BSDMS Summary Report

60 Grand River at S.R. 84 near Painesville, OH

Site Location:

Site ID: 60

Site Name: Grand River at S.R. 84 near Painesville, OH

County: Lake

Nearest City: Painesville

State: OH

Latitude: 414308

Longitude: 811341

USGS Station ID:

Route Number: 84

Route Class: State

Service Level: Other

Route Direction: South

Highway Mile Point: 18.88

Stream Name: Grand River

River Mile:

Contact:

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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:

This site is located at the SR 84 bridge crossing the Grand River near Painesville, Lake County, Ohio. The Ohio Department of Transportation (ODOT) bridge identification is "LAK-084-1888". (Upstream of Big Gordon Creek)
USGS streamgage Grand River at Painesville (04212100) is located on left downstream abutment of bridge. Data available from 1974 to current year.
Site is located on large bend in channel, and flow velocity is greatest at left side of channel. Also, there is an large wooded island located upstream of bridge and at highflow, the flow splits around the island. The right portion of the flow attacks the right most pier at 90 degrees (or directly at the long axis of the pier) causing a large scour hole along the side of the pier.
Bed-material samples were collected during an annual low-flow survey.
Note: 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

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Datum: MSL

MSL (ft): 0

Description of Reference Elevation:

RM2 - Chiseled square on top of left upstream abutment.
MSL elevation = 620.35

Stream Data

Drainage Area (sq mi):	685	**Floodplain Width:**	Narrow
Slope in Vicinity(ft/ft):	0.00109	**Natural Levees:**	Little
Flow Impact:	Left	**Apparent Incision:**	None
Channel Evolution	Degradation	**Channel Boundary:**	Alluvial
Armoring:	Partial	**Banks Tree Cover:**	Medium
Debris Frequency:	Occasional	**Sinuosity:**	Meandering
Debris Effect:	Local	**Braiding:**	Locally
Stream Size:	Medium	**Anabranching:**	Locally
Flow Habit:	Perennial	**Bars:**	Irregular
Bed Material:	Gravel	**Stream Width Variability:**	Random
Valley Setting:	Moderate		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:	0.065	0.045	0.075
Typical	0.065	0.042	0.075
Low:	0.06	0.04	0.07

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
AP1	1991	8	11		69	62	47.9	2.3	2.65		Unknown

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AP2	1993	10	25	66	54	15	1.2	2.65	Unknown
AP3	1994	7	19	65	53	25	0.72	2.65	Unknown
BR1	1990	11	1	39	28	10.2	0.82	2.65	Unknown
BR2	1991	8	11	39	25	6.5	0.66	2.65	Unknown
BR3	1992	7	30	21	12	1	0.08	2.65	Unknown
BR4	1993	10	25	66	43	4.3	0.43	2.65	Unknown
BR5	1994	7	19	51	29	9.8	0.72	2.65	Unknown
P1-1	1990	11	1	45	32	10	2.3	2.65	Unknown
P1-2	1991	8	11	70	61	23.5	2.2	2.65	Unknown
P1-3	1992	7	30	44	31	12	0.39	2.65	Unknown
P1-4	1993	10	25	63	34	13	0.76	2.65	Unknown
P1-5	1994	7	19	61	38	13	0.16	2.65	Unknown
P2-1	1990	11	1	28.5	17	0.7	0.06	2.65	Unknown
P2-2	1991	8	11	62	32	10	0.66	2.65	Unknown
P2-3	1992	7	30	62	44	13	0.14	2.65	Unknown

P2-4	1993	10	25	60	19	5	0.14	2.65	Unknown
P2-5	1994	7	19	67	43	2	0.17	2.65	Unknown
P3-1	1990	11	1	43	33	19.5	9.6	2.65	Unknown
P3-2	1991	8	11	55	37	17.3	0.8	2.65	Unknown
P3-3	1992	7	30	71	34	9	0.09	2.65	Unknown
P3-4	1993	10	25	72	66	23	1.7	2.65	Unknown
P3-5	1994	7	19	56	35	13	4.5	2.65	Unknown

