BSDMS Summary Report

30 Pearl River at westbound U.S. 98 near Columbia, MS

Site Location:

Site ID: 30

Site Name: Pearl River at westbound U.S. 98 near Columbia, MS

County: Marion

Nearest City: Columbia

State: MS

Latitude: 311414

Longitude: 895054

USGS Station ID: 2489000

Route Number: 98

Route Class: US

Service Level: Mainline

Route Direction: West

Highway Mile Point: 118.5

Stream Name: Pearl River

River Mile:

Contact:

U.S. Geological Survey, WRD, MS. District
100 W. Capitol Street, Suite 710
Jackson, MS. 39269
(601) 965-4600

Publication:

Turnipseed, D.P., and Smith, J.A., 1992, Monitoring lateral movement of channel banks on the Pearl River in Mississippi: Mississippi Water Resources Conference Proceedings, 1992, p.101-108.

Site Description:

This is a 785-ft-long bridge crossing the Pearl River about 1.5 mile southwest of Columbia at river mile 137.8. This entry is for the westbound lanes, which are upstream from the eastbound lanes. The bridge has three 4-ft-diameter pier bents (Nos. 4-6) within the low-water channel supporting the main span over the channel and five interior double-18x18-inch-pile bents (Nos. 2-3 & 7-9) supporting the approach spans on the flood plain. The bridge is in a 680-ft-long vertical curve with 4.0% approach grades. A 150-ft-long spur dike is located at the right (west) abutment. The left (east) bank is covered with riprap through the bridge. The spill-through abutments are paved under the bridge but are not paved on the upstream slope.

The upstream left (east) bank has experienced lateral erosion in recent years. The bridge crossing is in a channel reach in a transition between a 125-degree bend about 1,600 ft upstream and a 145-degree bend about 1,200 ft downstream of the bridge. In an effort to control the bank erosion on the left bank, five flow deflectors were constructed in 1985-86 along the left bank from the bridge to about 1500 ft upstream.

Scour data were collected during high and low flows using a fathometer. The flow velocities approaching the bridge piers were determined from velocity soundings during discharge measurements at the upstream side of the bridge.

On October 4-9, 1991, bed samples were collected from the main channel at selected intervals along three channel cross sections. Individual samples with similiar characteristics were combined for gradation analyses. The following is a brief description of the bed samples collected :

Cross Section	Distance Upstream	Sample	Comments
1	100 ft	1	Represents right part of chanel begin near station 8180.
1	100 ft	2	Represents left part of channel end near station 8180.
2	1,100 ft	3	Within main flow of low-water channel, from tip of 4th jetty upstream to about 100 ft right.
2	1,100 ft	4	Right part of channel, 175ft from tip of 4th jetty to RWE
2	1,100 ft	5	Near upstream end of 4th jetty.
3	2,000 ft	6	At upstream end of sand/gravel bar, all samples here combined.

No bed samples were obtained at the piers due to debris, etc. Based on rod probings at the piers, the material at the base of the piers is thought to be mostly gravel with some sand and debris. Also, soil borings by the MDOT indicate gravel is present. Therefore, bed sample no. 6 is thought to be most representative for the bed material at the base of pier nos. 4-6.

The International Standard ISO 9195, "Liquid flow measurement in open channels -Sampling and analysis of gravel-bed material", prepared by Technical Committee ISO/TC 113 suggests sampling at the upstream end of gravel bars. The coarse material is associated with the channel-forming processes and sediment^ transport. Therefore sample no. 6 was selected as the most representative.

Elevation Reference

Datum: MSL

MSL (ft):

Description of Reference Elevation:

Wire-weight gage attached to the upstream side of the upstream bridge. Check-bar reading at 61.00 ft (elev. 176.81 ft (NGVD)).
Centerline elevation of downstream bridge at the left (east) abutment (Elev. 155.46 ft).
BM-6.-- Chiseled square on downstream streamward corner of bridge seat of left (east) abutment (Elev. 151.47 ft).

