ERR-CODE =       0

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

X-Y COORDINATE PAIRS  (NGP =  18):
      X      Y          X      Y          X      Y          X      Y
   1100.0   45.00    1101.0   39.00    3700.0   38.70    3800.0   38.60
   3900.0   38.40    4000.0   38.10    4016.0   37.90    4069.0   37.70
   4115.0   33.00    4118.0   32.90    4151.0   37.80    4213.0   37.60
   4300.0   38.10    4400.0   38.50    4500.0   38.60    4600.0   38.70
   6999.0   39.00    7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   1100.0   45.00    4118.0   32.90    7000.0   45.00    1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4069.   4151.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060

+++ BEGINNING PROFILE CALCULATIONS --   4
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
```

P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PRE-DEVELOPMENT CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:34

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	4079.	139.	.01	*****	37.41	34.58	100.	37.40
1887.	******	4141.	3535.	1.00	*****	*******	.08	.72	
EXIT :XS	50.	4075.	146.	.01	.04	37.45	*******	100.	37.44
1937.	50.	4151.	3378.	1.00	.00	.00	.09	.69	
UP1 :XS	126.	4076.	179.	.00	.08	37.53	*******	100.	37.53
2063.	126.	4218.	4529.	1.02	.00	.00	.08	.56	
UP2 :XS	37.	4071.	188.	.00	.02	37.55	*******	100.	37.55
2100.	37.	4149.	4960.	1.00	.00	.00	.06	.53	

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PRE-DEVELOPMENT CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:34

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	2581.	1036.	.01	*****	38.67	35.94	446.	38.66
1887.	******	5731.	15758.	2.54	*****	*******	.21	.43	
EXIT :XS	50.	2391.	989.	.01	.04	38.71	*******	446.	38.70
1937.	50.	5570.	14904.	2.51	.00	.00	.23	.45	
UP1 :XS	126.	2382.	885.	.01	.11	38.81	*******	446.	38.80
2063.	126.	5422.	14717.	2.77	.00	-.01	.27	.50	
UP2 :XS	37.	2544.	875.	.01	.03	38.84	*******	446.	38.83
2100.	37.	5667.	14991.	2.85	.00	.00	.29	.51	

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PRE-DEVELOPMENT CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:34

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	2360.	1207.	.01	*****	38.72	36.13	512.	38.71
1887.	******	5920.	18090.	2.45	*****	*******	.20	.42	
EXIT :XS	50.	2165.	1168.	.01	.04	38.76	*******	512.	38.75
1937.	50.	5820.	17192.	2.46	.00	.00	.21	.44	
UP1 :XS	126.	2018.	1078.	.01	.11	38.87	*******	512.	38.86

```
     2063.   126.  5870.   16713.  2.98   .00    -.01     .27     .47

 UP2  :XS      37.  2052.    1079.   .01   .03   38.90 *******    512.   38.89
     2100.    37.  6121.   17007.  3.14   .00     .00     .29     .47
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PRE-DEVELOPMENT CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:34

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

 DNSTR:XS    ******  1951.    1579.   .01 *****   38.81   36.46    666.   38.80
     1887. ******  6270.   23536.  2.21 ***** *******      .18     .42

 EXIT :XS      50.  1747.    1563.   .01   .04   38.86 *******    666.   38.85
     1937.    50.  6284.   22704.  2.24   .00     .01     .19     .43

 UP1  :XS     126.  1339.    1560.   .01   .11   38.97 *******    666.   38.96
     2063.   126.  6706.   22376.  2.95   .00     .00     .24     .43

 UP2  :XS      37.  1155.    1590.   .01   .03   39.00 *******    666.   38.99
     2100.    37.  6949.   22737.  3.21   .00     .00     .25     .42
   ER

1  NORMAL  END  OF  WSPRO  EXECUTION.
```

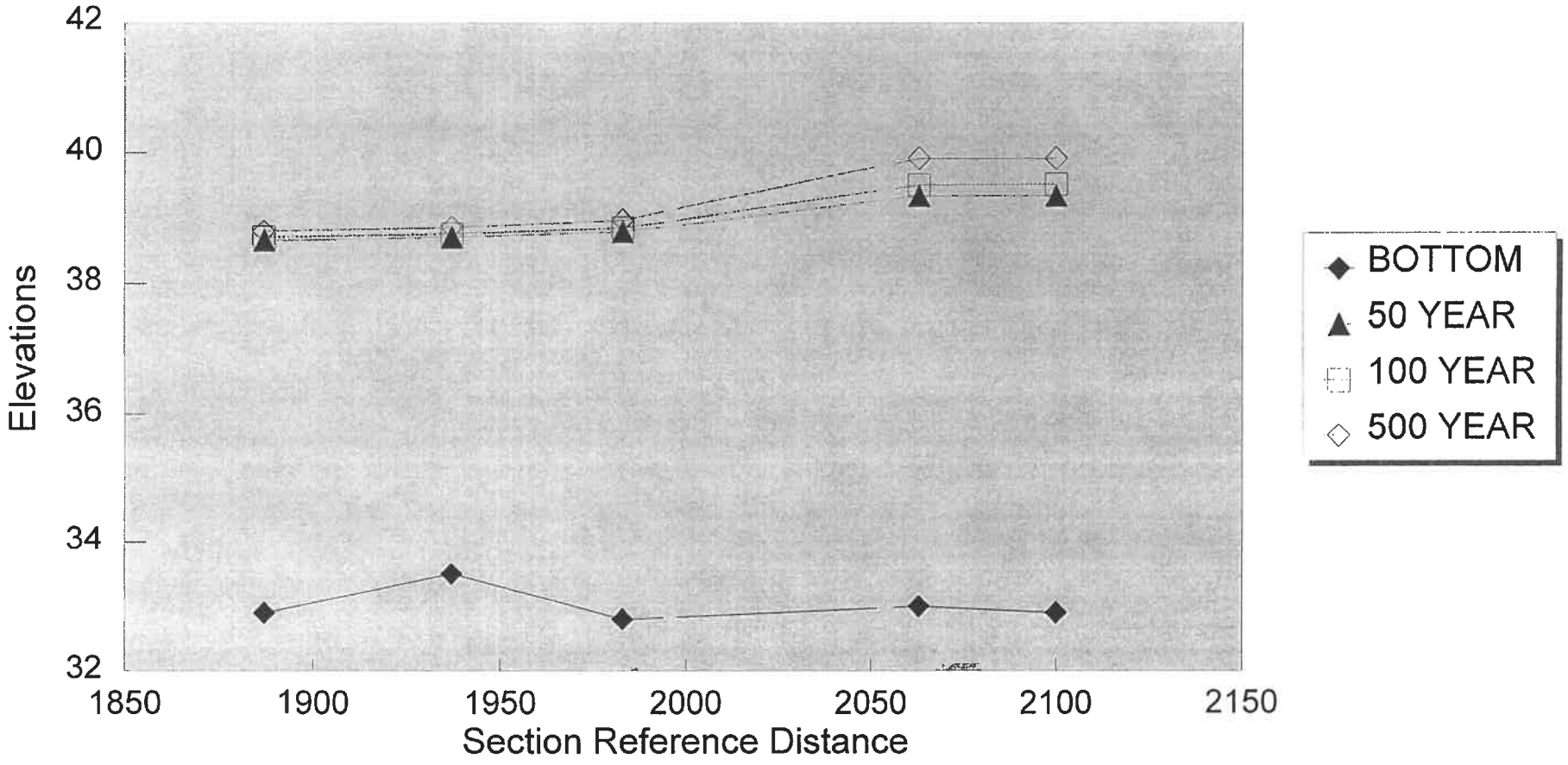
WSPRO

Existing Bridge Analysis

SR 29 York Branch
Bridge No. 050032

Water Surface Profiles

S.R. 29 - York Branch, Existing Conditions



```
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

           *** RUN DATE & TIME: 04-15-96  17:30

  *F
  T1 SR 29 - OPEN CHANNEL ANALYSIS
  T2 BR# 50032, YORK BRANCH
  T3 EXISTING CONDITIONS
  *
  J3        5 6 3 17 13 14 16 28
+++108 NOTE:  iratbl MUST BE 0, 1, OR 2 ON THE J3 COMMAND
+++112 WARNING:  OPTION CODE DEFAULTED TO ZERO
  *
  *  2 YEAR   50 YEAR   100 YEAR   500 YEAR
  Q    100     446        512          666
*** Q-DATA FOR SEC-ID, ISEQ =            1
  *  SLOPE FROM QUAD MAP
  SK 0.0008  0.0008  0.0008  0.0008
  *
  *  CROSS SECTION LOCATED 113' DOWNSTREAM OF BRIDGE
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

*** START PROCESSING CROSS SECTION - "DNSTR"
  XS   DNSTR 1887
  GR 1100,45.0 1101,39.0 3700,38.4 3800,38.2 3900,38.2 3984,37.9
  GR 4038,37.6 4079,37.4 4110,32.9 4143,37.7
  GR 4149,37.7 4163,37.8 4200,37.7 4300,37.8 4400,38.3 6999,39.0 7000,45.0
  N  0.06       0.10   0.06
  SA     4079   4143
  *  EXIT CROSS SECTION LOCATED 63' DOWNSTREAM (EXISTING)

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

--- DATA SUMMARY FOR SECID "DNSTR" AT SRD =   1887.  ERR-CODE =       0

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

X-Y COORDINATE PAIRS  (NGP =  17):
       X       Y          X       Y          X       Y          X       Y
   1100.0   45.00     1101.0   39.00     3700.0   38.40     3800.0   38.20
   3900.0   38.20     3984.0   37.90     4038.0   37.60     4079.0   37.40
   4110.0   32.90     4143.0   37.70     4149.0   37.70     4163.0   37.80
   4200.0   37.70     4300.0   37.80     4400.0   38.30     6999.0   39.00
   7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
   1100.0   45.00     4110.0   32.90     7000.0   45.00     1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4079.   4143.

ROUGHNESS COEFFICIENTS (NSA =  3):
```

```
        .060    .100    .060
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

*** START PROCESSING CROSS SECTION - "EXIT "
  XS   EXIT   1937
  GR 1100,45.0 1101,39.0 3700,38.4 3800,38.3 3900,38.2 3984,38.1
  GR 4072,37.7 4091,35.8 4108,33.4 4149,37.4 4161,37.7 4200,37.7
  GR 4300,37.9 4400,38.3 4500,38.5 4600,38.5 6999,39.0 7000,45.0
  N  0.06    0.10  0.06
  SA     4072    4149
  *  FULL VALLEY CROSS SECTION (PROPOSED) LOCATED 24' DOWNSTREAM

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

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =   1937.  ERR-CODE =      0

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

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
   1100.0   45.00    1101.0   39.00    3700.0   38.40    3800.0   38.30
   3900.0   38.20    3984.0   38.10    4072.0   37.70    4091.0   35.80
   4108.0   33.40    4149.0   37.40    4161.0   37.70    4200.0   37.70
   4300.0   37.90    4400.0   38.30    4500.0   38.50    4600.0   38.50
   6999.0   39.00    7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   1100.0   45.00    4108.0   33.40    7000.0   45.00    1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4072.   4149.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

 *** START PROCESSING CROSS SECTION - "FLVY2"
   XT   FLVY2 1976 0.0008
   GR 1100,45.0 1101,39.0 3600,38.6 3700,38.4 3800,38.4 3900,38.3
   GR 4016,38.0 4100,37.4 4110,33.5 4115,33.8 4122,34.2
   GR 4200,37.6 4300,38.0 4400,38.4 4500,38.6 4600,38.6
   GR 6999,39.0 7000,45.0
   *  FULL VALLEY CROSS SECTION TEMPLATED, LOCATED 17' DOWNSTREAM

 *** FINISH PROCESSING CROSS SECTION - "FLVY2"
 *** TEMPLATE CROSS SECTION "FLVY2" SAVED INTERNALLY.
1
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

*** START PROCESSING CROSS SECTION - "FLVLY"
  XS   FLVLY 1983 * * * 0.0008
  GT
  N  0.06   0.10  0.06
  SA    4072     4149
  *  EXISTING BRIDGE CROSS SECTION

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

--- DATA SUMMARY FOR SECID "FLVLY" AT SRD =   1983.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0008        .50        .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X       Y          X       Y          X       Y          X       Y
   1100.0   45.01     1101.0   39.01     3600.0   38.61     3700.0   38.41
   3800.0   38.41     3900.0   38.31     4016.0   38.01     4100.0   37.41
   4110.0   33.51     4115.0   33.81     4122.0   34.21     4200.0   37.61
   4300.0   38.01     4400.0   38.41     4500.0   38.61     4600.0   38.61
   6999.0   39.01     7000.0   45.01

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
   1100.0   45.01     4110.0   33.51     7000.0   45.01     1100.0   45.01

SUBAREA BREAKPOINTS (NSA =  3):
       4072.   4149.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060     .100     .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

*** START PROCESSING CROSS SECTION - "BRDGE"
  BR   BRDGE 1983
  BL 0       43 4093 4136
  BD         1.5 41.06
  CD         4 35 6.0 41.06 43
  PW 1       33.51,2 38.6,2 38.6,4 40.36,4
  N  0.10
  *  CROSS SECTION LOCATED 63' UPSTREAM

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

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =   1983.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
```

```
      .0        0.      .0008        .50        .00

X-Y COORDINATE PAIRS  (NGP =   9):
       X       Y           X       Y           X       Y           X       Y
  4093.0   39.56     4093.0   37.46     4100.0   37.41     4110.0   33.51
  4115.0   33.81     4122.0   34.21     4136.0   34.82     4136.0   39.56
  4093.0   39.56

 X-Y MAX-MIN POINTS:
     XMIN        Y          X    YMIN       XMAX        Y          X    YMAX
  4093.0   39.56     4110.0   33.51     4136.0   34.82     4093.0   39.56

ROUGHNESS COEFFICIENTS (NSA =  1):
         .100

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH      LSEL  USERCD  EMBSS    EMBELV  WWANGL
    4       35.0    39.56 *******   6.00     41.06   43.00

DESIGN DATA:     BRLEN  LOCOPT  XCONLT  XCONRT
                  43.0      0.    4093.   4136.

                GIRDEP  BDELEV   BDSLP   BDSTA
                  1.50   41.06 ******* *******

 PIER DATA:  NPW =  4     PPCD = 1.
      PELV  PWDTH       PELV  PWDTH       PELV  PWDTH       PELV  PWDTH
      33.51   2.0       38.60   2.0       38.60   4.0       40.36   4.0
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         EXISTING CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:30

 *** START PROCESSING CROSS SECTION - "UP1   "
   AS   UP1      2063
   GR 1100,45.0 1101,39.0 3700,38.6 3800,38.5 3900,38.4 3984,38.1 4035,37.9
   GR 4074,37.7 4121,33.0 4155,37.7 4300,38.1 4400,38.5 4500,38.7
   GR 4600,38.7 6999,39.0 7000,45.0
   N  0.06     0.10     0.06
   SA      4074     4155
   *  CROSS SECTION LOCATED 100' UPSTREAM

 *** FINISH PROCESSING CROSS SECTION - "UP1   "
 *** CROSS SECTION "UP1   " WRITTEN TO DISK, RECORD NO. =  5

 --- DATA SUMMARY FOR SECID "UP1   " AT SRD =    2063.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE         EK         CK
        .0         0.      .0008        .50        .00

 X-Y COORDINATE PAIRS  (NGP =  16):
       X       Y           X       Y           X       Y           X       Y
  1100.0   45.00     1101.0   39.00     3700.0   38.60     3800.0   38.50
  3900.0   38.40     3984.0   38.10     4035.0   37.90     4074.0   37.70
  4121.0   33.00     4155.0   37.70     4300.0   38.10     4400.0   38.50
  4500.0   38.70     4600.0   38.70     6999.0   39.00     7000.0   45.00

  X-Y MAX-MIN POINTS:
     XMIN        Y          X    YMIN       XMAX        Y          X    YMAX
  1100.0   45.00     4121.0   33.00     7000.0   45.00     1100.0   45.00
```

```
SUBAREA BREAKPOINTS (NSA =  3):
       4074.   4155.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

*** START PROCESSING CROSS SECTION - "UP2  "
  XS   UP2   2100
  GR 1100,45.0 1101,39.0 3700,38.7 3800,38.6 3900,38.4 4000,38.1 4016,37.9
  GR 4069,37.7 4115,33.0 4118,32.9 4151,37.8 4213,37.6
  GR 4300,38.1 4400,38.5 4500,38.6 4600,38.7 6999,39.0 7000,45.0
  N  0.06     0.10  0.06
  SA     4069     4151
  HP 1 UP1 39.21 1 39.21

*** FINISH PROCESSING CROSS SECTION - "UP2  "
*** CROSS SECTION "UP2  " WRITTEN TO DISK, RECORD NO. =  6

--- DATA SUMMARY FOR SECID "UP2  " AT SRD =   2100.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0008        .50        .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
   1100.0   45.00    1101.0   39.00    3700.0   38.70    3800.0   38.60
   3900.0   38.40    4000.0   38.10    4016.0   37.90    4069.0   37.70
   4115.0   33.00    4118.0   32.90    4151.0   37.80    4213.0   37.60
   4300.0   38.10    4400.0   38.50    4500.0   38.60    4600.0   38.70
   6999.0   39.00    7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
   1100.0   45.00    4118.0   32.90    7000.0   45.00    1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4069.   4151.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30
    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = UP1  ;  SRD =    2063.