Bed Material Comments

Measurement No: AP1

Approach-section composite sample

Measurement No: AP2

Approach-section composite sample

Measurement No: AP3

Approach-section composite sample

Measurement No: BR1

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

Measurement No: BR2

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

Measurement No: BR3

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

Measurement No: BR4

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

Measurement No: BR5

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: P1-2

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

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: P2-2

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

Measurement No: P2-5

Sample collected at the upstream face of pier 2

Measurement No: P3-1

Sample collected at the upstream face of pier 3

Measurement No: P3-2

Sample collected at the upstream face of pier 3

Measurement No: P3-3

Sample collected at the upstream face of pier 3

Measurement No: P3-4

Sample collected at the upstream face of pier 3

Measurement No: P3-5

Sample collected at the upstream face of pier 3

Bridge Data

Structure No: LAK-084-1888

Length(ft): 363.9

Width(ft): 38

Number of Spans: 4

Vertical Configuration: Horizontal

Low Chord Elev (ft): 611.3

Upper Chord Elev (ft): 620

Overtopping Elev (ft): 620

Skew (degrees): 20

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Guide Banks: None

Waterway Classification: Main

Year Built: 1930

Avg Daily Traffic: 7630

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 constructed of concrete and steel I-beams, and it has solid-wall round-nose piers. The site plans are dated 1931. The piers are referenced from the left to right abutments when looking downstream.

Abutment Data

Left Station: 14.2804

Right Station: 17.9196

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft): 43.7

Right Abutment Length (ft) 43.7

Left Abutment to Channel Bank (ft): 0

Right Abutment to Channel Bank (ft): 117

Left Abutment Protection:

Right Abutment Protection

Contracted Opening Type: I

Embankment Skew (deg): 20

Embankment Slope (ft/ft): 3

Abutment Slope (ft/ft) 2

Wingwalls: Yes

Wingwall Angle (deg): 44

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1	89.71	0	15.1775	Single	0	
2	181.96	0	16.1	Single	0	
3	274.21	0	17.0225	Single	0	

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
1	5.5	Round		35.67	None	Piles
2	5.5	Round		35.67	None	Piles
3	5.5	Round		35.67	None	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1	596.79	592.29	9	Square	
2	596.79	592.29	9	Square	
3	596.79	592.29	9	Square	

Pier Description

Pier ID 1

The concrete pier is a solid wall with round nose.

Pier ID 2

The concrete pier is a solid wall with round nose.

Pier ID 3

The concrete pier is a solid wall with round nose.

Pier Scour Data

Pier ID	Date	Time	USOrDS
1	12/31/92	11:05	Upstream
3	12/31/92	11:05	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)
1	1.4	0.5	6.28	18	4.8	6.9	5.4	0
3	1.1	0.5	21.6	45	2.6	5.9	5.4	85

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
1	Live-bed	Non-cohesive	Unknown			8.92	Insignificant
3	Live-bed	Non-cohesive	Unknown			19.3	Insignificant

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
1	44	31	12	0.39
3	71	33.5	9	0.09

Pier Scour Comments

Pier ID 1 **Time:** 11:05 **US/DS:** Upstream

Bed-material sample collected during low flow 7/30/92.

Pier ID 3 **Time:** 11:05 **US/DS:** Upstream

Bed-material sample collected during low flow 7/30/92.

Abutment Scour

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ContractionScour

Measurement Number	Contracted Date	Contracted Time	Uncontracted Date	Uncontracted Time	US/DS	Scour Depth(ft)
1	12/31/92	11:00	10/25/93			0.5

Measurement Number	Accuracy	Contracted Avg Vel(ft/s)	Contracted Discharge(cfs)	Contracted Depth(ft)	Contracted Width(ft)
1	0.5	3.71	7640	6.6	312

Measurement Number	Uncontracted Avg Vel(ft/s)	Uncontracted Discharge(cfs)	Uncontracted Depth(ft)	Uncontracted Width(ft)	Channel Contraction Ratio
1	4.41	7620	6.5	235	0.22

Measurement Number	Pier Contraction Ratio	Scour Location	Eccent-ricity	Sediment Transport	Bed Form	Debris Effects
1	0.06	Main Channel		Live-bed	Unknown	Unknown

Measurement Number	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	Sigma Bed Material	Bed Material
1	21	12	1	0.075	12.65	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.

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)
1992	12	31	11:05		8190								2	1

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Hydrograph

Supporting Files