

BSDMS Summary Report

84 247 Street over James River near Mitchell, SD

Site Location:

Site ID: 84

Site Name: 247 Street over James River near Mitchell, SD

County: Davidson

Nearest City: Mitchell

State: SD

Latitude: 434815

Longitude: 980122

USGS Station ID: Forrestsburg

Route Number: 247

Route Class: County

Service Level: Other

Route Direction:

Highway Mile Point:

Stream Name: James River

River Mile:

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Publication:

Site Description:

The study site is located on the James River approximately 6 miles north of the town of Mitchell and east of State Highway 37 on 247 street. The site is approximately 21 miles downstream from the USGS gaging station near Forestburg (06477000). The USGS National Bridge Scour Team was deployed to the site to collect real-time bridge scour measurements during the flood in April of 2001. Boat access at the site was unavailable therefore all scour measurements were collected from the bridge deck. 247 street and the bridge were closed at the time of the measurements due to overtopping of the roadway on the left floodplain.

The site is located in a highly rural/agricultural landscape with very little topographic relief, especially in the left floodplain. The bridge is a concrete girder, three span structure supported by two groups of cylindrical piers (2 in each group) which are both founded on timber piles. The channel bed is comprised of a silty-clay with a narrow horizontal clay wedge. The James River has a great deal of meander in the vicinity of the bridge. The left floodplain is expansive at the bridge and the right overbank consists of bluffs rising relatively steeply from the edge of channel.

Elevation Reference

Datum: MSL

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MSL (ft):

Description of Reference Elevation:

The water-surface elevation was measured from the both the upstream (north) and downstream (south) edges of the bridge via a tapedown at rail #15. The elevation of the tapedown location was surveyed to be 1236.29 feet above sea level. The surveyed water-surface elevations were based on the elevation of the top of pavement at the right downstream abutment corner, 1230.78 ft.

Stream Data

Drainage Area (sq mi):		Floodplain Width:	Wide
Slope in Vicinity(ft/ft):	.000104	Natural Levees:	
Flow Impact:	Straight	Apparent Incision:	None
Channel Evolution		Channel Boundary:	Alluvial
Armoring:	Unknown	Banks Tree Cover:	Medium
Debris Frequency:	Unknown	Sinuosity:	High
Debris Effect:	Unknown	Braiding:	None
Stream Size:	Medium	Anabranching:	Locally
Flow Habit:	Perennial	Bars:	Narrow
Bed Material:		Stream Width Variability:	Equiwidth
Valley Setting:	Low		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:	0.08		0.075
Typical		0.029	
Low:	0.045		0.06

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
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1	USGS BM- 54H Sampler	4	0.2	0.04	Unknown
2	USGS BM- 54H Sampler	0.9	0.1	0.02	Unknown
3	USGS BM- 54H Sampler	0.18	0.08	0.02	Unknown

Bed Material Comments

Measurement No: 1

200 ft Upstream of bridge, 3 samples collected from boat during low-flow at depth ~ 9 ft.

Results:

Size (mm)	8	4	2	1	.5	.25	.125	.062	.016	.004	.002
% < than	100	95.0	93.0	91.2	89.6	86.8	79.0	59.9	35.4	24.4	22.7

Measurement No: 2

350' Downstream of bridge, 3 samples collected from boat during low-flow at depth ~ 8 ft.

Results:

Size (mm)	8	4	2	1	.5	.25	.125	.062	.016	.004	.002
% < than	100	96.5	95.8	95.1	93.4	91.8	87.1	70.7	44.3	29.0	25.1

Measurement No: 3

No material collected under bridge, rocks and/or concrete present. 3 samples were collected from boat during low-flow just downstream of the bridge along the left bank at a depth ~ 4 ft.

Results:

Size (mm)	8	4	2	1	.5	.25	.125	.062	.016	.004	.002
% < than	100	100	99.8	99.2	98.4	96.9	90.2	76.7	46.7	35.8	30.3

Bridge Data

Structure No: 18-153-030

Length(ft): 262

Width(ft): 30

Number of Spans: 3

Vertical Configuration: Sloping

Low Chord Elev (ft): 1224.6

Upper Chord Elev (ft): 1235.8

Overtopping Elev (ft): 1230.78

Skew (degrees): 30

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Guide Banks: None
Waterway Classification: Main
Year Built: 1975
Avg Daily Traffic:
Plans on File: Yes
Parallel Bridges No
Upstream/Downstream: N/A
Continuous Abutment: Yes
Distance Between Centerlines:
Distance Between Pier Faces: 16
Bridge Description:

Abutment Data

Left Station: 1591
Right Station: 1329
Left Skew (deg): 0
Right Skew (deg) 0
Left Abutment Length (ft): 43.67
Right Abutment Length (ft) 43.67
Left Abutment to Channel Bank (ft): 0
Right Abutment to Channel Bank (ft): 15
Left Abutment Protection: Riprap
Right Abutment Protection Riprap
Contracted Opening Type: III
Embankment Skew (deg):
Embankment Slope (ft/ft): 0.2
Abutment Slope (ft/ft) 3
Wingwalls: 0

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Wingwall Angle (deg):

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1		0	1510	Group		
2		0	1410	Group		

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
1	3	Cylindrical		29.5	Unknown	Piles
2	3	Cylindrical		29.5	Unknown	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1	1196.83	1193.83	3.25	Square	
2	1199.13	1196.13	3.25	Square	

Pier Description

Pier ID 1

Pier #1 is the left-most pier (looking downstream) and consists of two separate 3' diameter cylindrical piers with foundations supported by 10 batter piles.

Pier ID 2

Pier #2 is the right-most pier (looking downstream) and consists of two separate 3' diameter cylindrical piers with foundations supported by 10 batter piles.

Pier Scour Data

Pier ID	Date	Time	USOrDS
1	4/14/01		
2	4/14/01		

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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)
1								40
2								0

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
1	Unknown	Unknown	Unknown				Unknown
2	Unknown	Unknown	Unknown				Unknown

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
1				
2				

Pier Scour Comments

Pier ID 1 Time: US/DS:

Pier ID 2 Time: US/DS:

Abutment Scour

ContractionScour

Measurement Number	Contracted Date	Contracted Time	Uncontracted Date	Uncontracted Time	US/DS	Scour Depth(ft)
1	4/14/01	18:30				1

Measurement Number	Contracted Accuracy	Contracted Avg Vel(ft/s)	Contracted Discharge(cfs)	Contracted Depth(ft)	Contracted Width(ft)

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Measurement Number	Uncontracted Avg Vel(ft/s)	Uncontracted Discharge(cfs)	Uncontracted Depth(ft)	Uncontracted Width(ft)	Channel Contraction Ratio
1	1	6	13900	13.8	240

Measurement Number	Pier Contraction Ratio	Scour Location	Eccentricity	Sediment Transport	Bed Form	Debris Effects
1		Main Channel		Live-bed	Unknown	nsignifican

Measurement Number	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	Sigma Bed Material	Bed Material
1						Unknown

Contraction Scour Comments

Measurement No. 1

Remnants of the old bridge appear to be influencing the bathymetry of the bridge section, where the upstream bridge face section is 3-4 feet higher than the downstream bridge face section as well as other section collected further upstream of the bridge. It would also explain the inability to collect bed material samples at the upstream bridge face.

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			
					16800						1221.3		45

Hydrograph

Supporting Files

247St_DetailExample.doc - detailed summary of the site and data collection during the April, 2001 flood.

Site Photos:

 DSCN0017.jpg - DSCN0032.jpg & DSCN0054.jpg - DSCN0055.jpg - Photos taken during April, 2001 flood, description of each photo is documented in 247_Photos.doc Word file.

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247St0001.jpg - 247St0018.jpg & 247St0020.jpg - Photos taken during October, 2001 low-flow survey, description for each is documented in Post-Flood_Photos.doc Microsoft Word file.

247st.jpg - Descriptive Digital Ortho Quad image of the bridge site

Surveyed Sections:

Q_Measurement.xls - Excel spreadsheet containing current meter discharge measurement during April, 2001 flood.
Bathymetry.xls - Excel spreadsheet containing cross-sections collected during the April, 2001 flood from the bridge deck.
247DS(FullValley).xls - Excel spreadsheet containing surveyed data for the exit section used in a HEC-RAS model of the reach.
247US(FullValley).xls - Excel spreadsheet containing surveyed data for the approach section used in a HEC-RAS model of the reach.
247(ROAD).xls - Excel spreadsheet containing surveyed data of the roadway (247th Street).
247st_Hec-Ras.xls - Excel spreadsheet summarizing the elev. and stationing for all sections in the HEC-RAS model of the reach.
GrainSizeDist.xls - Bed material grain size distribution for the site, determined by analysis of samples collected during post-flood survey.