Hydraulic and Hydrological Study
for
Cochran Mill Road (CR 1392) over Pea Creek

Project Number: BRZLB-121(22)
P.I. No. 771275

Community Coordination Only Required
Unincorporated Fulton County, Georgia
Community No.: 135160

GEORGIA REGISTERED No. 27930 PROFESSIONAL ENGINEER ROBERT A. LAURA

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-27-2005

October 2005

by
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1.0 HYDRAULIC AND HYDROLOGICAL REPORT

Project Location and Description

The crossing of Cochran Mill Road (CR 1392) over Pea Creek is located in Fulton County, approximately 7 miles northwest of the city of Palmetto, Georgia. The existing 29 foot long by 19.5 foot wide (out-to-out) single span bridge is proposed to be replaced. The new structure is to be a 150 foot long by 38 foot wide (gutter-to-gutter) three span PSC beam bridge that will be constructed on a new alignment located 10 feet downstream of the existing roadway centerline. The abutments of the proposed bridge, like the abutments of the existing bridge, are to be built at 90 degrees to the roadway centerline. While there is no development in the upstream floodplain, there is a building located in the north downstream quadrant, approximately 400 feet from the centerline of the creek. This site is located in a very rural section of Fulton County and is densely wooded with minimal development.

Existing Condition

The existing bridge structure is a 29 foot long by 19.5 foot wide (out-to-out) single span bridge consisting of concrete vertical abutment walls on footings and steel beams with timber decking overlaid with asphalt. The abutments of the existing bridge are at a 90 degree angle to the roadway centerline and are aligned with the downstream channel, however the immediate upstream channel approaches the structure at 60 degrees (from north) and some minor scouring has occurred at the south abutment due to this angle of attack. The low chord elevation is 765.70 feet and roadway elevation is 768.70 feet.

Proposed Condition

The proposed replacement structure is to be a 150 foot long by 38 foot wide (gutter-to-gutter) three span PSC beam bridge with spillthrough abutments. Each of the three spans will be 50 feet in length with the middle span centered over the channel. The wider cross section that is provided by the bridge will be positioned to better accommodate the upstream angle of attack at the southern embankment. The minimum low chord elevation is 766.80 feet with a low roadway elevation of 770.00 feet. Since Cochran Mill Road will be closed for construction of the replacement bridge over Pea Creek, no detour bridge is required at this site.

Proposed Alternatives

Since this site has a drainage area of less than 20 square miles, an analysis of a 4 barrel 10x10 box culvert, which is the largest culvert to fit the channel, was made at this site. However, this option does not provide acceptable backwater values. Backwaters are 0.97 feet and 1.34 feet for the 50 and 100-year storms, respectively. Also, a culvert was not desirable for this site due to environmental impacts.

Method of Analysis for Proposed Bridge

Requirements and guidelines contained in Georgia Department of Transportation's (GDOT) Drainage Design Manual, Chapters 2 & 14, were used in the preparation of this report. While Federal Emergency Management Agency (FEMA) floodway (HEC-2) data exists for this site, the field survey data indicates a 2½ to 3 foot discrepancy in elevations between the survey and the FEMA model. Data points in the field survey place ground elevations higher than those used in the FEMA model. Therefore, the FEMA data was determined to be inaccurate and was used only to determine the impact of the proposed bridge on the published flood profile data. New models were created for the natural, existing, and proposed conditions. Cross-sectional information for these new models was provided by a field survey.

Modeling and hydraulic analysis was performed to size the proposed structure and to determine any change in storage from the existing to the proposed condition. In order to achieve this Soil Conservation Service (SCS) Type II hydrographs for the 10, 50, 100 and 500-year events were created using the HEC-HMS (Version 2.2.2, May 2003) program. The HEC-HMS program requires the user to create three components: a basin model, a meteorological model, and control specifications. Input parameters for the basin model are based on the guidelines and equations contained in the Georgia Stormwater Management Manual, Volume 2, Section 2.1.5 – SCS Hydrologic Method. The basin model requires input of three parameters: loss rate, transform, and baseflow. Loss rate was established by the SCS Curve Number (CN) method and required input for the initial loss, percent impervious and SCS CN. Using the aforementioned manual, the CN was determined to be 61. It was determined by a site assessment and soil maps that this basin is comprised of Group B soils with 50% of the basin area made up of woods with good cover (CN = 55), 40% made up of residential 1 acre lots (CN = 68) and 10% made up of open spaces with grass cover of 75% or more of the area (CN = 61). Percent impervious was set at 0% to optimize the impervious area beyond what is accounted for in the Curve Number. Initial loss equals 1.28 and was calculated as I = 0.2S, where S = (1000/CN)-10.

The transform method is used to compute direct runoff from excess precipitation. For this model the transform parameter the SCS method was used which required input for the SCS lag time. Lag time equals 140 minutes and is a percent of the total time of concentration (Tc) through the basin, calculated as 0.6Tc. The time of concentration includes calculations for sheet flow, shallow flow, and open channel flow in the basin. To calculate sheet flow a Manning's "n" value of 0.80 was determined for the wooded terrain at the head of the basin, along with a land slope value of 0.025 ft/ft (measured from a USGS topographic map), the distance or flow length (measured from a USGS topographic map) is approximately 100 ft, and the rainfall depth for the 2-year storm = 3.7 inches. These values entered into the equation for sheetflow equates to a travel time of 0.053 hours. After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. Shallow flow is calculated by dividing the flow length by the average velocity multiplied by a 3600 conversion factor for seconds to hours. The average velocity for shallow flow was determined to be 2.60 ft/sec and was taken from the TR-55 chart for shallow flow velocities. The flow length for shallow flow is approximately 5800 ft (measured from a USGS topographic map). Therefore, time of travel for shallow flow equates to 0.62 hours. Open channel flow requires the use of the Manning's equation (v = 1.49*r(2/3)*s(1/2)/n) to find the average velocity. Entering in a hydraulic radius equal to 1.41 feet (based on a 50 foot top of channel width, 2 to 1 side slopes, and a water depth of 3 feet where area equals 144 sf and perimeter equals 102 ft), a channel slope of 0.003125 ft/ft (measured from a USGS topographic map) and a Manning's "n" value of 0.06 for the stream channel, the average velocity was calculated as 1.75 ft/sec. The flow length in the channel up to the proposed crossing is approximately 3.95 miles or 20850 feet (measured from USGS topographic map). Time of travel for open channel flow was then calculated the same way as shallow flow, by dividing the flow length by the average velocity multiplied by a 3600 conversion factor for seconds to hours, and equals 3.30 hours. Total time of concentration equals 3.97 hours.

The baseflow parameter was established as the Constant Monthly method and was based on the observed water depth of approximately 1 foot. Calculated base flow uses the equation of Q = vA, where v = 1.49*r(2/3)*s(1/2)/n and A = area of trapezoidal channel shape. The constant "r" is the hydraulic radius = 0.49 feet, "s" is the channel slope = 0.003125, and "n" is the Manning's roughness coefficient for open channel flow = 0.06. Calculated baseflow was found to be 42 cfs.

The meteorological model was set for SCS Type II storms with rainfall depths entered for the 10, 50, 100 and 500-year events. Table 1 summarizes rainfall depths obtained from the Fulton County Drainage Manual. The rainfall depth for the 500-year event is derived by extrapolation of the Fulton County data using the Atlanta Intensity-Duration-Frequency (IDF) curves. The 500-year rainfall depth is 9.0 inches.

Table 1: 24-hour Rainfall

Recurrence Interval (years)	Rainfall Depth (inches)
2	3.7
5	4.8
10	5.7
25	6.6
50	7.6
100	7.9

Control specifications are required for the model to run. The control specifications were set for a 24 hour period with a time interval of 5 minutes. The time interval, or computation step, determines the resolution of model results computed during a run.

Modeling was performed with the HEC-RAS (Version 3.1.3, May 2005) program for unsteady flow under all storm events for the natural, existing and proposed condition. The upstream boundary conditions in these models were set using a flow hydrograph and the downstream boundary conditions were set as the normal depth using the hydraulic slope derived from United States Geological Survey (USGS) Quadrangle Topographical maps. Bridge hydraulic calculations were performed using the bridge analysis module (WSPRO Method) contained within HEC-RAS.

The design year ADT is 3070 vpd for this site. The design speed is 45 mph. The bridge width of 38 feet was obtained from MOG 4265 for a two-lane rural local road. The design storm is the 50-year event as per GDOT guidelines for a road not designated as a state route and with a design ADT of over 1500.

The drainage basin upstream of the proposed bridge crossing is approximately 5,360 acres (8.37 sq. mi.) and was measured from the USGS Quadrangle Topographical map for Palmetto, Georgia, in combination with FIS data. The drainage area for this project site is located in region 1. Peak discharges for the 10, 50, 100, and 500-year storms were determined by the SCS hydrographs created in HEC-HMS. These values were compared to FEMA data and discharge values that were calculated using the regression equations in the USGS publication, "Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins in Georgia". Results and discussion of this data can be found in Section 4.

Manning "n" values for the models created with the new survey data were specified as 0.06 in the channel and 0.11 in the overbank areas and are based on a site assessment and engineering judgment. Manning "n" values contained in the FEMA floodway data (HEC-2) were specified as 0.04 in the channel and 0.10 in the overbank areas.

FEMA Participation

Since Unincorporated Fulton County participates in the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA), all NFIP regulations apply. NFIP regulation 60.3(c) specifies requirements for areas mapped by FEMA with a base flood elevation (BFE) established and no floodway determined. Pea Creek has been previously studied by FEMA, and at the proposed bridge site is designated as a Zone AE flood area with a 100 year (base) flood elevation of 770.30 feet. However, this site is not within a designated floodway and no floodway widths have been established for this creek. The proposed structure has been sized to limit the backwater to no more than a 1 foot increase in the existing 100 year (base) flood elevation. In accordance with GDOT guidelines, no FEMA or community coordination is required for this site.

Hydraulic Assessment for Proposed Structure

Using the new survey data, the 10-, 50-, 100- and 500-year events were modeled for the natural, existing and proposed conditions using the HEC-RAS computer program with the WSPRO bridge analysis module. The natural conditions model was run with the bridge at Cochran Mill Road removed. The existing conditions model was run with the existing bridge in place. The proposed conditions model was run with the proposed 150 foot bridge at River Station 600. The area of opening, velocities, and floodstage elevations for the natural, existing and proposed conditions were calculated using the HEC-RAS modeling. This hydraulic data is detailed in Table 2. Table 3 details a comparison of data for storage impacts at River Sta. 6+50 (upstream of the bridge crossing) and River Sta. 5+00 (the section at location of structure). Table 3 compares existing to proposed conditions based on peak discharge data and water surface elevations.

Channel velocities for the proposed bridge for the 50 and 100-year storms are 7.22 ft/s and 7.58 ft/s, respectively. These velocities are within the recommended GDOT range of 1.5 to 1.75 times the natural/unrestricted channel velocity.

The maximum calculated channel scour depth is 9.63 feet for the 100-year storm and 12.97 feet for the 500-year storm. The maximum pier scour plus contraction scour depth occurs at Bent 2 and is 6.79 feet for the 100-year storm and 8.04 feet for the 500-year storm. (See Predicted Scour Report in Section 6.)

Models indicate that the existing bridge is overtopped during the 50 and 100-year storms. However, the proposed bridge clears the 50 and 100-year storms with no flow over the roadway occurring.

The proposed bridge has been sized to limit the 100-year backwater to no more than a one foot increase over the natural or unrestricted 100-year flood elevation. At the existing bridge the 50 and 100-year storms create 4.77 feet and 4.79 feet of backwater, respectively. At the proposed bridge the 50 and 100-year storms create 0.84 feet and 0.93 feet of backwater, respectively. Relative to the natural conditions, the above criteria is met.

A minimum of 2 feet of freeboard above the design floodstage and a minimum of 0.5 feet of freeboard above the 100-year floodstage is required. These conditions have been met or exceeded. (See Section 10 for clearance calculations.)

Table 2: Hydraulic Data

50-Year Storm		
	Existing Bridge	Proposed Bridge
Floodstage	764.33	764.49
Discharge Thru Bridge (cfs)	2574.72	3314.08
Discharge Over Bridge (cfs)	765.25	
Area of Bridge Opening (sf)	360.69	556.47
Velocity Thru Bridge (fps)	7.14	5.96
Channel Velocity (fps)	7.57	7.22
Backwater (ft)	4.77	0.84
Approach W/O Bridge	765.17	765.17
Approach W/Bridge	769.94	766.01
Natural Channel Velocity	4.27	
100-Year Storm		
	Existing Bridge	**Proposed Bridge**
Floodstage	764.45	764.62
Discharge Thru Bridge (cfs)	2596.64	3566.79
Discharge Over Bridge (cfs)	968.46	
Area of Bridge Opening (sf)	437.88	576.28
Velocity Thru Bridge (fps)	5.93	6.19
Channel Velocity (fps)	7.95	7.58
Backwater (ft)	4.79	0.93
Approach W/O Bridge	765.32	765.32
Approach W/Bridge	770.11	766.25
Natural Channel Velocity	4.35	
10-Year Floodstage		763.49
Note: Approach elevations taken at River Station 8+00		
Natural channel velocities taken at River Station 5+50 Floodstage taken at River Station 5+50		

Table 3: Comparison Of Storage Impacts

Comparison of Storage at River Sta. 6+50 (Upstream Section from Bridge):

	10-Year Peak Flow (cfs)	10-Year Peak Water Surface Elev (ft)	50-Year Peak Flow (cfs)	50-Year Peak Water Surface Elev (ft)	100-Year Peak Flow (cfs)	100-Year Peak Water Surface Elev (ft)	500-Year Peak Flow (cfs)	500-Year Peak Water Surface Elev (ft)
PROPOSED 150' BRIDGE	1828.78	763.85	3314.08	765.48	3566.79	765.72	4522.88	766.57
EXISTING 29' BRIDGE	1817.71	767.13	3316.77	769.85	3565.10	770.00	4525.04	770.52
Difference (feet)		-3.28		-4.37		-4.28		-3.95

Comparison of Storage at River Sta. 5+00 (Section at Location of Barn):

	10-Year Peak Flow (cfs)	10-Year Peak Water Surface Elev (ft)	50-Year Peak Flow (cfs)	50-Year Peak Water Surface Elev (ft)	100-Year Peak Flow (cfs)	100-Year Peak Water Surface Elev (ft)	500-Year Peak Flow (cfs)	500-Year Peak Water Surface Elev (ft)
PROPOSED 150' BRIDGE	1828.52	763.37	3313.38	764.43	3566.14	764.58	4522.69	765.10
EXISTING 29' BRIDGE	1817.13	763.36	3316.50	764.43	3564.35	764.58	4524.50	765.10
Difference (feet)		0.01		0.00		0.00		0.00

Spur dike calculations, performed as prescribed in the FHWA publication, HEC-23, "Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Second Edition," indicate that spur dikes are not required at this site. (See Section 8 for spur dike calculations.) Calculations for riprap, using the method shown in the FHWA publications, HEC-18, "Evaluating Scour at Bridges" and HEC-23, "Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Second Edition," indicate that Type I riprap is sufficient to protect both embankments of the proposed bridge. (See Section 9 for riprap calculations.)

There is a privately owned structure located in the downstream floodplain approximately 400 feet from the centerline of the stream in the northwest quadrant. Survey data indicates that the floor elevation of this structure is 761.71 feet. Calculations indicate that for the existing and proposed conditions the water surface elevation for the 100-year storm at River Station 5+00 is 764.58 and 764.58 feet, respectively. Relative to existing conditions, the water surface elevation for the 100 year storm at this location remains unchanged with the proposed bridge structure in place. An expanded analysis of storage indicates that there is a very minor increase in elevation for the 10-year storm of 0.01 feet (or 1/8"). However, like the 100-year storm, the 50 and 500-year event at the proposed bridge does not increase flooding conditions at this location.

The proposed 150 foot long bridge was chosen as the replacement for this site as it is the shortest length structure that provides a ten foot setback from the edge of bank to the roadway embankment and toes of the abutments, while also providing lower channel velocities and backwater elevations.

A risk assessment was performed for this site and no risk was determined since the proposed drainage structure is the most cost effective structure that has acceptable backwater and velocity values.

The required maps, calculations, computer runs, roadway and bridge sheets are included in the following sections.

2.0 HYDRAULIC SITE INSPECTION

On February 20, 2004, a hydraulic site inspection was performed at the Cochran Mill Road (CR 1392) crossing over Pea Creek and the following was noted:

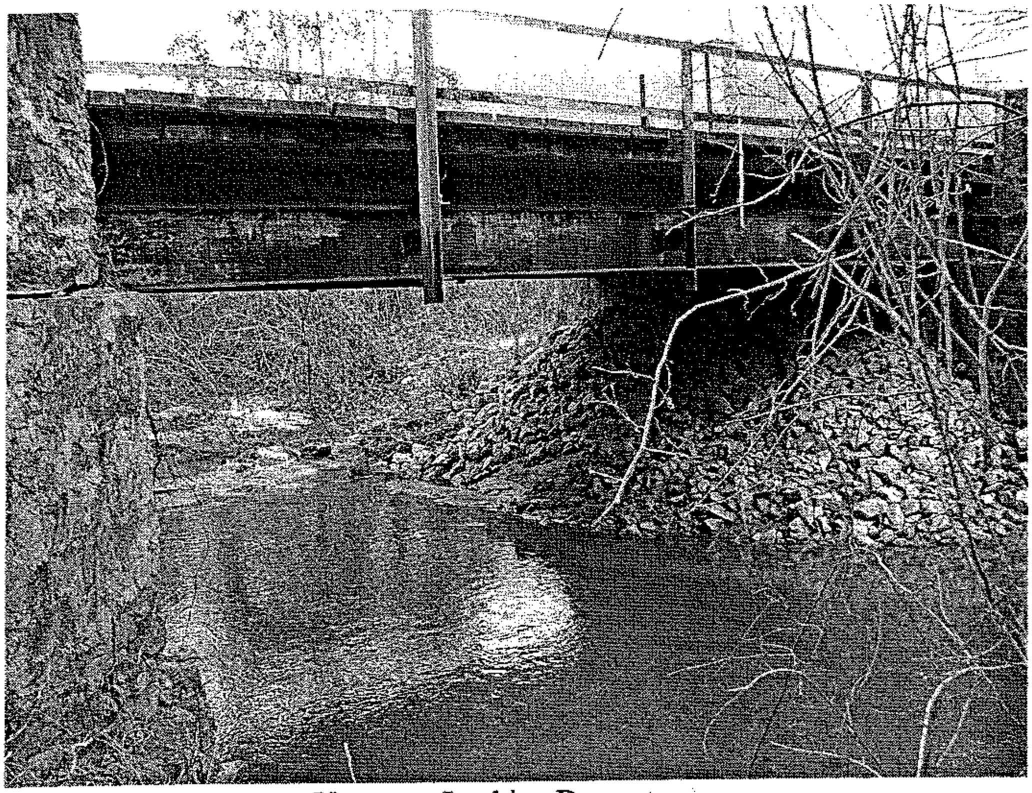
The upstream floodplain is densely wooded with moderate underbrush. The downstream floodplain in the south quadrant is also densely wooded with moderate underbrush, however the downstream north quadrant is cleared and contains a building located approximately 400 feet off the creek centerline and 300 feet from the centerline of roadway. The channel on the upstream side of the proposed bridge crossing is approximately 50 feet wide with high, well defined and cutting banks that are lined with brush and overhanging trees. The channel on the downstream side of the bridge is approximately 60 feet wide, also with high, well defined banks that are lined with brush and overhanging trees. The channel is approximately 30 feet wide at the existing bridge crossing.

The bottom of the channel is composed of sand and rock. At the time of the site inspection, the water in the channel was approximately 1 foot deep and moving quickly. It was observed that the channel is clear and contains no debris. Minor scour was observed at the south abutment. Rip rap has been placed in front of the northern abutment.