     WSEL  SA#      AREA         K    TOPW    WETP  ALPH     LEW     REW      QCR
              1    1405.    21166.  2973.  2973.                          5480.
              2     313.    11411.    81.    82.                          3486.
```

```
            3    1257.   18102.  2844.  2844.                        4740.
    39.21        2974.   50679.  5898.  5899.  1.61  1101.  6999.    9431.
1
  HP 2 UP1 39.21 * * 446
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30


    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = UP1  ;  SRD =    2063.

         WSEL     LEW     REW    AREA        K        Q    VEL
        39.21  1101.0  6999.0  2974.2   50679.     446.    .15

 X STA.      1101.0     2182.8     2680.0     3049.1     3364.4     3638.7
   A(I)           317.3      206.2      177.7      168.4      158.9
   V(I)             .07        .11        .13        .13        .14

 X STA.      3638.7     3860.3     3983.9     4054.6     4098.1     4111.4
   A(I)           147.7      111.9       88.5       93.6       61.0
   V(I)             .15        .20        .25        .24        .37

 X STA.      4111.4     4121.3     4132.0     4162.0     4219.4     4293.4
   A(I)            57.3       57.6       82.0       81.0       91.0
   V(I)             .39        .39        .27        .28        .25

 X STA.      4293.4     4430.5     4840.8     5278.5     5848.5     6999.0
   A(I)           119.1      210.5      198.1      222.0      324.4
   V(I)             .19        .11        .11        .10        .07
1
   HP 1 BRDGE 38.60 1 38.60
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30
    CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = BRDGE;  SRD =    1983.

     WSEL  SA#      AREA         K   TOPW   WETP  ALPH    LEW     REW      QCR
             1      154.    4931.    43.    49.                          1650.
    38.60           154.    4931.    43.    49.  1.00  4093.   4136.    1650.
1
   HP 2 BRDGE 38.60 * * 446
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30
```

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1983.

WSEL	LEW	REW	AREA	K	Q	VEL
38.60	4093.0	4136.0	153.8	4931.	446.	2.90

X STA.	4093.0	4107.0	4108.6	4109.8	4111.0	4112.2
A(I)		26.1	6.6	6.1	6.0	5.8
V(I)		.86	3.36	3.64	3.72	3.83

X STA.	4112.2	4113.4	4114.6	4115.9	4117.2	4118.5
A(I)		5.9	6.0	6.1	6.1	6.0
V(I)		3.76	3.73	3.68	3.65	3.71

X STA.	4118.5	4119.9	4121.3	4122.8	4124.3	4125.8
A(I)		6.2	6.5	6.5	6.5	6.5
V(I)		3.57	3.42	3.42	3.44	3.45

X STA.	4125.8	4127.4	4129.0	4130.6	4132.3	4136.0
A(I)		6.7	6.4	6.7	6.7	14.3
V(I)		3.32	3.47	3.31	3.35	1.56

1
HP 1 UP1 39.41 1 39.41
1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

CROSS-SECTION PROPERTIES: ISEQ = 5; SECID = UP1 ; SRD = 2063.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	2000.	38114.	2973.	2973.				9305.
	2	329.	12414.	81.	82.				3760.
	3	1825.	33726.	2844.	2844.				8298.
39.41		4154.	84254.	5898.	5899.	1.24	1101.	6999.	17750.

1
HP 2 UP1 39.41 * * 512
1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

VELOCITY DISTRIBUTION: ISEQ = 5; SECID = UP1 ; SRD = 2063.

WSEL	LEW	REW	AREA	K	Q	VEL
39.41	1100.9	6999.1	4153.8	84254.	512.	.12

X STA.	1100.9	1805.9	2291.7	2682.1	3016.5	3315.2
A(I)		327.3	270.0	243.3	227.1	217.4
V(I)		.08	.09	.11	.11	.12

X STA.	3315.2	3588.0	3828.1	3983.8	4070.8	4108.9
A(I)		210.6	201.7	167.3	129.4	125.9
V(I)		.12	.13	.15	.20	.20

X STA.	4108.9	4124.5	4155.3	4232.7	4338.5	4598.8

```
 A(I)              91.8       117.2       124.0       142.0       214.7
 V(I)               .28         .22         .21         .18         .12

X STA.       4598.8      4956.3      5327.6      5768.5      6276.5      6999.1
 A(I)             245.9       238.5       260.7       270.3       328.9
 V(I)               .10         .11         .10         .09         .08
1
 HP 1 BRDGE 38.69 1 38.69
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30
    CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = BRDGE;  SRD =    1983.

     WSEL  SA#      AREA         K   TOPW   WETP  ALPH    LEW     REW      QCR
             1      158.     5127.    43.    49.                          1713.
    38.69           158.     5127.    43.    49.  1.00  4093.   4136.    1713.
1
  HP 2 BRDGE 38.69 * * 512
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30


    VELOCITY DISTRIBUTION:  ISEQ =  4;  SECID = BRDGE;  SRD =    1983.

         WSEL      LEW      REW     AREA         K         Q    VEL
        38.69  4093.0   4136.0    157.6     5127.      512.   3.25

X STA.       4093.0      4106.7      4108.4      4109.7      4110.9      4112.0
 A(I)             26.3         6.9         6.4         5.9         6.0
 V(I)              .97        3.69        4.00        4.31        4.26

X STA.       4112.0      4113.3      4114.5      4115.8      4117.1      4118.4
 A(I)              6.2         6.1         6.2         6.3         6.2
 V(I)             4.10        4.17        4.13        4.09        4.16

X STA.       4118.4      4119.8      4121.2      4122.7      4124.2      4125.8
 A(I)              6.4         6.7         6.7         6.7         6.8
 V(I)             4.00        3.82        3.83        3.85        3.77

X STA.       4125.8      4127.3      4128.9      4130.6      4132.3      4136.0
 A(I)              6.6         6.8         6.7         7.1        14.7
 V(I)             3.89        3.78        3.83        3.62        1.74
1
  HP 1 UP1 39.86 1 39.86
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                    (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
```

*** RUN DATE & TIME: 04-15-96 17:30

CROSS-SECTION PROPERTIES: ISEQ = 5; SECID = UP1 ; SRD = 2063.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	3337.	89504.	2973.	2974.				20065.
	2	365.	14790.	81.	82.				4402.
	3	3105.	81750.	2844.	2845.				18412.
39.86		6808.	186045.	5898.	5900.	1.05	1101.	6999.	40589.

1
HP 2 UP1 39.86 * * 666
1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

VELOCITY DISTRIBUTION: ISEQ = 5; SECID = UP1 ; SRD = 2063.

WSEL	LEW	REW	AREA	K	Q	VEL
39.86	1100.9	6999.1	6808.0	186045.	666.	.10

X STA.	1100.9	1569.9	1985.5	2349.4	2685.1	2995.2
A(I)		420.3	400.7	372.7	361.8	349.8
V(I)		.08	.08	.09	.09	.10
X STA.	2995.2	3285.1	3559.9	3814.4	3999.2	4102.9
A(I)		340.3	334.4	325.8	283.8	252.2
V(I)		.10	.10	.10	.12	.13
X STA.	4102.9	4136.2	4245.1	4411.4	4710.4	5028.5
A(I)		196.2	248.3	272.1	353.9	358.4
V(I)		.17	.13	.12	.09	.09
X STA.	5028.5	5363.4	5716.3	6107.9	6524.0	6999.1
A(I)		363.4	367.9	390.0	393.4	422.7
V(I)		.09	.09	.09	.08	.08

1
HP 1 BRDGE 38.85 1 38.85
1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

CROSS-SECTION PROPERTIES: ISEQ = 4; SECID = BRDGE; SRD = 1983.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	165.	5481.	43.	49.				1826.
38.85		165.	5481.	43.	49.	1.00	4093.	4136.	1826.

1
HP 2 BRDGE 38.85 * * 666
1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS

BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1983.

WSEL	LEW	REW	AREA	K	Q	VEL
38.85	4093.0	4136.0	164.5	5481.	666.	4.05

X STA.	4093.0	4106.3	4108.1	4109.4	4110.7	4111.8
A(I)		26.9	7.3	6.8	6.4	6.3
V(I)		1.24	4.54	4.91	5.22	5.31
X STA.	4111.8	4113.1	4114.3	4115.6	4116.9	4118.3
A(I)		6.4	6.4	6.5	6.6	6.5
V(I)		5.21	5.17	5.11	5.07	5.14
X STA.	4118.3	4119.7	4121.1	4122.6	4124.1	4125.7
A(I)		6.7	7.0	7.0	6.9	6.9
V(I)		4.98	4.76	4.77	4.79	4.80
X STA.	4125.7	4127.3	4128.9	4130.5	4132.2	4136.0
A(I)		7.0	7.1	7.0	7.1	15.7
V(I)		4.73	4.70	4.76	4.66	2.12

1
EX

+++ BEGINNING PROFILE CALCULATIONS -- 4

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	4079.	139.	.01	*****	37.41	34.58	100.	37.40
1887.	******	4141.	3535.	1.00	*****	*******	.08	.72	
EXIT :XS	50.	4075.	146.	.01	.04	37.45	*******	100.	37.44
1937.	50.	4151.	3378.	1.00	.00	.00	.09	.69	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FLVLY" KRATIO = 1.43

FLVLY:FV	46.	4090.	187.	.00	.03	37.48	*******	100.	37.48
1983.	46.	4197.	4813.	1.00	.00	.00	.07	.54	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

UP1 :AS	80.	4076.	176.	.01	.04	37.52	*******	100.	37.51
2063.	80.	4154.	4480.	1.00	.00	.00	.07	.57	

<<<<<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.	4093.	106.	.02	.05	37.50	34.99	100.	37.48

```
     1983.    46.  4136.    2728.  1.21   .00     .00     .12     .95

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB.  XRAB
       4.   1.   1.   .907   .075   39.56    43.  4093.  4136.

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

UP1  :AS      45.  4075.     183.   .00   .04   37.61   34.53    100.   37.61
     2063.    46.  4154.    4732.  1.00   .07     .00     .06     .55

       M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
       .447   .010    4693.  4092.  4135.    37.59

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

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

UP2  :XS      37.  4070.     194.   .00   .02   37.63 *******    100.   37.62
     2100.    37.  4217.    5178.  1.00   .00     .00     .06     .52
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         EXISTING CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:30
   FIRST USER DEFINED TABLE.

    XSID:CODE       Q    SRD    WSEL     AREA     VEL      FR#        K   XSTW
   DNSTR:XS       100.  1887.   37.40     139.     .72     .08    3535.    62.
   EXIT :XS       100.  1937.   37.44     146.     .69     .09    3378.    76.
   FLVLY:FV       100.  1983.   37.48     187.     .54     .07    4813.   107.
   BRDGE:BR       100.  1983.   37.48     106.     .95     .12    2728.    43.
   UP1  :AS       100.  2063.   37.61     183.     .55     .06    4732.    79.
   UP2  :XS       100.  2100.   37.62     194.     .52     .06    5178.    91.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         EXISTING CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:30

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

DNSTR:XS   ******  2581.    1036.   .01 *****   38.67   35.94    446.   38.66
     1887. ******  5731.   15758.  2.54 ***** *******     .21     .43

EXIT :XS      50.  2391.     989.   .01   .04   38.71 *******    446.   38.70
     1937.    50.  5570.   14904.  2.51   .00     .00     .23     .45

FLVLY:FV      46.  2741.     865.   .01   .05   38.75 *******    446.   38.74
     1983.    46.  5425.   13385.  2.34   .00     .00     .24     .52
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

UP1  :AS      80.  2284.     902.   .01   .08   38.83 *******    446.   38.82
     2063.    80.  5543.   14738.  2.89   .00    -.01     .28     .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.	4093.	162.	.15	.12	38.93	36.26	446.	38.78
1983.	46.	4136.	5331.	1.29	.11	.00	.28	2.76	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
4.	1.	1.	.882	.068	39.56	43.	4093.	4136.

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
UP1 :AS	45.	1101.	3610.	.00	.07	39.32	35.78	446.	39.32
2063.	124.	6999.	67814.	1.36	.32	-.01	.03	.12	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.987	.866	9386.	4091.	4134.	39.32

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

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
UP2 :XS	37.	1101.	3508.	.00	.00	39.32	*******	446.	39.32
2100.	37.	6999.	65242.	1.43	.00	.00	.03	.13	

1

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

FIRST USER DEFINED TABLE.

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
DNSTR:XS	446.	1887.	38.66	1036.	.43	.21	15758.	3150.
EXIT :XS	446.	1937.	38.70	989.	.45	.23	14904.	3180.
FLVLY:FV	446.	1983.	38.74	865.	.52	.24	13385.	2684.
BRDGE:BR	446.	1983.	38.78	162.	2.76	.28	5331.	43.
UP1 :AS	446.	2063.	39.32	3610.	.12	.03	67814.	5898.
UP2 :XS	446.	2100.	39.32	3508.	.13	.03	65242.	5898.

1

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
EXISTING CONDITIONS
*** RUN DATE & TIME: 04-15-96 17:30

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	2360.	1207.	.01	*****	38.72	36.13	512.	38.71
1887.	******	5920.	18090.	2.45	*****	*******	.20	.42	
EXIT :XS	50.	2165.	1168.	.01	.04	38.76	*******	512.	38.75
1937.	50.	5820.	17192.	2.46	.00	.00	.21	.44	
FLVLY:FV	46.	2410.	1025.	.01	.05	38.81	*******	512.	38.80
1983.	46.	5743.	15069.	2.45	.00	.00	.25	.50	

```
        <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

UP1  :AS      80.  1910.    1114.   .01   .08   38.89 *******     512.   38.88
     2063.    80.  6004.   17000.  3.06   .00     .00     .27     .46
        <<<<<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.  4093.     164.   .19   .13   39.03   36.46     512.   38.84
     1983.    46.  4136.    5466.  1.26   .14     .00     .32    3.12

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
        4.   1.   1.   .890   .068   39.56    43.  4093.  4136.

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

UP1  :AS      45.  1101.    4649.   .00   .07   39.49   35.94     512.   39.49
     2063.   145.  6999.  100615.  1.17   .39     .01     .02     .11

       M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
       .989   .901     9788.  4090.  4133.    39.49

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

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

UP2  :XS      37.  1101.    4547.   .00   .00   39.50 *******     512.   39.50
     2100.    37.  6999.   97429.  1.20   .00     .00     .02     .11
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30
  FIRST USER DEFINED TABLE.

    XSID:CODE        Q     SRD     WSEL      AREA      VEL      FR#         K   XSTW
    DNSTR:XS       512.  1887.    38.71    1207.      .42      .20   18090.  3561.
    EXIT :XS       512.  1937.    38.75    1168.      .44      .21   17192.  3655.
    FLVLY:FV       512.  1983.    38.80    1025.      .50      .25   15069.  3333.
    BRDGE:BR       512.  1983.    38.84     164.     3.12      .32    5466.    43.
    UP1  :AS       512.  2063.    39.49    4649.      .11      .02  100615.  5898.
    UP2  :XS       512.  2100.    39.50    4547.      .11      .02   97429.  5898.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        EXISTING CONDITIONS
           *** RUN DATE & TIME: 04-15-96  17:30

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

DNSTR:XS    ******  1951.    1579.   .01 *****   38.81   36.46     666.   38.80
     1887.  ******  6270.   23536.  2.21 ***** *******     .18     .42
```

```
EXIT :XS      50.  1747.    1563.   .01   .04   38.86 *******    666.   38.85
     1937.    50.  6284.   22704.  2.24   .00     .01     .19     .43

FLVLY:FV      46.  1796.    1411.   .01   .05   38.90 *******    666.   38.89
     1983.    46.  6332.   19708.  2.40   .00     .00     .23     .47
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

UP1  :AS      80.  1233.    1619.   .01   .08   38.99 *******    666.   38.98
     2063.    80.  6837.   23029.  2.97   .00     .01     .23     .41
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===220 FLOW CLASS 1 (4) SOLUTION INDICATES POSSIBLE PRESSURE FLOW.
           WS3,WSIU,WS1,LSEL =    38.96      39.82      39.90      39.56

 ===245 ATTEMPTING FLOW CLASS 2 (5) SOLUTION.

 ===250 INSUFFICIENT HEAD FOR PRESSURE FLOW.
                        YU/Z,WSIU,WS = 1.07      39.84      39.92

 ===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      46.  4093.     169.   .30   .16   39.25   36.87    666.   38.96
     1983.    46.  4136.    5724.  1.23   .24     .00     .39    3.94

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.   1.   1.   .901   .069   39.56    43.  4093.  4136.

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

UP1  :AS      45.  1101.    7019.   .00   .07   39.90   36.27    666.   39.90
     2063.   185.  6999.  195570.  1.04   .57     .00     .02     .09

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .992   .944   10978.  4089.  4132.    39.90

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

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

UP2  :XS      37.  1101.    6914.   .00   .00   39.90 *******    666.   39.90
     2100.    37.  6999.  190980.  1.05   .00     .00     .02     .10
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         EXISTING CONDITIONS
            *** RUN DATE & TIME: 04-15-96  17:30
   FIRST USER DEFINED TABLE.

     XSID:CODE       Q     SRD     WSEL      AREA      VEL      FR#        K   XSTW
    DNSTR:XS       666.  1887.    38.80     1579.      .42      .18    23536.  4319.
    EXIT :XS       666.  1937.    38.85     1563.      .43      .19    22704.  4537.
    FLVLY:FV       666.  1983.    38.89     1411.      .47      .23    19708.  4536.
    BRDGE:BR       666.  1983.    38.96      169.     3.94      .39     5724.    43.
    UP1  :AS       666.  2063.    39.90     7019.      .09      .02   195570.  5898.
```

```
 UP2  :XS      666.  2100.   39.90    6914.      .10      .02  190980.  5898.
ER

 1  NORMAL  END  OF  WSPRO  EXECUTION.
```