Stream Data

Drainage Area (sq mi):	5720	**Floodplain Width:**	Wide
Slope in Vicinity(ft/ft):	0.000189	**Natural Levees:**	Little
Flow Impact:	Left	**Apparent Incision:**	None
Channel Evolution	Unknown	**Channel Boundary:**	Alluvial
Armoring:	Unknown	**Banks Tree Cover:**	Medium
Debris Frequency:	Occasional	**Sinuosity:**	Meandering
Debris Effect:	Local	**Braiding:**	None
Stream Size:	Wide	**Anabranching:**	None

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Flow Habit:	Unknown	**Bars:**	Narrow
Bed Material:	Gravel	**Stream Width Variability:**	Random
Valley Setting:	Moderate		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:			
Typical	0.18	0.03	0.18
Low:			

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1991	10	4	BMH-60	5.8	0.4	0.25	0.16	2.65		Non-Cohesive
2	1991	10	4	BMH-60	0.28	0.2	0.14	0.09	2.65		Non-Cohesive
3	1991	10	4	BMH-60	17.3	10	2.1	0.35	2.65		Non-Cohesive
4	1991	10	4	BMH-60	15	10	2	0.33	2.65		Non-Cohesive
5	1991	10	9	BMH-60	0.86	0.5	0.32	0.13	2.65		MILD
6	1991	10	9	SHOVEL	20	15	6.9	0.39	2.65		Non-Cohesive

Bed Material Comments

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Measurement No: 1

On October 4-9, 1991, bed samples were collected from the main channel at selected intervals along three channel cross sections. Individual samples with similiar characteristics were combined for gradation analyses. The following is a brief description of the bed samples collected :

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3	2,000 ft	6	At upstream end of sand/gravel bar, all samples here combined.

No bed samples were obtained at the piers due to debris, etc. Based on rod probings at the piers, the material at the base of the piers is thought to be mostly gravel with some sand and debris. Also, soil borings by the MDOT indicate gravel is present. Therefore, bed sample no. 6 is thought to be most representative for the bed material at the base of pier nos. 4-6.

The International Standard ISO 9195, "Liquid flow measurement in open channels -Sampling and analysis of gravel-bed material", prepared by Technical Committee ISO/TC 113 suggests sampling at the upstream end of gravel bars. The coarse material is associated with the channel-forming processes and sediment^ transport. Therefore sample no. 6 was selected as the most representative.

Measurement No: 2

On October 4-9, 1991, bed samples were collected from the main channel at selected intervals along three channel cross sections. Individual samples with similiar characteristics were combined for gradation analyses. The following is a brief description of the bed samples collected :

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Measurement No: 3

On October 4-9, 1991, bed samples were collected from the main channel at selected intervals along three channel cross sections. Individual samples with similiar characteristics were combined for gradation analyses. The following is a brief description of the bed samples collected :

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2	1,100 ft	5	Near upstream end of 4th jetty.
3	2,000 ft	6	At upstream end of sand/gravel bar, all samples here combined.

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Measurement No: 4

On October 4-9, 1991, bed samples were collected from the main channel at selected intervals along three channel cross sections. Individual samples with similiar characteristics were combined for gradation analyses. The following is a brief description of the bed samples collected :

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1	100 ft	1	Represents right part of chanel begin near station 8180.
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2	1,100 ft	4	Right part of channel, 175ft from tip of 4th jetty to RWE
2	1,100 ft	5	Near upstream end of 4th jetty.
3	2,000 ft	6	At upstream end of sand/gravel bar, all samples here combined.

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Measurement No: 5

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2	1,100 ft	5	Near upstream end of 4th jetty.
3	2,000 ft	6	At upstream end of sand/gravel bar, all samples here combined.

No bed samples were obtained at the piers due to debris, etc. Based on rod probings at the piers, the material at the base of the piers is thought to be mostly gravel with some sand and debris. Also, soil borings by the MDOT indicate gravel is present. Therefore, bed sample no. 6 is thought to be most representative for the bed material at the base of pier nos. 4-6.

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Measurement No: 6

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2	1,100 ft	3	Within main flow of low-water channel, from tip of 4th jetty upstream to about 100 ft right.
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Bridge Data

Structure No: 118.5A

Length(ft): 785

Width(ft): 32

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Number of Spans: 9

Vertical Configuration: Curvilinear

Low Chord Elev (ft): 159.8

Upper Chord Elev (ft): 167.4

Overtopping Elev (ft):

Skew (degrees): 0

Guide Banks: Elliptical

Waterway Classification: Main

Year Built: 1970

Avg Daily Traffic: 5295

Plans on File: Yes

Parallel Bridges Yes

Upstream/Downstream: Upstream

Continuous Abutment: No

Distance Between Centerlines: 75

Distance Between Pier Faces: 51

Bridge Description:

Abutment Data

Left Station: 7688

Right Station: 8471

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft):

Right Abutment Length (ft)