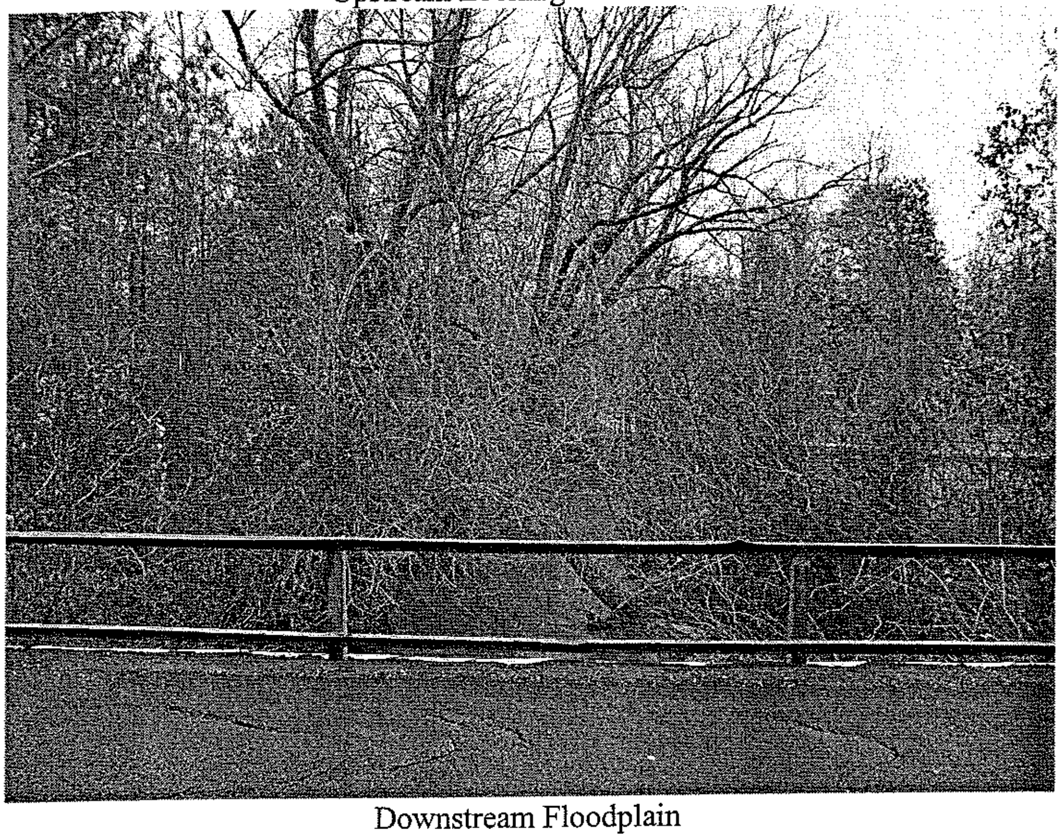
No development was observed in the immediate upstream or downstream floodplains, except for the structure as noted above. Overhead power lines are located on the downstream side, approximately 30 feet from the roadway centerline.

Upstream Floodplain

Immediate Upstream Section

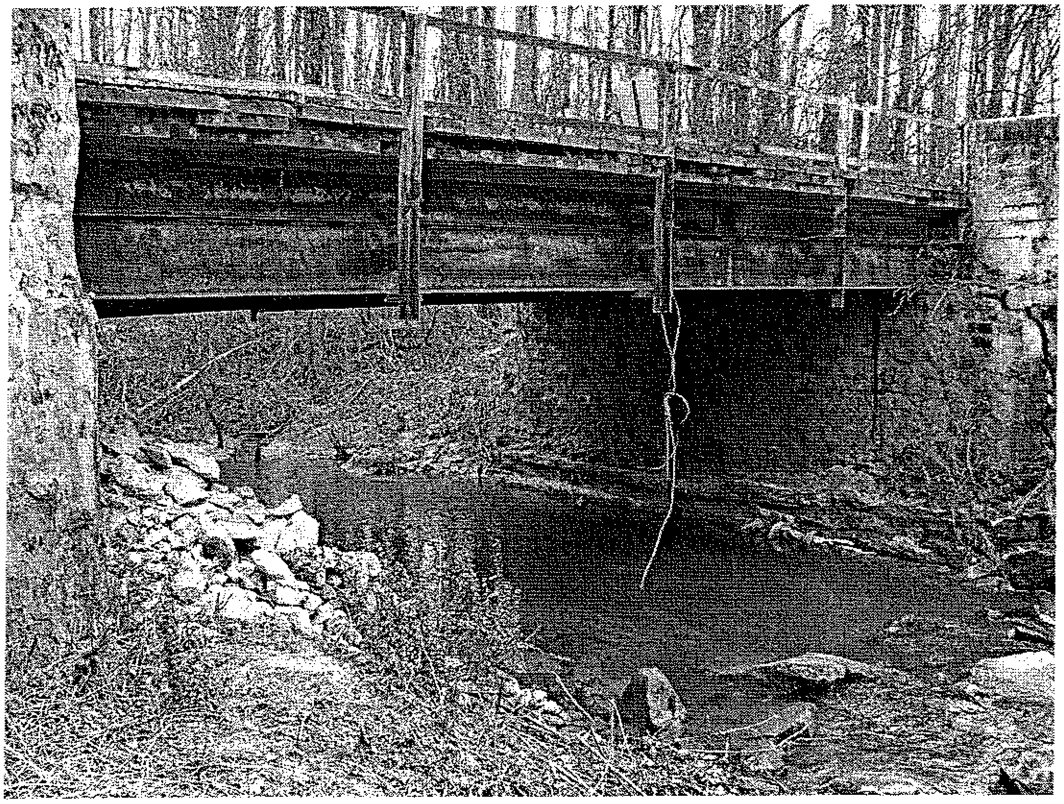


Upstream Looking Downstream

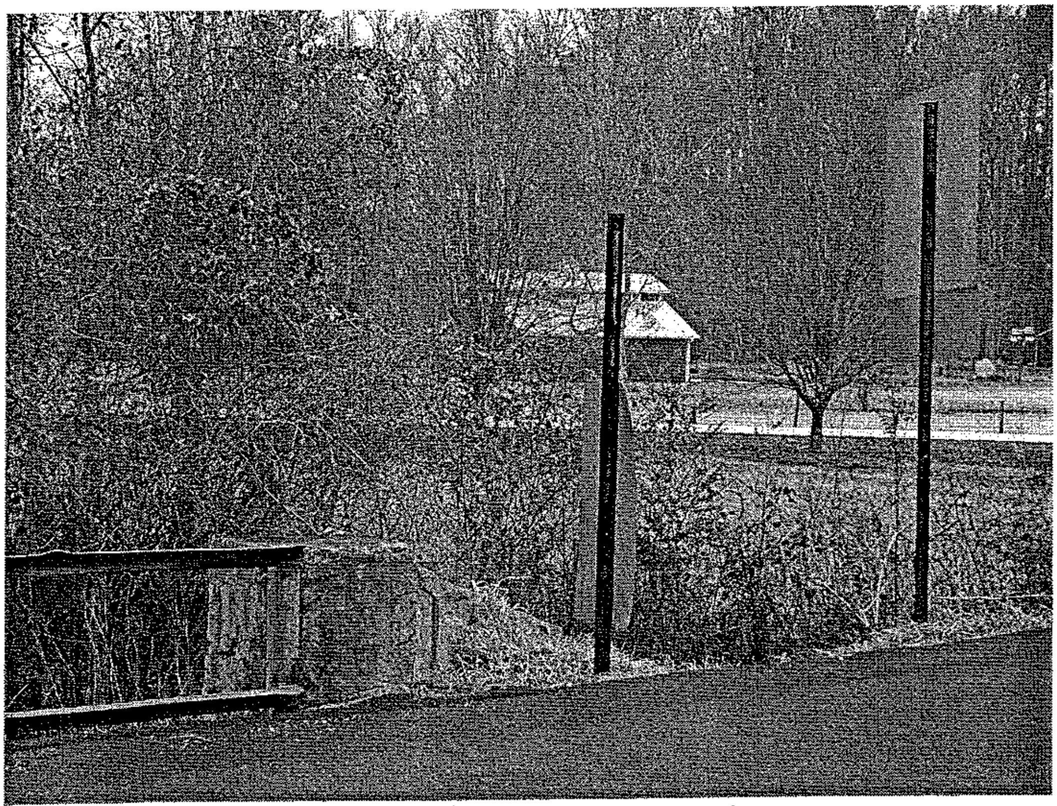


Downstream Floodplain

Immediate Downstream Section

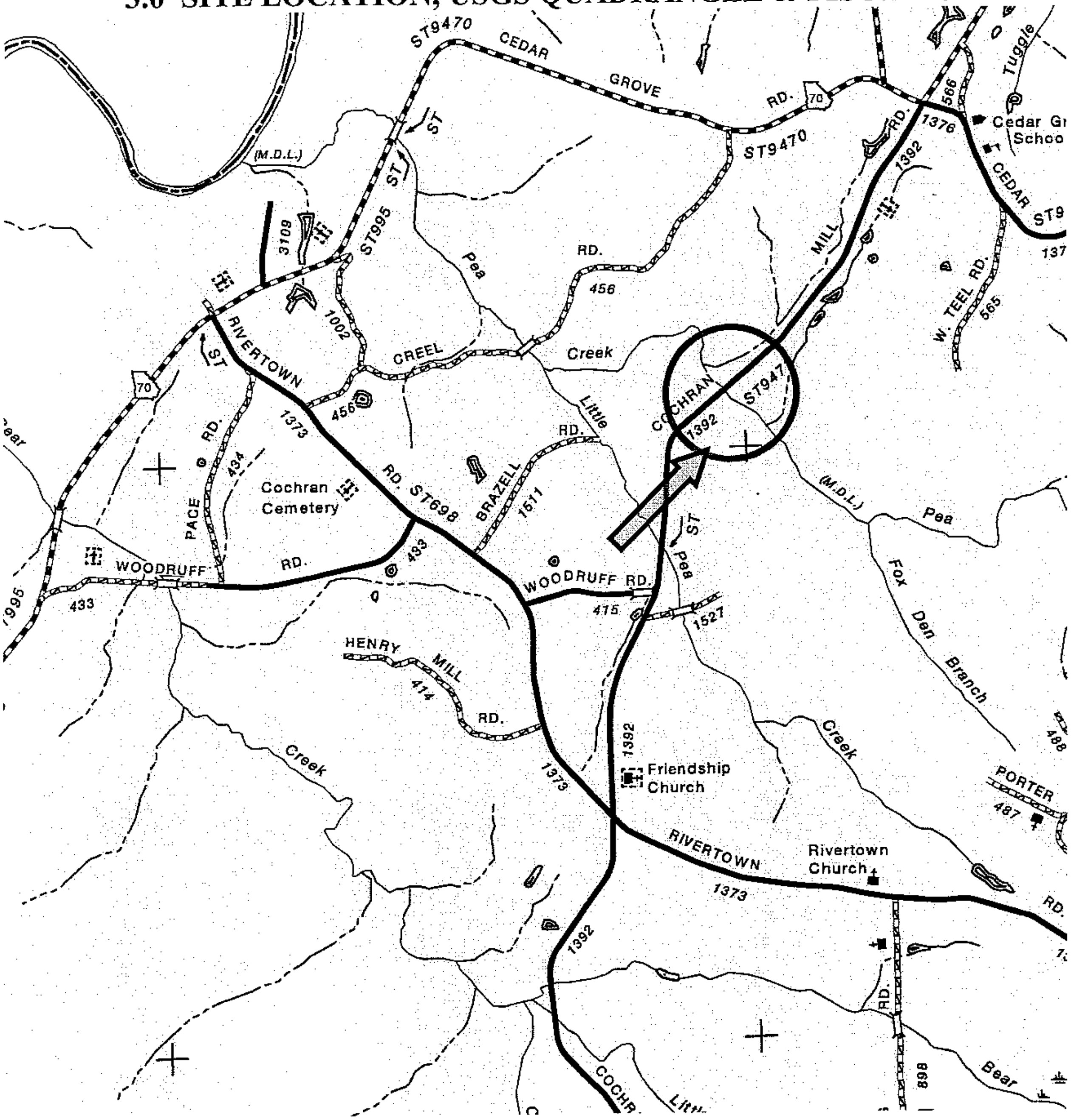


Downstream Looking Upstream



Building in North Downstream Quadrant

3.0 SITE LOCATION, USGS QUADRANGLE & FIS MAPS

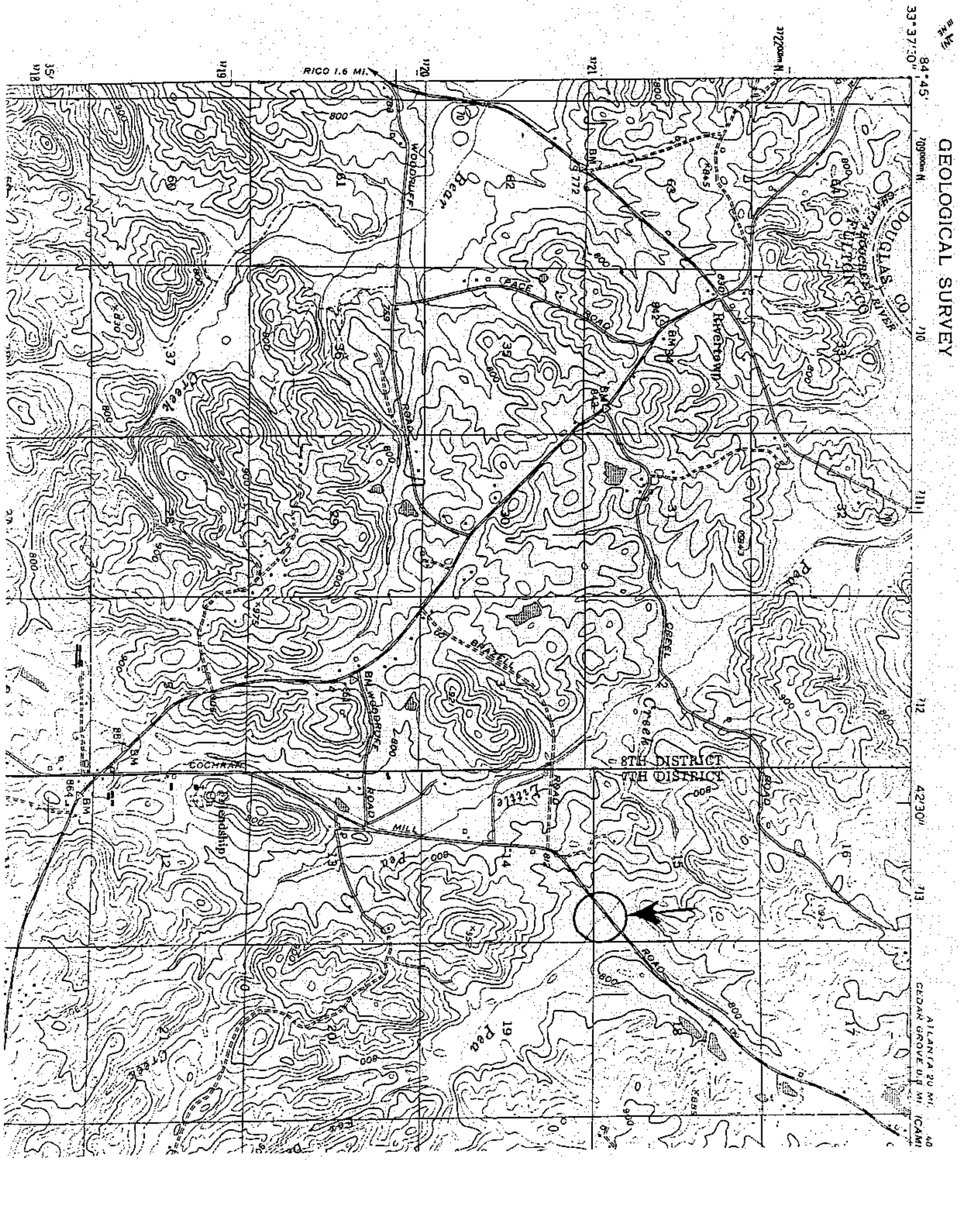


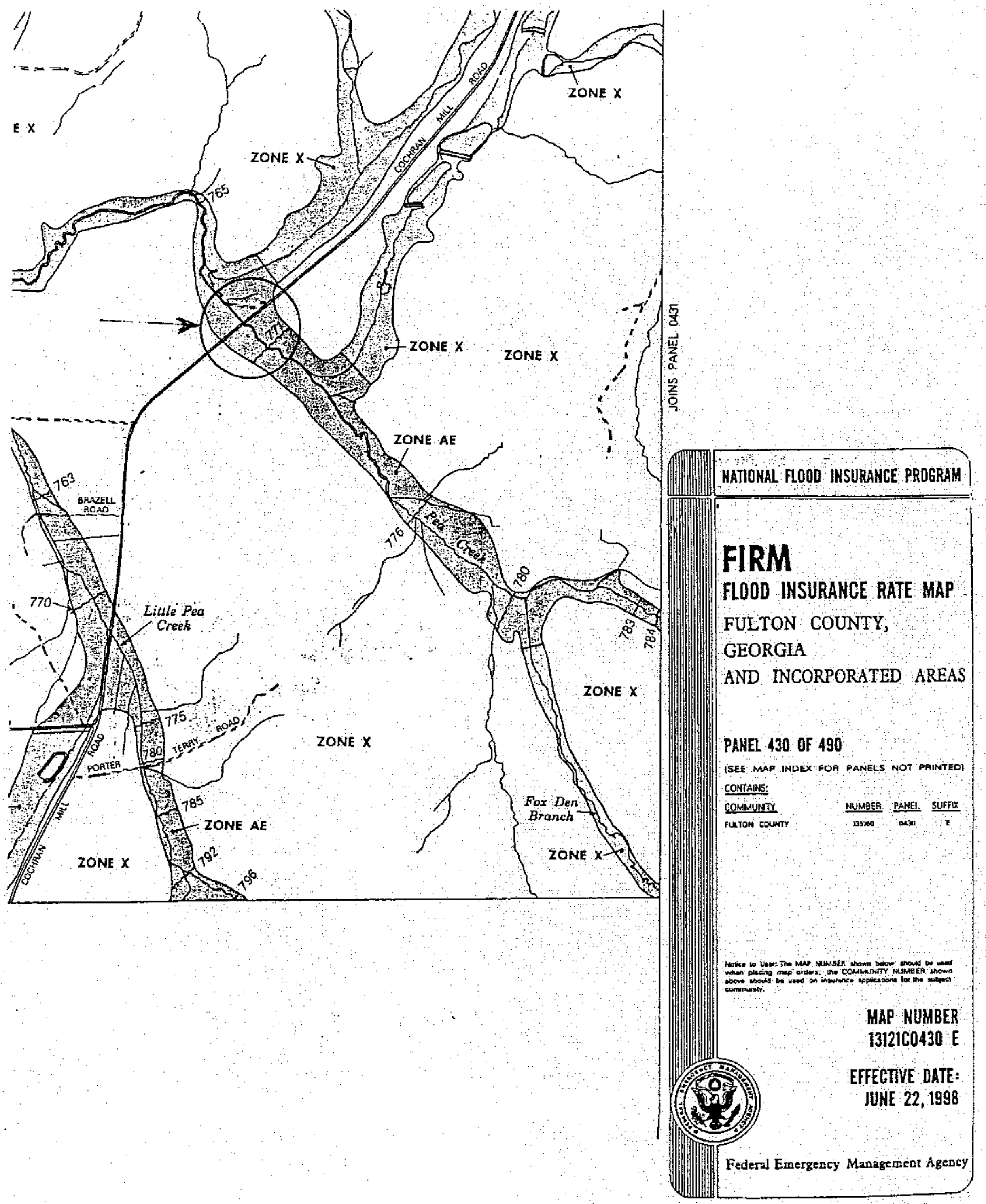
Scale: 1 inch = 1 mile

Location Map

Project: BRZLB-121(22), Fulton County **PI No.:** 771275

Description: Cochran Mill Road (CR 1392) over Pea Creek, 10.3 mi SW of Atlanta


GEOLOGICAL SURVEY
84°45'
33°37'30"
RICO 1.6 MI.
DOUGLAS CO
FULTON CO
Bear
Creek
Pea
Creek
Little
8TH DISTRICT
7TH DISTRICT
COCHRAN
MILL
ROAD
ROAD
42'30"



E X
ZONE X
ZONE X
COCHRAN MILL ROAD
765
771
ZONE X
ZONE X
JOINS PANEL 0431
ZONE AE
763
BRAZELL ROAD
776
Pea Creek
780
770
Little Pea Creek
783
784
ZONE X
775
TERRY ROAD
780
PORTER ROAD
ZONE X
785
ZONE AE
Fox Den Branch
792
796
ZONE X
COCHRAN MILL
ZONE X
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
FULTON COUNTY, GEORGIA
AND INCORPORATED AREAS
PANEL 430 OF 490
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
FULTON COUNTY 135160 0430 E
Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.
MAP NUMBER
13121C0430 E
EFFECTIVE DATE:
JUNE 22, 1998
Federal Emergency Management Agency

4.0 DRAINAGE DATA COMPARISONS

DISCHARGE DATA FROM FEMA HEC-2

HEC-2 data for the 1998 FEMA Flood Insurance Study for Unincorporated Fulton County provides discharge values at this site of 2620 cfs for the 10-year storm (Q_{10}), 4800 cfs for the 100-year storm (Q_{100}), and 9100 cfs for the 500-year storm (Q_{500}). Values for the 50-year storm (Q_{50}) were derived through interpolation of probability plots. It was determined that the 50-year storm (Q_{50}) is 4000 cfs at this site. (See probability plots contained in the following pages.) It was noted that FIS values for the 500-year storm (Q_{500}) were derived by multiplying the 100-year storm (Q_{100}) by 1.9, an old methodology for calculating Q_{500}.

