

BSDMS Summary Report

17 South Altamaha River at I-95 near Brunswick, GA

Site Location:

Site ID: 17

Site Name: South Altamaha River at I-95 near Brunswick, GA

County: Glynn/McIntosh

Nearest City: Brunswick

State: GA

Latitude: 312015

Longitude: 812800

USGS Station ID: 2226168

Route Number: 95

Route Class: Interstate

Service Level: Mainline

Route Direction: South

Highway Mile Point:

Stream Name: South Altamaha River

River Mile:

Contact:
Landers, Mark. Hydrologist,
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Publication:

Site Description:

The I-95 crossing of the Altamaha River is located in the Southeastern tip of Georgia. It was built in 1970 over a waterway whose flows are tidally affected but do not normally reverse direction over the tide cycle. This data set is for the southbound, upstream bridge. The northbound lane crosses on a nearly identical, parallel bridge 47 feet downstream. On January 23, 1990 a passing motorist on the southbound bridge noticed a pronounced bump and called Georgia Department of Transportation (GDOT). GDOT inspected the bridge and found a 4-inch sag in the deck at pier 15. Divers then found a large scour hole at pier 15 and found exposed pile tips on at least four of the 12 supporting piles. Emergency contracts were let to provide additional support for repairs of bents 14,15, & 16 of the southbound bridge and bent 14 of the northbound bridge. In subsequent years additional repairs and countermeasures have been made at additional piers on the northbound and southbound bridges. Personnel of the USGS visited the site in February, 1990 to collect detailed channel geometry, geophysical, and velocity data. Analyses indicate that the failure was due to a combination of local scour at pier 15, and the northward migration of the thalweg since 1970, to a present location coinciding with pier 15. This broadly meandering stream has had stable channel boundaries according to areal photos from 1951 to present. However, there is a meander cut-off forming about 2000 feet north of the bridge. The near channel banks were about 200 feet apart at the upstream and downstream side of the potential

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meander cut-off location in 1951 and 1974 and were about 160 feet apart in 1988. The average channel width is about 500 feet. When this cut-off occurs, it could place the bridge at increased risk due to scour.

Elevation Reference

Datum: MSL

MSL (ft):

Description of Reference Elevation:

Bridge repairs may have damaged or destroyed these RPs.

RP1: BENT 15 of northbound lane, top of base of pier, which is also the pile cap and is near mean high-water elevation, at each of it's four corners, Elevation 4.00 ft, MSL (elevation from construction crews)

RP2: BENT 15.5, northbound lane, top of base of pier, which is also the pile cap and is near mean high-water elevation, at each of it's four corners, Elevation 3.50 ft, MSL (elevation from construction crews)

RP3: handrail on upstream end of left (North) fender. Top of handrail is 15.38 ft from levels run from RP2 on 2/11/90. Temporary staff gage was set.

Stream Data

Drainage Area (sq mi):	14000	Floodplain Width:	Wide
Slope in Vicinity (ft/ft):		Natural Levees:	Little
Flow Impact:	Left	Apparent Incision:	None
Channel Evolution	Premodified	Channel Boundary:	Alluvial
Armoring:	None	Banks Tree Cover:	Medium
Debris Frequency:	None	Sinuosity:	Sinuuous
Debris Effect:	None	Braiding:	None
Stream Size:	Wide	Anabranching:	None
Flow Habit:	Perennial	Bars:	Irregular
Bed Material:	Sand	Stream Width Variability:	Equiwidth
Valley Setting:	Low		

Roughness Data

Manning's n Values

Left Overbank	Channel	Right Overbank
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High:	0.15	0.031	0.15
Typical	0.1	0.03	0.1
Low:	0.08	0.029	0.08

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1991	6	25	BMH-53 us	4.1	2.5	1	0.55	2.65		Non-Cohesive
2	1991	6	25	BMH-53 ds	2.55	1.2	0.64	0.33	2.65		Non-Cohesive

Bed Material Comments

Measurement No: 1

Two bed-material samples collected on 6/25/90 are both five-sample composites from the channel. Sample 1 was taken 1000 feet upstream from the bridge. Sample 2 was taken 500 feet downstream from the bridge.

Measurement No: 2

Two bed-material samples collected on 6/25/90 are both five-sample composites from the channel. Sample 1 was taken 1000 feet upstream from the bridge. Sample 2 was taken 500 feet downstream from the bridge.