Left Abutment to Channel Bank (ft): 170

Right Abutment to Channel Bank (ft): 95

Left Abutment Protection:

Right Abutment Protection

Contracted Opening Type: III

Embankment Skew (deg): 0

Embankment Slope (ft/ft): 3

Abutment Slope (ft/ft) 2

Wingwalls: No

Wingwall Angle (deg): 0

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
4	8240	0	8240	Group	2	17
5	8110	0	8110	Group	2	17
6	7980	0	7980	Group	2	17

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
4	4	Cylindrica		21	None	Piles
5	4	Cylindrica		21	None	Piles
6	4	Cylindrica		21	None	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
4	122.1	118.1	11.2	Square	79
5	122.3	118.3	11.2	Square	81
6	122.1	118.1	11.2	Square	82

Pier Description

Pier ID 4

Pier consists of two 4-ft-diameter concrete columns spaced 17.0 ft apart. Each column is on a 11.2-ft-wide, 8.5-ft-long, 4.0-ft-deep concrete footing supported by 12 18x18-in concrete piles. There are four piles at the upstream side of the footing, four in the middle, and four at the downstream side.

Pier ID 5

Pier consists of two 4-ft-diameter concrete columns spaced 17.0 ft apart. Each column is on a 11.2-ft-wide, 8.5-ft-long, 4.0-ft-deep concrete footing supported by 12 18x18-in concrete piles. There are four piles at the upstream side of the footing, four in the middle, and four at the downstream side.

Pier ID 6

Pier consists of two 4-ft-diameter concrete columns spaced 17.0 ft apart. Each column is on a 11.2-ft-wide, 8.5-ft-long, 4.0-ft-deep concrete footing supported by 12 18x18-in concrete piles. There are four piles at the upstream side of the footing, four in the middle, and four at the downstream side.

Pier Scour Data

Pier ID	Date	Time	USOrDS
4	1/27/90	14:55	Upstream
4	1/30/90	15:00	Upstream
4	5/10/91	10:45	Upstream
5	1/27/90	12:30	Upstream
5	1/30/90	15:00	Upstream
5	2/5/90	17:35	Upstream
5	5/10/91	10:45	Downstream
6	1/27/90	14:55	Upstream
6	1/30/90	15:00	Downstream
6	2/5/90	17:35	Downstream
6	5/10/91	10:45	Upstream

Pier ID	Scour Depth	Accuracy (ft)	Side Slope (ft/ft)	TopWidth (ft)	Apprch Vel (ft/s)	Apprch Depth(ft)	Effective Pier Width	Skew to Flow(deg)
4	1.9	0.5	7.2	34	5.33	26.9	5.4	8
4	3.2	0.5	4.5	41	4.64	25	5.5	8
4	1.4	0.5	4.4	13	5.14	29.1	5.5	11
5	7.5	0.5	4.8	82	7.69	28.4	5.5	22
5	3.3	0.5	3.3	44	5.69	28.6	6.4	8
5	2	0.5	5.2	38	4.34	25.7	5.8	16

5	4.5	0.5	2.8	36	6.64	28.9	5.5	11
6	4.9	0.5	3.4	46	5.55	30.1	5.5	16
6	6.5	0.5	4.1	62	6.94	27.7	5.5	14
6	6.6	0.5	2.1	30	4.24	25.1	5.8	18
6	9.9	0.5	2.1	49	7.17	27.3	5.4	14

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
4	Live-bed	Non-cohesive	Unknown			6.2	Unknown
4	Live-bed	Non-cohesive	Unknown			6.2	Unknown
4	Live-bed	Non-cohesive	Unknown			6.2	Unknown
5	Live-bed	Non-cohesive	Unknown			6.2	Unknown
5	Live-bed	Non-cohesive	Unknown			6.2	Unknown
5	Live-bed	Non-cohesive	Unknown			6.2	Unknown
5	Live-bed	Non-cohesive	Unknown			6.2	Unknown
6	Live-bed	Non-cohesive	Unknown			6.2	Insignificant
6	Live-bed	Non-cohesive	Unknown			6.2	Unknown
6	Live-bed	Non-cohesive	Unknown			6.2	Unknown
6	Live-bed	Non-cohesive	Unknown			6.2	Unknown

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
4	20	15	6.9	0.39
4	20	15	6.9	0.39
4	20	15	6.9	0.39
5	20	15	6.9	0.39
5	20	15	6.9	0.39
5	20	15	6.9	0.39
5	20	15	6.9	0.39
6	20	15	6.9	0.39
6	20	15	6.9	0.39
6	20	15	6.9	0.39
6	20	15	6.9	0.39