DISCHARGE DATA FROM RURAL REGRESSION EQUATIONS

The drainage area for this project site is located in region 1. The measured drainage basin upstream of the proposed bridge crossing is approximately 5,360 acres (8.37 sq. mi.). Discharges for the 10, 50, 100, and 500-year storms were calculated using the regression equations in the USGS publication, *Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins of Georgia.* (See discharge calculations contained in the following pages.) Discharge values derived from this publication are at least 40 percent lower than FEMA values.

DISCHARGE DATA FROM SCS HYDROGRAPHS

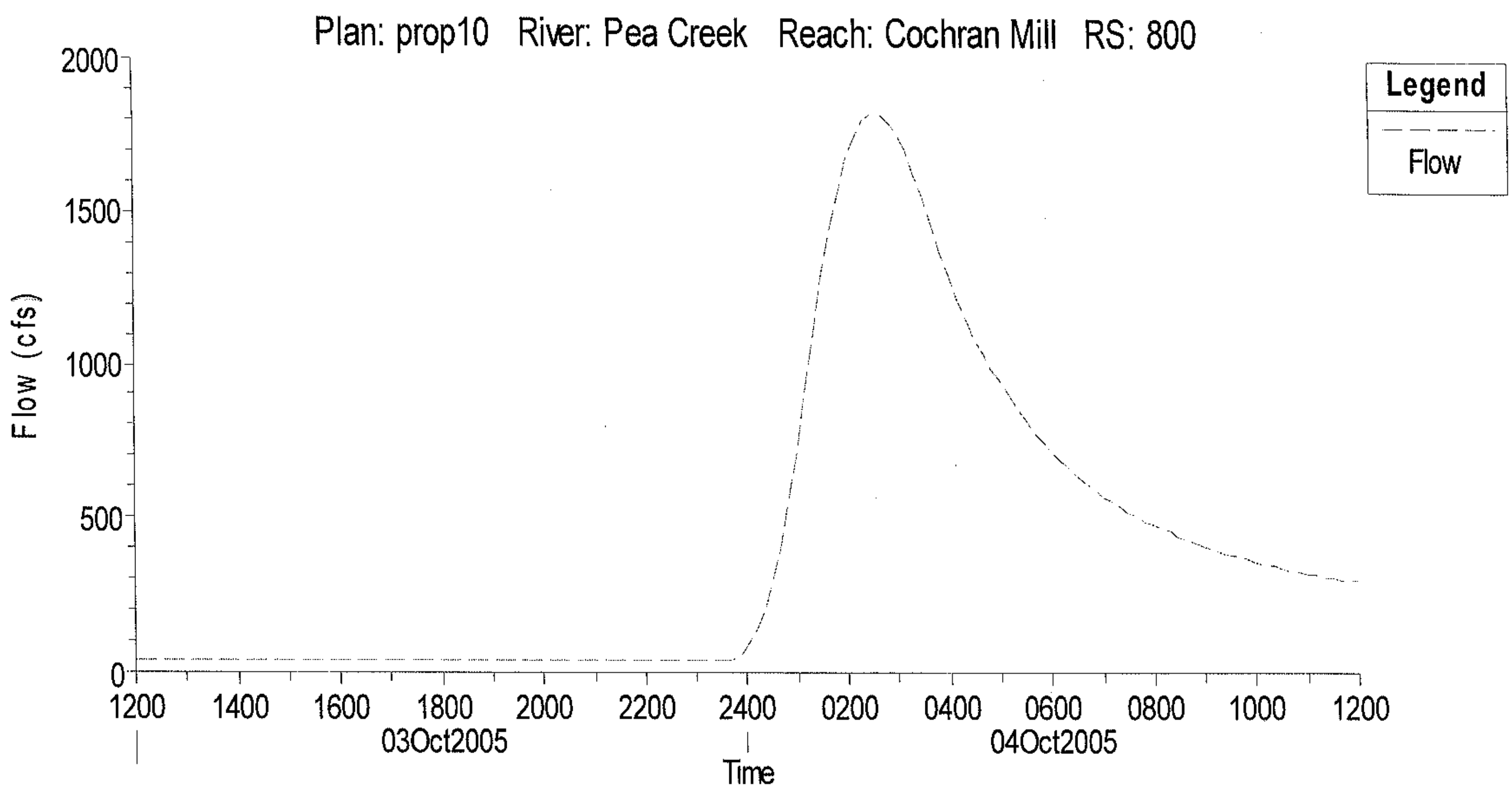
Peak discharge values obtained from the HEC-HMS hydrographs for a SCS Type II storms are 1830.8 cfs for the 10-year storm (Q_{10}), 3317.3 cfs for the 50-year storm (Q_{50}), 3569.6 cfs for the 100-year storm (Q_{100}), and 4529 cfs for the 500-year storm (Q_{500}). (See storm hydrographs contained in the following pages.) These discharge values were used in the new models created with field survey data.

NOTE: The source of the 1998 FEMA discharge values is not verifiable. The hydrographs calculated with HEC-HMS allow more accurate modeling of storage and dynamic effects of the bridge on the resulting water surface profiles and peak flows and are within the accuracy of the regression flows. (See Discharge Data Summary below)

DISCHARGE DATA SUMMARY

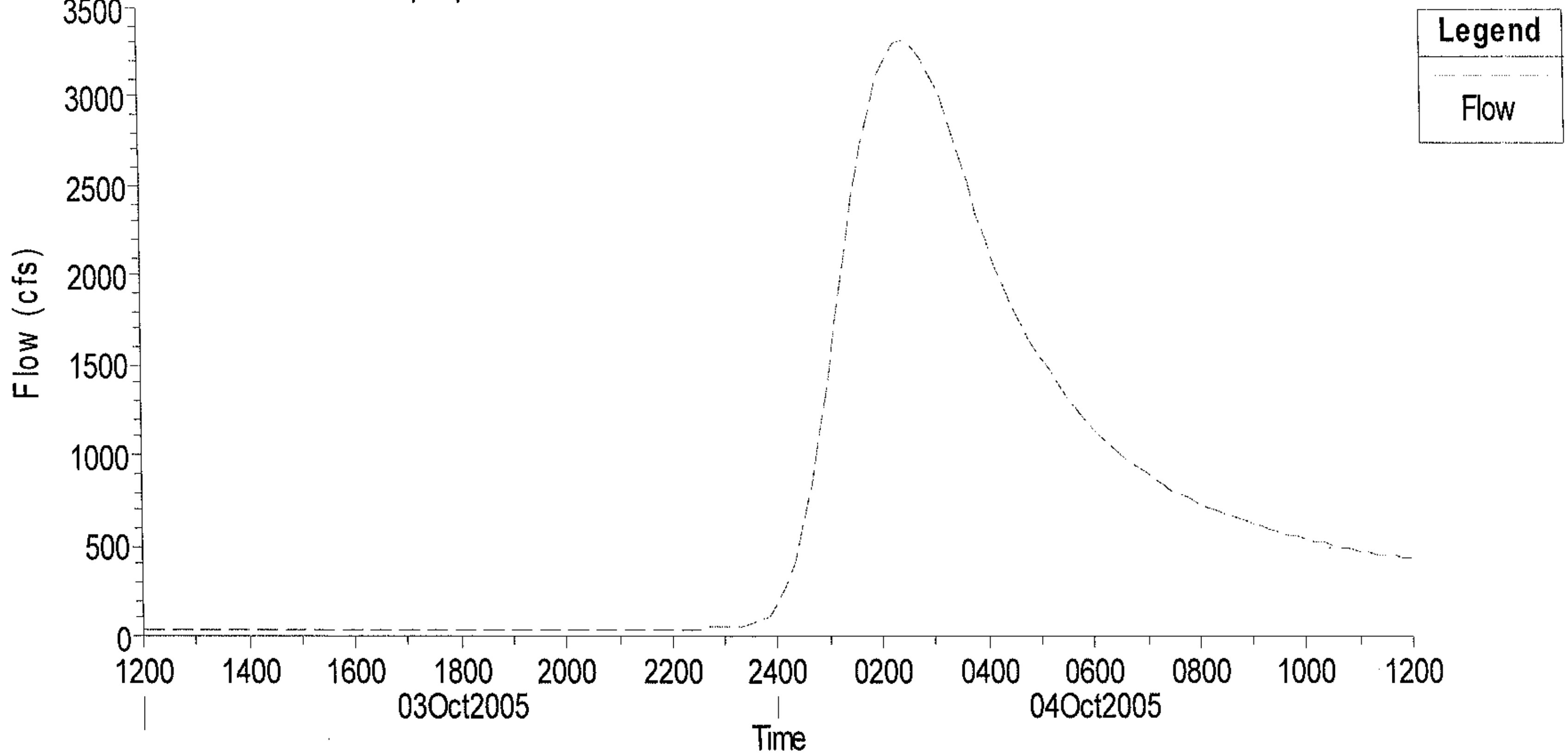
	FIS/FEMA	**USGS – Rural Regression**	**HEC-HMS Hydrographs**
Storm Event	(cfs)	(cfs)	(cfs)
10-Year Storm	2620	1795.6	1830.8
50-Year Storm	4000	2927.7	3317.3
100-Year Storm	4800	3493	3569.6
500-Year Storm	9100	5060.4	4529

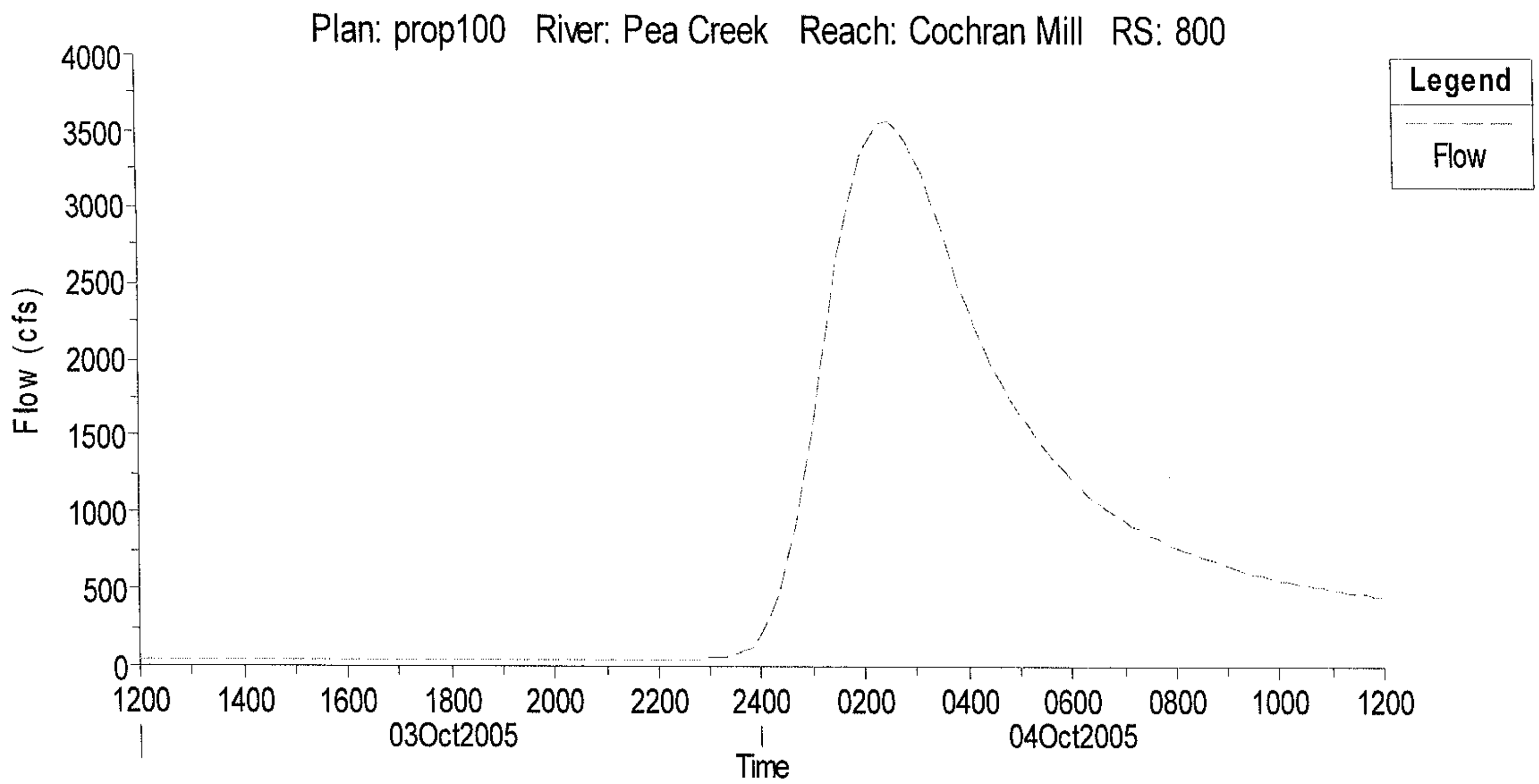
The difference between peak flows from the HEC-HMS hydrographs and the peak flows from the regression equations is 2.0% for the 10-year event, 13.3% for the 50-year event, 2.2% for the 100-year event, and 10.5% for the 500-year event. The accuracy limits of the regression equations for Region 1 are 31%. Peak flows from the HEC-HMS hydrographs are within these accuracy limits.

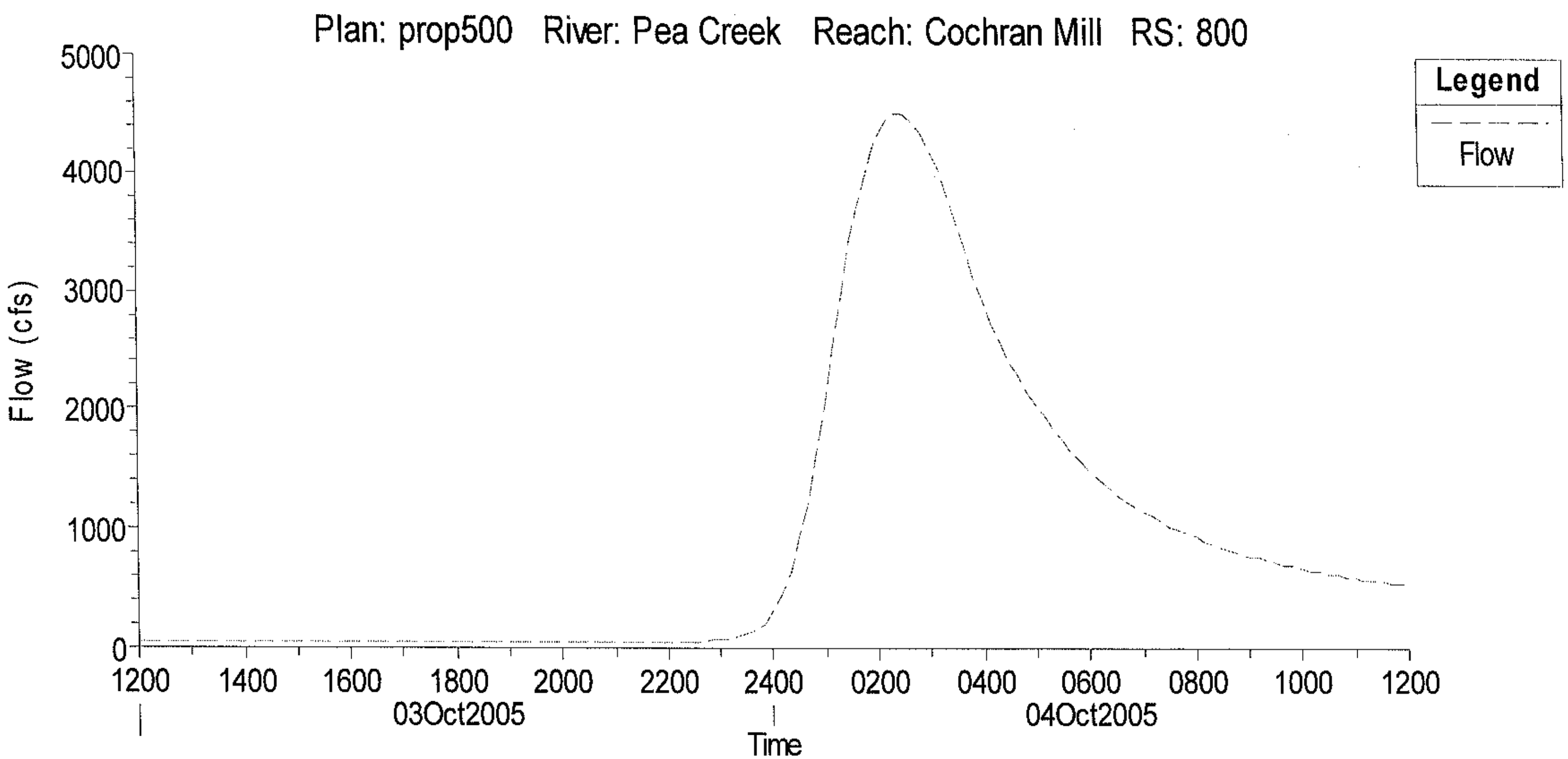


Plan: prop10 River: Pea Creek Reach: Cochran Mill RS: 800
Legend
Flow
Flow (cfs)
2000
1500
1000
500
0
1200
1400
1600
1800
2000
2200
2400
0200
0400
0600
0800
1000
1200
03Oct2005
04Oct2005
Time

Plan: prop50 River: Pea Creek Reach: Cochran Mill RS: 800




Plan: prop100 River: Pea Creek Reach: Cochran Mill RS: 800
Legend
Flow
Flow (cfs)
4000
3500
3000
2500
2000
1500
1000
500
0
1200
1400
1600
1800
2000
2200
2400
0200
0400
0600
0800
1000
1200
03Oct2005
04Oct2005
Time


Plan: prop500 River: Pea Creek Reach: Cochran Mill RS: 800
Legend
Flow
Flow (cfs)
5000
4000
3000
2000
1000
0
1200
1400
1600
1800
2000
2200
2400
0200
0400
0600
0800
1000
1200
03Oct2005
04Oct2005
Time

DISCHARGE CALCULATIONS USING RURAL EQS.

