

BSDMS Summary Report

47 Todd Fork at S.R. 22 at Morrow, OH

Site Location:

Site ID:	47	
Site Name:	Todd Fork at S.R. 22 at Morrow, OH	
County:	Warren	
Nearest City:	Morrow	Contact:
State:	OH	Scott Jackson
Latitude:	392115	U.S. Geological Survey
Longitude:	840760	614-469-5553
USGS Station ID:		75 West Third Ave.
Route Number:	22	Columbus, Ohio 43212
Route Class:	State	or
Service Level:	Mainline	William Krouse
Route Direction:	NA	Ohio Department of Transportation
Highway Mile Point:	10.54	614-466-2398
Stream Name:	Todd Fork	25 South Front St.
River Mile:		Columbus, Ohio 43216
		Publication:
		Jackson, K.S., 1996, Evaluation of
		bridge-scour data at selected
		sites in Ohio: U.S. Geological
		Survey Water-Resources
		Investigations Report 97-4182.

Site Description:

The site is located at the Ohio Route 22 bridge crossing Todd Fork in Morrow, Warren County, Ohio. The Ohio Department of Transportation (ODOT) identification for the bridge is WAR-22-1054. The site is upstream from the confluence with the Little Miami River. Based on the scour measurements, there appears to be some backwater effect from the confluence with the Little Miami River.

Bed-material samples were collected during annual low-flow surveys.

Notes: All piers are referenced numerically, increasing from left to right, when viewing the upstream face of the bridge while facing in the downstream direction.

Slope in Vicinity (reported in Stream Site Data) is estimated from USGS 7.5-minute quadrangle topographic maps.

Water-surface slope (if reported in Pier Scour Data comments section) is the measured slope between water surfaces at the approach and bridge sections during the scour measurement.

Elevation Reference

Datum:	MSL
MSL (ft):	0

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Description of Reference Elevation:

RM1 - chiseled square on streamward, upstream side of the right abutment.
MSL elevation = 648.09 ft.

Stream Data

Drainage Area (sq mi):	262	Floodplain Width:	Little
Slope in Vicinity(ft/ft):	0.00179	Natural Levees:	Little
Flow Impact:	Straight	Apparent Incision:	None
Channel Evolution	Premodified	Channel Boundary:	Alluvial
Armoring:	Partial	Banks Tree Cover:	Medium
Debris Frequency:	Rare	Sinuosity:	Sinuuous
Debris Effect:	Local	Braiding:	Locally
Stream Size:	Medium	Anabranching:	None
Flow Habit:	Perennial	Bars:	Narrow
Bed Material:	Gravel	Stream Width Variability:	Equiwidth
Valley Setting:	Moderate		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:	0.05	0.036	0.06
Typical	0.045	0.034	0.055
Low:	0.04	0.032	0.05

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
AP-1	1991	7	29		67	23	4.1	0.87	2.65		Unknown
AP-2	1993	7	16		23	21	12	1.2	2.65		Unknown

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AP-3	1994	7	5		69	60	38.5	2.2	2.65	Unknown
BR-1	1990	8	20	HAND	45	29	2.35	0.4	2.65	Non-Cohesive
BR-2	1991	7	29		66	24	5.68	0.42	2.65	Unknown
BR-3	1992	7	20		77	59	34	13	2.65	Unknown
BR-4	1993	7	16		71	65	42	12	2.65	Unknown
BR-5	1994	7	5		37	24	12.5	2	2.65	Unknown
P1-1	1990	8	20	HAND	22	16	5	0.67	2.65	Non-Cohesive
P1-1A	1990	8	20	HAND	9	3.1	0.83	0.15	2.65	Non-Cohesive
P1-2	1991	7	29		32	20	10.2	1.8	2.65	Unknown
P1-3	1992	7	20		76	56	25	6	2.65	Unknown
P1-4	1993	7	16		46	40	30	13	2.65	Unknown
P1-5	1994	7	5		51	30	5.4	0.8	2.65	Unknown
P2-1	1990	8	20	HAND	40	29	17	4.55	2.65	Non-Cohesive
P2-1A	1990	8	20	HAND	49	46	23.5	2.75	2.65	Non-Cohesive
P2-2	1991	7	29		72	64	12.7	1.13	2.65	Unknown

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P2-3	1993	7	16	70	63	51	37	2.65	Unknown
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P2-4	1994	7	5	61	50	35.5	6.8	2.65	Unknown
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Bed Material Comments

Measurement No: AP-1

Approach-section composite sample

Measurement No: AP-2

Approach-section composite sample

Measurement No: AP-3

Approach-section composite sample

Measurement No: BR-1

Bridge-section composite sample, collected along the upstream bridge face.