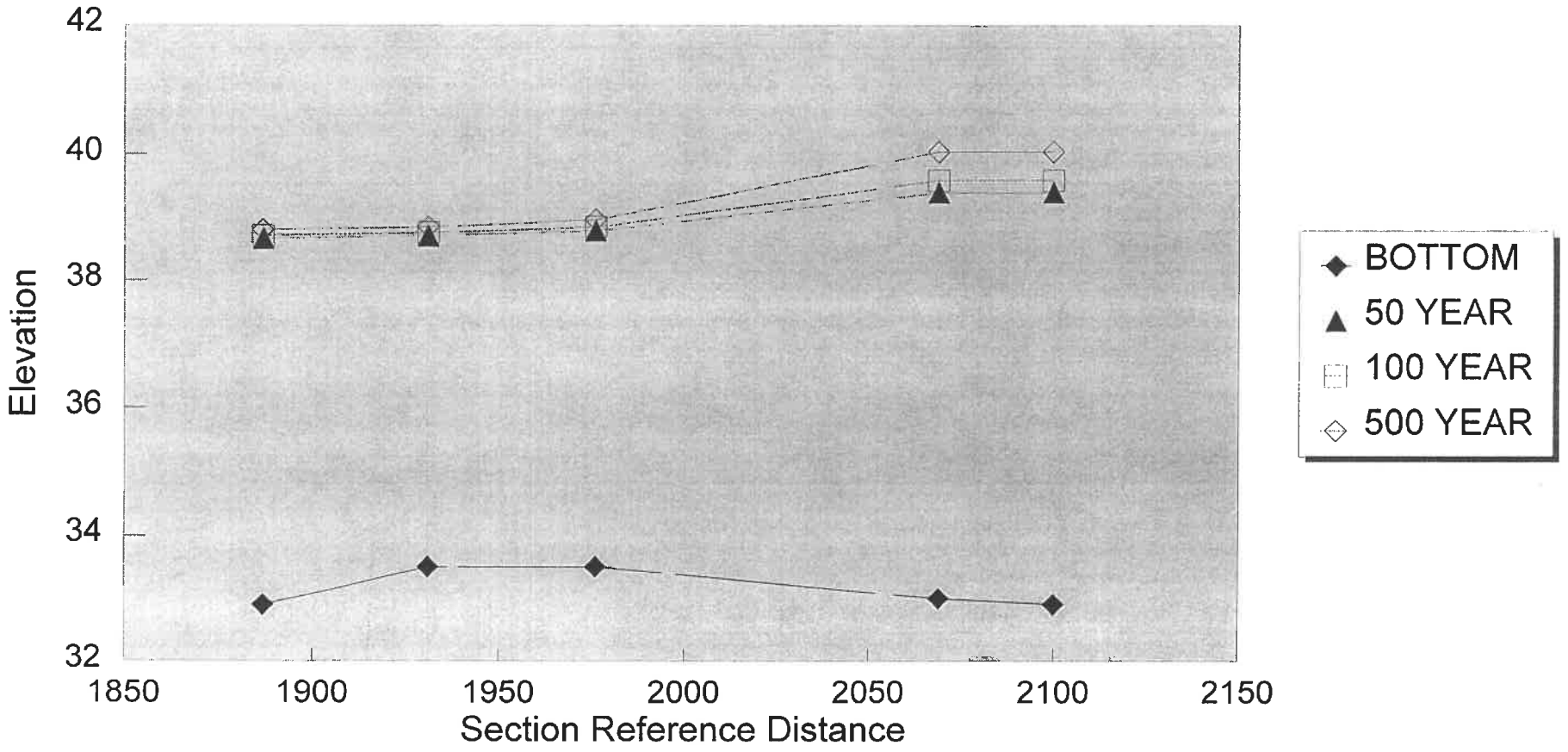
WSPRO

Proposed Bridge Analysis

SR 29 York Branch
Bridge No. 050032

Water Surface Profile

S.R. 29 - York Branch, Proposed Conditions



```
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

           *** RUN DATE & TIME: 04-15-96  17:36

  *F
  T1 SR 29 - OPEN CHANNEL ANALYSIS
  T2 BR# 50032, YORK BRANCH
  T3 PROPOSED WIDENED BRIDGE
  *
  J3        5  6  3  17  13  14  16  28
+++108 NOTE:  iratbl MUST BE 0, 1, OR 2 ON THE J3 COMMAND
+++112 WARNING:  OPTION CODE DEFAULTED TO ZERO
  *  2 YEAR   50 YEAR   100 YEAR   500 YEAR
  Q   100     446        512         666
*** Q-DATA FOR SEC-ID, ISEQ =             1
  *  SLOPE FROM QUAD MAP
  SK 0.0008  0.0008  0.0008  0.0008
  *
  *  CROSS SECTION LOCATED 113' DOWNSTREAM OF BRIDGE
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36

*** START PROCESSING CROSS SECTION - "DNSTR"
  XS   DNSTR 1887
  GR 1100,45.0 1101,39.0 3700,38.4 3800,38.2 3900,38.2 3984,37.9
  GR 4038,37.6 4079,37.4 4110,32.9 4143,37.7
  GR 4149,37.7 4163,37.8 4200,37.7 4300,37.8 4400,38.3 6999,39.0 7000,45.0
  N  0.06   0.10    0.06
  SA     4079   4143
  *  CROSS SECTION LOCATED 63' DOWNSTREAM (EXISTING)

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

--- DATA SUMMARY FOR SECID "DNSTR" AT SRD =   1887.  ERR-CODE =       0

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

X-Y COORDINATE PAIRS  (NGP =  17):
       X       Y          X       Y          X       Y          X       Y
   1100.0   45.00     1101.0   39.00     3700.0   38.40     3800.0   38.20
   3900.0   38.20     3984.0   37.90     4038.0   37.60     4079.0   37.40
   4110.0   32.90     4143.0   37.70     4149.0   37.70     4163.0   37.80
   4200.0   37.70     4300.0   37.80     4400.0   38.30     6999.0   39.00
   7000.0   45.00

 X-Y MAX-MIN POINTS:
      XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
   1100.0   45.00     4110.0   32.90     7000.0   45.00     1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4079.    4143.

ROUGHNESS COEFFICIENTS (NSA =  3):
          .060     .100     .060
```

```
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36

*** START PROCESSING CROSS SECTION - "EXIT "
  XT   EXIT  1937
  GR 1100,45.0 1101,39.0 3700,38.4 3800,38.3 3900,38.2 3984,38.1
  GR 4072,37.7 4091,35.8 4108,33.4 4149,37.4 4161,37.7
  GR 4200,37.7 4300,37.9 4400,38.3 4500,38.5 4600,38.5 6999,39.0 7000,45.0
  *  EXIT CROSS SECTION TEMPLATED FROM STA 1937(69' DOWNSTREAM)

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** TEMPLATE CROSS SECTION "EXIT " SAVED INTERNALLY.
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36

*** START PROCESSING CROSS SECTION - "EXT2 "
  XS   EXT2  1931 0.0008
  GT
  N  0.06     0.10   0.06
  SA     4072   4149
  *  FULL VALLEY CROSS SECTION (PROPOSED) LOCATED 24' DOWNSTREAN

*** FINISH PROCESSING CROSS SECTION - "EXT2 "
*** CROSS SECTION "EXT2 " WRITTEN TO DISK, RECORD NO. =  2

--- DATA SUMMARY FOR SECID "EXT2 " AT SRD =   1931.  ERR-CODE =       0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0000        .50        .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X       Y          X       Y          X       Y          X       Y
    1100.0   45.00     1101.0   39.00     3700.0   38.40     3800.0   38.30
    3900.0   38.20     3984.0   38.10     4072.0   37.70     4091.0   35.80
    4108.0   33.40     4149.0   37.40     4161.0   37.70     4200.0   37.70
    4300.0   37.90     4400.0   38.30     4500.0   38.50     4600.0   38.50
    6999.0   39.00     7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN        Y          X     YMIN       XMAX        Y          X     YMAX
    1100.0   45.00     4108.0   33.40     7000.0   45.00     1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
        4072.   4149.

ROUGHNESS COEFFICIENTS (NSA =  3):
          .060     .100     .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)
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        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36

*** START PROCESSING CROSS SECTION - "FLVY2"
  XS   FLVY2 1976 * * * 0.0008
  GR 1100,45.0 1101,39.0 3600,38.6 3700,38.4 3800,38.4 3900,38.3
  GR 4016,38.0 4100,37.4 4110,33.5 4115,33.8
  GR 4122,34.2 4200,37.6
  GR 4300,38.0 4400,38.4 4500,38.6 4600,38.6 6999,39.0 7000,45.0
  N  0.06   0.10    0.06
  SA 4072  4149
  *  PROPOSED BRIDGE CROSS SECTION

*** FINISH PROCESSING CROSS SECTION - "FLVY2"
*** CROSS SECTION "FLVY2" WRITTEN TO DISK, RECORD NO. =  3

--- DATA SUMMARY FOR SECID "FLVY2" AT SRD =   1976.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0008        .50        .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X       Y          X       Y          X       Y          X       Y
   1100.0   45.00     1101.0   39.00     3600.0   38.60     3700.0   38.40
   3800.0   38.40     3900.0   38.30     4016.0   38.00     4100.0   37.40
   4110.0   33.50     4115.0   33.80     4122.0   34.20     4200.0   37.60
   4300.0   38.00     4400.0   38.40     4500.0   38.60     4600.0   38.60
   6999.0   39.00     7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
   1100.0   45.00     4110.0   33.50     7000.0   45.00     1100.0   45.00

SUBAREA BREAKPOINTS (NSA =  3):
       4072.   4149.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36

*** START PROCESSING CROSS SECTION - "BRDGE"
  BR   BRDGE 1976
  BL 0       43 4093 4136
  BD         1.5 41.06
  CD         4 47.1 6.0 41.06 43
  PW 1       33.5,2 38.6,2 38.6,4 40.36,4
  N  0.10
  *  CROSS SECTION LOCATED 63' UPSTREAM

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

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =   1976.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0008        .50        .00
```

```
X-Y COORDINATE PAIRS  (NGP =   9):
       X      Y          X      Y          X      Y          X      Y
   4093.0   39.56    4093.0   37.45    4100.0   37.40    4110.0   33.50
   4115.0   33.80    4122.0   34.20    4136.0   34.81    4136.0   39.56
   4093.0   39.56

 X-Y MAX-MIN POINTS:
     XMIN       Y         X    YMIN      XMAX       Y         X    YMAX
   4093.0   39.56    4110.0   33.50    4136.0   34.81    4093.0   39.56

ROUGHNESS COEFFICIENTS (NSA =  1):
         .100

 BRIDGE PARAMETERS:
  BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
     4      47.1    39.56 *******   6.00    41.06   43.00

 DESIGN DATA:     BRLEN  LOCOPT  XCONLT  XCONRT
                   43.0       0.   4093.   4136.

                GIRDEP  BDELEV   BDSLP   BDSTA
                  1.50   41.06 ******* *******

 PIER DATA:  NPW =  4    PPCD = 1.
      PELV  PWDTH       PELV  PWDTH       PELV  PWDTH       PELV  PWDTH
      33.50   2.0       38.60   2.0       38.60   4.0       40.36   4.0
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36

 *** START PROCESSING CROSS SECTION - "UP1  "
   XT   UP1    2063 0.0008
   GR 1100,45.0 1101,39.0 3700,38.6 3800,38.5 3900,38.4 3984,38.1 4035,37.9
   GR 4074,37.7 4121,33.0 4155,37.7 4200,37.4 4300,38.1 4400,38.5 4500,38.7
   GR 4600,38.7 6999,39.0 7000,45.0
   *  CROSS SECTION, TEMPLATED 69' UPSTREAM

 *** FINISH PROCESSING CROSS SECTION - "UP1  "
 *** TEMPLATE CROSS SECTION "UP1  " SAVED INTERNALLY.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36

 *** START PROCESSING CROSS SECTION - "PRO2 "
   AS    PRO2     2069 * * * 0.0008
   GT
   N  0.06    0.10    0.06
   SA      4074    4155
   *  CROSS SECTION LOCATED 100' UPSTREAM

 *** FINISH PROCESSING CROSS SECTION - "PRO2 "
 *** CROSS SECTION "PRO2 " WRITTEN TO DISK, RECORD NO. =  5
```

```
--- DATA SUMMARY FOR SECID "PRO2 " AT SRD =   2069.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0008        .50        .00

X-Y COORDINATE PAIRS  (NGP =  17):
       X       Y          X       Y          X       Y          X       Y
   1100.0   45.00     1101.0   39.00     3700.0   38.60     3800.0   38.50
   3900.0   38.40     3984.0   38.10     4035.0   37.90     4074.0   37.70
   4121.0   33.00     4155.0   37.70     4200.0   37.40     4300.0   38.10
   4400.0   38.50     4500.0   38.70     4600.0   38.70     6999.0   39.00
   7000.0   45.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
   1100.0   45.00     4121.0   33.00     7000.0   45.00     1100.0   45.00

 SUBAREA BREAKPOINTS (NSA =  3):
        4074.   4155.

 ROUGHNESS COEFFICIENTS (NSA =  3):
          .060    .100    .060

 BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                         ******* ******* ******* *******
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36

 *** START PROCESSING CROSS SECTION - "UP2  "
   XS   UP2   2100
   GR 1100,45.0 1101,39.0 3700,38.7 3800,38.6 3900,38.4 4000,38.1 4016,37.9
   GR 4069,37.7 4115,33.0 4118,32.9 4151,37.8 4213,37.6
   GR 4300,38.1 4400,38.5 4500,38.6 4600,38.7 6999,39.0 7000,45.0
   N  0.06  0.10   0.06
   SA     4069    4151
   HP 1 PRO2 39.29 1 39.29

 *** FINISH PROCESSING CROSS SECTION - "UP2  "
 *** CROSS SECTION "UP2  " WRITTEN TO DISK, RECORD NO. =  6

 --- DATA SUMMARY FOR SECID "UP2  " AT SRD =   2100.  ERR-CODE =      0

      SKEW      IHFNO     VSLOPE         EK         CK
        .0         0.      .0008        .50        .00

 X-Y COORDINATE PAIRS  (NGP =  18):
       X       Y          X       Y          X       Y          X       Y
    1100.0   45.00     1101.0   39.00     3700.0   38.70     3800.0   38.60
    3900.0   38.40     4000.0   38.10     4016.0   37.90     4069.0   37.70
    4115.0   33.00     4118.0   32.90     4151.0   37.80     4213.0   37.60
    4300.0   38.10     4400.0   38.50     4500.0   38.60     4600.0   38.70
    6999.0   39.00     7000.0   45.00

  X-Y MAX-MIN POINTS:
      XMIN       Y          X     YMIN       XMAX       Y          X     YMAX
    1100.0   45.00     4118.0   32.90     7000.0   45.00     1100.0   45.00

 SUBAREA BREAKPOINTS (NSA =  3):
        4069.   4151.
```

```
ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .100    .060
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36
    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = PRO2 ;  SRD =    2069.

      WSEL  SA#      AREA        K    TOPW    WETP  ALPH    LEW     REW      QCR
              1     1629.    27073.  2973.   2973.                          6839.
              2      319.    11784.    81.     82.                          3588.
              3     1501.    24348.  2844.   2844.                          6189.
    39.29           3448.    63204.  5898.   5899.  1.41  1101.   6999.   12589.
1
  HP 2 PRO2 39.29 * * 446
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36


    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = PRO2 ;  SRD =    2069.

         WSEL     LEW      REW     AREA        K         Q     VEL
        39.29  1101.0   6999.0  3448.5    63204.     446.     .13

X STA.      1101.0     2006.6     2516.6     2903.0     3224.2     3508.6
  A(I)             321.4      236.5      205.9      188.6      180.3
  V(I)               .07        .09        .11        .12        .12

X STA.      3508.6     3767.9     3945.4     4036.6     4095.6     4112.1
  A(I)             177.2      152.1      110.8      113.2       75.5
  V(I)               .13        .15        .20        .20        .30

X STA.      4112.1     4124.1     4140.1     4191.6     4240.9     4323.5
  A(I)              70.9       75.8      101.6       86.9      109.0
  V(I)               .31        .29        .22        .26        .20

X STA.      4323.5     4613.2     5028.4     5475.9     6051.8     6999.0
  A(I)             206.5      231.5      225.4      253.2      326.3
  V(I)               .11        .10        .10        .09        .07
1
  HP 1 BRDGE 38.60 1 38.60
1
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36
    CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = BRDGE;  SRD =    1976.
```

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	154.	4943.	43.	49.				1654.
38.60		154.	4943.	43.	49.	1.00	4093.	4136.	1654.

1
HP 2 BRDGE 38.60 * * 446
1

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1976.