Drainage Area (sq. mi.)	8.37
Region No.	1

Gage No.	*	
Drainage Area @ gage		8.37
	Q10*	
	Q50*	
	Q100*	
	Q500*	
	* no data available	

DISCHARGE (cfs)

	Regional	Urbanized	Weighted
Q2	830.7		0.0
Q10	1795.6		0.0
Q50	2927.7		0.0
Q100	3493.0		0.0
Q500	5060.4		0.0

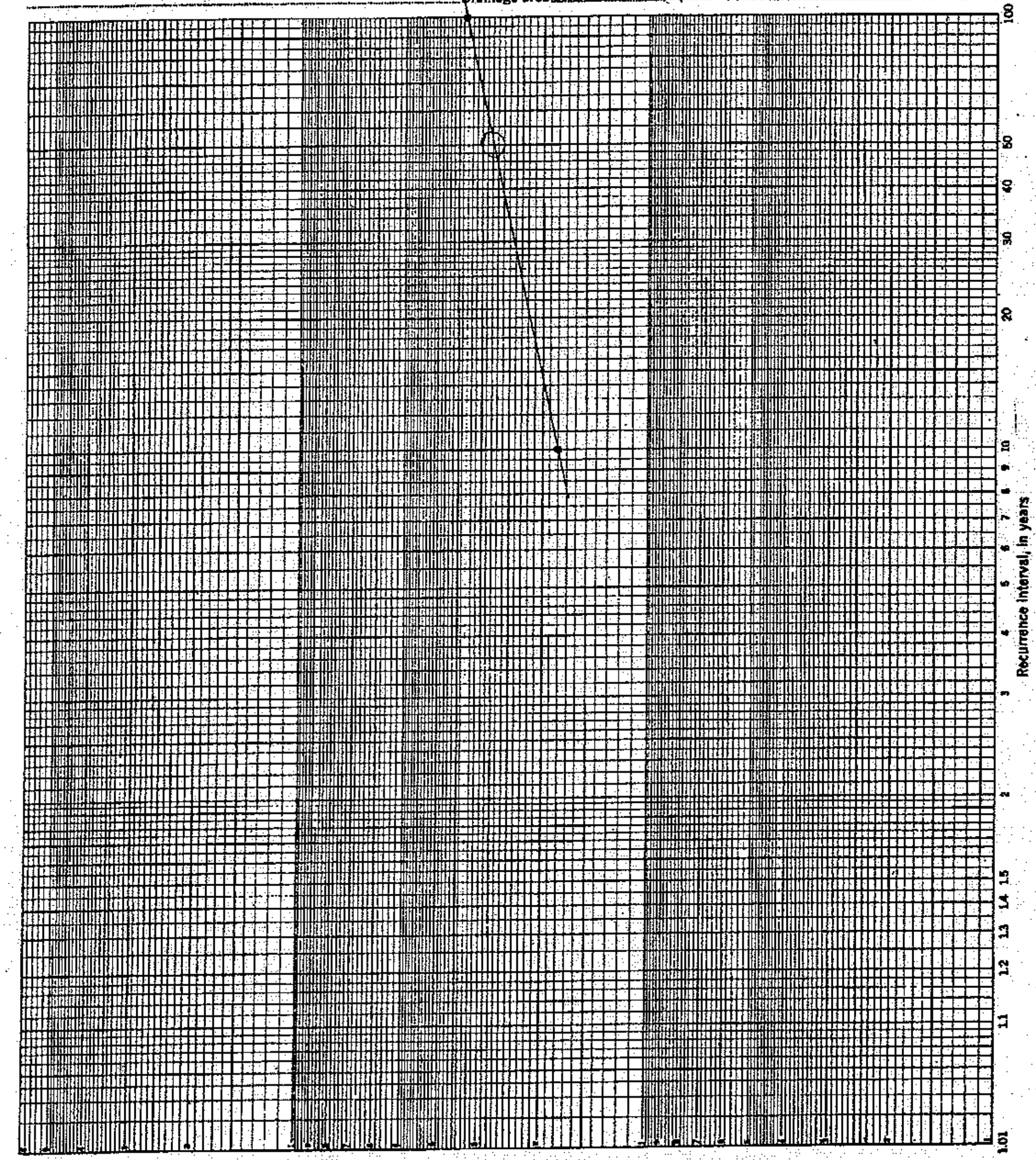
9-179b
Extreme log data plot
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No.........................

Magnitude and frequency of RIVER STA. 5.510 on PEA CREEK

Drainage area.............sq. mi. Period..............



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GPO 928-900

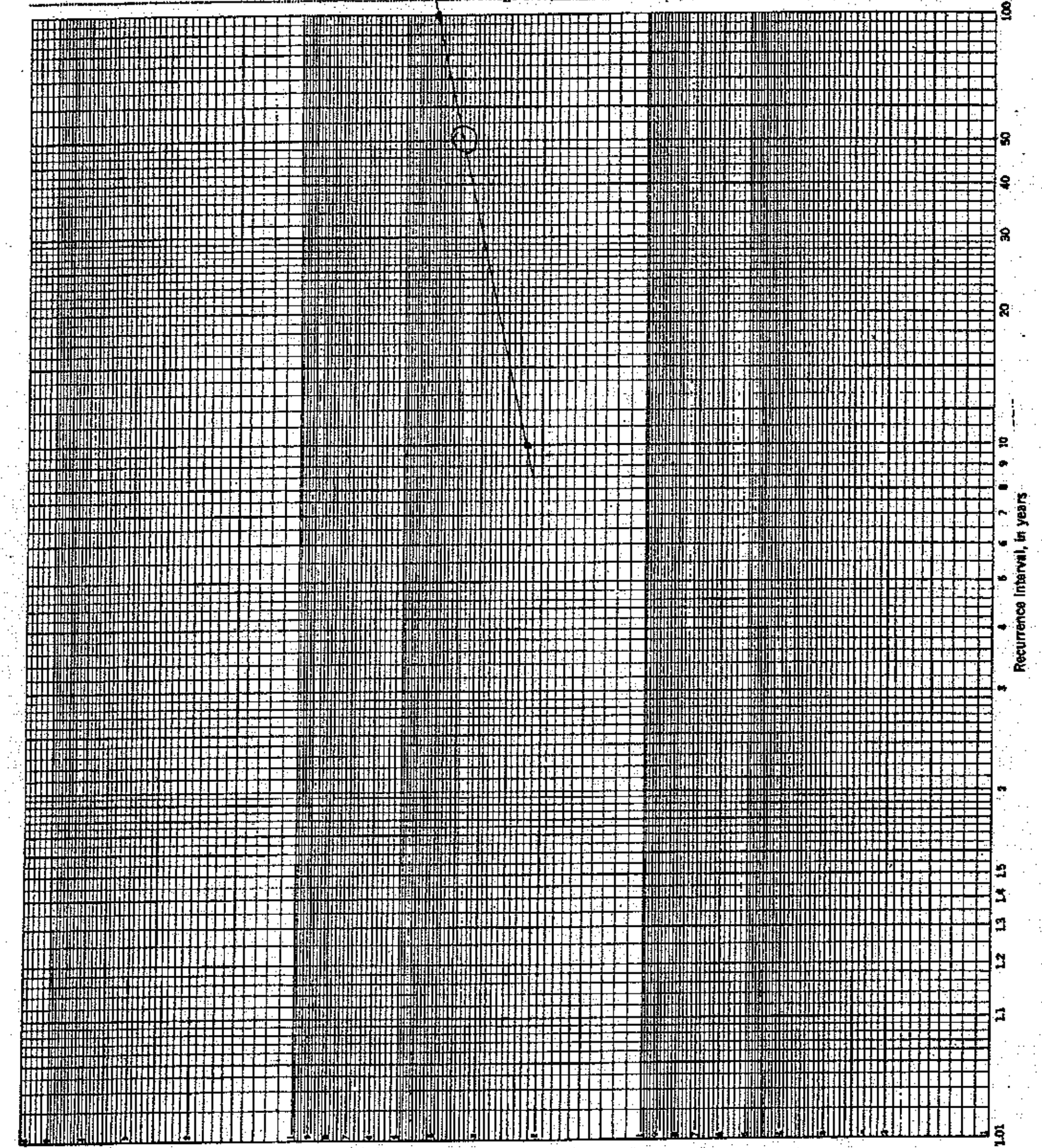
9-179b
Extreme log data plot
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No.........................

Magnitude and frequency of RIVER STA. 4560 on PEA CREEK

Drainage area.................. sq. mi. Period..................



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GPO 925-900

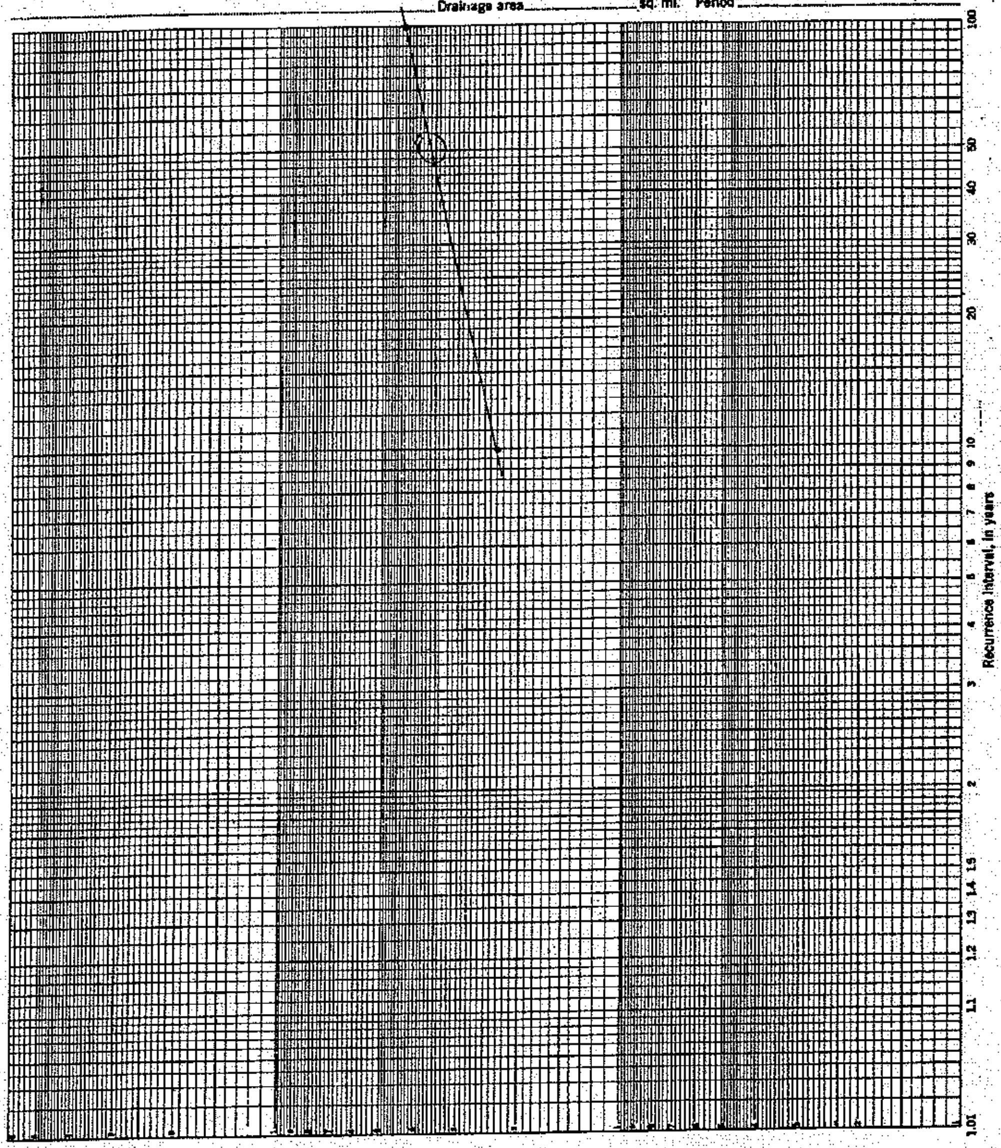
9-179b
Extreme log data plot
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No.........................

Magnitude and frequency of RIVER STA. 3,780 on PEA CREEK

Drainage area________ sq. mi. Period________



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GPO 928-900

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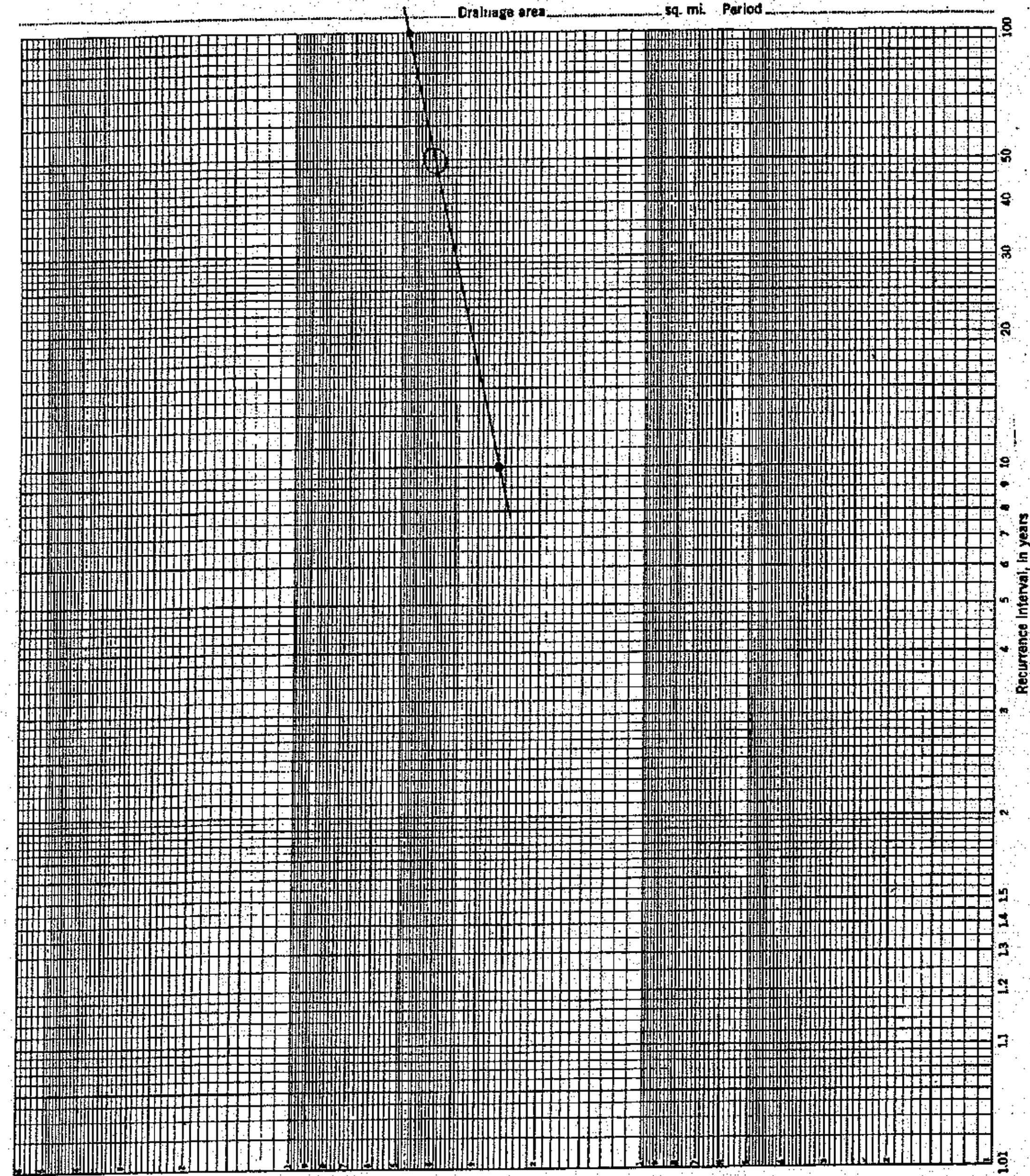
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No. ....

Magnitude and frequency of ____ RIVER STA. 3.15 ____ on ____ PEA CREEK ____

________________ Drainage area ________ sq. mi. Period ________



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GPO 925-900

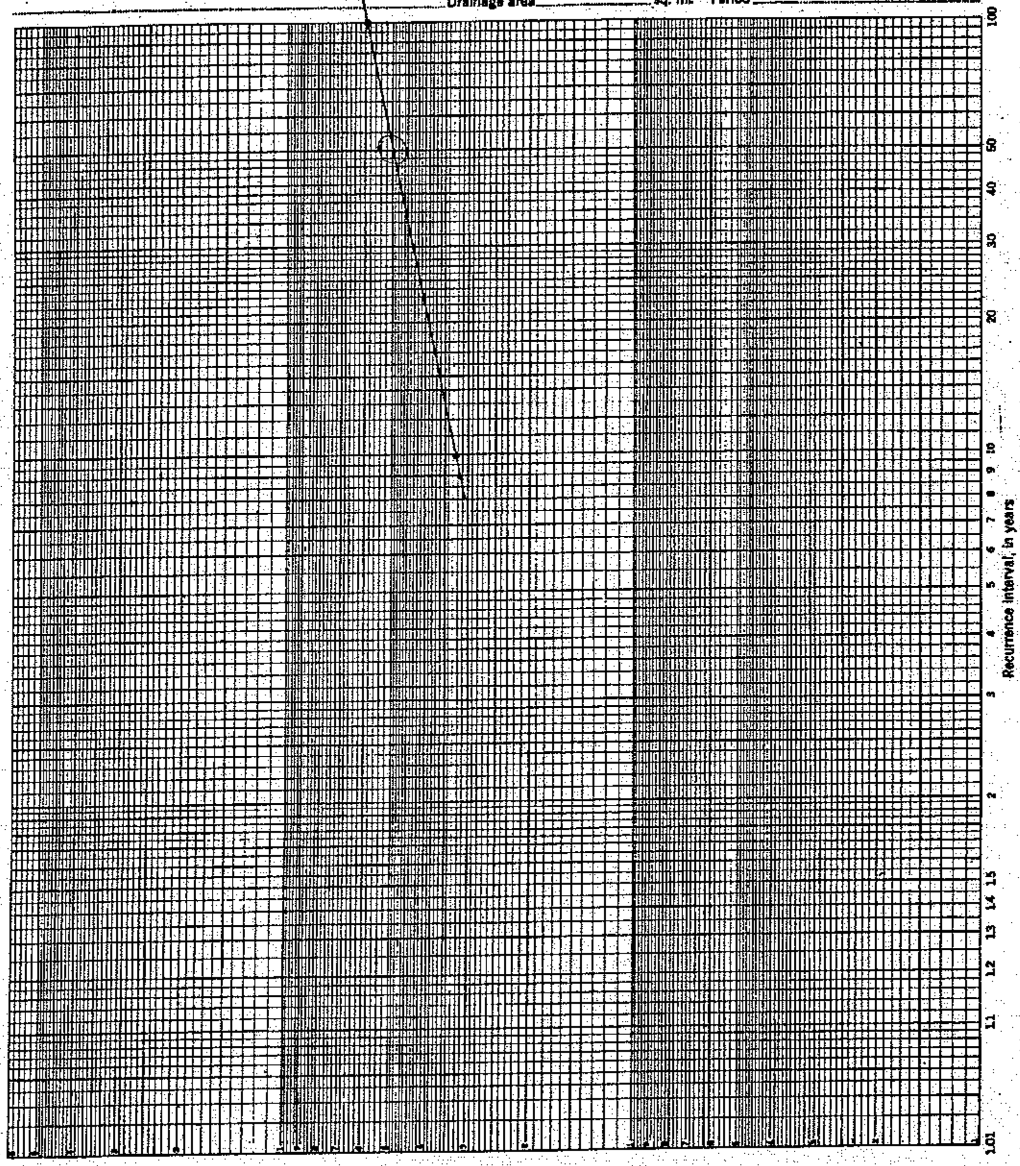
9-179b
Extreme log data plot
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No. ....

Magnitude and frequency of RIVER STA. 1.930 on PEA CREEK

Drainage area________ sq. mi. Period________



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GPO 925-900

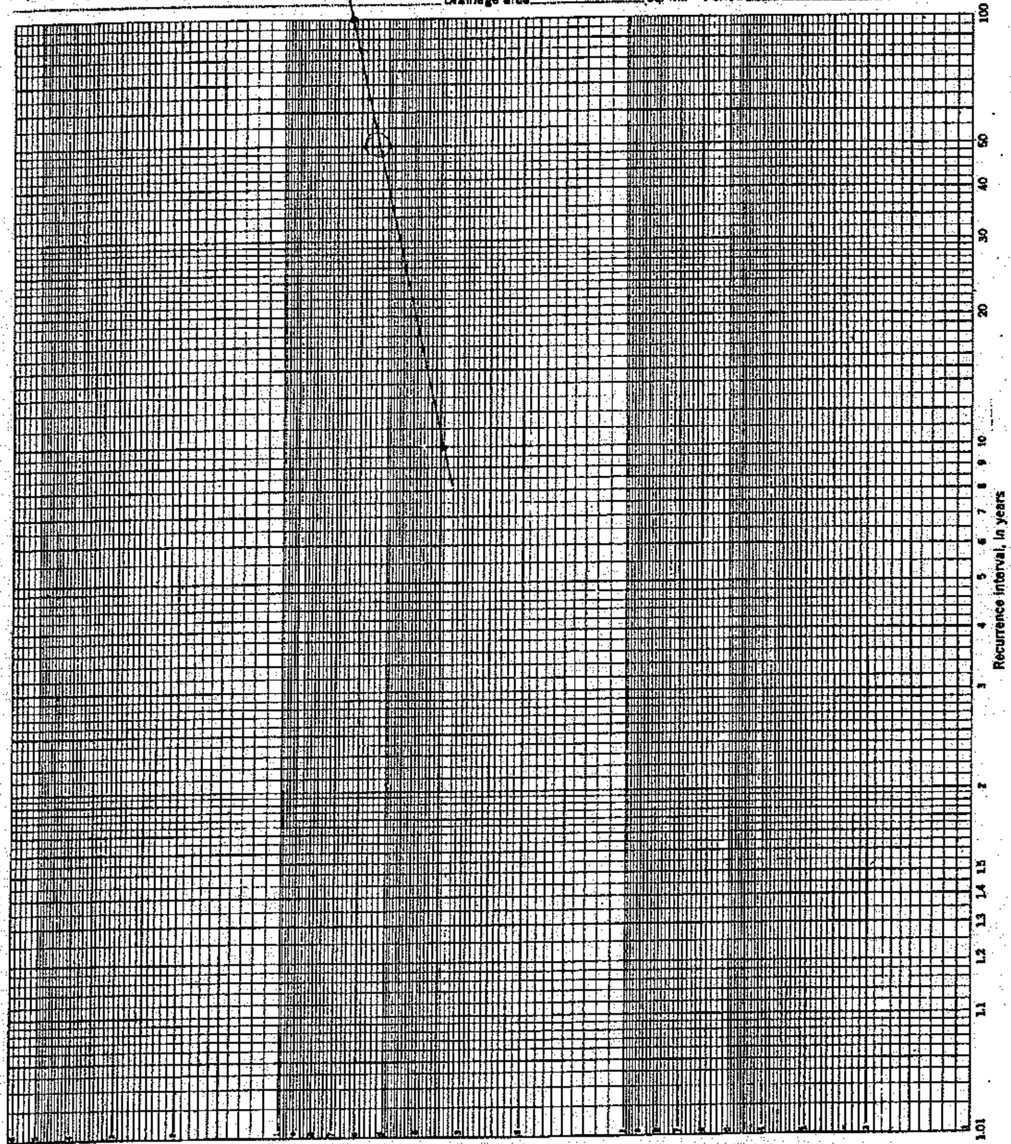
9-179b
Extreme log data plot
(Rev. 7-67)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sta. No. ....