Bridge Data

Structure No:	127-00405-04435N
Length(ft):	1765
Width(ft):	40
Number of Spans:	8
Vertical Configuration:	Horizontal
Low Chord Elev (ft):	32.3
Upper Chord Elev (ft):	46.91
Overtopping Elev (ft):	30
Skew (degrees):	19.7
Guide Banks:	None

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Waterway Classification: Main

Year Built: 1970

Avg Daily Traffic: 12300

Plans on File: Yes

Parallel Bridges Yes

Upstream/Downstream: Upstream

Continuous Abutment: Yes

Distance Between Centerlines: 88

Distance Between Pier Faces: 47

Bridge Description:

This is the upstream, southbound lane bridge of I-95. The northbound lane is parallel and is about 80 feet downstream. The bridge has fenders between piers 13 and 14. These are supported by driven columns that also have local scour associated with them. The bridge deck is over 40 ft above the water surface. The bridge is skewed 20 degrees to flow, but piers are nearly parallel to the flow. There are actually 25 spans, but the BSDMS will only accept 21 at most. The main span is a three-span continuous steel girder with maximum span length of 154 feet. In the Edit>Site>Pier> section, piers that are alike are listed under the same pier ID. Piers that had scour data (11,12,13) are identified separately.

Abutment Data

Left Station: 1765

Right Station: 0

Left Skew (deg): 20

Right Skew (deg) 20

Left Abutment Length (ft): 45

Right Abutment Length (ft) 45

Left Abutment to Channel Bank (ft): 540

Right Abutment to Channel Bank (ft): 520

Left Abutment Protection:

Right Abutment Protection

Contracted Opening Type: III

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Embankment Skew (deg): 19.7
 Embankment Slope (ft/ft): 2.5
 Abutment Slope (ft/ft) 2.5
 Wingwalls: No
 Wingwall Angle (deg): 0

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	File Spacing(ft)
11	633	20	0	Group	12	0
12	694	20	0	Group	12	0
13	805	20	0	Group	20	0
14	948	20	0	Group	20	0
15	1058	20	0	Group	20	0
2-5	0	0	0	Group	2	0
6,20	0	0	0	Group	10	0

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
11	4	Square		32.5	NONE	Piles
12	4	Square		35.5	None	Piles
13	6	Square		35.5	None	Piles
14	6	Square		35.5	None	Piles
15	4	Square		35.5	None	Piles
2-5	3	Square		27.5	None	Piles
6,20	4	Square		31	None	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
11	4.25	-1.5	8.5	Square	
12	3.92	-1.5	8.7	Square	-46

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13	4.25	-1.5	11	Square	-50
14	4.5	-1.5	11	Square	-55
15	3.92	-1.5	8.7	Square	-48
2-5	27.7	31	4.5	Square	-69
6,20	3.5	-1.5	8.5	Square	

Pier Description

Pier ID 11

Pile cap is near high-tide elevation, so piles make effective width for scour. Six pairs of 2x2 ft concrete piles are angled 10 deg. from vertical. The piles are spaced about 5 ft apart, cl to cl (3 ft clearance) at pile cap, perpendicular to flow.

Pier ID 12

Pile cap is near high-tide elevation, so piles make effective width for scour. Six pairs of 2x2 ft concrete piles are driven vertically and spaced 5 ft apart, cl to cl (3 ft clearance), perpendicular to flow.

Pier ID 13

Pile cap is near high-tide elevation, so piles make effective width for scour. Six triplets and 2 pairs of 2x2 ft conc. piles are driven vertically. Triplets are spaced 3.7 ft apart, cl to cl (1.7 ft clearance), perpendicular to flow. The total number of piles is 22.

Pier ID 14

Pile cap is near high-tide elevation, so piles make effective width for scour. Eight triplets of 2x2 ft conc. piers are driven vertically and spaced 3.7 ft apart, cl to cl (1.7 ft clearance), perpendicular to flow. The total number of piles is 24.

Pier ID 15

Pile cap is near high-tide elevation, so piles make effective width for scour. Six pairs of 2x2 ft concrete piles are driven vertically and spaced 5 ft apart, cl to cl (3 ft clearance), perpendicular to flow.

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Pier ID 2-5

The geometries noted for this 'Pier' are for piers 2,3,4,5, and 21,22,23 & 24. These piers are not skewed to the bridge, and are skewed to the flow. They are overbank piers. The piles are 3 x 3 ft concrete squares, and are capped at the bridge-deck support, with no ground-line pile cap.

Pier ID 6,20

Geometries noted for this pier id are for piers 6,6.5, & 15.5 to 20. Piles are angled out 10 deg. from vertical. Five pairs of 2x2 ft conc. piles are spaced 5 ft apart, centerline to centerline (3 ft clearance) at cap, perpendicular to flow. The piles make effective pier width for purposes of scour.

