BSDMS Summary Report

1 Susitna River at S.R. 3 near Sunshine, AK

Site Location:

Site ID: 1

Site Name: Susitna River at S.R. 3 near Sunshine, AK

County: Town of Sunshine

Nearest City: Sunshine

State: AK

Latitude: 621000

Longitude: 1500500

USGS Station ID:

Route Number: 3

Route Class: State

Service Level: Mainline

Route Direction: NA

Highway Mile Point: 104

Stream Name: Susitna River

River Mile:

Contact:
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218 E Street, Skyline Building
Anchorage, AK 99501

Publication:
U.S. Geological Survey
Water-Resources Investigations 32-75
Scour at Selected Bridge Sites in Alaska
By Vernon W. Norman
November 1975

Site Description:

This study site is located on the Susitna River at mile 104 of the Anchorage-Fairbanks Highway, about 3.2 miles west of Sunshine and 10.5 miles downstream from the mouth of the Talkeetna River. The Susitna River basin above the bridge site covers about 11,500 square miles. Less than 15 percent of the area is occupied by glaciers. In the vicinity of the bridge site the river channel is braided and consists of multiple bars and islands. Surface bed material consists of gravel and cobbles and some sand.

Floodflows on the Susitna result from snow melt in the spring and from rain-fall combined with glacial melt water in mid to late summer. Records of flood data have been collected about 50 miles upstream on the Susitna River at Gold Creek since 1949. The peak flow occurred June 7, 1964. In 14 of these years, floods occurred in June. The mean annual flood for the scour site was estimated to be about 80,000 cfs. Information on floods in the Susitna River during the summer of 1971 is given by Lamke (1972).

The data herein were collected as part of a study and report on general scour at bridge crossings and local scour at bridge piers at sites in south-central and interior Alaska during 1965-72. The purpose of the study was to collect scour data at bridge sites and compare the results with existing laboratory data, field data, and predicted values from selected scour formulas.

The report includes a detailed description of the physical setting, hydraulic characteristics, and channel geometry at low and high flows to assist the reader in developing background knowledge on the scour phenomenon in various situations.

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For the study, all indications of scour were considered to be related to either channel contraction or localized flow conditions at piers and abutments (local scour). All of the scour conditions probably occurred when there was significant bedload transport throughout the streams and Froude Numbers were less than 1, because scour at high flows was followed by fill. Information was obtained from floods greater than or equal to the mean annual flood.
Soundings to determine cross-sectional profiles, longitudinal profiles, and scour-hole depths were generally obtained with a Raytheon Model DE119 D recording fathometer. Transducers used with the fathometer produced a 8-degree beam width.
Equipment used to make soundings, measure velocities, and make discharge measurements were standard USGS equipment as described by Buchanan and Somers (1969). This equipment consists of the "B" reel, Price Type AA current meters, and sounding weights ranging from 50 to 100 lbs.
Streambed-material samples were collected using samplers appropriate to stream velocities. Streambeds of sand and small gravel were sampled using a US-BM54. A locally constructed drag sampler was used in conjunction with a 100-lb sounding weight to sample bed material in gravel and cobble streams.
Water-surface elevations were measured using standard surveying instruments and techniques. River stages were recorded by automatic recorders or by measuring down from a fixed point using a wire-weight gage.
Photographs and surveys were used to aid in interpreting channel patterns, variations in channel cross-sectional shapes, and velocity distributions.

Elevation Reference

Datum: Gage

MSL (ft): 208.35

Description of Reference Elevation:

Elevations given for pier definitions are to mean sea level. Elevations given for all stage data (including the hydrograph) and channel cross-section coordinates are given with reference to the gage datum, 208.35 ft (63.50 m)

Stream Data

Drainage Area (sq mi):	11500	**Floodplain Width:**	Unknown
Slope in Vicinity(ft/ft):	0.0004	**Natural Levees:**	Unknown
Flow Impact:	Right	**Apparent Incision:**	Unknown
Channel Evolution	Unknown	**Channel Boundary:**	Semi-alluvial
Armoring:	Unknown	**Banks Tree Cover:**	High
Debris Frequency:	Unknown	**Sinuosity:**	Unknown
Debris Effect:	Unknown	**Braiding:**	Generally
Stream Size:	Wide	**Anabranching:**	Generally
Flow Habit:	Perennial	**Bars:**	Wide