WSEL	LEW	REW	AREA	K	Q	VEL
38.60	4093.0	4136.0	154.0	4943.	446.	2.90

X STA.	4093.0	4107.0	4108.6	4109.8	4111.0	4112.2
A(I)		26.1	6.7	6.1	5.8	5.9
V(I)		.85	3.35	3.64	3.83	3.80

X STA.	4112.2	4113.4	4114.6	4115.9	4117.2	4118.5
A(I)		6.1	6.0	6.1	6.1	6.0
V(I)		3.66	3.72	3.68	3.65	3.71

X STA.	4118.5	4119.9	4121.3	4122.8	4124.3	4125.8
A(I)		6.2	6.5	6.5	6.5	6.6
V(I)		3.57	3.41	3.42	3.44	3.37

X STA.	4125.8	4127.4	4129.0	4130.6	4132.3	4136.0
A(I)		6.4	6.6	6.7	6.7	14.3
V(I)		3.48	3.38	3.31	3.34	1.56

1
HP 1 PRO2 39.41 1 39.41
1

CROSS-SECTION PROPERTIES: ISEQ = 5; SECID = PRO2 ; SRD = 2069.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	1985.	37662.	2973.	2973.				9206.
	2	328.	12389.	81.	82.				3753.
	3	1843.	34255.	2844.	2844.				8415.
39.41		4156.	84306.	5898.	5899.	1.24	1101.	6999.	17778.

1
HP 2 PRO2 39.41 * * 512
1

```
     VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = PRO2 ;  SRD =    2069.

          WSEL      LEW      REW     AREA        K         Q    VEL
         39.41  1100.9   6999.1   4156.3    84306.      512.    .12

  X STA.      1100.9     1806.4     2310.6     2704.4     3034.1     3337.0
    A(I)          324.1      278.6      244.8      223.3      219.9
    V(I)            .08        .09        .10        .11        .12

  X STA.      3337.0     3609.1     3844.4     3994.4     4082.8     4111.0
    A(I)          209.6      199.2      165.1      139.3      112.9
    V(I)            .12        .13        .16        .18        .23

  X STA.      4111.0     4126.4     4163.6     4221.4     4301.9     4532.3
    A(I)           91.7      120.1      109.8      126.7      211.3
    V(I)            .28        .21        .23        .20        .12

  X STA.      4532.3     4904.0     5291.2     5735.4     6254.5     6999.1
    A(I)          256.3      249.0      262.5      275.5      336.3
    V(I)            .10        .10        .10        .09        .08
1
    HP 1 BRDGE 38.68 1 38.68
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36
     CROSS-SECTION PROPERTIES:  ISEQ =  4;  SECID = BRDGE;  SRD =    1976.

       WSEL  SA#      AREA         K   TOPW   WETP  ALPH    LEW    REW      QCR
              1      157.     5117.    43.    49.                         1710.
     38.68           157.     5117.    43.    49.  1.00  4093.  4136.    1710.
1
    HP 2 BRDGE 38.68 * * 512
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36



     VELOCITY DISTRIBUTION:  ISEQ =  4;  SECID = BRDGE;  SRD =    1976.

          WSEL      LEW      REW     AREA        K         Q    VEL
         38.68  4093.0   4136.0    157.4     5117.      512.   3.25

  X STA.      4093.0     4106.8     4108.4     4109.7     4110.9     4112.1
    A(I)           26.5        6.7        6.4        5.9        6.1
    V(I)            .97       3.80       4.00       4.31       4.17

  X STA.      4112.1     4113.3     4114.5     4115.8     4117.1     4118.4
    A(I)            6.1        6.1        6.2        6.3        6.2
    V(I)           4.21       4.17       4.13       4.09       4.16
```

```
X STA.      4118.4     4119.8     4121.2     4122.7     4124.2     4125.8
  A(I)            6.5        6.6        6.7        6.6        6.8
  V(I)           3.94       3.89       3.84       3.85       3.77

X STA.      4125.8     4127.3     4128.9     4130.6     4132.3     4136.0
  A(I)            6.6        6.8        6.7        7.1       14.7
  V(I)           3.90       3.79       3.83       3.63       1.75
1
  HP 1 PRO2 40.0 1 40.00
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36
    CROSS-SECTION PROPERTIES:  ISEQ =  5;  SECID = PRO2 ;  SRD =    2069.

     WSEL  SA#     AREA        K   TOPW   WETP  ALPH    LEW     REW      QCR
             1    3739.  108180.  2973.  2974.                       23797.
             2     376.   15537.    81.    82.                        4602.
             3    3521.  100769.  2844.  2845.                       22226.
    40.00         7636.  224485.  5898.  5901.  1.03  1101.  6999.   48609.
1
  HP 2 PRO2 40.00 * * 666
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36


    VELOCITY DISTRIBUTION:  ISEQ =  5;  SECID = PRO2 ;  SRD =    2069.

      WSEL     LEW     REW     AREA        K        Q    VEL
     40.00  1100.8  6999.2  7636.2  224485.     666.    .09

X STA.      1100.8     1546.6     1946.2     2308.6     2645.3     2953.0
  A(I)          458.8      437.4      418.0      406.3      386.6
  V(I)            .07        .08        .08        .08        .09

X STA.      2953.0     3249.7     3523.4     3786.5     3989.9     4104.0
  A(I)          386.7      368.6      368.4      332.5      290.0
  V(I)            .09        .09        .09        .10        .11

X STA.      4104.0     4151.6     4256.2     4445.7     4756.8     5075.6
  A(I)          253.7      253.5      325.6      404.4      400.3
  V(I)            .13        .13        .10        .08        .08

X STA.      5075.6     5413.2     5763.1     6146.0     6546.8     6999.2
  A(I)          410.0      410.0      431.0      431.6      462.9
  V(I)            .08        .08        .08        .08        .07
1
  HP 1 BRDGE 38.84 1 38.84
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)
```

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

CROSS-SECTION PROPERTIES: ISEQ = 4; SECID = BRDGE; SRD = 1976.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	164.	5472.	43.	49.				1823.
38.84		164.	5472.	43.	49.	1.00	4093.	4136.	1823.

1
HP 2 BRDGE 38.84 * * 666

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1976.

WSEL	LEW	REW	AREA	K	Q	VEL
38.84	4093.0	4136.0	164.3	5472.	666.	4.05

X STA.	4093.0	4106.3	4108.1	4109.5	4110.7	4111.9
A(I)		26.8	7.3	6.8	6.4	6.3
V(I)		1.24	4.54	4.91	5.23	5.32
X STA.	4111.9	4113.1	4114.3	4115.6	4117.0	4118.3
A(I)		6.4	6.4	6.5	6.6	6.5
V(I)		5.21	5.17	5.11	5.07	5.15
X STA.	4118.3	4119.7	4121.1	4122.6	4124.1	4125.7
A(I)		6.6	6.9	6.9	6.9	7.1
V(I)		5.02	4.79	4.80	4.82	4.72
X STA.	4125.7	4127.3	4128.9	4130.5	4132.2	4136.0
A(I)		7.0	7.1	7.0	7.1	15.7
V(I)		4.74	4.71	4.76	4.67	2.13

1
EX

+++ BEGINNING PROFILE CALCULATIONS -- 4

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	4079.	139.	.01	*****	37.41	34.58	100.	37.40
1887.	******	4141.	3535.	1.00	*****	*******	.08	.72	
EXT2 :XS	44.	4075.	145.	.01	.04	37.44	*******	100.	37.44
1931.	44.	4150.	3364.	1.00	.00	.00	.09	.69	

```
===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "FLVY2"     KRATIO =  1.43

FLVY2:FV      45.  4090.     187.   .00   .03   37.47 *******    100.   37.47
     1976.    45.  4197.    4814.  1.00   .00     .00     .07     .54
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

PRO2 :AS      93.  4076.     177.   .01   .04   37.52 *******    100.   37.51
     2069.    93.  4216.    4473.  1.02   .00     .00     .08     .57
         <<<<<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.  4093.     106.   .02   .05   37.50   34.99    100.   37.48
     1976.    45.  4136.    2726.  1.29   .00     .00     .12     .95

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.   1.   1.   .882   .075   39.56    43.  4093.  4136.

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

PRO2 :AS      46.  4075.     190.   .00   .04   37.62   34.53    100.   37.62
     2069.    48.  4231.    4788.  1.05   .09     .00     .08     .53

       M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
       .692   .019    4713.  4092.  4135.    37.60

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

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

UP2  :XS      31.  4070.     195.   .00   .01   37.64 *******    100.   37.63
     2100.    31.  4219.    5204.  1.00   .00     .00     .06     .51
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36
   FIRST USER DEFINED TABLE.

    XSID:CODE        Q     SRD     WSEL      AREA      VEL      FR#        K   XSTW
   DNSTR:XS        100.  1887.   37.40       139.      .72      .08     3535.   62.
   EXT2 :XS        100.  1931.   37.44       145.      .69      .09     3364.   76.
   FLVY2:FV        100.  1976.   37.47       187.      .54      .07     4814.  107.
   BRDGE:BR        100.  1976.   37.48       106.      .95      .12     2726.   43.
   PRO2 :AS        100.  2069.   37.62       190.      .53      .08     4788.  142.
   UP2  :XS        100.  2100.   37.63       195.      .51      .06     5204.   96.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                      (Input modified to free format by GKY&A 01/92)

        SR 29 - OPEN CHANNEL ANALYSIS
        BR# 50032, YORK BRANCH
        PROPOSED WIDENED BRIDGE
           *** RUN DATE & TIME: 04-15-96  17:36
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 XSID:CODE    SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD    FLEN     REW         K  ALPH     HO      ERR      FR#      VEL

DNSTR:XS    ******  2581.     1036.    .01 *****    38.67   35.94     446.   38.66
     1887. ******  5731.    15758.   2.54 ***** *******      .21      .43

EXT2 :XS       44.  2415.      972.    .01    .04   38.70 *******     446.   38.70
     1931.     44.  5543.    14682.   2.52    .00     .00      .23      .46

FLVY2:FV       45.  2741.      865.    .01    .05   38.75 *******     446.   38.74
     1976.     45.  5424.    13382.   2.34    .00     .00      .25      .52
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

PRO2 :AS       93.  2300.      925.    .01    .09   38.83 *******     446.   38.82
     2069.     93.  5524.    15109.   2.83    .00    -.01      .27      .48
         <<<<<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.  4093.      162.    .15    .11   38.92   36.26     446.   38.78
     1976.     45.  4136.     5329.   1.25    .11     .00      .28     2.76

     TYPE PPCD FLOW       C     P/A     LSEL    BLEN    XLAB    XRAB
       4.    1.    1.    .893    .067    39.56     43.   4093.   4136.

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

PRO2 :AS       46.  1101.     3988.    .00    .06   39.38   35.78     446.   39.38
     2069.    123.  6999.    79038.   1.27    .40    -.01      .03      .11

       M(G)    M(K)        KQ    XLKQ    XRKQ     OTEL
       .987    .881     9633.   4092.   4135.    39.38

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

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

UP2  :XS       31.  1101.     3879.    .00    .00   39.38 *******     446.   39.38
     2100.     31.  6999.    76070.   1.33    .00     .00      .03      .11
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)

         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36
   FIRST USER DEFINED TABLE.

     XSID:CODE        Q    SRD    WSEL     AREA      VEL      FR#        K   XSTW
    DNSTR:XS        446.  1887.   38.66    1036.      .43      .21   15758.  3150.
    EXT2 :XS        446.  1931.   38.70     972.      .46      .23   14682.  3128.
    FLVY2:FV        446.  1976.   38.74     865.      .52      .25   13382.  2683.
    BRDGE:BR        446.  1976.   38.78     162.     2.76      .28    5329.    43.
    PRO2 :AS        446.  2069.   39.38    3988.      .11      .03   79038.  5898.
    UP2  :XS        446.  2100.   39.38    3879.      .11      .03   76070.  5898.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
                     (Input modified to free format by GKY&A 01/92)
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SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
DNSTR:XS	******	2360.	1207.	.01	*****	38.72	36.13	512.	38.71
1887.	******	5920.	18090.	2.45	*****	*******	.20	.42	
EXT2 :XS	44.	2191.	1146.	.01	.04	38.76	*******	512.	38.75
1931.	44.	5792.	16904.	2.47	.00	.00	.22	.45	
FLVY2:FV	45.	2412.	1023.	.01	.05	38.80	*******	512.	38.79
1976.	45.	5740.	15055.	2.45	.00	.00	.25	.50	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

PRO2 :AS	93.	1922.	1137.	.01	.09	38.89	*******	512.	38.88
2069.	93.	5989.	17359.	3.00	.00	-.01	.26	.45	

<<<<<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.	4093.	164.	.18	.13	39.02	36.46	512.	38.84
1976.	45.	4136.	5464.	1.22	.14	.00	.31	3.12	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
4.	1.	1.	.904	.068	39.56	43.	4093.	4136.

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
PRO2 :AS	46.	1101.	5123.	.00	.06	39.57	35.95	512.	39.57
2069.	145.	6999.	117414.	1.12	.49	.01	.02	.10	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.989	.912	10123.	4091.	4134.	39.57

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

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
UP2 :XS	31.	1101.	5016.	.00	.00	39.57	*******	512.	39.57
2100.	31.	6999.	113810.	1.15	.00	.00	.02	.10	

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
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SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

FIRST USER DEFINED TABLE.

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
DNSTR:XS	512.	1887.	38.71	1207.	.42	.20	18090.	3561.
EXT2 :XS	512.	1931.	38.75	1146.	.45	.22	16904.	3600.
FLVY2:FV	512.	1976.	38.79	1023.	.50	.25	15055.	3328.
BRDGE:BR	512.	1976.	38.84	164.	3.12	.31	5464.	43.

```
   PRO2 :AS      512.  2069.   39.57    5123.      .10      .02  117414.   5898.
   UP2  :XS      512.  2100.   39.57    5016.      .10      .02  113810.   5898.
1
 WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
 P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS
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         SR 29 - OPEN CHANNEL ANALYSIS
         BR# 50032, YORK BRANCH
         PROPOSED WIDENED BRIDGE
            *** RUN DATE & TIME: 04-15-96  17:36

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

DNSTR:XS    ******  1951.    1579.   .01 *****   38.81   36.46     666.   38.80
     1887. ******  6270.   23536.  2.21 ***** *******      .18      .42

EXT2 :XS       44.  1776.    1533.   .01   .04   38.85 *******     666.   38.84
     1931.     44.  6251.   22261.  2.26   .00     .00      .20      .43

FLVY2:FV       45.  1802.    1407.   .01   .05   38.90 *******     666.   38.89
     1976.     45.  6326.   19650.  2.40   .00     .00      .23      .47
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

PRO2 :AS       93.  1239.    1644.   .01   .09   38.99 *******     666.   38.98
     2069.     93.  6829.   23434.  2.91   .00     .01      .22      .41
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===220 FLOW CLASS 1 (4) SOLUTION INDICATES POSSIBLE PRESSURE FLOW.
           WS3,WSIU,WS1,LSEL =     38.95       39.96       40.02       39.56

 ===245 ATTEMPTING FLOW CLASS 2 (5) SOLUTION.

 ===250 INSUFFICIENT HEAD FOR PRESSURE FLOW.
                        YU/Z,WSIU,WS = 1.07       39.84       39.92

 ===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.  4093.     169.   .29   .16   39.24   36.85     666.   38.95
     1976.     45.  4136.    5721.  1.19   .23     .00      .38     3.94

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
        4.   1.   1.   .918   .069   39.56    43.  4093.  4136.