Magnitude and frequency of RIVER STA. 0.830 on PEA CREEK

Drainage area________ sq. mi. Period ________



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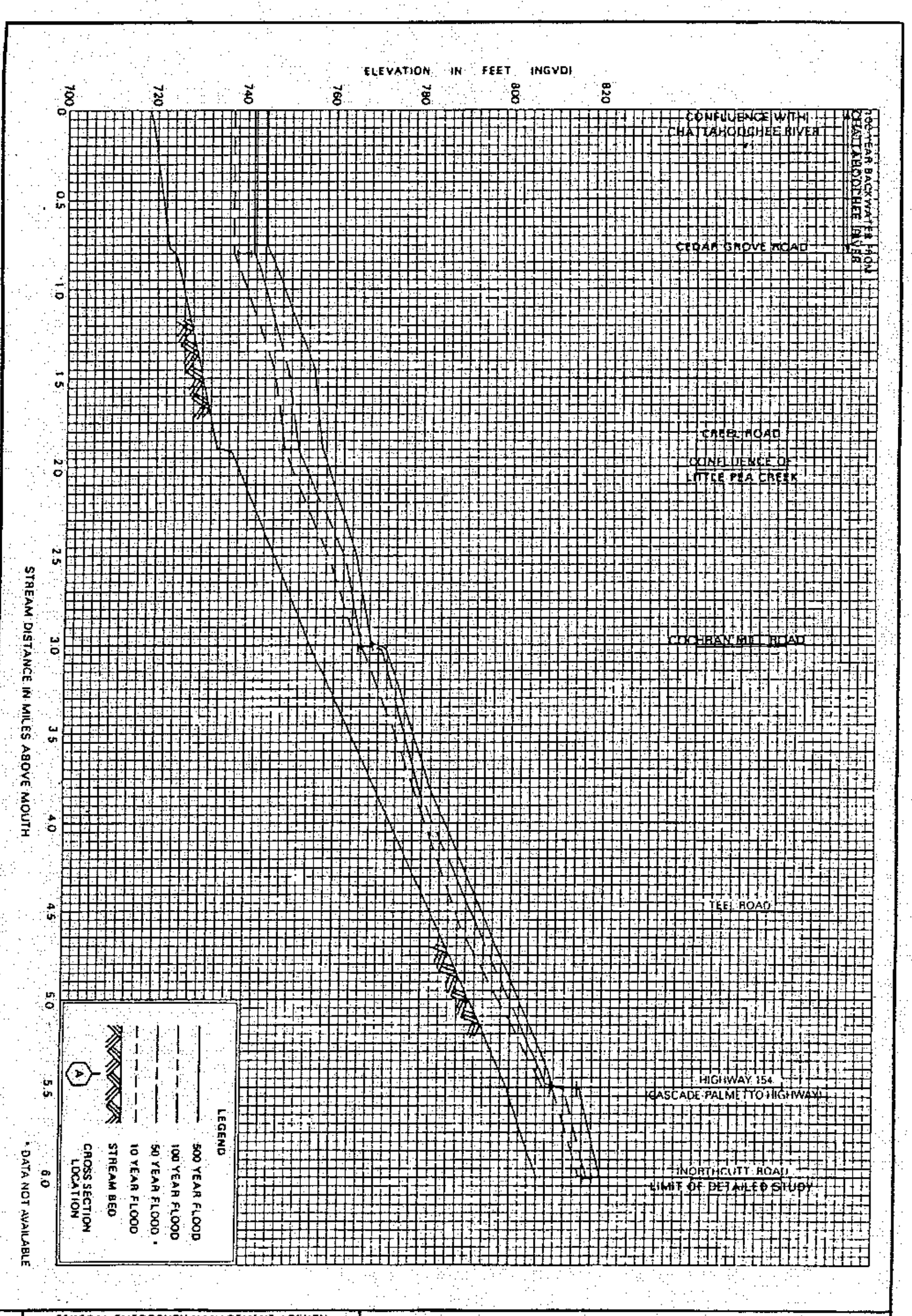
GPO 925-900

TABLE 6 - SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
NANCY CREEK					
At mouth	40.20	5,710	9,485	11,153	15,692
Just downstream of West Paces Ferry Road	38.10	5,799	9,536	11,193	15,767
Approximately 1,850 feet upstream of Wieuca Road	23.45	6,246	9,851	10,863	23,201
Approximately 5,550 feet upstream of Wieuca Road	21.78	6,000	9,300	9,600	21,800
Just upstream of Peachtree Dunwood Road	20.06	5,500	8,600	9,000	19,000
NISKEY CREEK					
At mouth	2.37	779	1,451	1,565	2,361
NORTH FORK PEACHTREE CREEK					
At mouth	38.60	5,094	7,868	8,983	12,429
NORTH UTOY CREEK					
At mouth	10.17	3,160	4,495	5,056	6,458
At Benjamin E. Mays Drive	8.85	3,056	4,329	4,865	6,196
At Willis Mill Road	5.51	2,374	3,169	3,502	4,340
Just downstream of Beecher Road	4.10	1,989	2,657	2,938	3,844
PEA CREEK					
At mouth	14.27	3,550	*	6,500	12,400
At Cochran Mill Road	8.37	2,620	*	4,800	9,100
At Northcutt Road	4.16	1,760	*	3,250	6,200
PEACHTREE CREEK					
At mouth	134.00	12,306	21,777	25,918	36,733
Upstream of confluence of Nancy Creek Tributary	93.60	10,873	17,086	19,877	27,069
Downstream of Northside Drive	86.80	10,511	16,171	18,747	25,417
Downstream of Norfolk Southern Railway	69.80	9,183	14,181	16,519	22,563

*Data not available



162P	FEDERAL EMERGENCY MANAGEMENT AGENCY FULTON COUNTY, GA AND INCORPORATED AREAS	FLOOD PROFILES PEA CREEK

6.0 PREDICTED SCOUR REPORT, CALCULATIONS & TABLES

Overview

Theoretical scour depths for the proposed bridge at this site were calculated by using the methods shown in the FHWA publication, HEC-18, "Evaluating Scour at Bridges" and the HEC-RAS computer program. General contraction scour and local pier scour, if applicable, were calculated for the 100 and 500-year storms, as called for in this publication. While geotechnical soil borings were not conducted for this site, an assessment of the soil type was made in the field during the site inspection. The soil type at this site was judged to be medium sand. Therefore, the D_{50} and D_{90} soil particle sizes are estimated to be 0.00123 feet (0.38 mm) and 0.00154 feet (0.47 mm), respectively. Tables and calculations showing predicted scour depths are included in the following pages. The predicted scour depths at each intermediate bent will be provided to the Office of Materials & Research Soils Lab and the Bridge Structural Designer for inclusion in the analysis and design of the bridge foundation

Results

Channel scour depths for the 100-year storm and 500-year storm are 9.63 feet and 12.97 feet, respectively. See next page for predicted scour depths at each intermediate bent. The following calculation sheets include theoretical scour depths at the abutments in the absence of riprap, however rip rap placed at the abutments protects against scouring. See Section 8 for rip rap calculations.

Summary & Conclusion

Foundations for the proposed bents should exceed the scour depths noted. The exception will be if rock is encountered before such depths. Plots of the total scour for the proposed bridge under both storm events are included in the following pages.

THEORETICAL SCOUR DEPTHS (feet)

	100 Year Storm			500 Year Storm		
	General	Local	Total	General	Local	Total
Bent 2	3.19	3.60	6.79	4.44	3.60	8.04
Bent 3	2.81	3.60	6.41	3.99	3.60	7.59

Hydraulic Design Data – 100 Yr Storm

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	1.94	6.18	2.63
Approach Velocity (ft/s):	0.83	2.93	1.01
Br Average Depth (ft):	3.88	6.53	3.69
BR Opening Flow (cfs):	655.07	2255.56	656.16
BR Top WD (ft):	50.79	33.00	56.10
Grain Size D50 (mm):	0.38	0.38	0.38
Approach Flow (cfs):	330.16	1721.01	1516.48
Approach Top WD (ft):	205.82	95.00	570.72
K1 Coefficient:	0.640	0.690	0.640
Results			
Scour Depth Ys (ft):	3.19	9.63	2.81
Critical Velocity (ft/s):	1.35	1.63	1.42
Equation:	Clear	Live	Clear

Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Round nose
Pier Width (ft):	1.50
Grain Size D50 (mm):	0.38000
Depth Upstream (ft):	8.89
Velocity Upstream (ft/s):	6.06
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	38.00
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.47000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	3.60
Froude #:	0.36
Equation:	CSU equation

Pier Scour Limited to Maximum of Ys = 2.4 * a

Abutment Scour

	Left	Right
Input Data		
Station at Toe (ft):	436.57	571.60
Toe Sta at appr (ft):	379.57	576.60
Abutment Length (ft):	155.40	519.12
Depth at Toe (ft):	2.23	4.66
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	155.40	519.12
Avg Depth Obstrd Ya (ft):	1.76	2.61
Flow Obstructed Qe (cfs):	216.48	1368.66
Area Obstructed Ae (sq ft):	274.02	1353.72

Results

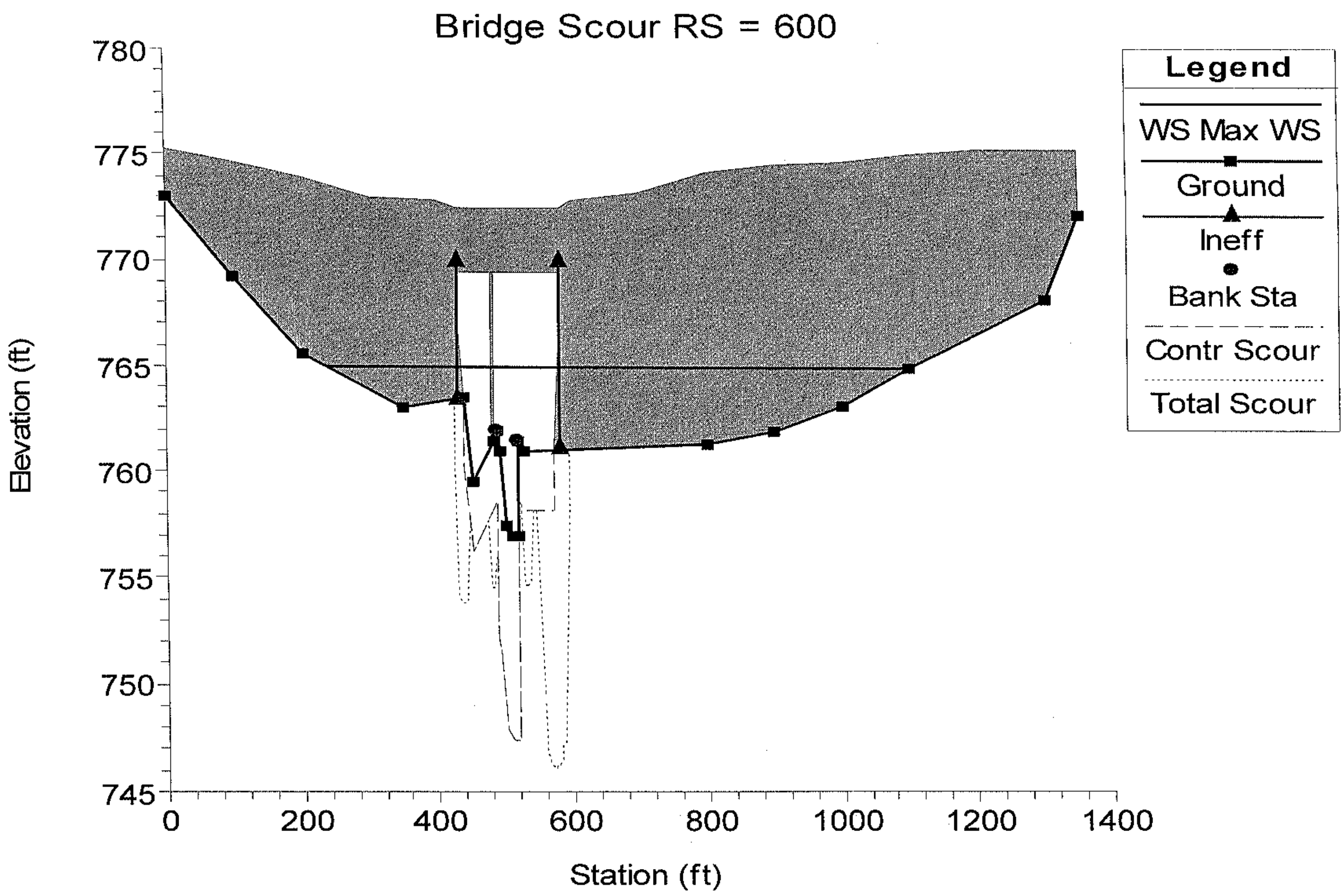
Scour Depth Ys (ft):	6.48	12.12
Froude #:	0.38	0.27
Equation:	HIRE	HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank:	6.79
Right Bank:	6.41

Left abutment scour + contraction scour (ft):	9.67
Right abutment scour + contraction scour (ft):	14.92



Bridge Scour RS = 600
Elevation (ft)
780
775
770
765
760
755
750
745
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
Contr Scour
Total Scour

Hydraulic Design Data – 500 Yr Storm

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	2.50	7.03	3.22
Approach Velocity (ft/s):	0.88	2.85	1.05
Br Average Depth (ft):	4.44	7.16	4.25
BR Opening Flow (cfs):	868.40	2774.03	880.44
BR Top WD (ft):	51.58	33.00	57.06
Grain Size D50 (mm):	0.38	0.38	0.38
Approach Flow (cfs):	516.54	1903.93	2102.80
Approach Top WD (ft):	234.71	95.00	623.10
K1 Coefficient:	0.640	0.690	0.640
Results			
Scour Depth Ys (ft):	4.44	12.97	3.99
Critical Velocity (ft/s):	1.40	1.67	1.46
Equation:	Clear	Live	Clear

Pier Scour - All piers have the same scour depth

Input Data	
Pier Shape:	Round nose
Pier Width (ft):	1.50
Grain Size D50 (mm):	0.38000
Depth Upstream (ft):	9.53
Velocity Upstream (ft/s):	6.25
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	38.00
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.47000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	3.60
Froude #:	0.36
Equation:	CSU equation

Pier Scour Limited to Maximum of Ys = 2.4 * a

Abutment Scour

	Left	Right
Input Data		
Station at Toe (ft):	436.57	571.60
Toe Sta at appr (ft):	379.57	576.60
Abutment Length (ft):	184.28	571.49
Depth at Toe (ft):	3.08	5.50
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	184.28	571.49
Avg Depth Obstrd Ya (ft):	2.27	3.18
Flow Obstructed Qe (cfs):	351.88	1899.55

Area Obstructed Ae (sq ft):	418.24	1815.12

Results

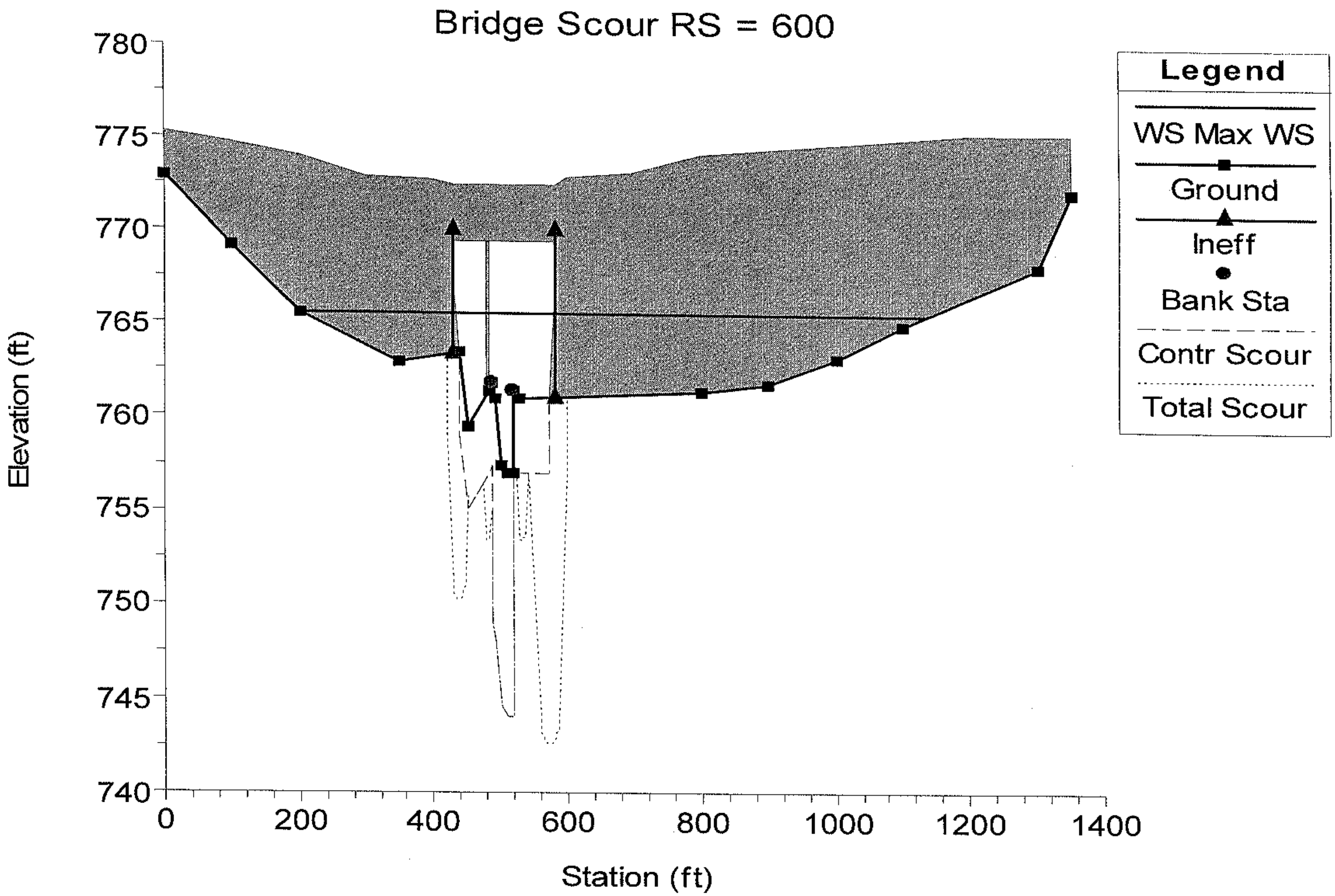
Scour Depth Ys (ft):	8.83	14.45
Froude #:	0.36	0.28
Equation:	HIRE	HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank:	8.04
Right Bank:	7.59

Left abutment scour + contraction scour (ft): 13.27
Right abutment scour + contraction scour (ft):18.44



Bridge Scour RS = 600
780
775
770
765
760
755
750
745
740
Elevation (ft)
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
WS Max WS
Ground
Ineff
Bank Sta
Contr Scour
Total Scour