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Bed Material: Cobbles

Stream Width Variability: Wider

Valley Setting: Unknown

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:			
Typical			
Low:			

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1971	7	2	Drag	96	85	70	58	2.65		Unknown
2	1972	7	3	PhotoZeiss	128	105	77	56	2.65		Unknown

Bed Material Comments

Measurement No: 1

Only the D90=90 and D50=70 were reported with the data. The D95, D84, and D16 were computed from the provided data. The D84 was interpolated from the D90 and D50 using a log-probability interpolation. Sigma was computed as D84/D50. D95 and D16 were computed from the equation D50 * Sigma^(standard normal deviate of 95 or 16).

Measurement No: 2

Only the D90=115 and D50=77 were reported with the data.The D95, D84, and D16 were computed from the provided data. The D84 was interpolated from the D90 and D50 using a log-probability interpolation. Sigma was computed as D84/D50. D95 and D16 were computed from the equation D50 * Sigma^(standard normal deviate of 95 or 16).

Bridge Data

Structure No: 254

Length(ft): 1072

Width(ft):

Number of Spans: 5

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Vertical Configuration: Horizontal

Low Chord Elev (ft): 278

Upper Chord Elev (ft): 300

Overtopping Elev (ft):

Skew (degrees): 0

Guide Banks: None

Waterway Classification: Main

Year Built:

Avg Daily Traffic:

Plans on File: Yes

Parallel Bridges No

Upstream/Downstream: N/A

Continuous Abutment: No

Distance Between Centerlines:

Distance Between Pier Faces:

Bridge Description:

This bridge is 1072 ft long and is supported by four piers spaced 250 feet apart.

Abutment Data

Left Station: 0

Right Station: 0

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft):

Right Abutment Length (ft)

Left Abutment to Channel Bank (ft):

Right Abutment to Channel Bank (ft):

Left Abutment Protection:

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Right Abutment Protection

Contracted Opening Type: Unknown

Embankment Skew (deg): 0

Embankment Slope (ft/ft):

Abutment Slope (ft/ft)

Wingwalls: No

Wingwall Angle (deg): 0

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1	700	0	0	Single	0	
2	950	0	0	Single	0	
3	1200	0	0	Single	0	
4	1450	0	0	Single	0	

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
1	5	Sharp		20	Unknown	Piles
2	5	Sharp		20	Unknown	Piles
3	5	Sharp		20	Unknown	Piles
4	5	Sharp		20	Unknown	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1	236	226	21	Square	191
2	235	225	21	Square	190
3	235	225	21	Square	200
4	235	225	21	Square	200

Pier Description

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Pier ID 1

The upper portion of the pier (whose height varies) is 5 ft wide and 20 ft long as described. The lower 15 ft is a 7-ft-wide by 28-ft-long round-nose stem. It rests on a 21-ft by 33-ft footing and a 24-ft by 36-ft seal, which are both 5 ft high and are founded on piles.

Pier ID 2

The upper portion of the pier (whose height varies) is 5 ft wide and 20 ft long as described. The lower 15 ft is a 7-ft-wide by 28-ft-long round-nose stem. It rests on a 21-ft by 33-ft footing and a 24-ft by 36-ft seal, which are both 5 ft high and are founded on piles.

Pier ID 3

The upper portion of the pier (whose height varies) is 5 ft wide and 20 ft long as described. The lower 15 ft is a 7-ft-wide by 28-ft-long round-nose stem. It rests on a 21-ft by 33-ft footing and a 24-ft by 36-ft seal, which are both 5 ft high and are founded on piles.

Pier ID 4

The upper portion of the pier (whose height varies) is 5 ft wide and 20 ft long as described. The lower 15 ft is a 7-ft-wide by 28-ft-long round-nose stem. It rests on a 21-ft by 33-ft footing and a 24-ft by 36-ft seal, which are both 5 ft high and are founded on piles.

