BSDMS Summary Report

92 Knik River at Old Glenn Highway near Palmer, AK

Site Location:

Site ID: 92

Site Name: Knik River at Old Glenn Highway near Palmer, AK

County: Matnuska Susitna

Nearest City: Palmer

State: AK

Latitude: 613018

Longitude: 1490148

USGS Station ID: 15281000

Route Number: 1

Route Class: State

Service Level: Mainline

Route Direction: NA

Highway Mile Point: 8.9

Stream Name: Knik River

River Mile:

Contact:

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Publication:

An unpublished level-2 analysis was performed by Alaska USGS under the title:
"Bridge no. 539
Knik River, Old Glenn Highway
Step-Backwater Model and
Bridge Scour Analysis"

Site Description:

The Knik River is located approximately 35 miles northeast of Anchorage near the town of Palmer. The river emanates from the Knik Glacier approximately 17 miles upstream from the bridges and drains into Knik Arm, the northern most extent of Cook Inlet, approximately 8 miles downstream of the bridge. At the mouth of the glacier, the river is anastomosing, but reduces to a single strand through the bridge reach. Branching of the channel resumes downstream of the bridge, but not to the extent found in the headwaters.

A daily station (station 15281000) was operational at this site from 1958-1988 , 1991-1992, and was reactivated in 2001. The gage is located at the new bridge on the right bank. Average annual mean flow (from 1960-1987) is 6904 cfs, with annual peaks occurring in August-September and averaging 37,000 cfs (excluding outburst floods). High volume (up to 359,000 cfs) glacial outburst floods occurred annually on the Knik River up until 1966. Due to recession of the Knik glacier these flows no longer occur.

Two bridges are located in the study reach (figure 2). The upstream bridge was built to accommodate the high volume outburst floods and extends across the entire channel. The newer downstream bridge was built after the cessation of the outburst floods and its approaches constrict the flow. The embankments for the new bridge are rip rapped and spur dikes extend upstream beyond the old bridge, which is discussed in the database under Site ID #2.

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The right overbank is wide, level, unvegetated, and armored with gravel and cobbles. The left overbank rises steeply from the river and is densely vegetated.

A survey of the Knik River and the new bridge was conducted in 1999 for the purpose of conducting a level 2 bridge scour anaylsis. A HEC-RAS model of the site was developed and used in conjunction with HEC-18 procedures to predict the scour attributed to the contracted bridge opening.

Elevation Reference

Datum: MSL

MSL (ft):

Description of Reference Elevation:

A gage (station 15281000) was operational at this site from 1958-1988 and from 1991-1992. Gage datum is tied to a Corps of Engineers benchmark (elevation 62.67 ft above MSL) on the upstream side of the left abutment of the old bridge. Elevation to gage datum for this point is 32.50 ft. To correct elevations to gage datum adjust by 30.17 ft.

Stream Data

Drainage Area (sq mi):	1200	**Floodplain Width:**	Unknown
Slope in Vicinity(ft/ft):	.00069	**Natural Levees:**	Unknown
Flow Impact:	Straight	**Apparent Incision:**	Unknown
Channel Evolution	Unknown	**Channel Boundary:**	Alluvial
Armoring:	Partial	**Banks Tree Cover:**	High
Debris Frequency:	Unknown	**Sinuosity:**	Sinuous
Debris Effect:	Unknown	**Braiding:**	Generally
Stream Size:	Wide	**Anabranching:**	Generally
Flow Habit:	Perennial	**Bars:**	Wide
Bed Material:	Gravel	**Stream Width Variability:**	Wider
Valley Setting:	Moderate		

Roughness Data

Manning's n Values

	Left Overbank	Channel	Right Overbank
High:		0.037	

Typical	0.08	0.03	0.08
Low:		0.027	

Bed Material

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1965	7	9	BM-54	26	7	1	0.14	2.65		Unknown
2	1965	7	11	BM-54	47	15	2.5	0.42	2.65		Unknown
3	1965	7	12	BM-54	10	5	1.5	0.48	2.65		Unknown
4	1965	7	12	BM-54	17	6	1	0.18	2.65		Unknown
5				BM-54	11	5	1.6	0.5	2.65		Unknown

Bed Material Comments

Measurement No: 1

Only the D90=13 and D50=1 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=25 and D50=2.5 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: 3

Only the D90=6.5 and D50=1.5 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: 4

Only the D90=9 and D50=1 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: 5

Bridge Data

Structure No: 539

Length(ft): 505.5

Width(ft): 28

Number of Spans: 3

Vertical Configuration: Horizontal

Low Chord Elev (ft): 63

Upper Chord Elev (ft): 63

Overtopping Elev (ft): 71

Skew (degrees): 0

Guide Banks: Elliptical

Waterway Classification: Main

Year Built: 1975

Avg Daily Traffic:

Plans on File: Yes

Parallel Bridges Yes

Upstream/Downstream: Downstream

Continuous Abutment: No

Distance Between Centerlines: 100

Distance Between Pier Faces:

Bridge Description:

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Two bridges are located at the site, bridge 539 and an older structure approximately 100 ft upstream. The bridge and piers are aligned relatively perpendicular to flow for both bridges. The bridge is supported by sloping spillthrough abutments and two concrete webbed piers. The foundations of the abutments and the two piers are supported by pilings driven to an elevation -14 ft MSL.