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

PRO2 :AS       46.  1101.    7765.   .00   .06   40.02   36.28     666.   40.02
     2069.    186.  6999.  230713.  1.03   .72     .00      .01      .09

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
        .992   .950   11511.  4090.  4133.   40.02

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

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

UP2  :XS       31.  1101.    7655.   .00   .00   40.02 *******     666.   40.02
     2100.     31.  6999.  225580.  1.03   .00     .00      .01      .09
```

1
WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS
(Input modified to free format by GKY&A 01/92)

SR 29 - OPEN CHANNEL ANALYSIS
BR# 50032, YORK BRANCH
PROPOSED WIDENED BRIDGE
*** RUN DATE & TIME: 04-15-96 17:36

FIRST USER DEFINED TABLE.

XSID:CODE	Q	SRD	WSEL	AREA	VEL	FR#	K	XSTW
DNSTR:XS	666.	1887.	38.80	1579.	.42	.18	23536.	4319.
EXT2 :XS	666.	1931.	38.84	1533.	.43	.20	22261.	4476.
FLVY2:FV	666.	1976.	38.89	1407.	.47	.23	19650.	4524.
BRDGE:BR	666.	1976.	38.95	169.	3.94	.38	5721.	43.
PRO2 :AS	666.	2069.	40.02	7765.	.09	.01	230713.	5898.
UP2 :XS	666.	2100.	40.02	7655.	.09	.01	225580.	5898.

ER

1 NORMAL END OF WSPRO EXECUTION.

Appendix E

Stream Stability and Scour Analysis

SR 29 York Branch
Bridge No. 050032

HEC - 20
Level One Stream Stability Analysis

Step 1: Define Stream Characteristics

Stream Characteristics
York Branch is a small stream, tributary to Linden Pens Marsh. The average width of the stream ranges from 14 to 20 meters (46 to 66 feet). The stream flows all or most of the year. The bed material is Floridana Fine Sand, Depressional and has a low relief valley setting. The floodplain for this creek is very wide (>10x channel width), as evidenced on the Federal Emergency Management Agencies (FEMA) Flood Insurance Rate Map (FIRM) for this area. Natural levees are not apparent and the stream is incised. Tree cover and vegetation is heavy along the channel banks, estimated at between 70 and 90 percent. There is no evidence of the stream being braided or anabranched.

Step 2: Evaluate Land Use Changes

Land Use Changes
This area consists predominantly of wetlands and undeveloped low-lying woodlands. Due to these factors, it is unlikely that any significant land use changes would occur. The future land use map for Glades County does not anticipate development of any significance in this vicinity.

Step 3: Assess Overall Stability

Overall Stability
Based upon field reviews and the interpretation of stream characteristics, York Branch is considered to be stable for the purposes of this analysis.

Step 4 & 5: Evaluate Lateral & Vertical Stability

Vertical and Lateral Stability
The FDOT Bridge Inspection Reports rate the channel as "very good". There are no reports or observations of bank erosion in the vicinity of the bridge, nor has any significant aggradation or degradation of the channel bottom been encountered. Therefore, York Branch is considered to be a vertically and laterally stable channel.

Step 6: Evaluate Channel Response to Change

Based on the comparison of observed and historical channel and watershed conditions, it is evident that the channel has not experienced significant change due to previous impacts. Given that the nature of the watershed is unlikely to change within the foreseeable future, it appears that the proposed widening of SR 29 will not greatly affect the channel and cause a noticeable response.

Conclusion:

Based on the results of the level one stream stability analysis, the York Branch Waterway in the vicinity of the SR 29 crossing is deemed a stable channel. Further analysis of this channel is not warranted.

HEC 18
Evaluating Scour at Highway Bridges

A scour analysis was performed for both the existing and proposed structures on SR 29 at York Branch. The analysis was performance in accordance with FHWA's *Evaluating Scour at Bridges*, HEC 18. This analysis included scour predictions for the 100 year and 500 year frequency events.

The hydraulic performance of York Branch at this crossing was evaluated using FHWA's WSPRO software. The results from the WSPRO analysis were used in the scour calculations.

Scour predictions included four types of scour: aggradation/degredation, contraction, pier, and abutment scour. Among the factors examined were the potential for future land use changes, historic records (inspection reports), the location and types of existing up and downstream controls and visual site verifications.

The results are summarized in the body of the report. This appendix includes plotted cross sections showing the predicted scour.

CONTRACTION SCOUR CONDITIONS
SR 29 - BRIDGE 50032

The following calculations are based on HEC 18, Chapter 4. The results from WSPRO are also used.

This crossing can be classified as Case 1.a, which is decribed as follows:

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.

Determine if flow upstream is transporting bed material:

Check critical velocity at approach:

Vc = 11.52* y1^0.167 * D50^0.333

D50 = 0.25 mm
D50 = 0.00082025 feet

Based on computed Vc, compare Vappr (from WSPRO) to Vc.

If Vappr < Vc, Clear Water Contraction Scour exists
If Vappr > Vc, Live Bed Contraction Scour exists

	A appr (SF)	TOPW appr (FT)	y 1 (FT)	V appr (FPS)	Vc (FPS)	Scour Type
Existing Bridge						
50 year	313	81	3.86	0.14	1.35	Clear Water
100 year	329	81	4.06	0.11	1.37	Clear Water
500 year	365	81	4.51	0.09	1.39	Clear Water
Proposed Bridge						
50 year	319	81	3.94	0.12	1.36	Clear Water
100 year	328	81	4.05	0.12	1.37	Clear Water
500 year	376	81	4.64	0.08	1.40	Clear Water

Estimated Scour

Estimated Scour (English)									
Storm Event	Channel Bottom	Contraction		Pier		Abutment		Existing Channel Bottom Scour Elevation	Proposed Channel Bottom Scour Elevation
		Existing	Proposed	Existing	Proposed	Existing	Proposed		
50 Year Storm	32.5	2.95	2.95	2.78	2.78	8.08	8.08	26.77	26.77
100 Year Storm	32.5	3.64	3.65	2.93	2.93	8.57	8.58	25.93	25.92
500 Year Storm	32.5	5.14	5.12	3.27	3.24	9.45	9.46	24.09	24.14

Estimated Scour (Metric)									
Storm Event	Channel Bottom	Contraction		Pier		Abutment		Existing Channel Bottom Scour Elevation	Proposed Channel Bottom Scour Elevation
		Existing	Proposed	Existing	Proposed	Existing	Proposed		
50 Year Storm	9.91	0.90	0.90	0.85	0.85	2.46	2.46	8.16	8.16
100 Year Storm	9.91	1.11	1.11	0.89	0.89	2.61	2.62	7.90	7.90
500 Year Storm	9.91	1.57	1.56	1.00	0.99	2.88	2.88	7.34	7.36

Scour Calculations

Existing Bridge

SR 29 York Branch
Bridge No. 050032

HEC 18 SCOUR ANALYSIS

Design Frequency: 50 year
Bridge Configuration: Existing

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.6678 * W^2))^0.429

Q =	446	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	313	sf	Area at approach
TOPW appr =	81	ft	Top width of approach
y1 =	3.86	ft	Average depth at the bridge before scour
y2 =	6.82	ft	Calculated as per formula above
y s =	2.95	ft	Contraction scour depth (y s = y 2 minus y 1)
	0.90	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube =	5.80	sf	Conveyance tube area (from WSPRO)
v1 =	3.83	fps	Velocity of conveyance tube
top width =	1.20	ft	Top width of tube
y1 =	4.83	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.31		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.1		Correction for pier shape (see HEC - 18, Chapter 2) K1 = 1.0 for circular cylinder or group of cylinders K1 = 1.1 for square nose
K2 =	1.0		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.1		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.0	ft	Width of pier
ys =	2.53	ft	Local Scour at Piers
ys =	0.77	m	
ys =	2.78	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	0.85	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1101.0		Left edge of conveyance tube #1
X - sta 2 =	4093.0		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4098.1		Right edge of conveyance tube beyond bridge
	8		Number of tubes completely obstructed
# Tubes =	8.88		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	198.02	cfs	Flow in left overbank obstructed by left abutment
Ae =	1459.0	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1.00
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.00	ft	Length of abutment projected normal to flow
Ae =	1459.00	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	198.02	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.14	fps	Qe / Ae
ya =	0.49	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.42	ft	Scour depth
	1.65	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	446.00	cfs	Total discharge input to WSPRO
q tube =	22.30	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.10	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	0.86	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube 1	14.00	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	1.86	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.00	ft	Length of abutment projected normal to flow
y1 =	1.86	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1604.90		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	0.86	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	1.86	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.111		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	3.61	ft	Scour depth
	1.10	m	

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4132.0		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4162.0		Right edge of conveyance tube beyond bridge
	7		Number of tubes completely obstructed
# Tubes =	7.87		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	175.50	cfs	Flow in right overbank obstructed by right abutment
Ae =	1317.44	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.0	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1.00
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2863.00	ft	Length of abutment projected normal to flow
Ae =	1317.44	sf	Right abutment; area of conveyance. Determined from WSPRO output
Qe =	175.50	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.13	fps	Qe / Ae
ya =	0.46	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.17	ft	Scour depth
	1.58	m	

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	446.00	cfs	Total discharge input to WSPRO
q tube =	22.30	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	14.30	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.56	fps	Mean velocity of conveyance tube #1, adjacent to right abutment.
TOPW tube 1	3.70	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	3.86	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.00	ft	Length of abutment projected normal to flow
y1 =	3.86	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	740.78		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	1.56	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	3.86	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.140		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	8.08	ft	Scour depth
	2.46	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	5.74	ft	5.74	ft
Total scour at left abutment:	3.61	ft	10.11	ft
Total scour at right abutment:	8.08	ft	22.62	ft

HEC 18 SCOUR ANALYSIS

Design Frequency: 100 year
Bridge Configuration: Existing

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.667*W^2))^0.429

Q =	512	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	329	sf	Area at approach
TOPW appr	81	ft	Top width of approach
y1 =	4.06	ft	Average depth at the bridge before scour
y2 =	7.70	ft	Calculated as per formula above
y s =	3.64	ft	Contraction scour depth (y s = y 2 minus y 1)
	1.11	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube	5.90	sf	Conveyance tube area (from WSPRO)
v1 =	4.31	fps	Velocity of conveyance tube
top width =	1.20	ft	Top width of tube
y1 =	4.92	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.34		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.10		Correction for pier shape (see HEC - 18, Chapter 2) K1 = 1.0 for circular cylinder or group of cylinders K1 = 1.1 for square nose
K2 =	1.00		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.10		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.00	ft	Width of pier
ys =	2.67	ft	Local Scour at Piers
ys =	0.81	m	
ys =	2.93	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	0.89	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1100.9		Left edge of conveyance tube #1
X - sta 2 =	4093		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4108.9		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.59		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	245.50	cfs	Flow in left overbank obstructed by left abutment