Pier Scour Data

Pier ID	Date	Time	USOrDS
1	7/2/71	0:00	Upstream
1	8/11/71	0:00	Upstream
2	7/2/71	0:00	Upstream
2	8/11/71	0:00	Unknown
3	7/2/71	0:00	Upstream
3	8/11/71	0:00	Unknown
4	7/2/71	0:00	Downstream
4	8/11/71	0:00	Downstream

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	2.5	0.5			6.5	19	5	0
1	2	0.5			10	17.5	5	0
2	2.5	0.5			8.5	13.5	5	0

2	2	1	9.5	21.5	5	0
3	2	0.5	7	11	5	0
3	2	1	11.5	17	5	0
4	5	0.5	5	13.5	5	0
4	5	1	9.5	17.5	5	0

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
1	Clear-water	Non-cohesive	Dune			1.2	Insignificant
1	Clear-water	Non-cohesive	Unknown			1.2	Insignificant
2	Clear-water	Non-cohesive	Dune			1.2	Insignificant
2	Clear-water	Non-cohesive	Unknown			1.2	Insignificant
3	Clear-water	Non-cohesive	Dune			1.2	Insignificant
3	Clear-water	Non-cohesive	Unknown			1.2	Insignificant
4	Clear-water	Non-cohesive	Dune			1.2	Substantial
4	Clear-water	Non-cohesive	Unknown			1.2	Substantial

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
1	96	85	70	58
1	96	85	70	58
2	96	85	70	58
2	96	85	70	58
3	96	85	70	58
3	96	85	70	58
4	96	85	70	58
4	96	85	70	58

Pier Scour Comments

Pier ID 1 **Time:** 0:00 **US/DS:** Upstream

Pier ID 1 **Time:** 0:00 **US/DS:** Upstream

For this date, this is the only pier where scour could be actually measured.

Pier ID 2 **Time:** 0:00 **US/DS:** Upstream

Pier ID 2 **Time:** 0:00 **US/DS:** Unknown

This scour measurement was estimated from partial fathometer trace.

Pier ID 3 **Time:** 0:00 **US/DS:** Upstream

Pier ID 3 **Time:** 0:00 **US/DS:** Unknown

This scour measurement was estimated from soundings on cross sections at the bridge and from results obtained in July 1971.

Pier ID 4 **Time:** 0:00 **US/DS:** Downstream

Submerged debris at the nose of the pier probably caused the scour depth to be about twice that expected if the debris had not been present. It also probably caused the scour to move further downstream.

Pier ID 4 **Time:** 0:00 **US/DS:** Downstream

This scour measurement was estimated from soundings on cross sections at the bridge and from results obtained in July 1971. Submerged debris probably caued the scour depth to be twice that expected if debris had not been present and probably caused the scour to move downstream.

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)
1971	8	11		0	171000	none	1971	8	10		0	62	9	20
1971	7	2		0	74600	none	1971	7	2		0	56.6	7.5	
1965	6	1		0	80200	none	1965	6			0	56.2		
1971	5	27		0	37400	none	1971	5	27		0	52.9		

Hydrograph

Hydrograph Number	Year	Month	Day	Hr	Min	Sec	Stage(ft)	Discharge (cfs)
1	1971	6	1	0	0	0	52.7	
1	1971	6	5	0	0	0	53.2	
1	1971	6	8	0	0	0	57.1	
1	1971	6	11	0	0	0	57	
1	1971	6	13	0	0	0	59	
1	1971	6	19	0	0	0	55	
1	1971	6	25	0	0	0	58.2	
1	1971	6	28	0	0	0	57.6	
1	1971	6	30	0	0	0	58.1	
1	1971	7	5	0	0	0	55	
1	1971	7	12	0	0	0	55.9	
1	1971	7	15	0	0	0	57.8	
1	1971	7	20	0	0	0	56.2	
1	1971	7	25	0	0	0	53.2	
1	1971	7	28	0	0	0	54.2	
1	1971	7	30	0	0	0	54	

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1	1971	8	4	0	0	0	56
1	1971	8	6	0	0	0	54.8
1	1971	8	10	0	0	0	62
1	1971	8	18	0	0	0	55
1	1971	8	22	0	0	0	55.7
1	1971	8	23	0	0	0	56
1	1971	8	25	0	0	0	55.4
1	1971	8	29	0	0	0	53.5
1	1971	9	14	0	0	0	52
1	1971	9	18	0	0	0	51.3
1	1971	9	22	0	0	0	51.5
1	1971	9	24	0	0	0	51.2
1	1971	9	25	0	0	0	50.8
1	1971	9	31	0	0	0	50

Supporting Files