Pier Scour Data

Pier ID	Date	Time	USOrDS					
11	2/12/90	14:45	Upstream					
11	2/12/90	17:05	Upstream					
12	2/12/90	13:00	Upstream					
12	2/12/90	14:45	Upstream					
12	2/12/90	17:05	Upstream					
13	2/12/90	13:00	Upstream					
13	2/12/90	14:45	Upstream					
13	2/12/90	17:05	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)
11	7	0.25	3.8	62	1.9	18.7	4	0
11	6.6	0.25	3.4	58	1.7	18.1	4	0
12	4	0.25	6.7	65	1.8	23.2	4	0
12	4.7	0.25	5	73	2.3	20.9	4	0
12	5.5	0.25	4.5	68	2.3	20.2	4	0
13	3.9	0.25	6.2	87	1.7	26.4	6	0
13	4.8	0.25	5.8	78	2.15	24.8	6	0
13	5.2	0.25	5.2	83	2.23	23.1	6	0
PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects	
11	Live-bed	Non-cohesive	Unknown			2.1	Insignificant	
11	Live-bed	Non-cohesive	Unknown			2.1	Insignificant	
12	Live-bed	Non-cohesive	Unknown			2.1	Insignificant	

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12	Live-bed	Non-cohesive	Unknown	2.1	Insignificant
12	Live-bed	Non-cohesive	Unknown	2.1	Insignificant
13	Live-bed	Non-cohesive	Unknown	2.1	Insignificant
13	Live-bed	Non-cohesive	Unknown	2.1	Insignificant
13	Live-bed	Non-cohesive	Unknown	2.1	Insignificant

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
11	4.1	2.45	1	0.55
11	4.1	2.45	1	0.55
12	4.1	2.45	1	0.55
12	4.1	2.45	1	0.55
12	4.1	2.45	1	0.55
13	4.1	2.45	1	0.55
13	4.1	2.45	1	0.55
13	4.1	2.45	1	0.55

Pier Scour Comments

Pier ID 11 **Time:** 14:45 **US/DS:** Upstream

Measurement made from boat. Depth computed as ws - ref. elev. at hole. Velocity was measured at 15:09 at pier. Scour-hole cl offset from pier cl by 10 ft. Channel did have live-bed mat. entering scour hole, however at small rate of transport. Two 2x2 ft conc. piles have an eff. width of 4 ft.

Pier ID 11 **Time:** 17:05 **US/DS:** Upstream

Measurement made from boat. Two 2x2 ft square concrete piles have effective width of 4 feet. Channel was live-bed, but no large transport was ongoing. Velocity was measured at pier at 17:34. Flow depth computed as water-surface elevation minus reference elevation at scour holes.

Pier ID 12 **Time:** 13:00 **US/DS:** Upstream

Channel geometry measurements were made by fathometer from boats. Velocities measured real-time at pier. Flow depth computed as water surface minus reference elevation at scour hole. Two 2x2 ft concrete piles give an effective pier width of 4 ft.

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Pier ID 12 **Time:** 14:45 **US/DS:** Upstream

Channel geometry measurements were made by fathometer from boats. Velocities measured real-time at pier. Flow depth computed as water surface minus reference elevation at scour hole. Two 2x2 ft concrete piles give an effective pier width of 4 ft.

Pier ID 12 **Time:** 17:05 **US/DS:** Upstream

Channel geometry measurements were made by fathometer from boats. Velocities measured real-time at pier. Flow depth computed as water surface minus reference elevation at scour hole. Two 2x2 ft concrete piles give an effective pier width of 4 ft.

Pier ID 13 **Time:** 13:00 **US/DS:** Upstream

Channel geometry measurements were made by fathometer from boats. Velocities measured real-time at pier. Flow depth computed as water surface minus reference elevation at scour hole. Three 2x2 ft concrete piles give an effective pier width of 6 ft.

Pier ID 13 **Time:** 14:45 **US/DS:** Upstream

Channel geometry measurements were made by fathometer from boats. Velocities measured real-time at pier. Flow depth computed as water surface minus reference elevation at scour hole. Three 2x2 ft concrete piles give an effective pier width of 6 ft.

Pier ID 13 **Time:** 17:05 **US/DS:** Upstream

Channel geometry measurements were made by fathome

Abutment Scour

Contraction Scour

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Stage and Discharge Data

Peak Discharge					Flow (cfs)	Peak Stage					Stage (ft)	Water Temp (C)	Return Period(yr)
year	mo	dy	hr	mi		year	mo	dy	hr	mi			

Hydrograph

Hydrograph Number	Year	Month	Day	Hr	Min	Sec	Stage(ft)	Discharge (cfs)
1	1990	2	12	14	0	0	1.85	
1	1990	2	12	10	0	0	4.4	
1	1990	2	12	10	30	0	4.45	
1	1990	2	12	11	0	0	4.3	
1	1990	2	12	11	30	0	4.05	
1	1990	2	12	12	0	0	3.8	
1	1990	2	12	12	30	0	3.3	
1	1990	2	12	9	30	0	4.15	
1	1990	2	12	13	30	0	2.35	
1	1990	2	12	18	0	0	-1.95	
1	1990	2	12	14	30	0	1.3	
1	1990	2	12	15	0	0	0.85	
1	1990	2	12	15	30	0	0.5	
1	1990	2	12	16	0	0	-0.1	
1	1990	2	12	16	30	0	-0.8	
1	1990	2	12	17	0	0	-1.5	
1	1990	2	12	17	30	0	-1.75	
1	1990	2	12	13	0	0	2.8	

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Supporting Files