Ae =	2030.60	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992.10	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.10	ft	Length of abutment projected normal to flow
Ae =	2030.60	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	245.50	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.12	fps	Qe / Ae
ya =	0.68	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.69	ft	Scour depth
	1.74	m	

100 year Scour - Existing

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.3	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	0.97	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube	13.70	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	1.92	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.10	ft	Length of abutment projected normal to flow
y1 =	1.92	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1558.62		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	0.97	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	1.92	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.12		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	3.85	ft	Scour depth
	1.17	m	

100 year Scour - Existing

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4124.5		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4155.3		Right edge of conveyance tube beyond bridge
	8		Number of tubes completely obstructed
# Tubes =	8.62		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	220.672	cfs	Flow in left overbank obstructed by right abutment
Ae =	1897.66	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.1	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2863.1	ft	Length of abutment projected normal to flow
Ae =	1897.66	sf	Righft abutment; area of conveyance. Determined from WSPRO output
Qe =	220.67	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.12	fps	Qe / Ae
ya =	0.66	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.44	ft	Scour depth
	1.66	m	

100 year Scour - Existing

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	14.7	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.74	fps	Mean velocity of conveyance tube #20, adjacent to right abutment.
TOPW tube	3.7	ft	Difference between left and right station of conveyance tube #20 (From WSPRO)
y1 =	3.97	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.10	ft	Length of abutment projected normal to flow
y1 =	3.97	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	720.64		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	1.74	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	3.97	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.15		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	8.57	ft	Scour depth
	2.61	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	**6.57**	**ft**	**6.57**	**ft**
Total scour at left abutment:	**3.85**	**ft**	**10.78**	**ft**
Total scour at right abutment:	**8.57**	**ft**	**23.99**	**ft**

HEC 18 SCOUR ANALYSIS

Design Frequency: 500 year
Bridge Configuration: Existing

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.667*W^2))^0.429

Q =	666	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	365	sf	Area at approach
TOPW appr	81	ft	Top width of approach
y1 =	4.51	ft	Average depth at the bridge before scour
y2 =	9.65	ft	Calculated as per formula above
y s =	5.14	ft	Contraction scour depth (y s = y 2 minus y 1)
	1.57	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube	6.30	sf	Conveyance tube area (from WSPRO)
v1 =	5.31	fps	Velocity of conveyance tube
top width =	1.10	ft	Top width of tube
y1 =	5.73	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.39		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.10		Correction for pier shape (see HEC - 18, Chapter 2) K1 = 1.0 for circular cylinder or group of cylinders K1 = 1.1 for square nose
K2 =	1.00		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.10		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.00	ft	Width of pier
ys =	2.98	ft	Local Scour at Piers
ys =	0.91	m	
ys =	3.27	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	1.00	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1100.9		Left edge of conveyance tube #1
X - sta 2 =	4093.0		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4102.9		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.9		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	329.67	cfs	Flow in left overbank obstructed by left abutment
Ae =	3416.58	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992.10	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.10	ft	Length of abutment projected normal to flow
Ae =	3416.58	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	329.67	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.10	fps	Qe / Ae
ya =	1.14	ft	Average depth of flow on the floodplain
Fr e =	0.02		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	6.16	ft	Scour depth
	1.88	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.9	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.24	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube	13.30	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	2.02	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.10	ft	Length of abutment projected normal to flow
y1 =	2.02	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1479.37		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	1.24	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	2.02	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.15		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	4.36	ft	Scour depth
	1.33	m	

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4102.9		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4136.2		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.01		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	300.033	cfs	Flow in left overbank obstructed by right abutment
Ae =	3172.06	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.1	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape		
			Vertical abutment	K1 =	1
			Vertical abutment with wingwalls	K1 =	0.82
			Spill - through abutment	K1 =	0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13		
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream		
a' =	2863.1	ft	Length of abutment projected normal to flow		
Ae =	3172.06	sf	Righft abutment; area of conveyance. Determined from WSPRO output		
Qe =	300.03	cfs	Flow obstructed by the abutment and approach abutment		
Ve =	0.09	fps	Qe / Ae		
ya =	1.11	ft	Average depth of flow on the floodplain		
Fr e =	0.02		Froude number of approach flow upstream : Ve / (gya)^0.5		
ys =	5.93	ft	Scour depth		
	1.81	m			

500 year Scour - Existing

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	15.7	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	2.12	fps	Mean velocity of conveyance tube #1, adjacent to right abutment.
TOPW tube	3.8	ft	Difference between left and right station of conveyance tube #20 (From WSPRO)
y1 =	4.13	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.10	ft	Length of abutment projected normal to flow
y1 =	4.13	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	692.98		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	2.12	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	4.13	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.18		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	9.45	ft	Scour depth
	2.88	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	**8.41**	**ft**	**8.41**	**ft**
Total scour at left abutment:	**4.36**	**ft**	**12.21**	**ft**
Total scour at right abutment:	**9.45**	**ft**	**26.46**	**ft**

Scour Calculations

Proposed Bridge

SR 29 York Branch
Bridge No. 050032

HEC 18 SCOUR ANALYSIS

Design Frequency: 50 year
Bridge Configuration: Proposed

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.667*W^2))^0.429

Q =	446	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	319	sf	Area at approach
TOPW appr	81	ft	Top width of approach
y1 =	3.94	ft	Average depth at the bridge before scour
y2 =	6.84	ft	Calculated as per formula above
y s =	2.90	ft	Contraction scour depth (y s = y 2 minus y 1)
	0.88	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube	5.80	sf	Conveyance tube area (from WSPRO)
v1 =	3.83	fps	Velocity of conveyance tube
top width =	1.20	ft	Top width of tube
y1 =	4.83	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.31		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.10		Correction for pier shape (see HEC - 18, Chapter 2) K1 = 1.0 for circular cylinder or group of cylinders K1 = 1.1 for square nose
K2 =	1.00		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.10		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.00	ft	Width of pier
ys =	2.53	ft	Local Scour at Piers
ys =	0.77	m	
ys =	2.78	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	0.85	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1101.0		Left edge of conveyance tube #1
X - sta 2 =	4093.0		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4095.6		Right edge of conveyance tube beyond bridge
	8		Number of tubes completely obstructed
# Tubes =	8.96		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	199.81	cfs	Flow in left overbank obstructed by left abutment
Ae =	1681.47	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992.00	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.00	ft	Length of abutment projected normal to flow
Ae =	1681.47	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	199.81	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.12	fps	Qe / Ae
ya =	0.56	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.28	ft	Scour depth
	1.61	m	

50 year Scour - Proposed

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.1	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	0.85	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube	14.00	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	1.86	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.00	ft	Length of abutment projected normal to flow
y1 =	1.86	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1604.90		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	0.85	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	1.86	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.11		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	3.60	ft	Scour depth
	1.10	m	

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4124.1		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4140.1		Right edge of conveyance tube beyond bridge
	8		Number of tubes completely obstructed
# Tubes =	8.74		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	194.902	cfs	Flow in left overbank obstructed by right abutment
Ae =	1596.49	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.0	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape		
			Vertical abutment	K1 =	1
			Vertical abutment with wingwalls	K1 =	0.82
			Spill - through abutment	K1 =	0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13		
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream		
a' =	2863	ft	Length of abutment projected normal to flow		
Ae =	1596.49	sf	Righft abutment; area of conveyance. Determined from WSPRO output		
Qe =	194.90	cfs	Flow obstructed by the abutment and approach abutment		
Ve =	0.12	fps	Qe / Ae		
ya =	0.56	ft	Average depth of flow on the floodplain		
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5		
ys =	5.26	ft	Scour depth		
	1.60	m			

50 year Scour - Proposed

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	446	cfs	Total discharge input to WSPRO
q tube =	22.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	14.3	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.56	fps	Mean velocity of conveyance tube #1, adjacent to right abutment.
TOPW tube	3.7	ft	Difference between left and right station of conveyance tube #20 (From WSPRO)
y1 =	3.86	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.00	ft	Length of abutment projected normal to flow
y1 =	3.86	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	740.78		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

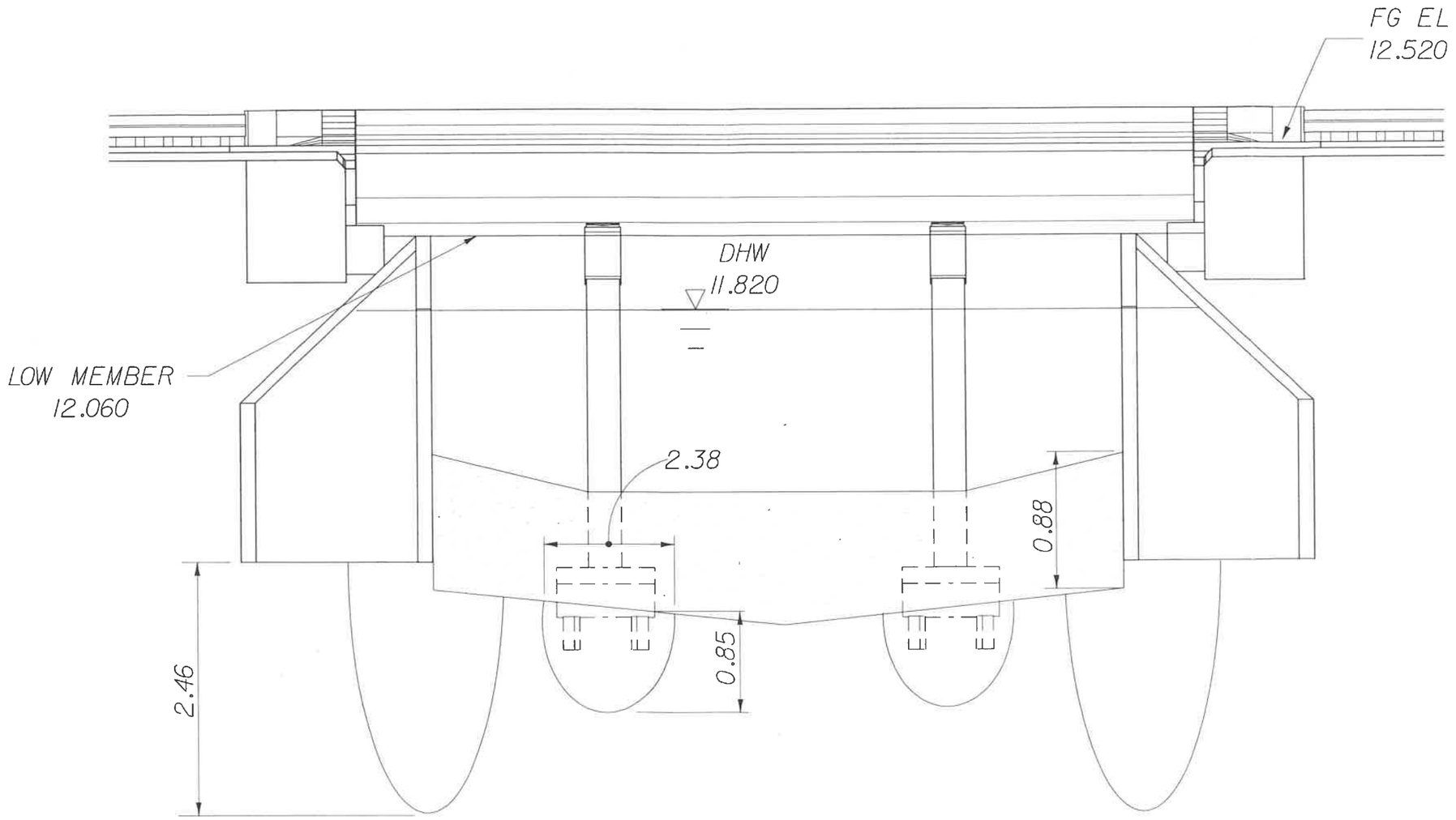
V abut =	1.56	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	3.86	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.14		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	8.08	ft	Scour depth
	2.46	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	**5.68**	**ft**	**5.68**	**ft**
Total scour at left abutment:	**3.60**	**ft**	**10.07**	**ft**
Total scour at right abutment:	**8.08**	**ft**	**22.62**	**ft**

PROPOSED BRIDGE OVER YORK BRANCH



NOTE:
ALL DIMENSIONS SHOWN
ARE IN METERS

50 YEAR SCOUR PROFILE

NTS

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HEC 18 SCOUR ANALYSIS