Measurement No: BR-2

Bridge-section composite sample, collected along the upstream bridge face.

Measurement No: BR-3

Bridge-section composite sample, collected along the upstream bridge face.

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Measurement No: BR-4

Bridge-section composite sample, collected along the upstream bridge face.

Measurement No: BR-5

Bridge-section composite sample, collected along the upstream bridge face.

Measurement No: P1-1

Sample collected at the upstream face of Pier 1.

Measurement No: P1-1A

Sample collected 2 ft upstream of the upstream face of Pier 1.

Measurement No: P1-2

Sample collected at the upstream face of pier 1

Measurement No: P1-3

Sample collected at the upstream face of pier 1

Measurement No: P1-4

Sample collected at the upstream face of pier 1

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Measurement No: P1-5

Sample collected at the upstream face of pier 1

Measurement No: P2-1

Sample collected at the upstream face of Pier 2

Measurement No: P2-1A

Sample collected 4 ft upstream of the upstream face of Pier 2

Measurement No: P2-2

Sample collected at the upstream face of pier 2

Measurement No: P2-3

Sample collected at the upstream face of pier 2

Measurement No: P2-4

Sample collected at the upstream face of pier 2

Bridge Data

Structure No: WAR-22-1054

Length(ft): 206

Width(ft): 42

Number of Spans: 3

Vertical Configuration: Horizontal

Low Chord Elev (ft): 645.3

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Upper Chord Elev (ft): 649.5

Overtopping Elev (ft): 649.5

Skew (degrees): 7.5

Guide Banks: None

Waterway Classification: Main

Year Built: 1935

Avg Daily Traffic: 9630

Plans on File: Yes

Parallel Bridges No

Upstream/Downstream: Unknown

Continuous Abutment: No

Distance Between Centerlines:

Distance Between Pier Faces:

Bridge Description:

The bridge is of reinforced-concrete, steel-beam construction. The site plans are dated 1934, and it is assumed that construction was completed in 1935. The bridge deck was renovated in 1992, but the piers and foundations were not renovated.

Abutment Data

Left Station: 569.3109

Right Station: 571.4261

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft): 91.3

Right Abutment Length (ft) 86.1

Left Abutment to Channel Bank (ft): 80

Right Abutment to Channel Bank (ft): 40

Left Abutment Protection:

Right Abutment Protection

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Contracted Opening Type: I
Embankment Skew (deg): 7.5
Embankment Slope (ft/ft): 1.5
Abutment Slope (ft/ft): 1.5
Wingwalls: No
Wingwall Angle (deg): 0

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1	63	7.5	570.7685	Single	0	
2	143	7.5	569.9685	Single	0	

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
1	3.7	Round		39	None	Piles
2	3.7	Round		39	None	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1	627.25	624	9	Square	
2	627.25	624	9	Square	

Pier Description

Pier ID 1

This is a concrete, solid-wall pier with a round nose.

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Pier ID 2

This is a concrete, solid-wall pier with a round nose.

Pier Scour Data

Pier ID	Date	Time	USOrDS
1	5/16/90	11:45	Upstream
1	5/17/90	9:05	Upstream
1	12/18/90	14:30	Upstream
1	1/28/94	12:50	Upstream
2	5/16/90	11:45	Upstream
2	5/17/90	9:05	Upstream
2	12/18/90	14:30	Upstream
2	1/28/94	12:50	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)
1	1.3	0.5	5.9	20	5.2	5.1	3.7	0
1	2.4	0.5	9.2	40	7	9.4	3.7	0
1	1.6	0.5	6	23	5.9	10.1	3.7	0
1	1.9	0.5	5.3	20	5.9	8.2	3.7	0
2	2.4	0.5	8.9	45	5.5	6.7	4.3	0
2	3	0.5	6.2	40	7	10.5	4.4	0
2	3.2	0.5	6.7	40	6.5	11.1	4.5	0
2	3.3	0.5	4.4	31	5.7	8.8	4.4	0

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
1	Live-bed	Non-cohesive	Unknown			4.9	Insignificant
1	Live-bed	Non-cohesive	Unknown			4.9	Insignificant
1	Live-bed	Non-cohesive	Unknown			4.9	Insignificant
1	Clear-water	Non-cohesive	Unknown			1.75	Insignificant
2	Live-bed	Non-cohesive	Unknown			2.5	Insignificant
2	Live-bed	Non-cohesive	Unknown			2.5	Insignificant
2	Live-bed	Non-cohesive	Unknown			2.5	Insignificant