7.0 SUB-AREA PROPERTY CALCULATIONS & TABLES

HEC-RAS Plan: Proposed 150' Bridge over Pea Creek

River Sta	Q Total	Q Left	Q Channel	Q Right	Area Left	Area Channel	Area Right	Vel Left	Vel Chnl	Vel Right
	(cfs)	(cfs)	(cfs)	(cfs)	(sq ft)	(sq ft)	(sq ft)	(ft/s)	(ft/s)	(ft/s)
800	1830.13	58.66	1281.30	490.17	114.08	434.31	653.02	0.51	2.95	0.75
800	3317.27	295.80	1657.49	1363.97	396.87	586.26	1493.66	0.75	2.83	0.91
800	3569.57	341.40	1716.58	1511.59	447.31	609.11	1632.49	0.76	2.82	0.93
800	4524.21	526.25	1930.16	2067.80	642.88	690.43	2155.64	0.82	2.80	0.96
700	1829.20	38.01	1348.82	442.37	77.22	409.93	531.61	0.49	3.29	0.83
700	3315.07	283.09	1670.25	1361.72	350.84	564.53	1364.75	0.81	2.96	1.00
700	3567.65	330.16	1721.01	1516.48	399.48	587.46	1500.90	0.83	2.93	1.01
700	4523.27	516.54	1903.93	2102.80	586.39	667.88	2005.98	0.88	2.85	1.05
650	1828.78	328.81	1098.01	401.95	217.99	177.44	1103.86	2.25	6.19	2.35
650	3314.08	737.02	1706.79	870.27	597.53	231.14	2018.49	3.10	7.38	3.20
650	3566.79	808.50	1806.51	951.78	666.62	239.11	2167.58	3.22	7.56	3.32
650	4522.88	1081.86	2178.21	1262.81	922.41	267.04	2719.20	3.63	8.16	3.72
600 BR U	1828.78	282.30	1277.09	269.39	126.47	168.88	129.27	2.23	7.56	2.08
600 BR U	3314.08	600.03	2115.37	598.68	188.54	210.01	197.68	3.18	10.07	3.03
600 BR U	3566.79	655.07	2255.56	656.16	197.05	215.56	207.08	3.32	10.46	3.17
600 BR U	4522.88	868.40	2774.03	880.44	229.17	236.27	242.59	3.79	11.74	3.63
600 BR D	1828.78	54.85	1686.02	87.91	59.94	271.85	79.69	0.92	6.20	1.10
600 BR D	3314.08	202.66	2851.00	260.42	112.88	311.93	131.66	1.80	9.14	1.98
600 BR D	3566.79	231.80	3041.87	293.12	120.14	317.34	138.81	1.93	9.59	2.11
600 BR D	4522.88	354.73	3740.10	428.05	147.56	337.62	165.87	2.40	11.08	2.58
550	1828.78	57.70	1770.36	0.72	128.74	361.62	572.37	0.91	4.90	0.20
550	3314.08	222.42	3045.83	45.83	323.28	421.66	1068.84	1.85	7.22	1.20
550	3566.79	254.91	3254.53	57.35	353.51	429.64	1139.06	2.00	7.58	1.34
550	4522.88	392.01	4019.92	110.94	474.86	459.33	1408.85	2.52	8.75	1.85
500	1828.52	230.71	1225.47	372.34	260.50	267.80	493.66	0.89	4.58	0.75
500	3313.38	593.24	1525.36	1194.78	497.49	305.85	1036.95	1.19	4.99	1.15
500	3566.14	656.71	1570.02	1339.42	533.76	311.09	1116.13	1.23	5.05	1.20
500	4522.69	904.72	1717.78	1900.19	672.24	330.02	1411.22	1.35	5.21	1.35
470	1828.29	209.22	1295.24	323.83	239.39	274.43	443.85	0.87	4.72	0.73
470	3312.94	566.15	1616.55	1130.24	472.71	314.21	982.12	1.20	5.14	1.15
470	3565.73	628.87	1663.67	1273.20	508.52	319.69	1060.68	1.24	5.20	1.20
470	4522.48	873.69	1818.97	1829.82	644.83	339.42	1352.36	1.35	5.36	1.35

HEC-RAS Plan: Existing Bridge over Pea Creek

River Sta	Q Total	Q Left	Q Channel	Q Right	Area Left	Area Channel	Area Right	Vel Left	Vel Chnl	Vel Right
	(cfs)	(cfs)	(cfs)	(cfs)	(sq ft)	(sq ft)	(sq ft)	(ft/s)	(ft/s)	(ft/s)
800	1824.43	216.37	768.21	839.85	668.05	700.28	2222.13	0.32	1.10	0.38
800	3317.27	526.89	1055.92	1734.45	1436.98	959.27	4201.09	0.37	1.10	0.41
800	3569.57	572.30	1117.93	1879.34	1493.67	975.98	4338.96	0.38	1.15	0.43
800	4528.97	742.58	1366.01	2420.38	1636.41	1016.99	4679.03	0.45	1.34	0.52
700	1819.82	231.44	708.52	879.86	722.20	721.08	2364.75	0.32	0.98	0.37
700	3316.90	559.25	969.08	1788.56	1531.34	986.94	4429.66	0.37	0.98	0.40
700	3566.44	580.53	1088.63	1897.29	1589.32	1003.61	4567.88	0.37	1.08	0.42
700	4526.26	752.86	1333.54	2439.85	1734.36	1044.34	4907.15	0.43	1.28	0.50
650	1817.71	446.51	913.50	457.69	1102.59	285.53	3108.77	1.53	3.20	1.49
650	3316.77	865.18	1541.25	910.34	2100.42	375.22	5209.94	2.07	4.11	2.04
650	3565.10	815.93	407.26	2341.90	2163.72	380.36	5334.88	0.38	1.07	0.44
650	4525.04	1053.92	493.88	2977.24	2380.08	397.57	5755.00	0.44	1.24	0.52
600 BR U	1817.71		1817.71			145.31			12.51	
600 BR U	3316.77	463.53	2489.58	427.14	116.02	265.48	101.75	10.34	9.38	8.48
600 BR U	3565.10	704.81	2262.04	595.48	173.94	273.84	153.88	4.05	8.26	3.87
600 BR U	4525.04	1280.55	2093.94	1152.44	285.07	287.63	294.72	4.49	7.28	3.91
600 BR D	1817.71		1817.71			225.77			8.05	
600 BR D	3316.77	437.51	2546.22	396.52	116.59	333.65	101.75	9.64	7.63	7.87
600 BR D	3565.10	623.04	2407.84	531.44	161.08	340.05	140.47	3.87	7.08	3.78
600 BR D	4525.04	1179.13	2278.75	1069.05	277.72	354.54	282.32	4.25	6.43	3.79
550	1817.71	95.40	1709.42	12.88	286.02	411.42	980.23	1.04	4.15	0.61
550	3316.77	174.97	3117.95	23.85	287.97	411.97	984.94	1.89	7.57	1.12
550	3565.10	200.48	3334.11	30.51	314.23	419.21	1047.52	2.04	7.95	1.26
550	4525.04	309.78	4152.84	62.41	418.08	445.87	1284.81	2.61	9.31	1.80
500	1817.13	228.15	1222.21	366.78	258.67	267.48	489.23	0.88	4.57	0.75
500	3316.50	594.03	1525.90	1196.58	497.96	305.92	1037.97	1.19	4.99	1.15
500	3564.35	656.26	1569.69	1338.40	533.52	311.05	1115.59	1.23	5.05	1.20
500	4524.50	905.19	1718.09	1901.22	672.47	330.05	1411.71	1.35	5.21	1.35
470	1816.72	206.69	1291.59	318.44	237.57	274.09	439.42	0.87	4.71	0.72
470	3316.26	566.96	1617.21	1132.09	473.16	314.28	983.13	1.20	5.15	1.15
470	3563.88	628.40	1663.35	1272.12	508.25	319.65	1060.08	1.24	5.20	1.20
470	4524.44	874.18	1819.36	1830.90	645.06	339.45	1352.85	1.36	5.36	1.35

8.0 GUIDE BANK (SPUR DIKE) CALCULATIONS

Spur dike calculations were performed in accordance with the FHWA publication, HEC-23, "Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Second Edition," and are shown in the following pages. Based upon these calculations, the projected length of the spur dike under proposed conditions is lower than the values represented in nomographs contained within HEC-23. This indicates that the projected length is less than the minimum requirement for spur dike construction. Therefore, no spur dike structure will be required for this project.

Guide Bank Calculations: HEC-23

Total Discharge of Stream for 100 year storm,

$Q =$ 3567 cfs

Lateral/floodplain discharge of either floodplain intercepted by the embankment,

$Q_f =$ 952 cfs
(Right Bank, representing higher value)

Discharge in 100 feet of stream adjacent to the abutment,

$Q_{100} =$ 1721 cfs
(Q in channel)

Therefore, $Q_f/Q_{100} =$ 0.55

Cross-sectional flow area at the bridge opening at normal stage,

$A_{n2} =$ 576 ft^2

Average velocity through the bridge opening,

$Q/A_{n2} = V_{n2} =$ 6.19 ft/s

Projected length of guide bank,

$L_s =$ N/A (Lower value than obtainable from the charts and tables in HEC-23)

* Values for above calculations are taken from discharge and flow area values for the 100 year storm profile at the upstream bridge face.

9.0 RIPRAP CALCULATIONS

The FHWA publications, HEC-18, "Evaluating Scour at Bridges" and HEC-23, "Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance Second Edition," were used to determine the riprap requirements for this project. Calculations are based on the 100-year storm. The two sizes of riprap used by GDOT are Type 1 and Type 3, each with a median diameter (D_{50}) of 1.14 feet and 0.64 feet, respectively. The unit weight for all stones is 165 pounds per cubic foot. The depth and extent of riprap will conform to GDOT standards (see Preliminary Bridge Layout for Riprap Detail). Plastic filter fabric will be required under the riprap as well.

The calculations summarized in the following table indicate that the larger sized Type 1 riprap will be required at the abutments for the proposed conditions, and that the apron width will be 8 feet. Calculations for riprap are based on the Isbash relationship described in HEC-18 and HEC-23. Calculations for the apron width are in accordance with Chapter 14 of the Georgia Department of Transportation Drainage Design Manual.

RIP RAP SIZING (HEC-18), based on Isbash relationship:

D_{50} =		Median stone diameter, ft
V=	6.19	Characteristic avg. velocity in the contracted section, ft/s
S_S=	2.64	Specific gravity of rock riprap
g=	32.20	Gravitational acceleration, 32.2 ft/s
y=	3.96	Depth of flow in the contracted bridge opening, ft
K=	0.89	0.89 for a spill-through abutment
		1.02 for a vertical wall abutment

D_{50} = 0.65

Since D_{50} < 1.15, Use Type I Rip Rap

Apron Width =	7.92	ft = 8 ft minimum **USE 8 FT APRON**
	3.96	Depth of flow in left overbank, ft
	3.66	Depth of flow in right overbank, ft
	761.00	Ground elevation at left overbank
	761.30	Ground elevation at right overbank
	764.96	W.S. elevation, 100 yr upstream

10.0 CLEARANCE CALCULATIONS

As per GDOT policy, the proposed bridge superstructure shall clear the 50-year (design) floodstage by a minimum of 2 feet and the 100-year floodstage by a minimum of 0.5 foot. The following table lists the bridge clearance results, which meet or exceed the minimum requirements:

Clearance to the Low Chord of Bridge				
Design Event (year)	**Flow (cfs)**	**Floodstage (feet)**	**Low Chord of Bridge (feet)**	**Freeboard (feet)**
10	1,828.8	763.49	766.80	3.31
50	3,314.0	764.49	766.80	2.31
100	3,566.8	764.62	766.80	2.18
500	4,522.9	765.12	766.80	1.68

11.0 HYDRAULIC ENGINEERING FIELD REPORT

Location:

District: 7 County: Fulton Project No.: BRZLB-121(2) P.I. No.: 771275

Location: Cochran Mill Road (CR 1392)

Stream Name: Pea Creek

On road from Palmetto (town) to Cedar Grove (town) at Station ______

General location is 7 miles from Palmetto (town) in a northwest direction.

Surveyed by: ______

Site Information:

Cross sections of the floodplain should be shown on the Roadway Plans at (1) 50' to 100' upstream and at centerline of crossing or (2) 50' to 100' downstream and at centerline of crossing. These can be taken from the roadway cross sections and should be plotted by the road designer. See TOPPS section 4270 for Elevation Datum. Cross section elevations should be accurate to + 0.5 feet. Cross-sections located upstream or downstream of centerline should be taken parallel to the bridge and extend out far enough on each side of the floodplain until an elevation is reached that is two feet higher than the Flood of Record Elevation. If the project does not extend far enough to use roadway cross sections to obtain the desired elevations, elevations should be shot parallel to the existing road off the roadway fill. These shots should be made where there is a significant change in elevation (2.0 ft) and can be spaced as much as 500 ft. apart. The road designer will plot on the roadway plans or attach a sketch showing the meander of both banks of the stream for a distance of 500' both upstream or downstream. Also show on a sketch the water surface elevation and the flowline elevation of the stream every 100 feet.

Drainage area = 8.37 sq. miles. How obtained? (map, traverse) USGS Topographic Maps + FEMA Data

Character of drainage area: (Flat, rolling, mountainous, etc.) Rolling, wooded and moderately vegetated

Are banks stable, caving, steep, etc.? high banks, well defined

Is stream cutting or filling at site? cutting

Are dikes present? No If so, describe them: ___________________________
Are there other things (dams, levees, pipes or culverts etc.) in flood plain that would interfere with natural drainage of site? N/A
Describe character of flood valley as to uniformity and obstructions. Also determine any natural obstructions. Flood plain is narrow and rolling hills

Water Surface Data at Bridge Site:

If not available. give elevations where found.

	Extreme High Water (Give date of occurrence)	Water Surface Elevation at time of Survey
Elevations and dates of same:	Unknown	____________
Source of information:	____________	____________
Head (or backwater from ________):	**N/A**	____________
Location where taken:	____________	____________
Elevation of extreme low water:	**Unknown**	Date: ___________

Are there flood control works (dams, levees, etc.) upstream of crossing? N/A
If so, give location, date of construction, drainage area, elevation of top of dam and spillways, etc. ____
Give other factors which affect water stages (highwater from other streams, reservoirs, tides, etc.)
____

Existing Bridge at or near Proposed Site:

(NOTE: Complete all information in this section if new bridge is replacing old.)

Bridge identification Number: 121-5114-0
Elev. Floor: 768.3 Roadway width: 19.5 ft
Built by: _________________________ Date built: 1935
Is there any indication of scour at piers or abutments? Some minor scour at the south abutment
Is bridge on a skew? No
Show sketch on survey notes of any dikes or protective work around piers or abutments. Was this placed subsequent to construction? ________________

Miscellaneous Information:

Are there any houses that have been flooded or may be flooded? Yes
Provide location and floor elevation: located in downstream North quadrant, FFE = 761.71 ft
Give any other information that would be helpful to designers (Name of Owner, Elevation and Date of Flood, Number of times house has been flooded, etc.): structure appears to be an outbuilding or barn, flooding history not available

Other Bridges Across Same Stream:

The information in these sections is needed for bridges immediately upstream and downstream. Include photos of each crossing. Submit sketches of these bridges and waterways if not on a State Route. If the upstream or downstream bridge is on a State Route, the State Route number can be given in lieu of the information in Section 1 below.

Section 1		
	Upstream	**Downstream**
Distance from proposed structure, upstream or down (scale to mile):	__N/A__	__N/A__
Railroad or highway bridge. Year of construction:	______________	______________
Type (Deck or thru truss, girder, etc.):	______________	______________
Kind of substructure:	______________	______________
Number and length of spans	______________	______________
Drainage area above bridge	__________sq.ft.	__________sq.ft.
Area of waterway below extreme high water	__________sq.ft.	__________sq.ft.
Does this carry entire flood discharge?	______________	______________

If not, state kind and area of additional	_________sq.ft.	__________sq.ft.

Section 2

Give all obtainable information as to scour.

Has any protective work been placed since construction? ________

Should waterway be greater or less? ________________________________

Why? ____

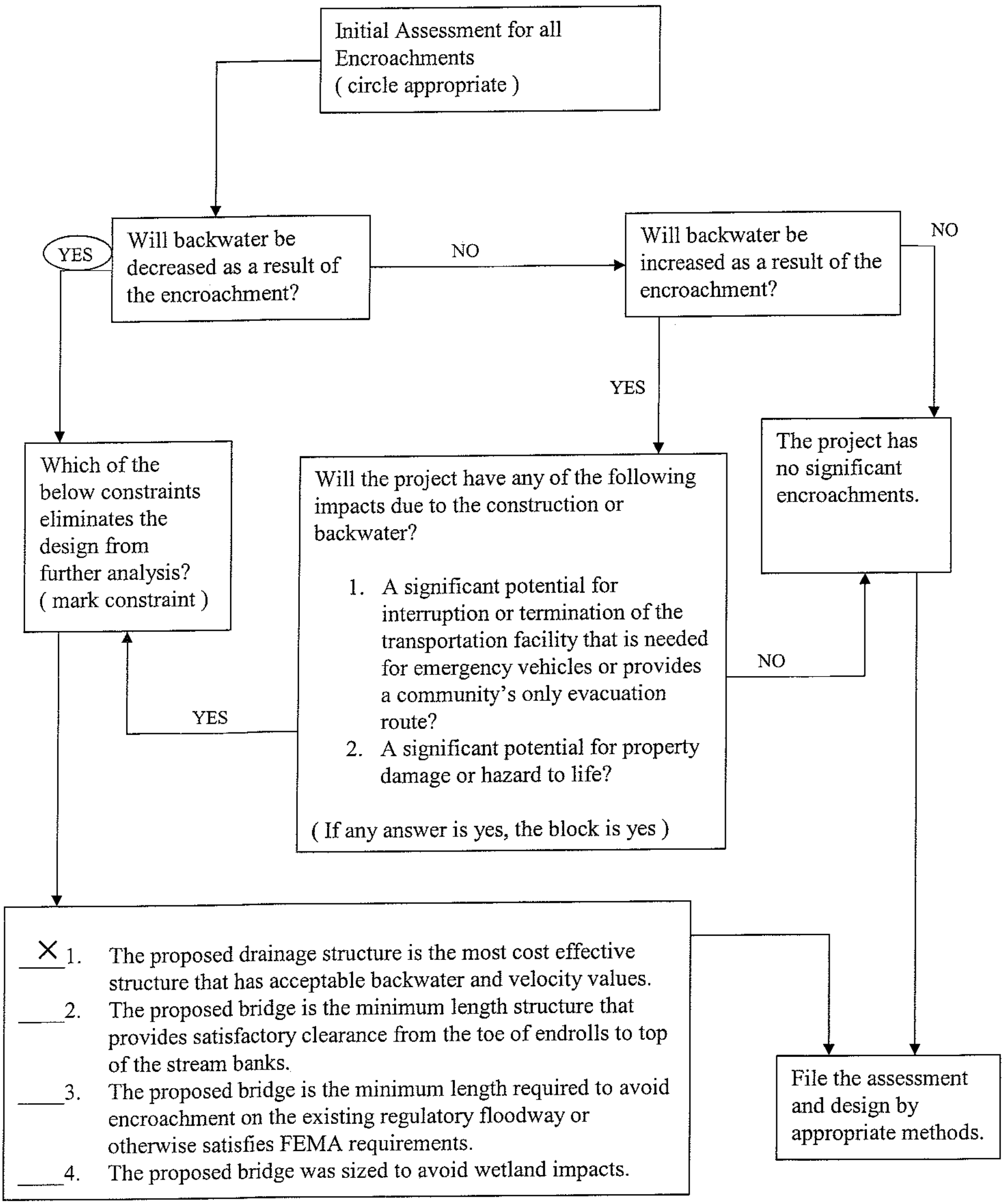
Is bridge well located with respect to stream and valley? ________

Miscellaneous Information:

Give any other information that would be helpful to designers: Rocks have been placed on the immediate downstream side of the structure. Existing roadway embankments are very steep, 1.5:1 or less.