Design Frequency: 100 year
Bridge Configuration: Proposed

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.667*W^2))^0.429

Q =	512	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	328	sf	Area at approach
TOPW appr	81	ft	Top width of approach
y1 =	4.05	ft	Average depth at the bridge before scour
y2 =	7.70	ft	Calculated as per formula above
y s =	3.65	ft	Contraction scour depth (y s = y 2 minus y 1)
	1.11	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube	5.90	sf	Conveyance tube area (from WSPRO)
v1 =	4.31	fps	Velocity of conveyance tube
top width =	1.20	ft	Top width of tube
y1 =	4.92	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.34		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.10		Correction for pier shape (see HEC - 18, Chapter 2) K1 = 1.0 for circular cylinder or group of cylinders K1 = 1.1 for square nose
K2 =	1.00		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.10		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.00	ft	Width of pier
ys =	2.67	ft	Local Scour at Piers
ys =	0.81	m	
ys =	2.93	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	0.89	m	

100 year Scour - Proposed

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1100.9		Left edge of conveyance tube #1
X - sta 2 =	4093.0		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4111.0		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.36		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	239.62	cfs	Flow in left overbank obstructed by left abutment
Ae =	2044.54	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992.10	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.10	ft	Length of abutment projected normal to flow
Ae =	2044.54	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	239.62	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.12	fps	Qe / Ae
ya =	0.68	ft	Average depth of flow on the floodplain
Fr e =	0.02		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.61	ft	Scour depth
	1.71	m	

100 year Scour - Proposed

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.5	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	0.97	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube	13.80	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	1.92	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.10	ft	Length of abutment projected normal to flow
y1 =	1.92	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1558.15		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	0.97	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	1.92	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.12		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	3.85	ft	Scour depth
	1.17	m	

100 year Scour - Proposed

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4126.4		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4163.6		Right edge of conveyance tube beyond bridge
	8		Number of tubes completely obstructed
# Tubes =	8.74		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	223.744	cfs	Flow in left overbank obstructed by right abutment
Ae =	1916.27	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.1	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2863.1	ft	Length of abutment projected normal to flow
Ae =	1916.27	sf	Righft abutment; area of conveyance. Determined from WSPRO output
Qe =	223.74	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.12	fps	Qe / Ae
ya =	0.67	ft	Average depth of flow on the floodplain
Fr e =	0.03		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.47	ft	Scour depth
	1.67	m	

100 year Scour - Proposed

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	512	cfs	Total discharge input to WSPRO
q tube =	25.6	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	14.7	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.75	fps	Mean velocity of conveyance tube #20, adjacent to right abutment.
TOPW tube	3.7	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	3.97	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.10	ft	Length of abutment projected normal to flow
y1 =	3.97	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	720.64		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

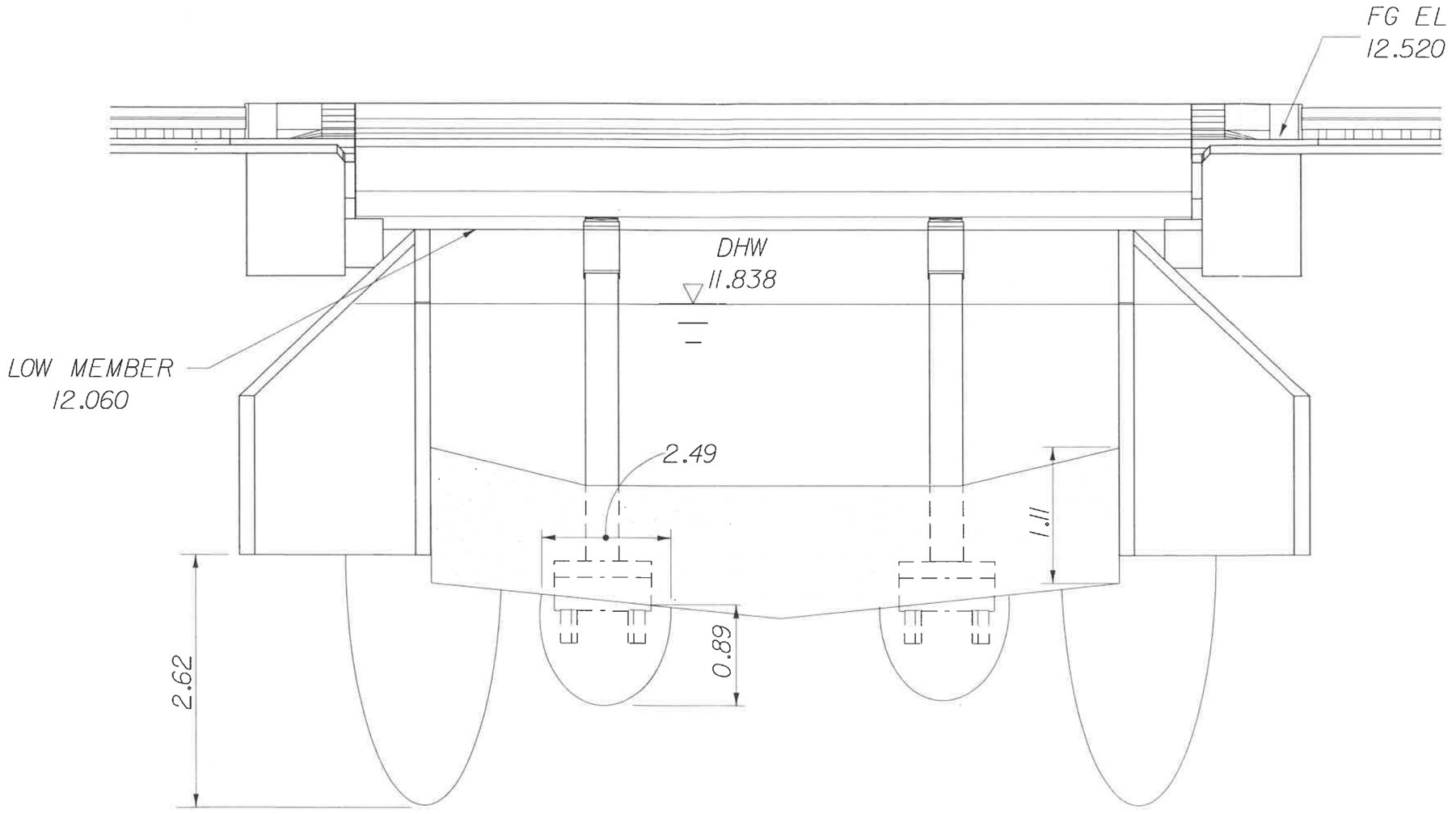
V abut =	1.75	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	3.97	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.15		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	8.58	ft	Scour depth
	2.62	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	**6.58**	**ft**	**6.58**	**ft**
Total scour at left abutment:	**3.85**	**ft**	**10.78**	**ft**
Total scour at right abutment:	**8.58**	**ft**	**24.04**	**ft**

PROPOSED BRIDGE OVER YORK BRANCH



100 YEAR SCOUR PROFILE

NTS

NOTE:
ALL DIMENSIONS SHOWN
ARE IN METERS

GENESIS
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$$$$$$$SITIME$$$$$$$
$$$$$$$$DGNSPECIFICATION$$$$$$$$

HEC 18 SCOUR ANALYSIS

Design Frequency: 500 year
Bridge Configuration: Proposed

Clear Water Contraction Scour :

y2 = (Q^2/ (120*Dm^0.667*W^2))^0.429

Q =	666	cfs	Discharge at bridge section (see WSPRO)
D50 =	0.25	mm	Median grain size at bridge (see geotech report)
	0.00082	ft	
Dm =	0.001025	ft	Effective mean grain size (1.25 times median grain size)
W1 =	43	ft	Bottom width of bridge minus pier widths or overbank width
A appr =	376	sf	Area at approach
TOPW appr	83	ft	Top width of approach
y1 =	4.53	ft	Average depth at the bridge before scour
y2 =	9.65	ft	Calculated as per formula above
y s =	5.12	ft	Contraction scour depth (y s = y 2 minus y 1)
	1.56	m	

Local Scour at Piers :

ys / y1 = 2.0 * K1 * K2 * K3 * (a / y1)^0.65 * Fr ^0.43

Note: Base analysis on conveyance tube with highest velocity

Area of tube	6.30	sf	Conveyance tube area (from WSPRO)
v1 =	5.32	fps	Velocity of conveyance tube
top width =	1.20	ft	Top width of tube
y1 =	5.25	ft	Flow depth directly upstream of pier. (Area of tube/ top width)
Fr =	0.41		Froude's Number : Fr = v1 / (g * y1)^0.5
K1 =	1.10		Correction for pier shape (see HEC - 18, Chapter 2)
			K1 = 1.0 for circular cylinder or group of cylinders
			K1 = 1.1 for square nose
K2 =	1.00		Correction for angle of attack of flow (see HEC - 18, Chapter 2)
K3 =	1.10		Correction factor for bed condition (see HEC - 18, Chapter 2)
a =	1.00	ft	Width of pier
ys =	2.94	ft	Local Scour at Piers
ys =	0.90	m	
ys =	3.24	ft	Correction for Clear Water Scour (see HEC - 18, Chapter 2.6, page 16)
ys =	0.99	m	

500 year Scour - Proposed

Abutment Scour :
Left Abutment :

Hydraulic variables for Froelich's Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	1100.8		Left edge of conveyance tube #1
X - sta 2 =	4093.0		Station of left edge of bridge (edge of obstruction)
X - sta 3 =	4104.0		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.9		(Number of approach section conveyance tubes which are obstructed by left abutment)
Qe =	329.67	cfs	Flow in left overbank obstructed by left abutment
Ae =	3824.30	sf	Left abutment; area of conveyance. Determined from WSPRO output
a' =	2992.20	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2992.20	ft	Length of abutment projected normal to flow
Ae =	3824.30	sf	Left abutment; area of conveyance. Determined from WSPRO output
Qe =	329.67	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.09	fps	Qe / Ae
ya =	1.28	ft	Average depth of flow on the floodplain
Fr e =	0.01		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	6.10	ft	Scour depth
	1.86	m	

Abutment Scour :
Left Abutment :

Hydraulic variables for Hire Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	26.8	sf	Area of conveyance tube #1, adjacent to left abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	1.24	fps	Mean velocity of conveyance tube #1, adjacent to left abutment.
TOPW tube	13.30	ft	Difference between left and right station of conveyance tube #1 (From WSPRO)
y1 =	2.02	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2992.20	ft	Length of abutment projected normal to flow
y1 =	2.02	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	1484.94		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

V abut =	1.24	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	2.02	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.15		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	4.35	ft	Scour depth
	1.32	m	

Abutment Scour :
Right Abutment :

Hydraulic variables for Froelich's Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
X - sta 1 =	4104.0		Left edge of conveyance tube beyond bridge
X - sta 2 =	4136.0		Station of right edge of bridge (edge of obstruction)
X - sta 3 =	4151.6		Right edge of conveyance tube beyond bridge
	9		Number of tubes completely obstructed
# Tubes =	9.33		(Number of approach section conveyance tubes which are obstructed by right abutment)
Qe =	310.689	cfs	Flow in left overbank obstructed by right abutment
Ae =	3613.02	sf	Right abutment; area of conveyance. Determined from WSPRO output
a' =	2863.2	ft	Length of abutment projected in WSPRO output.

Froelich's Equation:

ys/ya = 2.27 * K1 * K2 (a'/ya)^0.43 * Fr^0.61 + 1

K1 =	0.82		Coefficient for abutment shape
			Vertical abutment K1 = 1
			Vertical abutment with wingwalls K1 = 0.82
			Spill - through abutment K1 = 0.55
K2 =	1.00		Coefficient for angle of embankment to flow K2 = (O / 90)^0.13
O =	90	degrees	O < 90 degrees if embankment points downstream O > 90 degrees if embankment points upstream
a' =	2863.2	ft	Length of abutment projected normal to flow
Ae =	3613.02	sf	Righft abutment; area of conveyance. Determined from WSPRO output
Qe =	310.69	cfs	Flow obstructed by the abutment and approach abutment
Ve =	0.09	fps	Qe / Ae
ya =	1.26	ft	Average depth of flow on the floodplain
Fr e =	0.01		Froude number of approach flow upstream : Ve / (gya)^0.5
ys =	5.97	ft	Scour depth
	1.82	m	

500 year Scour - Proposed

Abutment Scour :
Right Abutment :

Hydraulic variables for Hire Equation:

Q =	666	cfs	Total discharge input to WSPRO
q tube =	33.3	cfs	Discharge per equal conveyance tube Defined as the total discharge divided by 20
A tube 1 =	15.7	sf	Area of conveyance tube #20, adjacent to right abutment (Read directly from WSPRO - Bridge X-Section)
Vtube =	2.13	fps	Mean velocity of conveyance tube #1, adjacent to right abutment.
TOPW tube	3.8	ft	Difference between left and right station of conveyance tube #20 (From WSPRO)
y1 =	4.13	ft	Average depth of conveyance tube #1. (Atube / TOPW tube)

Hire Equation:

Check L / y1 ratio:

L / y1 = a' / y1			Check for validity of equation
a' =	2863.20	ft	Length of abutment projected normal to flow
y1 =	4.13	ft	A tube / TOPW tube of conveyance tube # 1
a' / y1 =	693.00		The ratio for abutment length projection If ratio > 25, Use HIRE Equation If ratio < 25, HIRE Equation does not apply

Hire Computation:

ys / y1 = 4 * Fr^0.33

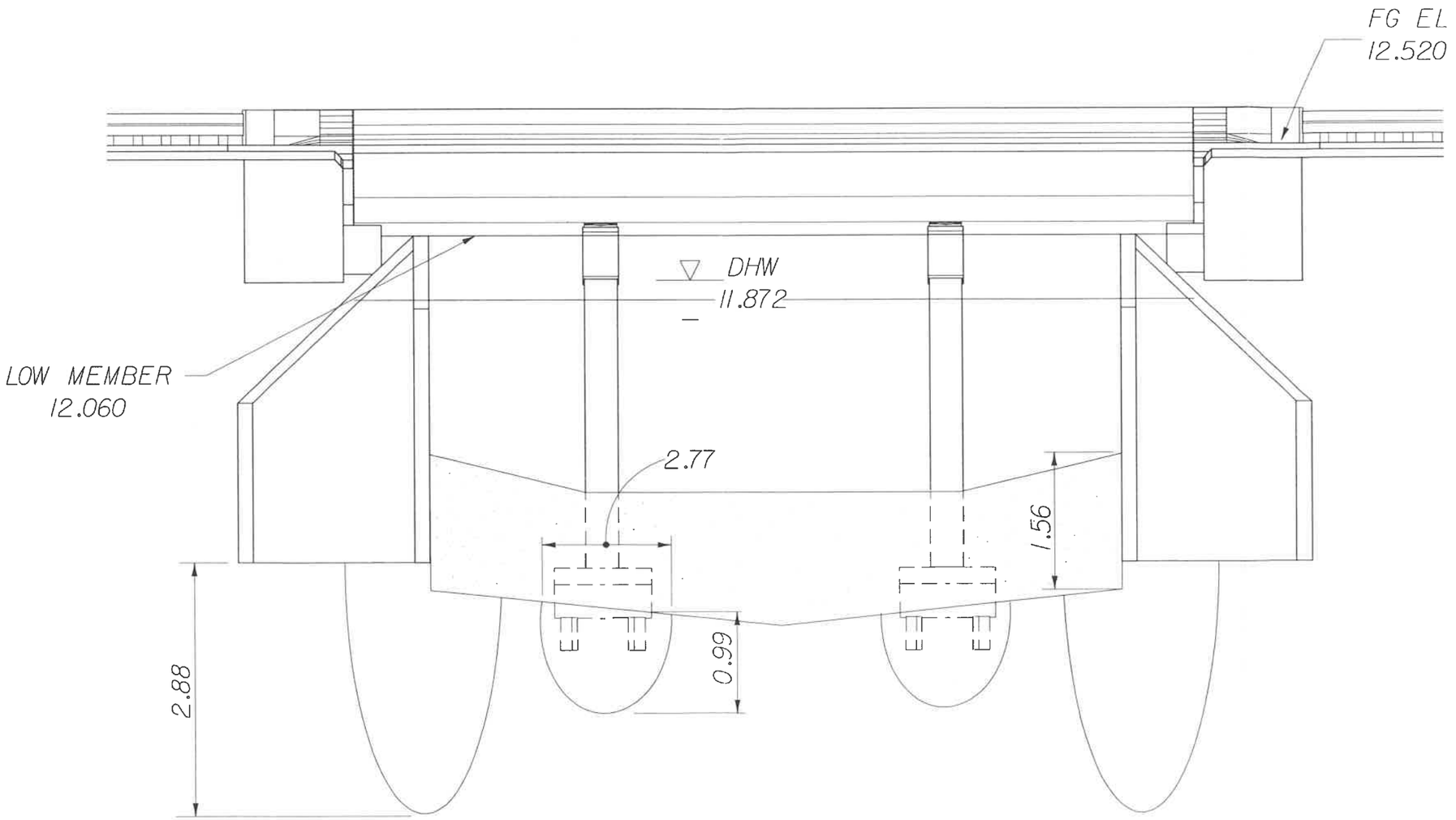
V abut =	2.13	fps	Velocity through bridge adjacent to abutment (Taken from WSPRO)
y 1 =	4.13	ft	Depth of flow at the abutment on the overbank or in the main channel
Fr 1 =	0.18		Froude number based on the velocity and depth in the bridge opening adjacent to the abutment
ys =	9.46	ft	Scour depth
	2.88	m	

Total Scour :

Assume that the width of the scour hole is equal to 2.8 * ys. (HEC 18 Manual)

	DEPTH		WIDTH	
Total scour at piers:	**8.36**	**ft**	**8.36**	**ft**
Total scour at left abutment:	**4.35**	**ft**	**12.17**	**ft**
Total scour at right abutment:	**9.46**	**ft**	**26.50**	**ft**

PROPOSED BRIDGE OVER YORK BRANCH



500 YEAR SCOUR PROFILE

NTS

NOTE:
ALL DIMENSIONS SHOWN
ARE IN METERS

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$$$$$$$$DGNSPECIFICATION$$$$$$$$

Appendix F
Economic Analysis

An economic analysis was completed for the widening of Bridge No. 050032 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 Number 050032 Widening

Item	Quantity	Unit	Unit Cost	Total Cost
Concrete (Superstructure)	30	CY	$450	$13,500
12 ft Additional width 45 ft Length 1.5 ft Depth of structure				
Concrete (Substructure)	20	CY	$525	$10,500
End bents - 2 total (including 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	$7,290
Superstructure: Assume 8% of concrete weight 30 CY @ 150 PCF @ 27 CF / CY Substructure: Assume 3% of concrete weight 20 CY @ 150 PCF @ 27 CF / CY				
Piles - Driven and Furnished	520	LF	$45	$23,400
8 piles @ 50 ft 4 piles @ 30 ft				
Barrier Wall	90	LF	$50	$4,500

Estimated Cost of Bridge Widening : $59,190

Appendix G
Correspondence

MEMORANDUM OF MEETING

DATE: February 29, 1996

PROJECT NO.: SR29, 9523-01

TIME: 10:30 am

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.

February 6, 1996

FDOT - District 1
Maintenance Office
880 West Garden Drive
Labelle , Florida 33935