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Pier Scour Comments

Pier ID 4 **Time:** 14:55 **US/DS:** Upstream

Reference bed is at elev. 113.5. Scour-hole side slope is rough due to close proximity of bank. Minimum bed elev. at pier is at upstream side at 111.6 ft. Scour-hole depth = 113.5 - 111.6 = 1.9 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 4 **Time:** 15:00 **US/DS:** Upstream

Reference bed is at elev. 114.1 ft.
Minimum bed at upstream side is at 110.9 ft. At ds side, bed is at 110.4 ft.
Scour-hole depth = 114.1 - 110.9 = 3.2 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 4 **Time:** 10:45 **US/DS:** Upstream

Reference bed is at elev. 111.3 ft.
Minimum bed elev. at pier is at upstream side at 109.9 ft.
Scour-hole depth = 111.3 - 109.9 = 1.4 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 5 **Time:** 12:30 **US/DS:** Upstream

Reference bed is at elev. 112.0 ft.
Minimum bed elev. at pier is upstream side at 104.5 ft.
Scour-hole depth = 112.0 - 104.5 = 7.5 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 5 **Time:** 15:00 **US/DS:** Upstream

Reference bed is at elev. 110.5 ft.
Minimum bed elev. at pier is at upstream side of pier at 107.2 ft.
Scour-hole depth = 110.5 - 107.2 = 3.3 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 5 **Time:** 17:35 **US/DS:** Upstream

Reference bed is at elev. 109.0 ft.
Minimum bed at pier is at upstream side at 107.0 ft.
Scour-hole depth = 109.0 - 107.0 = 2.0 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 5 **Time:** 10:45 **US/DS:** Downstream

Reference bed is at elev. 111.5 ft.
Minimum bed elev. at pier is at downstream side at 107.0 ft.
Scour-hole depth = 111.5 - 107.0 = 4.5 ft, at us side: 112.0 - 107.9 = 4.1 ft.
Eff. pier width is a depth-weighted ave. of the column, footing, and piling.

Pier ID 6 **Time:** 14:55 **US/DS:** Upstream

Reference bed is at elev. 110.3 ft.
Minimum bed elev. at pier is at upstream side at 105.4 ft.
Scour-hole depth = 110.3 - 105.4 = 4.9 ft. Effective pier width is a depth-weighted average of the column, footing, and piling widths.

Pier ID 6 **Time:** 15:00 **US/DS:** Downstream

Reference bed is at elev. 111.4 ft.
Minimum bed elev. at pier is at downstream side at 104.9 ft.
Scour-hole depth = 111.4 - 104.9 = 6.5 ft. Effective pier width is a
depth-weighted average of the column, footing, and piling widths.

Pier ID 6 **Time:** 17:35 **US/DS:** Downstream

Reference bed is at elev. 109.6 ft at downstream side.
Minimum bed elev. at pier is at downstream side at 103.0 ft.
Scour-hole depth = 109.6 - 103.0 = 6.6 ft, at us side, 109.3 - 105.6 = 3.7 ft.
Eff. pier width is a depth-weighted ave. of the column, footing, and piling.

Pier ID 6 **Time:** 10:45 **US/DS:** Upstream

Reference bed is at elev. 113.1 ft.
Minimum bed elev. at pier is at upstream side at 103.2 ft.
Scour-hole depth = 113.1 - 103.2 = 9.9 ft. Effective pier width is a
depth-weighted average of the column, footing, and piling widths.

Abutment Scour

ContractionScour

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Stage and Discharge Data

Peak Discharge					Flow		Peak Stage					Stage	Water	Return
year	mo	dy	hr	mi	(cfs)	Qacc	year	mo	dy	hr	mi	(ft)	Temp (C)	Period(yr)
1990	1	27	13:35	35	73000	5	1990	1	27	13:35	35	140.38		25
1991	5	10	13:20	20	71700	5	1991	5	10	13:20	20	140.37		25
					0		none	1990	1	30	0	139.09		
					0		none	1990	2	5	0	134.73		
					0		none	1990	2	14	0	134.09		
					0		none	1990	3	28	0	123.43		

Hydrograph

Hydrograph Number	Year	Month	Day	Hr	Min	Sec	Stage(ft)	Discharge (cfs)

Supporting Files