Prepared by: C. Matyas

12.0 RISK ASSESSMENT SHEET



13.0 ROADWAY PLAN SHEETS

COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
FULTON	BRZLB-121(22)	1	65

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4366
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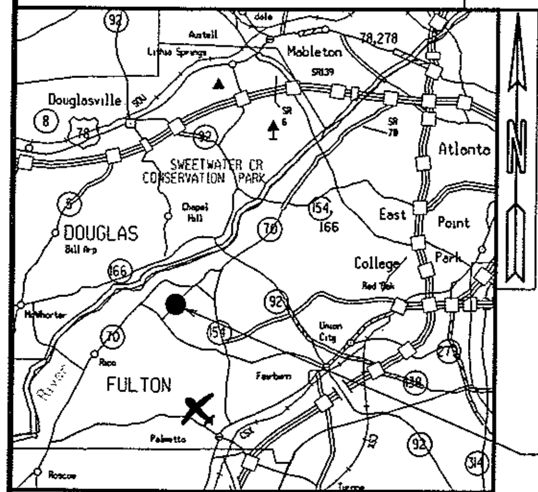
DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

ROAD CLOSED DURING CONSTRUCTION

"SEE SHEET NO. 2 FOR INDEX"

PLAN AND PROFILE OF PROPOSED
CR 1392/COCHRAN MILL ROAD BRIDGE REPLACEMENT OVER PEA CREEK
FULTON COUNTY



PROJECT LOCATION

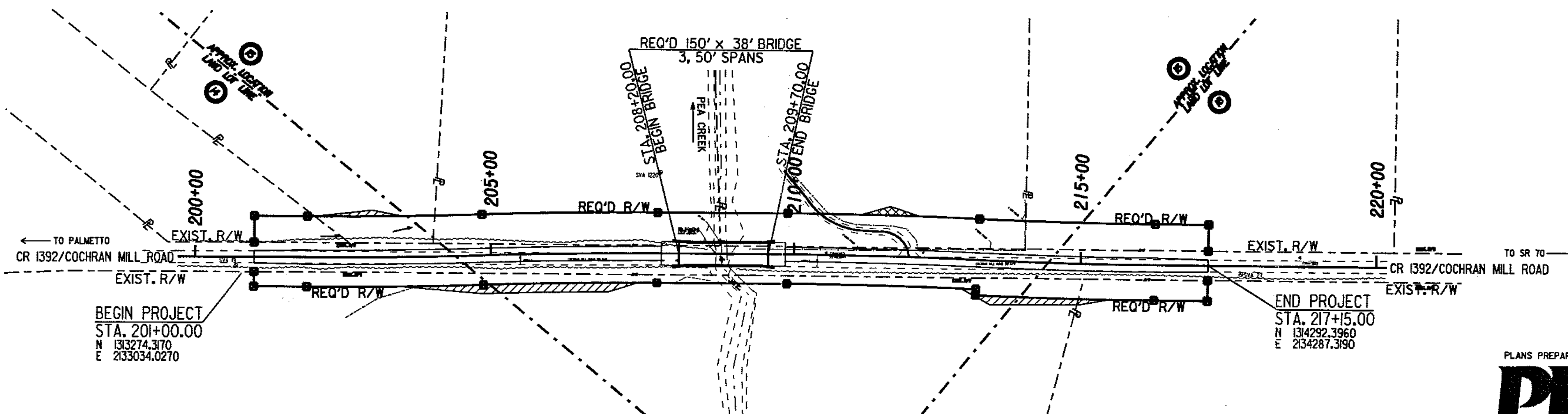
LOCATION SKETCH

FEDERAL AID PROJECT

Georgia D.O.T. P.I. No. 771275
FEDERAL ROUTE No. N/A
STATE ROUTE No. N/A
COUNTY ROUTE No. 1392

NOTE: THE CO-ORDINATES LISTED ARE WEST ZONE GRID CO-ORDINATES BASED ON THE GA. STATE PLANE CO-ORDINATE SYSTEM.
HORIZONTAL DATUM : NAD 1983
VERTICAL DATUM : NAVD 1988

MIDPOINT COORDINATE
STATION 209+07.50 N 1313792.7501 E 2133653.0462



SCALE IN FEET
0 100 200 400

PLANS PREPARED BY
PBS&J

THIS PROJECT IS LOCATED 100% IN FULTON COUNTY AND CONGRESSIONAL DISTRICT 13.

PROJECT DESIGNATION : EXEMPT
PDP CLASSIFICATION : MINOR
FUNCTIONAL CLASSIFICATION : RURAL MINOR COLLECTOR

NOTE:
ALL REFERENCES IN THIS DOCUMENT, WHICH INCLUDES ALL PAPERS, WRITINGS, DOCUMENTS DRAWINGS, OF PHOTOGRAPHS USED, OR TO BE USED IN CONNECTION WITH THIS DOCUMENT, TO 'STATE HIGHWAY DEPARTMENT OF GEORGIA', 'STATE HIGHWAY DEPARTMENT', 'GEORGIA STATE HIGHWAY DEPARTMENT', 'HIGHWAY DEPARTMENT', OR 'DEPARTMENT' WHEN THE CONTEXT THEREOF MEANS THE STATE HIGHWAY DEPARTMENT OF GEORGIA MEAN, AND SHALL BE DEEMED TO MEAN THE DEPARTMENT OF TRANSPORTATION.

THE DATA, TOGETHER WITH ALL OTHER INFORMATION SHOWN ON THESE PLANS, OR IN ANY WAY INDICATED THEREBY, WHETHER BY DRAWINGS OR NOTES, OR IN ANY OTHER MANNER, ARE BASED UPON FIELD INVESTIGATIONS AND ARE BELIEVED TO BE INDICATIVE OF ACTUAL CONDITIONS. HOWEVER, THE SAME ARE SHOWN AS INFORMATION ONLY, ARE NOT GUARANTEED, AND DO NOT BIND THE DEPARTMENT OF TRANSPORTATION IN ANY WAY. THE ATTENTION OF THE BIDDER IS SPECIFICALLY DIRECTED TO ARTICLES 102.04, 102.05, AND 104.03 OF THE SPECIFICATIONS OF THE DEPARTMENT OF TRANSPORTATION, STATE OF GEORGIA, FOR THE CONSTRUCTION OF ROADS AND BRIDGES, CURRENT EDITION, AND ANY MODIFICATIONS THEREOF, WHICH WILL BE A PART OF THIS CONTRACT.

ALL WORK TO BE DONE IN ACCORDANCE WITH THE SPECIFICATIONS OF THE DEPARTMENT OF TRANSPORTATION OF GEORGIA, CURRENT EDITION, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION.

DESIGN DATA:	AASHTO 2001
TRAFFIC A.D.T.:	1400 (2005)
TRAFFIC A.D.T.:	3070 (2025)
TRAFFIC D.H.V.:	307 (2025)
DIRECTIONAL DIST.:	50%
% TRUCKS:	1%
% 24 HR. TRUCKS:	1%
SPEED DESIGN:	45 MPH

LENGTH OF PROJECT	COUNTY NO. 121
	MILES
NET LENGTH OF ROADWAY	0.278
NET LENGTH OF BRIDGES	0.028
NET LENGTH OF PROJECT	0.306
NET LENGTH OF EXCEPTIONS	0.000
GROSS LENGTH OF PROJECT	0.306

DATE	DISTRICT 7 ENGINEER
DATE	CHIEF ENGINEER
LOCATION AND DESIGN APPROVAL DATE: JUNE 2, 2001	
PLANS COMPLETED DATE:	
REVISION DATES:	

Thursday, October 27, 2005 10:00:38 AM PRF
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h:\Fulton County\Bridge\T040_CochranPeaCrk\DGN\771275TY01.dgn

COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
FULTON	BRZLB-121(22)	5	65

ALLOWABLE RANGES TABLE

FOR THIS PROJECT, CROSS SLOPES THAT ARE ADJUSTED TO "BEST FIT" EXISTING PAVEMENT SLOPES ARE SUBJECT TO THE FOLLOWING LIMITS:

A. NORMAL CROWN

SECTION WITH GRADES 0.5% OR GREATER	SECTION WITH GRADES LESS THAN 0.5%
0.0150 - MINIMUM	0.0150 - MINIMUM
0.0200 - DESIRABLE	0.0200 - DESIRABLE
0.0250 - MAXIMUM	0.0300 - MAXIMUM

B. SUPERELEVATION RATE
S.E. RATE SHOWN ON PLANS OR SE RATE EXISTING IN FIELD, WHICHEVER IS GREATER.

C. SUPERELEVATION TRANSITION LENGTH (LENGTH FROM FLAT POINT TO FULL SE)

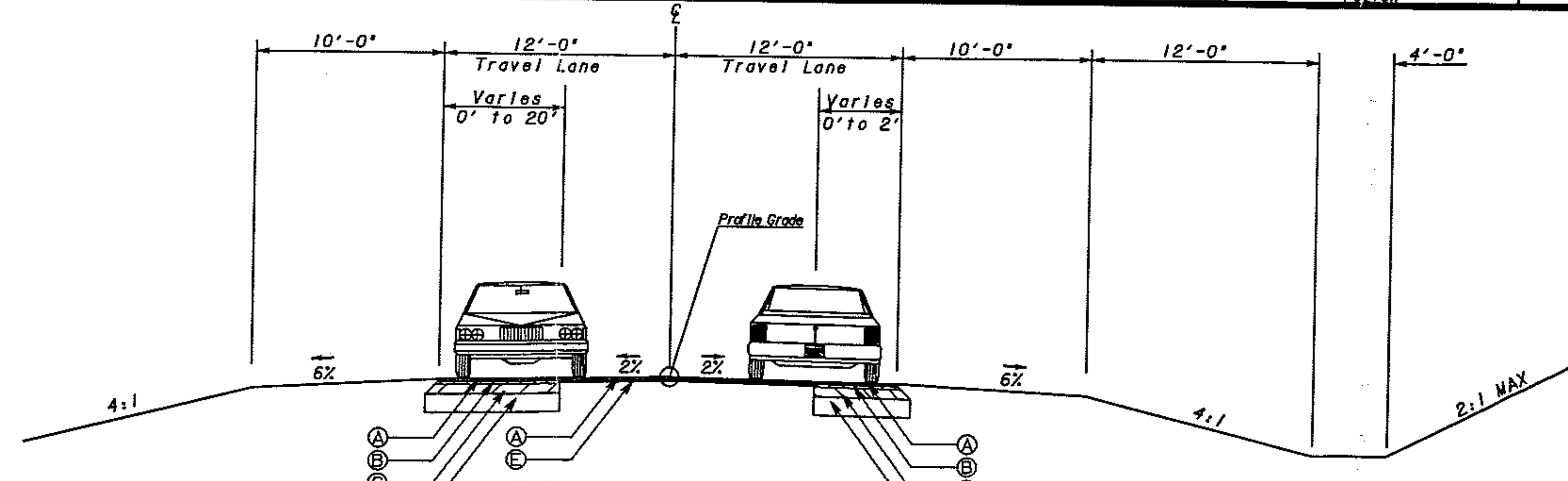
	RATE OF CHANGE	CORRESPONDING DIFFERENCE IN GRADE BETWEEN PIVOT POINT AND EDGE OF PAVEMENT
MINIMUM	1:150	0.67%
DESIRABLE	1:200	0.50%
MAXIMUM	1:300	0.33%

LENGTH SHALL BE SET TO AVOID CREATING A FLAT GUTTER GRADE ON LOW SIDE AND TO AVOID FLAT CROSS SLOPES AT OR NEAR THE LOW POINT OF VERTICAL CURVES.

D. POSITIONING OF SUPERELEVATION TRANSITION LENGTH ON SIMPLE CURVES
50% OF TRANSITION INSIDE CURVE - MAXIMUM
33% OF TRANSITION INSIDE CURVE - DESIRABLE
20% OF TRANSITION INSIDE CURVE - MINIMUM

NOTE: CROWN WIPE-OUT SHALL BE AT THE SAME RATE AS THE SE TRANSITION.

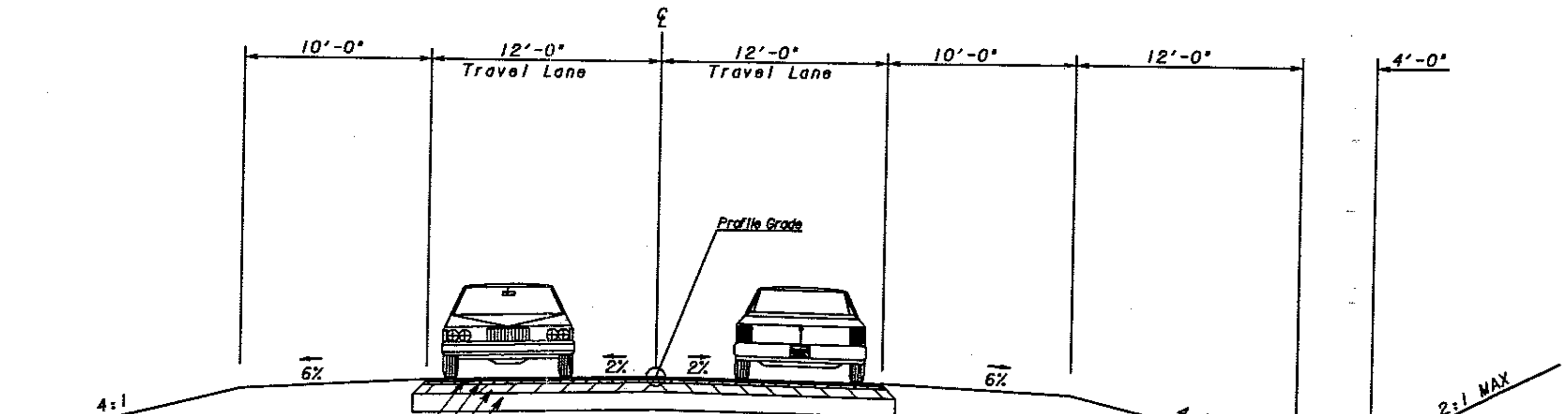
E. SMOOTHING OF BREAKS IN EDGE PROFILE AT BEGIN AND END OF TRANSITION SHALL BE ACCOMPLISHED BY VERTICAL CURVE WITH A MINIMUM LENGTH (IN FEET) EQUAL TO THE SPEED DESIGN (IN MPH).



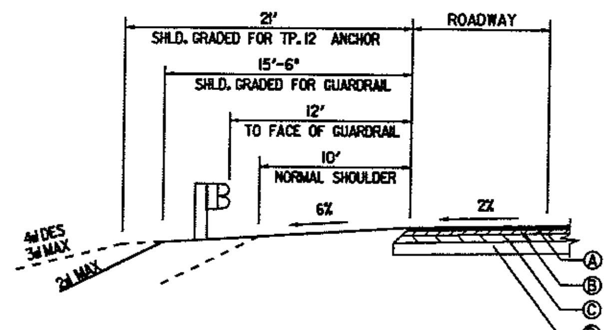
TYPICAL SECTION No. 1
TANGENT SECTION
STA. 201+00 TO 206+50
STA. 210+50 TO 217+15

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	0-10'	0-10'
3:1	--	--
2:1	OVER 10'	OVER 10'

CUT SLOPES MAY BE A MAXIMUM OF 2:1 TO REMAIN WITHIN THE RIGHT OF WAY LIMITS. FILL SLOPES STEEPER THAN 4:1 AND OVER 6' WILL REQUIRE GUARDRAIL.

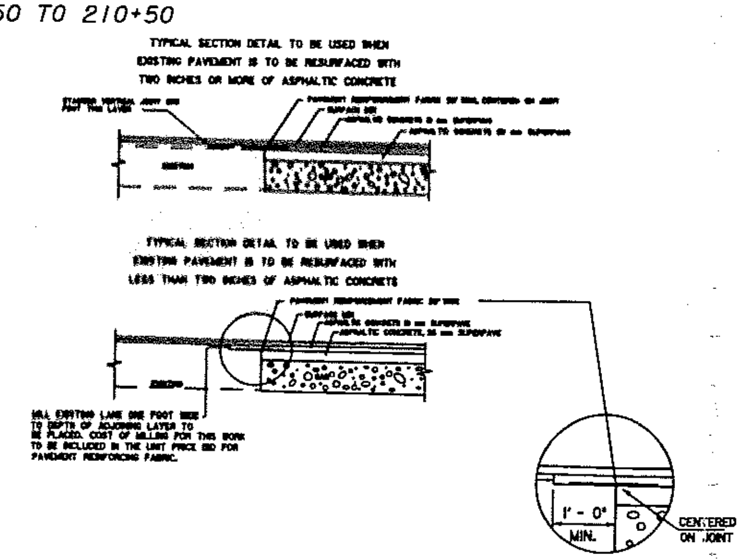


TYPICAL SECTION No. 2
TANGENT SECTION
STA. 206+50 TO 210+50



SHOULDER DETAIL FOR GUARDRAIL

SEE PLAN FOR LOCATION
SEE GA STD 4052 FOR DETAILS
N.T.S.

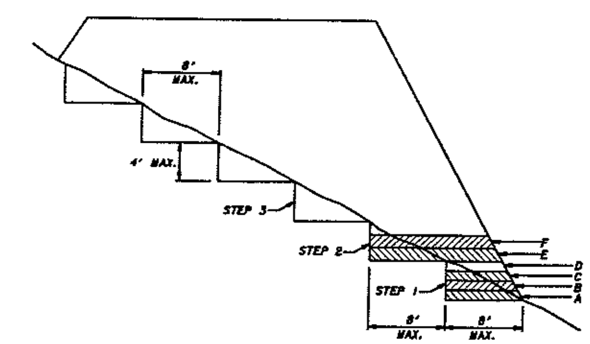


PAVEMENT REINFORCING FABRIC DETAIL

WHERE THE EMBANKMENT IS TO BE PLACED ON A HILLSIDE OR ANOTHER EXISTING EMBANKMENT HAVING A SLOPE OF 3 TO 1 OR STEEPER, THE FOUNDATION MUST BE BENCHED WHILE THE EMBANKMENT IS BEING MADE. (SEE DIAGRAM BELOW.)

THE DIAGRAM SHOWS THAT BEFORE LAYER "A" IS PLACED THE FIRST STEP (1) IS CUT INTO THE SLOPE A MAXIMUM DISTANCE OF ABOUT 8 FEET (ABOUT ⅔ THE WIDTH OF THE TYPICAL D-8 BULLDOZER BLADE). SUCCESSIVE LAYERS B, C, AND D ARE THEN PLACED BEFORE LAYER "E" IS PLACED. THE SECOND STEP IS CUT 8 FEET INTO THE SLOPE AND SUCCESSIVE LAYERS ARE AGAIN PLACED. IF IT IS ANTICIPATED THAT THE VERTICAL PART OF THE STEP WILL EXCEED 4 FEET IF A 8 FEET HORIZONTAL CUT IS MADE, THEN THE ACTUAL CUT STOPS WHEN THE VERTICAL PART REACHES A MAXIMUM OF 4 FEET ALLOWING THE HORIZONTAL DISTANCE TO VARY.

THE PROCESS OF BENCHING IS CONSIDERED INCIDENTAL TO THE ITEM OF GRADING COMPLETE IN CONSTRUCTION OF THE EMBANKMENT AND NO ADDITIONAL MEASUREMENT OF QUANTITY OR PAYMENT WILL BE MADE FOR BENCHING.