GENESIS GROUP, INC.

Attn. : Mr. Talbert Melton

Re: SR 29 Improvements
Glades County, Florida

Dear Mr. Melton:

Genesis Group is currently working on Roadway and Bridge Improvement Plans for SR 29 (Bridge Number 50032). The bridge is located over York Branch (Section 20, Township 41S, Range 30E), approximately 2.3 miles south of SR 74. A vicinity map is attached.

A Bridge Hydraulics Report (BHR) is being prepared to define the improvements appropriate for this bridge. In order to prepare this document, we are requesting input from your office. Any information which you have on file relative to this particular crossing will be appreciated. Among those items which could prove helpful are:

- Recorded high water levels
- Severity of historic flood events
- Existing and/or proposed improvements to the waterway in this vicinity

We will consider the information you forward in our analysis and attempt to model the waterway crossing to simulate the existing conditions. Our schedule for completion of the analysis is aggressive. Therefore, receipt of your input will be needed as quickly as possible.

Thank you for your assistance.

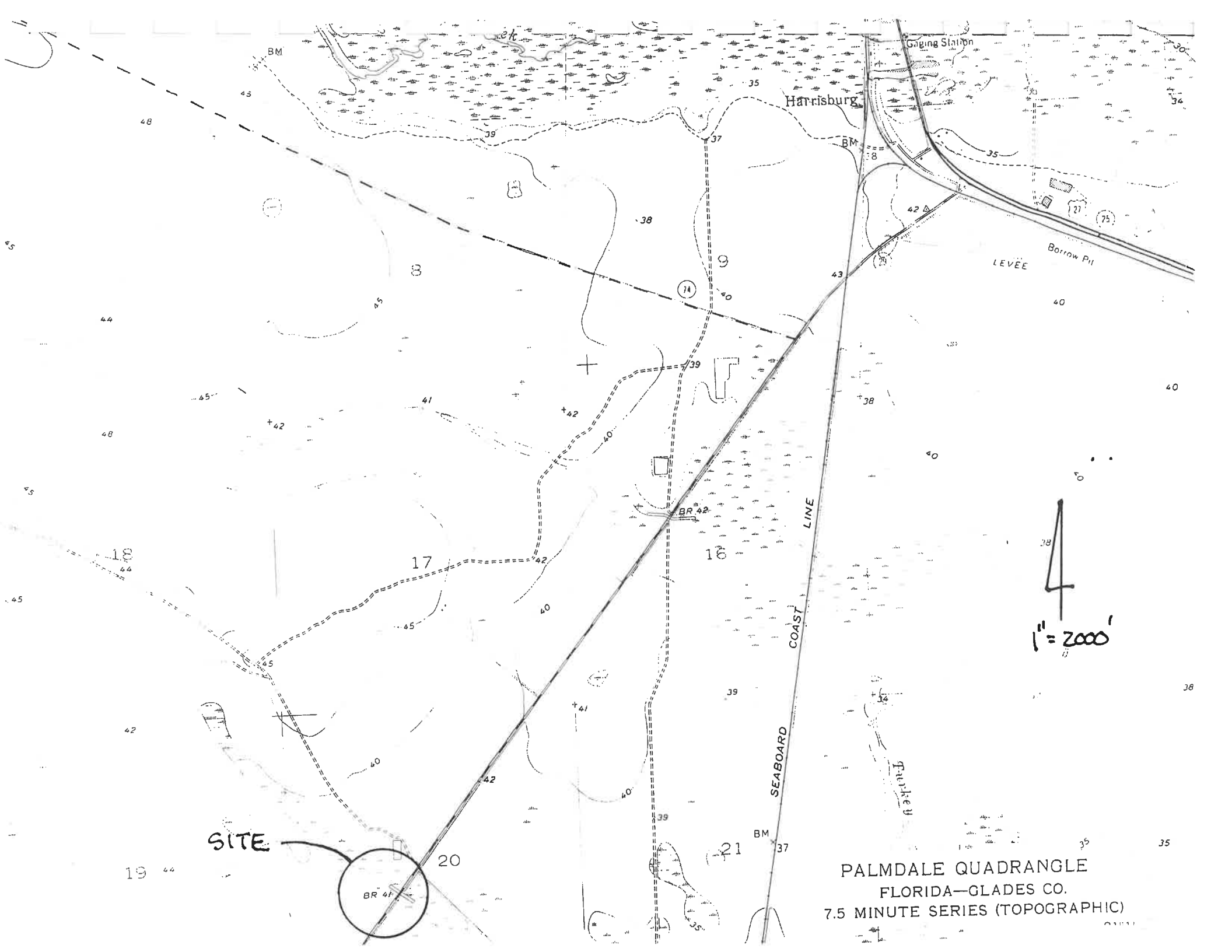
Sincerely,

Charles W. Savering

GENESIS GROUP, INC. SE
Charles W. Savering
Design Engineer

(G:\PROJECTS\FDT1\005\50032\WP.ENG\SWFWMD.LTR) February 6. 1996

820 East Park Avenue. · Bldg. 1, Suite 200 · Tallahassee, Florida 32301 · (904) 224-4400 · Fax (904) 681-3600
Tallahassee Jacksonville Sarasota St. Petersburg Chipley Tampa


Gaging Station
Harrisburg
BM
LEVEE
Borrow Pit
SEABOARD COAST LINE
BR 42
BR 41
SITE
Turkey
1" = 2000'
PALMDALE QUADRANGLE
FLORIDA—GLADES CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

Genesis Group, Inc.

820 E. Park Avenue, Building I, Suite 200
Tallahassee, Florida 32301
(904) 224-4400 • (904) 681-3600 Fax

Conversation Record

[X] Telephone

[ ] Personal Contact (i.e., lunch, meeting, etc.)

Date:	2-13-96	By:	Charles Savering
Conversed With:	Talbert Melton	Time:	2:00 p.m.
Company:	FDOT, District 1 Maintenance	Project Name:	Bridge Number 050032 on SR 29
Phone No.:	(941) 674 - 4027	Project No.:	FDT1 - 005

Subject: Maintenance Records

Remarks:

This conversation was a follow-up to a request for information which was faxed to Mr. Melton on Feb. 6. Mr. Melton acknowledged receipt of the request. He has researched the files and has found that there are no records of flooding or overtopping at this bridge. There also are no complaints on file concerning flooding at this location.

Mr. Melton suggested that the Bridge Inspection personnel in Tampa be questioned concerning actual high water levels, etc. at the bridge. I advised him that we were contacting that office, as well as SFWMD, as part as the research associated with the proposed bridge improvements.

Genesis Group, Inc.

820 E. Park Avenue, Building I, Suite 200
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(904) 224-4400 • (904) 681-3600 Fax

Conversation Record

[X] Telephone

[ ] Personal Contact (i.e., lunch, meeting, etc.)

Date:	2-15-96	By:	Charles Savering
Conversed With:	Lyndon Schmidt	Time:	2:30 p.m.
Company:	FDOT, Bridge Inspections	Project Name:	Bridge Number 050032 on SR 29
Phone No.:	(813) 744 - 6022	Project No.:	FDT1 - 005

Subject: Bridge Inspection Records

Remarks:

This conversation was a follow-up to a request for information which was faxed to Mr. Schmidt on Feb. 6. Mr. Schmidt acknowledged receipt of the request. He has researched the files and has compiled the inspection reports and the current Structure Inventory and Appraisal document for Bridge Number 050032. He mentioned that there is not a great deal of information on file for this particular crossing.

I mentioned that Talbert Melton (FDOT Maintenance office in LaBelle) suggested that Mr. Schmidt might have records concerning overtopping events, high water levels, etc. Unfornuately, there is little information of that sort in the records. However, Lyndon did state there this bridge has not been subject to flooding in the past. Maintenance has mostly consisted of removal of vegetation in the channel.

All of the information compiled by Lyndon will be faxed to Genesis today.

February 6, 1996

FDOT - District 7
Bridge Inspections
2916 Leslie Road
Tampa , Florida 33619

GENESIS GROUP, INC.

Attn. : Mr. Lyndon Schmidt

Re: SR 29 Improvements
Glades County, Florida

Dear Mr. Schmidt:

Genesis Group is currently working on Roadway and Bridge Improvement Plans for SR 29 (Bridge Number 50032). The bridge is located over York Branch (Section 20, Township 41S, Range 30E), approximately 2.3 miles south of SR 74. A vicinity map is attached.

A Bridge Hydraulics Report (BHR) is being prepared to define the improvements appropriate for this bridge. In order to prepare this document, we are requesting input from your office. Any information which you have on file relative to this particular crossing will be appreciated. Among those items which could prove helpful are the inspection reports for the bridge (including the underwater inspections).

We will consider the information you forward in our analysis and attempt to model the waterway crossing to simulate the existing conditions. Our schedule for completion of the analysis is aggressive. Therefore, receipt of your input will be needed as quickly as possible.

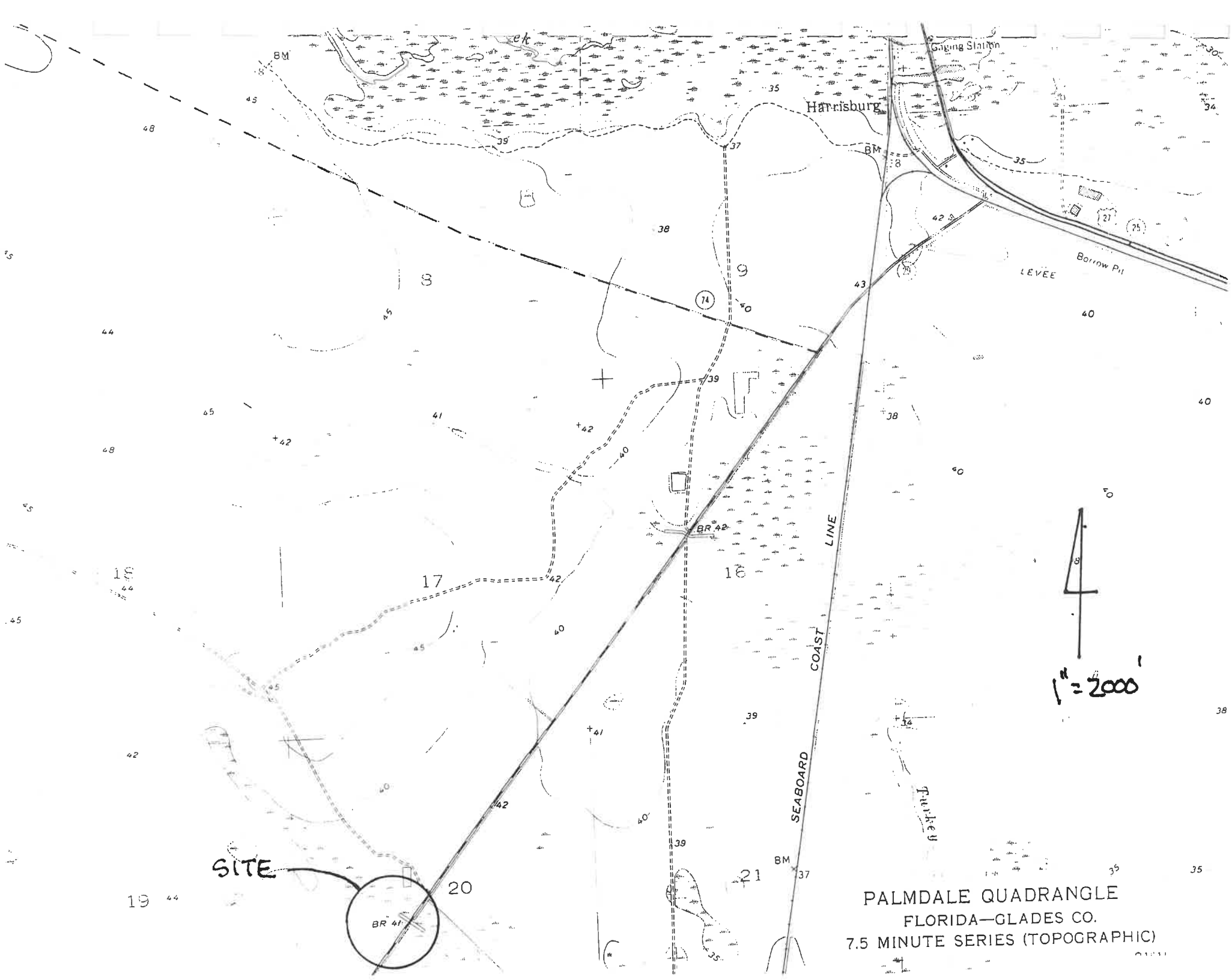
Thank you for your assistance.

Sincerely,

Charles W. Savering

GENESIS GROUP, INC. SE
Charles W. Savering
Design Engineer

820 East Park Avenue. • Bldg. I, Suite 200 • Tallahassee, Florida 32301 • (904) 224-4400 • Fax (904) 681-3600
Tallahassee Jacksonville Sarasota St. Petersburg Chipley Tampa


Harrisburg
Gaging Station
BM
LEVEE
Borrow Pit
SEABOARD COAST LINE
Turkey
SITE
BR 42
BR 41
1" = 2000'
PALMDALE QUADRANGLE
FLORIDA—GLADES CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

February 6, 1996

SWFWMD
PO Box 24680
West Palm Beach, Florida
33416-4680

GENESIS GROUP, INC.

Attn. : Mr. Ernest Gallego

Re: SR 29 Improvements
Glades County, Florida

Dear Mr. Gallego:

Genesis Group is currently working on Roadway and Bridge Improvement Plans for SR 29 (Bridge Number 50032). The bridge is located over York Branch (Section 20, Township 41S, Range 30E), approximately 2.3 miles south of SR 74. A vicinity map is attached.

A Bridge Hydraulics Report (BHR) is being prepared to define the improvements appropriate for this bridge. In order to prepare this document, we are requesting input from your office. Any information which you have on file relative to this particular crossing will be appreciated. Among those items which could prove helpful are:

- Recorded high water levels
- Severity of historic flood events
- Existing and/or proposed improvements to the waterway in this vicinity

We will consider the information you forward in our analysis and attempt to model the waterway crossing to simulate the existing conditions. Our schedule for completion of the analysis is aggressive. Therefore, receipt of your input will be needed as quickly as possible.

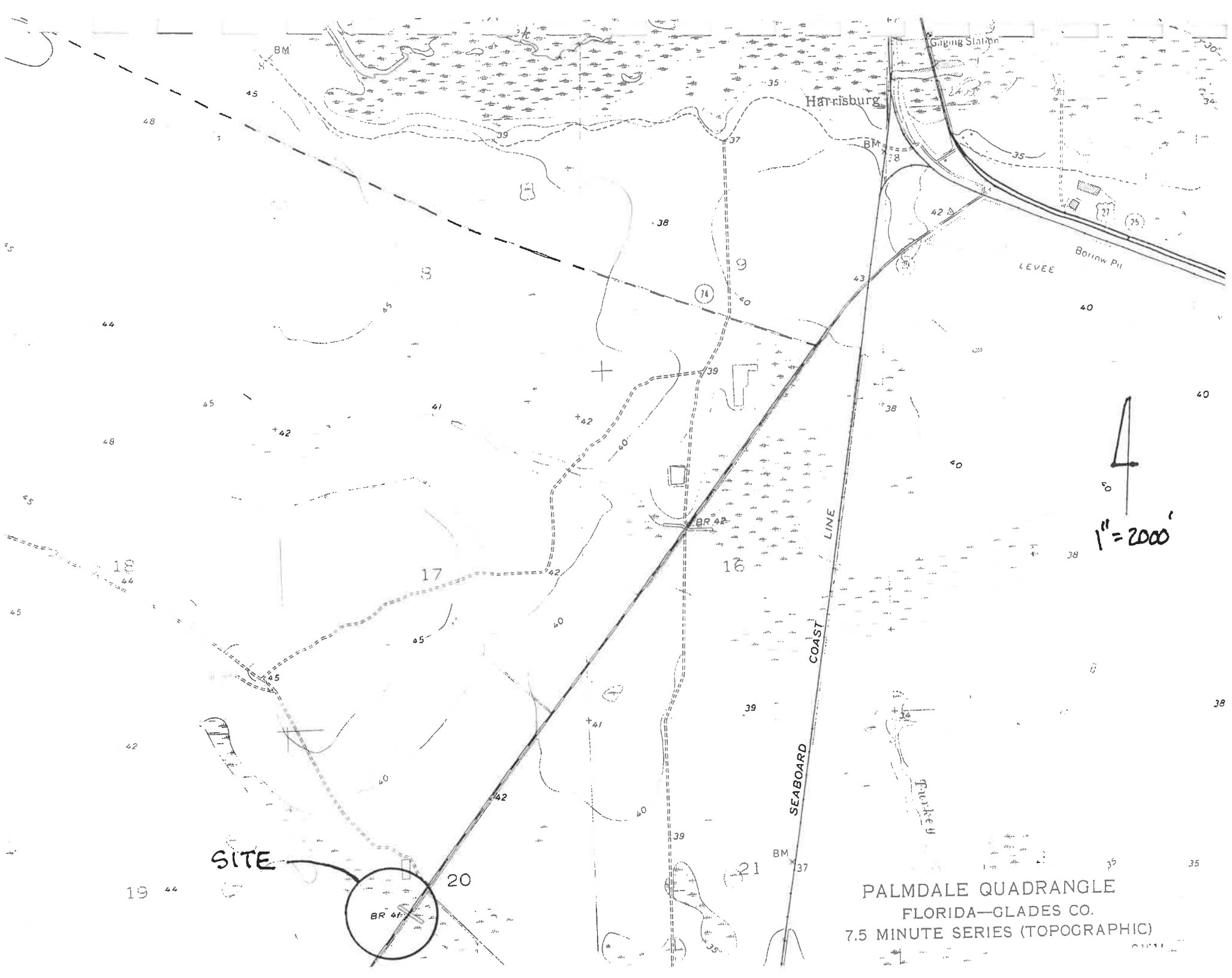
Thank you for your assistance.

Sincerely,

Charles W. Savering

GENESIS GROUP, INC. SE
Charles W. Savering
Design Engineer

(G:\PROJECTS\FDT1\005\50032\WP.ENG\SWFWMD.LTR) February 6, 1996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7.5 MINUTE SERIES (TOPOGRAPHIC)

Genesis Group, Inc.

820 E. Park Avenue, Building I, Suite 200
Tallahassee, Florida 32301
(904) 224-4400 • (904) 681-3600 Fax

Conversation Record

[X] Telephone

[ ] Personal Contact (i.e., lunch, meeting, etc.)

Date:	2-13-96	By:	Charles Savering
Conversed With:	Earnest Gallego	Time:	2:15 p.m.
Company:	South Florida Water Management District (SFWMD)	Project Name:	Bridge Number 050032 on SR 29
Phone No.:	(800) 432 - 2045	Project No.:	FDT1 - 005

Subject: General Information

Remarks:

This conversation was a follow-up to a request for information which was faxed to Mr. Gallego on Feb. 6. Mr. Gallego acknowledged receipt of the request. He indicated that he has no knowledge of any SFWMD history concerning this location. There is no history of flooding in this area as far as Mr. Gallego is aware.

Mr. Gallego suggested that Mr. Mierau (SFWMD ext 6107) be questioned concerning this area. He felt that Mr. Mierau may have more detailed information concerning this area.

Genesis Group, Inc.

820 E. Park Avenue, Building I, Suite 200
Tallahassee, Florida 32301
(904) 224-4400 • (904) 681-3600 Fax

Conversation Record

[X] Telephone

[ ] Personal Contact (i.e., lunch, meeting, etc.)

Date:	2-13-96	By:	Charles Savering
Conversed With:	Mr. Mierau	Time:	2:30 p.m.
Company:	South Florida Water Management District (SFWMD)	Project Name:	Bridge Number 050032 on SR 29
Phone No.:	(800) 432 - 2045, ext. 6107	Project No.:	FDT1 - 005

Subject: General Information

Remarks:

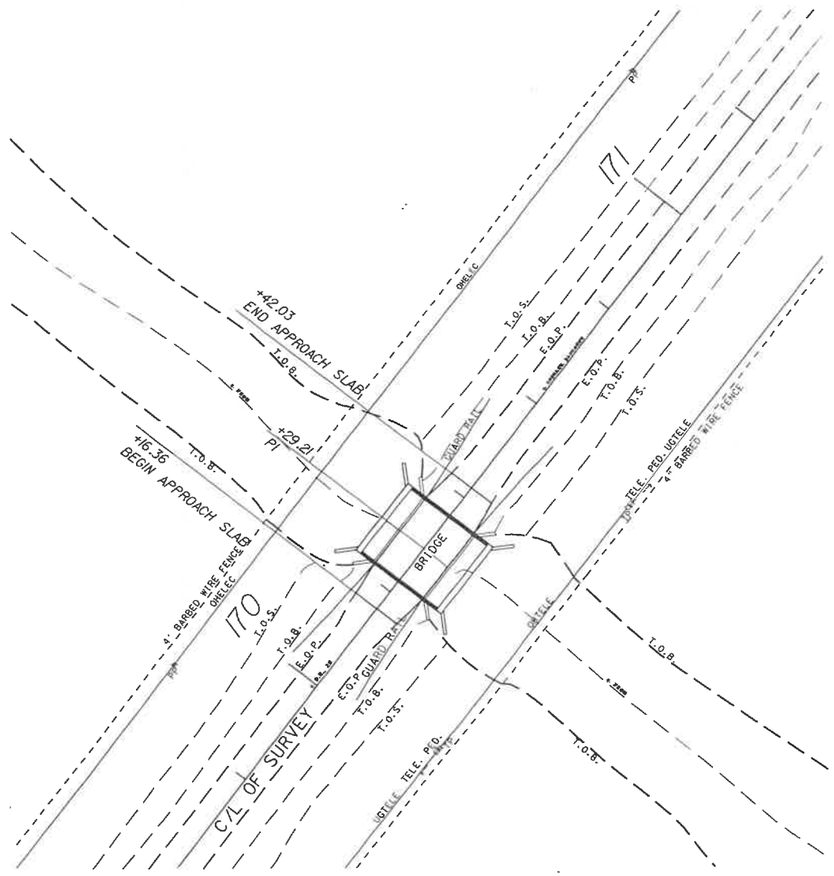
This conversation was a follow-up to a conversation I had with Earnest Gallego of SFWMD concerning the proposed widening (or replacement) of the existing bridge over York Branch on SR 29 in Glades County. Mr. Gallego suggested that Mr. Mierau may be helpful.

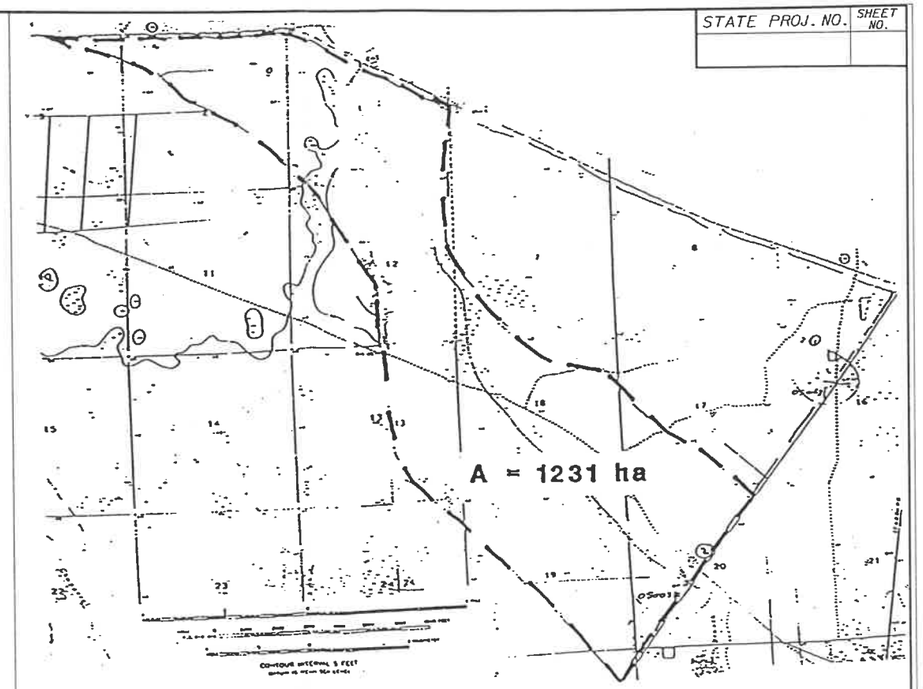
Mr. Mierau did not have any specific knowledge concerning this bridge. He did state that there were not, to his knowledge, any "Works of the District" associated with York Branch. He stated that Mr. Gallego would probably have more knowledge of this area than he would.

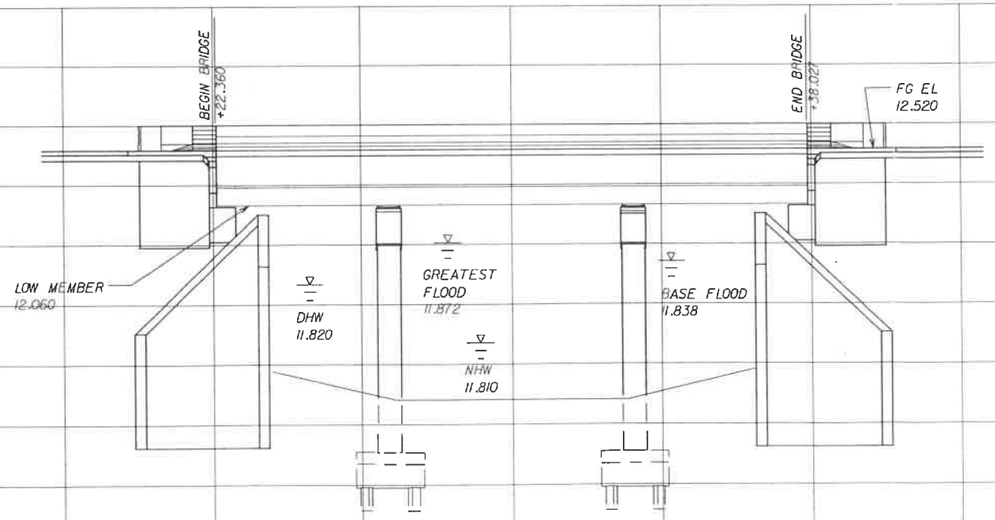
Appendix H

Bridge Hydraulics Recommendation Sheet & Deck Drainage Calculations

STATE PROJ. NO.	SHEET NO.







EXISTING STRUCTURES

(REFERENCE)	(1)	(2)	(3)	(4)	ASSUMED CONFIGURATION
FOUNDATION	0.035 PILES				0.305 PILES
OVERALL LENGTH	15.667				15.667
SPAN LENGTH	4.572				4.572
TYPE CONSTRUCTION	FLAT SLAB				FLAT SLAB
AREA OF OPENING @ H.W.	21.924				21.924
ROADWAY WIDTH	10.668				14.351
ELEV. LOW MEMBER	12.060				12.060

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 judgements 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) 11.810 M.H.W. _____ M.L.W. _____

☐ OVERTOPPING FLOOD
☒ GREATEST FLOOD

FLOOD DATA:	MAX. EVENT OF RECORD	DESIGN FLOOD	BASE FLOOD	GREATEST FLOOD
STAGE ELEV. NGVD (M)		11.820	11.838	11.872
DISCHARGE (CM/S)		446	512	666
AVERAGE VELOCITY (M/S)		0.884	0.994	1.237
EXCEEDANCE PROB. (%)				
FREQUENCY (YR.)				

HYDRAULIC RECOMMENDATIONS

1. BEGIN BRIDGE STATION 71+22.360 END BRIDGE STATION 71+38.027 SKEW ANGLE 0°
2. CHANNEL SECTION: ℄ STATION _____ BOTTOM WIDTH 13.716 ELEV. _____ 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. 0.270 ABOVE EL. 11.790
5. SCOUR PREDICTION: BASE FLOOD: Contraction El = 9.100; Pier El = 9.620
Greatest Flood: Contraction El = 8.430; Pier El = 9.710
6. SLOPE PROTECTION: NONE
7. DECK DRAINAGE: RUNOFF WILL SHEET FLOW OFF BRIDGE INTO EXISTING ROADSIDE DITCHES
8. OTHER: _____

REMARKS: _____

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

GENESIS GROUP, INC.

BRIDGE HYDRAULIC RECOMENDATIONS
SR# 29

$$$$$$$$DONSPECIFICATION$$$$$$$$
$$$$$$$$STTIME$$$$$$$$

DECK DRAINAGE CALCULATIONS
SR 29 - BRIDGE NUMBER 050032

Design Criteria

Per FDOT Drainage Manual, Volume I, Chapter 3 :

Spread Standards are as follows:

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.

Since the posted speed limit on SR 29 at this location is 55 miles per hour, this standard applies.

The following analysis compares the maximum allowable "gutter" flow to the anticipated gutter flow occurring on the bridge deck.

Maximum Allowable Gutter Flow:

$Q = (0.56 / n) * Sx^{5/3} * s^{0.5} * T^{8/3}$

Where:

Q =	?	cfs	(maximum gutter spread allowed)
n =	0.016		(based on broomed finished concrete deck)
Sx =	0.02	feet per foot	(cross slope of deck)
s =	0.003	feet per foot	(longitudnal slope of deck (minimum))
T =	10	feet	(shoulder width = max. spread allowed)
Q =	**1.31**	**cfs**	

Runoff within Bridge "Gutter"

Drainage Area :

A = 0.5 x length x width
A = 0.5 x 45' x 47.1'
A = 1059.7 square feet
A = 0.024 acres

Assuming no flow entering bridge from roadway:

Q =	c i A		(Rational formula)
c =	0.95		(asphalt pavement)
i =	4.0	inches / hour	(FDOT standard intensity)
A =	0.024	acres	(Drainage area)
Q =	**0.091**	**cfs**	

Therefore, since the anticipated gutter flow from a rainfall intensity of 4.0 inches per hour is less than the maximum discharge that can be accommodated without spreading into the travelway, the bridge deck drainage is adequate.

Compute Deck Spread

T = (0.091/((0.56/0.016)*0.02^5/3*0.03^0.5))^3/8

T = 3.68 feet

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).