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2 Clear-water Unknown Unknown 1.3 Insignificant

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
1	22	16	5	0.67
1	22	16	5	0.67
1	22	16	5	0.67
1	46	40	30	13
2	40	29	17	4.55
2	40	29	17	4.55
2	40	29	17	4.55
2	70	63	51	37

Pier Scour Comments

Pier ID 1 Time: 11:45 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90. Two samples were collected at Pier 1 on 8/20/90: The first sample was collected in the scour hole (D50 is 5.0 mm), and the second sample was collected 2 feet upstream from the scour hole (D50 is 0.83 mm). W.S. slope was 0.00096.

Pier ID 1 Time: 9:05 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90. Refer to comment for scour measurement on 5/16/90. Water-surface slope was 0.00081.

Pier ID 1 Time: 14:30 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90. Refer to comment for scour measurement on 5/16/90. Water-surface slope was 0.00299.

Pier ID 1 Time: 12:50 US/DS: Upstream

The bed-material sample was collected during low flow on XXXXX. The water-surface slope was 0.00038.

Pier ID 2 Time: 11:45 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90. Two samples were collected at Pier 2 on 8/20/90: The first sample was collected in the scour hole (D50 is 17 mm), and the second sample was collected 4 feet upstream from the scour hole (D50 is 23.5 mm). W.S. slope was 0.00096.

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Pier ID 2 Time: 9:05 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90.
Refer to comment for scour measurement on 5/16/90.
Water-surface slope was 0.00081.

Pier ID 2 Time: 14:30 US/DS: Upstream

Bed-material samples were collected during low flow on 8/20/90.
Refer to comment for scour measurement on 5/16/90.
Water-surface slope was 0.00299.

Pier ID 2 Time: 12:50 US/DS: Upstream

The bed-material sample was collected during low flow on XXXXXX.
The water-surface slope was 0.00038.

Abutment Scour

ContractionScour

Measurement Number	Contracted Date	Contracted Time	Uncontracted Date	Uncontracted Time	US/DS	Scour Depth(ft)
1	5/17/90	9:00	8/20/90			0.8
2	12/18/90	14:00	7/29/91			0.9
Measurement Number	Accuracy	Contracted Avg Vel(ft/s)	Contracted Discharge(cfs)	Contracted Depth(ft)	Contracted Width(ft)	
1	0.5	6.24		10.1	150	
2	0.5	5.25	9290	10.8	150	
Measurement Number	Uncontracted Avg Vel(ft/s)	Uncontracted Discharge(cfs)	Uncontracted Depth(ft)	Uncontracted Width(ft)	Channel Contraction Ratio	
1	7.63		9.6	130	0.055	
2	5.9	9430	10.9	130	0.055	

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Measurement Number	Pier Contraction Ratio	Scour Location	Eccentricity	Sediment Transport	Bed Form	Debris Effects
1	0.055	Main Channel	0	Live-bed	Unknown	Unknown
2	0.055	Main Channel	0	Live-bed	Unknown	Unknown

Measurement Number	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	Sigma Bed Material	Bed Material
1	45	28.5	2.35	0.4	8.4	Non-cohesive
2	45	28.5	2.35	0.4	8.4	Non-cohesive

Contraction Scour Comments

Measurement No. 1

The data for the contracted section were measured from the bridge deck during the flood event on the specified date. The geometry of the reference uncontracted section was measured during low flow. The hydraulic data for the uncontracted section were estimated using WSPRO to estimate the approach hydraulics for the reference channel geometry and the flood discharge observed on the date of the contracted section measurement.

Measurement No. 2

The data for the contracted section were measured from the bridge deck during the flood event on the specified date. The geometry of the reference uncontracted section was measured during low flow. The hydraulic data for the uncontracted section were estimated using WSPRO to estimate the approach hydraulics for the reference channel geometry and the flood discharge observed on the date of the contracted section measurement.

Stage and Discharge Data

Peak Discharge					Flow (cfs)	Qacc	Peak Stage					Stage (ft)	Water Temp (C)	Return Period(yr)
year	mo	dy	hr	mi			year	mo	dy	hr	mi			
1994	1	28	12:50		7050								1	2
1990	12	18	14:30	30	10500	8						0	4	5
1990	5	17	9:05	5	11700	8						0	16.5	5
1990	5	16	11:45	45	5370	5						0	16	2

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Hydrograph

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