BENCHING DETAIL

PAVEMENT MATERIAL SCHEDULE
Ⓐ RECYCLED ASPH. CONC. 9.5 mm SUPERPAVE, GP2 ONLY, INCL. BITUM. MAT'L & H. LIME, 135 LBS./SY, DESIGN MIX LEVEL A
Ⓑ RECYCLED ASPH. CONC. 19 mm SUPERPAVE, GP1 OR GP2, INCL. BITUM. MAT'L & H. LIME, 220 LBS./SY, DESIGN MIX LEVEL A
Ⓒ RECYCLED ASPH. CONC. 25 mm SUPERPAVE, GP1 OR GP2, INCL. BITUM. MAT'L & H. LIME, 330 LBS./SY, DESIGN MIX LEVEL A
Ⓓ GRADED AGGREGATE BASE COURSE, 8"
Ⓔ ASPHALTIC CONCRETE LEVELING, AS REQUIRED

PBS&J

SCALE IN FEET
0 5 10 20

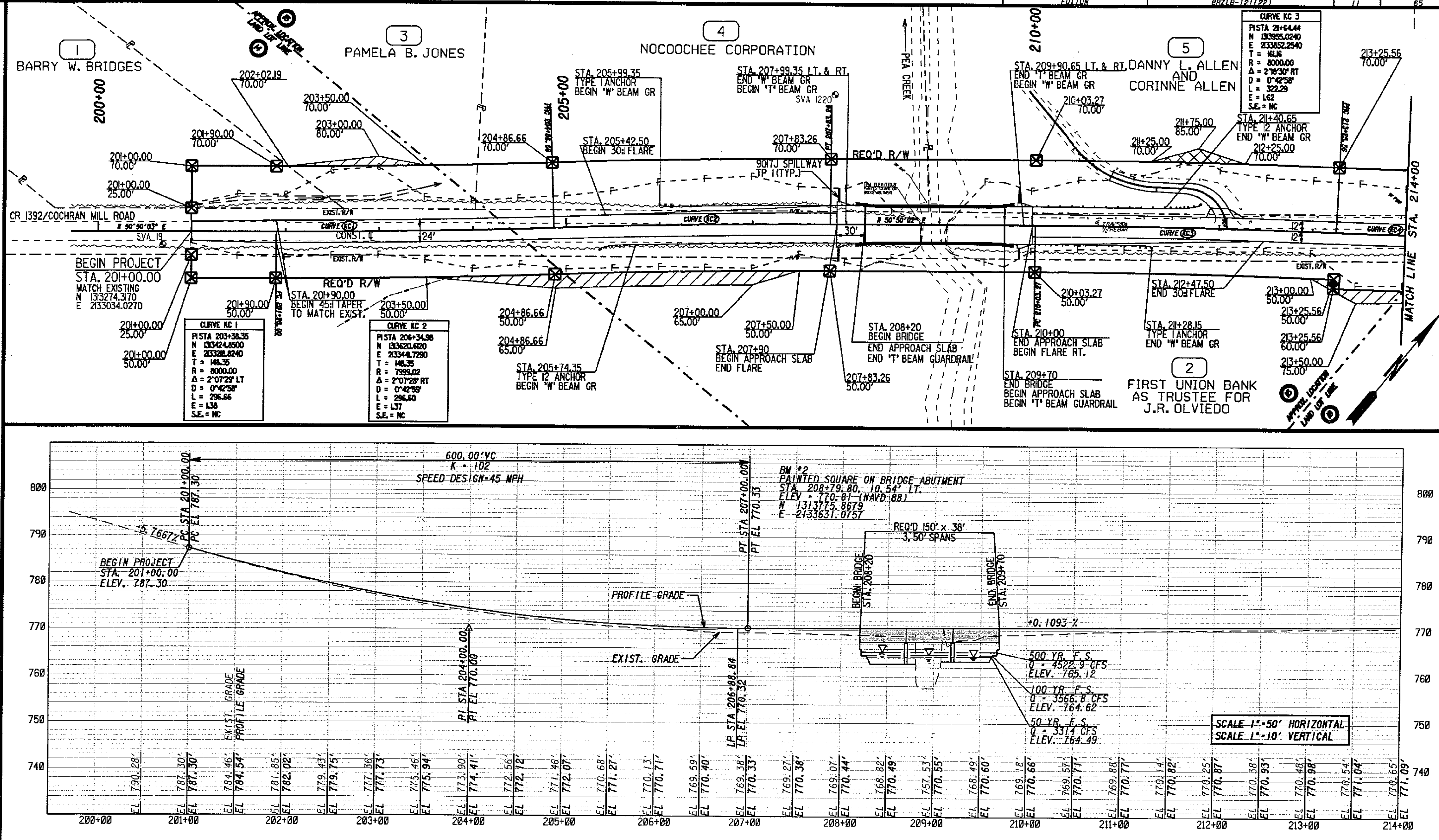
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT 7

TYPICAL SECTIONS

COCHRAN MILL RD @ PEA CREEK
BRIDGE REPLACEMENT

DRAWING No. 5-01



PROPERTY AND EXISTING R/W LINE	
REQUIRED R/W LINE	
CONSTRUCTION LIMITS	C F
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

BEGIN LIMIT OF ACCESS............BLA
END LIMIT OF ACCESS..............ELA
LIMIT OF ACCESS
R/W AND LIMIT OF ACCESS

PBS&J

SCALE IN FEET 0 50 100 200

REVISION DATES

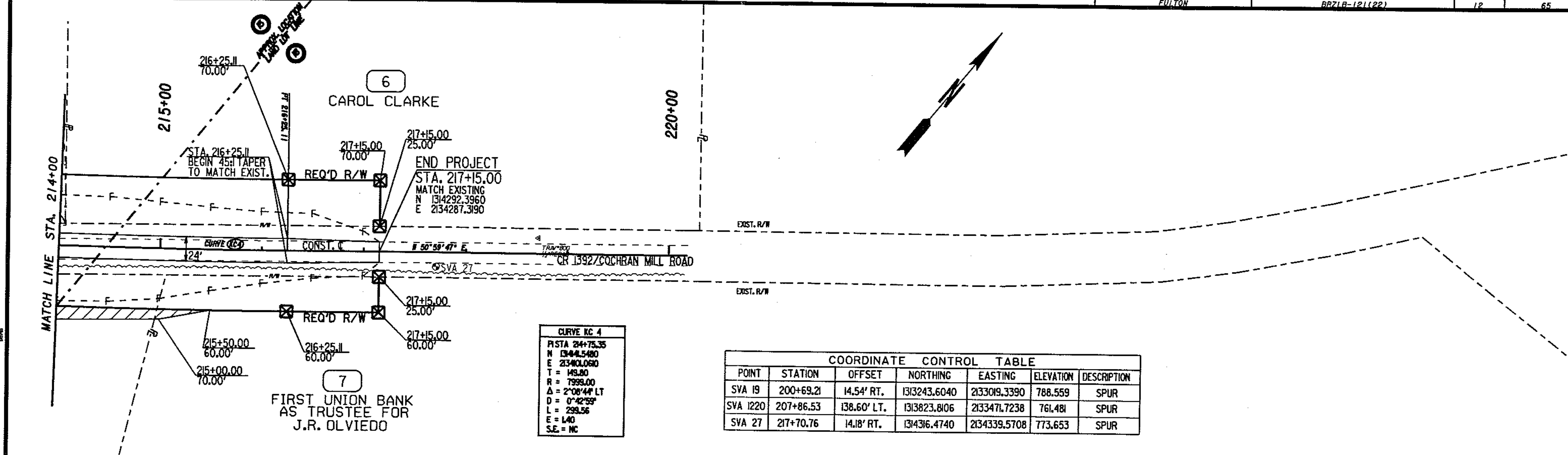
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT 7

MAINLINE PLAN & PROFILE

COCHRAN MILL RD @ PEA CREEK
BRIDGE REPLACEMENT

DRAWING No. 13-01

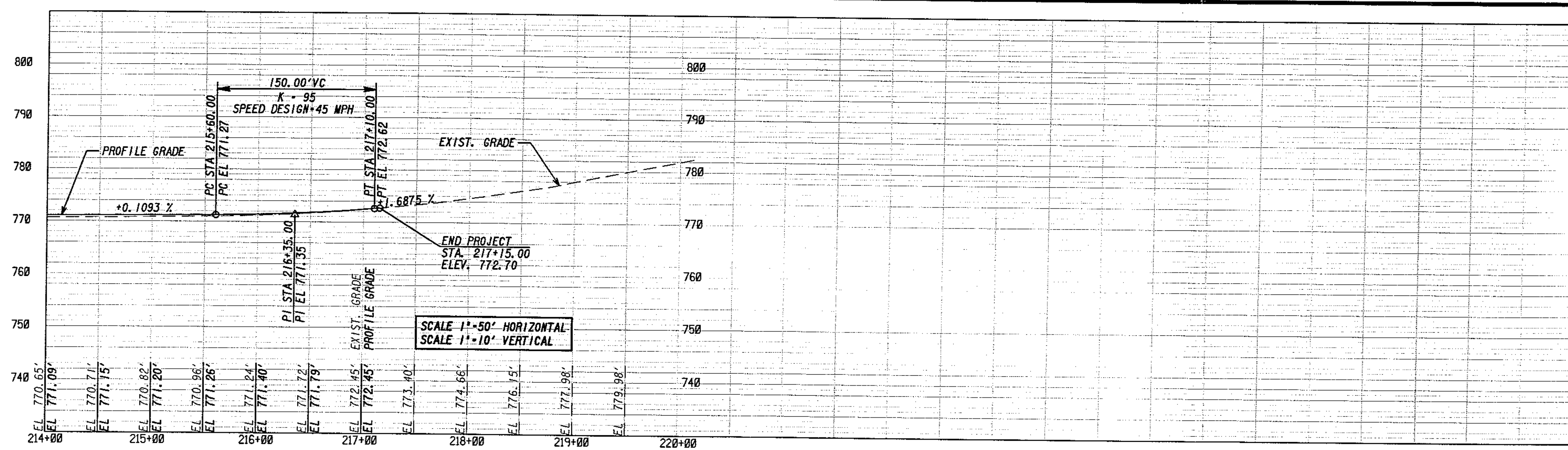
COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
FULTON	BRZLB-121(22)	12	65



CURVE KC 4
PI STA 214+75.35
N 1314441.5480
E 2134101.0610
T = 149.80
R = 7999.00
Δ = 2°08'44" LT
D = 0°42'59"
L = 299.56
E = 1.40
S.E. = NC

COORDINATE CONTROL TABLE

POINT	STATION	OFFSET	NORTHING	EASTING	ELEVATION	DESCRIPTION
SVA 19	200+69.21	14.54' RT.	1313243.6040	2133019.3390	788.559	SPUR
SVA 1220	207+86.53	138.60' LT.	1313823.8106	2133471.7238	761.481	SPUR
SVA 27	217+70.76	14.18' RT.	1314316.4740	2134339.5708	773.653	SPUR



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS............BLA
END LIMIT OF ACCESS............ELA
LIMIT OF ACCESS
R/W AND LIMIT OF ACCESS

PBS&J

SCALE IN FEET
0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT 7

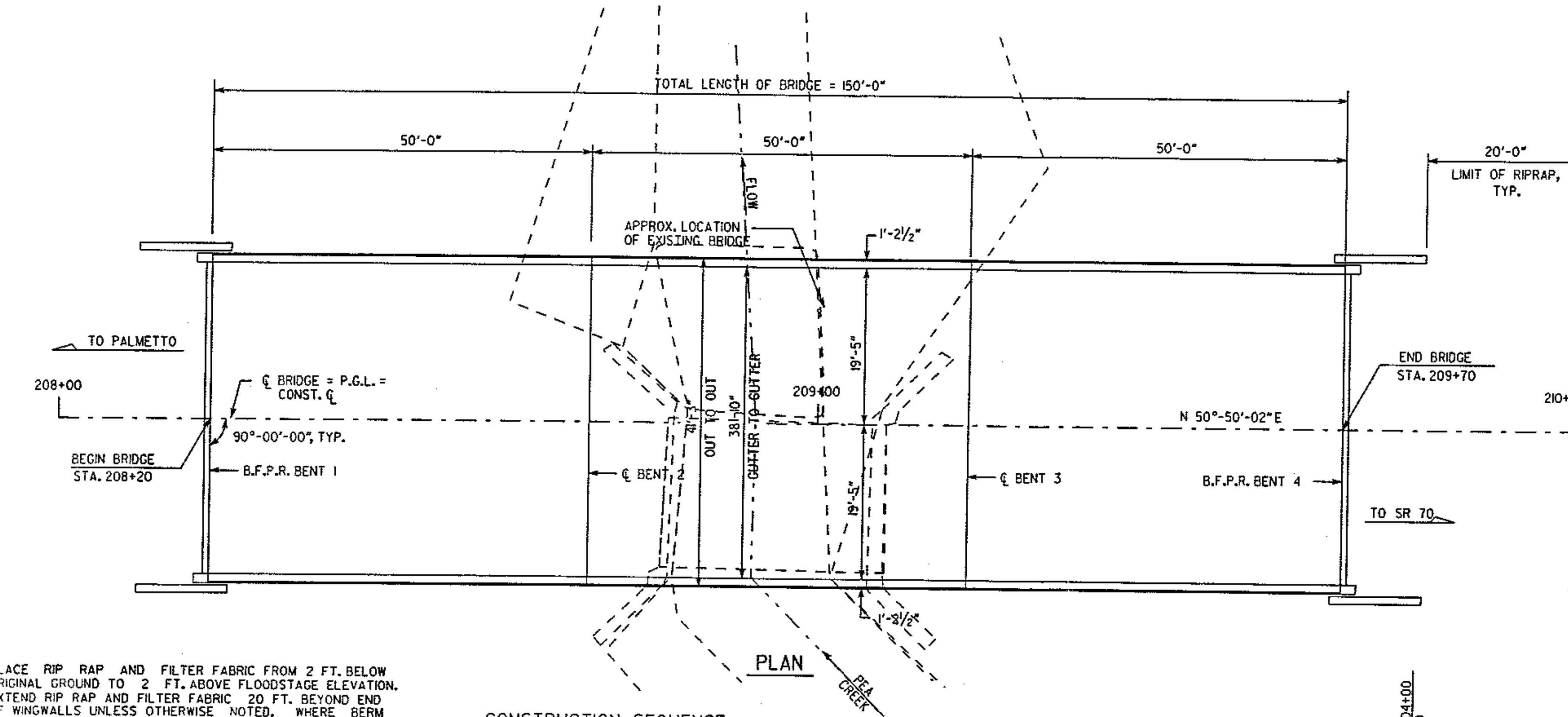
MAINLINE PLAN & PROFILE

COCHRAN MILL RD @ PEA CREEK
BRIDGE REPLACEMENT

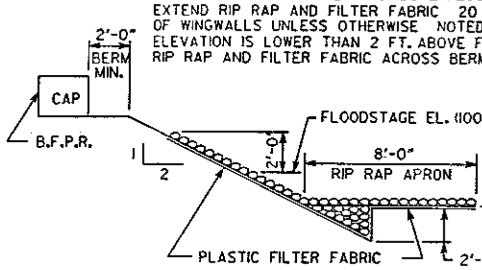
DRAWING No. 13-02

14.0 PRELIMINARY BRIDGE LAYOUT

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRZLB-121(22)		



PLACE RIP RAP AND FILTER FABRIC FROM 2 FT. BELOW ORIGINAL GROUND TO 2 FT. ABOVE FLOODSTAGE ELEVATION. EXTEND RIP RAP AND FILTER FABRIC 20 FT. BEYOND END OF WINGWALLS UNLESS OTHERWISE NOTED. WHERE BERM ELEVATION IS LOWER THAN 2 FT. ABOVE FLOODSTAGE, EXTEND RIP RAP AND FILTER FABRIC ACROSS BERM.



RIP RAP DETAIL
NO SCALE

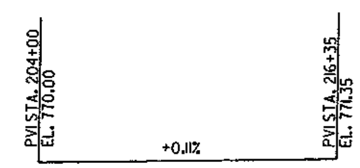
CONSTRUCTION SEQUENCE

1. SETUP DETOUR SIGNAGE AND CLOSE EXISTING BRIDGE.
2. REMOVE EXISTING BRIDGE IN ACCORDANCE WITH GA D.O.T. SPECIFICATIONS.
3. CONSTRUCT NEW BRIDGE.
4. SHIFT TRAFFIC TO NEW BRIDGE.
5. REMOVE DETOUR SIGNAGE.

THE ABOVE CONSTRUCTION SEQUENCE SHALL BE COORDINATED WITH ROADWAY OPERATIONS. SEE ROADWAY PLANS. IN LIEU OF THE ABOVE SEQUENCE, THE CONTRACTOR MAY SUBMIT A PROPOSED CONSTRUCTION SEQUENCE FOR APPROVAL.

NOTES:
NEW MAIN LINE BRIDGE - MINIMUM BOTTOM OF BEAM ELEVATION SHALL BE NO LOWER THAN 766.49. THE PROPOSED LOW CHORD IS 766.80.

PROPOSED BRIDGE DECK TO BE BUILT ON NORMAL CROWN OF 2%.



PROPOSED GRADE DATA

DESIGN DATA

SPECIFICATIONS ---------- AASHTO 1996 (WITH 1997 & 1998 INTERIMS) (DESIGN FOR SEISMIC PERFORMANCE CATEGORY A)
TYPICAL HS20-44 AND/OR MILITARY LOADING ------- IMPACT ALLOWED
FUTURE PAVING ALLOWANCE ------------------------- 30 LB/FT^2

BRIDGE CONSISTS OF

3 - 50'-0" AASHTO TYP I MOD PSC BEAM SPANS ---- SPECIAL DESIGN
KANSAS CORRAL RAIL ------------------------ SPECIAL DESIGN
2 - PILE END BENTS ------------------------ SPECIAL DESIGN
2 - PILE INTERMEDIATE BENTS ------------------------ SPECIAL DESIGN
24" TYPE I RIPRAP

TRAFFIC DATA

TRAFFIC ------------------------ ADT 1400 (2005) ADT 3070 (2025)
DESIGN SPEED ------------------------ 45 MPH
TRUCKS ------------------------ 1%
24 HR. TRUCKS ------------------------ 1%
DIRECTIONAL ------------------------ 50%

UTILITIES

TELEPHONE - BELLSOUTH TELECOMMUNICATIONS, INC.
ELECTRIC - GREYSTONE
WATER - CITY OF ATLANTA WATER

BENCH MARK

TBM
PAINTED SQUARE ON BRIDGE ABUTMENT
STA. 208+79.80, 10.54' LT.
ELEV = 770.81 (NAVD 88)

DRAINAGE DATA

FLOOD FREQUENCY (YR)	DISCHARGE (CFS)	MEAN VELOCITY (FT/SEC)	BACK WATER	AREA OF OPENING UNDER HIGHWATER (SF)
50	3314	5.96	0.84	556
100	3566.8	6.19	0.93	576
500	4522.9	6.95	1.27	651

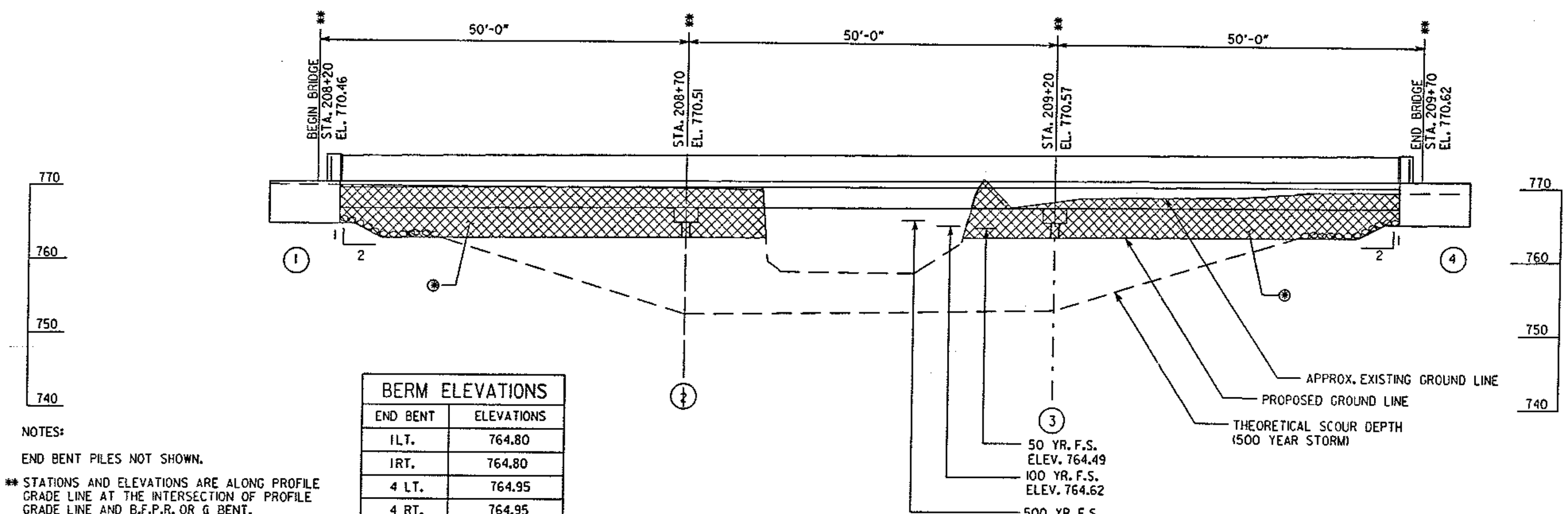
DRAINAGE AREA: 8.37 SQ. MILES

THEORETICAL SCOUR DEPTHS (FT)

BENT LOCATION	100 YEAR STORM			500 YEAR STORM		
	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
BENT 2	3.19	3.60	6.79	4.44	3.60	8.04
BENT 3	2.81	3.60	6.41	3.99	3.60	7.59

EXISTING BRIDGE SERIAL: 121-5114-0
EXISTING BRIDGE I.D.: 121-01329X-006.02N
PROJECT P.I.: 771275

BRIDGE NO. 1



ELEVATION

NOTES:

END BENT PILES NOT SHOWN.

** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ℄ BENT.

Ⓐ EXISTING FILL TO BE REMOVED.

BERM ELEVATIONS

END BENT	ELEVATIONS
1 LT.	764.80
1 RT.	764.80
4 LT.	764.95
4 RT.	764.95

NOTE: FOR BRIDGE STAKING PURPOSES ONLY

GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 026 ... BROWN

PBSJ Post, Buckley, Schuh & Jernigan, Inc.
CONSULTING ENGINEERS and PLANNERS

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

BRIDGE REPLACEMENT
CR 1392/COCHRAN MILL RD.
OVER PEA CREEK
PRELIMINARY LAYOUT
FULTON COUNTY BRZLB-121(22)

SCALE: 1" = 10'-0" DEC. 2004

REVISIONS | DATE | BY

DESIGNED CMM | CHECKED HWC | REVIEWED
DRAWN LLC | LIAISON ENGINEER | APPROVED

BRIDGE SHEET 1 OF 1

07-NOV-2005
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