Abutment Data

Left Station: 0

Right Station: 505.5

Left Skew (deg): 0

Right Skew (deg) 0

Left Abutment Length (ft): 46

Right Abutment Length (ft) 46

Left Abutment to Channel Bank (ft): 0

Right Abutment to Channel Bank (ft): 0

Left Abutment Protection: Riprap

Right Abutment Protection Riprap

Contracted Opening Type: III

Embankment Skew (deg):

Embankment Slope (ft/ft):

Abutment Slope (ft/ft) 2

Wingwalls: No

Wingwall Angle (deg):

Pier Data

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
1	155	0	10645.5	Single		
2	345	0	10835.5	Single		

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation

1	4.33	Sharp	26	None	Piles
2	4.33	Sharp	26	None	Piles

Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	Pile Tip Elevation(ft)
1	21	16	25	Square	-14
2	21	16	25	Square	-14

Pier Description

Pier ID 1

Pier #1 is on the left, looking downstream and is a single concrete webbed structure.

Pier ID 2

Pier #2 is on the right, looking downstream and is a single concrete webbed structure.

Pier Scour Data

Abutment Scour

Measurement Number	Abutment	Date	Time	US/DS	Scour Depth (ft)	Accuracy	Sediment Transport
1				Unknown	0	0	Unknown

Measurement Number	Velocity at Abut(ft/s)	Depth at Abut(ft)	Discharge Blocked(cfs)	Avg Velocity Blocked(ft/s)	Avg Depth Blocked(ft)

Measurement Number	Embankment Length (ft)	Bed Material	D50 (mm)	Sigma	Debris Effect
1					
1		Unknown			Unknown

Abutment Scour Comments

MeasurementNo	1

ContractionScour

Measurement Number	Contracted Date	Contracted Time	Uncontracted Date	Uncontracted Time	US/DS	Scour Depth(ft)
1	8/1/2001					7.5

Measurement Number	Accuracy	Contracted Avg Vel(ft/s)	Contracted Discharge(cfs)	Contracted Depth(ft)	Contracted Width(ft)
1	2				

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

Measurement Number	Pier Contraction Ratio	Scour Location	Eccent-ricity	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						Non-Cohesive

Contraction Scour Comments

Measurement No. 1

Contracted width does not include the width of the riprap protection (~150 ft) around pier #3 of the old bridge.

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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)
					23,000							41.57	45	
					21,700							41.13	40	

Hydrograph

Supporting Files

1999 Level 2-scour analysis files:

539_knik_ics.txt - Raw data files from the data logger in Northing, Easting, Elevation (ics) and full information formats.
539_knik_survey.xls - Excel spreadsheet containing transformation of points, surveyed cross sections, interpolated cross sections, and data exported to HEC-RAS
539_knik_writeup.doc - Document summarizing 1999 analysis
539_knik.g02 - Final HEC-RAS geometry file
539_knik.h01 - Final HEC-RAS hydraulic design file
539_knik.f02 - Final HEC-RAS flow file
539_knik.p02 - Final HEC-RAS plan file
539_knik.prj - Final HEC-RAS project file (details of files used, units, default parameters, etc.)
539_knik.r02 - Final HEC-RAS run file

2001 Survey Files:

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finaltable.txt - All bathymetry, topo and bride survey data from 1999 survey, in a text file format.
gps points.txt - Summary of all bathymetry, topo and bride gps data from 1999 survey, in a text file.
Hydrographic data collection on the Knik River.doc - Document summarizing 2001 survey.
GPS_data.xls - GPS and Total Station data for the overbanks and channel, contains historic plot of old bridge x-sec bathymetry 1999-2001.
Total_translate.txt - Total station data in a text file format.
Knik_stage.prn - Stage data from USGS gaging station at the site (7/23/01 - 8/3/01).

Edited ADCP (folder) - ADCP measurements at the following locations:
Knik013 1330 ft upstream of old bridge
Knik014 800 ft upstream of old bridge
Knik015 350 ft upstream of old bridge
Knik017 upstream of spur dike
Knik018 immediately upstream of old bridge

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Knik019    between bridges
Knik021    immediately downstream of new bridge
Knik023    immediately upstream of old bridge
Knik024    400 ft downstream of new bridge
Knik025    800 ft downstream of new bridge
Knik026    1200 ft downstream of new bridge
Knik027     tributary channel 1200 ft downstream
Knik028     1500 ft downstream of new bridge

Photos:
Name                Description
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Knik_002 - Downstream view to bridge piers
Knik_003 - Upstream view to bridges
Knik_004 - ADCP/GPS mount
Knik_005 - Tributary, US Right bank above spur dike
Knik_006 - Old bridge pier
Knik_007 - Right bank to left bank downstream of bridges
Knik_008 - Downstream right bank from new bridge
Knik_009 - Downstream channel from new bridge
Knik_010 - Right bank to left bank from new bridge
Knik_011 - Right bank to left bank between bridges
Knik_012 - Old bridge from new
Knik_013 - Left bank downstream of bridges
Knik_014 - Right bank to left bank under new bridge
Knik_016 - Tributary from end of right bank spur dike
Knik_017 - Right bank to left bank under old bridge
Knik_018 - Upstream from right bank spur dike
Knik_019 - Upstream view to bridges
Knik_020 - Right bank approach to bridge
Knik_021 - Upstream left bank
Knik_air1 - Aerial view of bridges looking downstream
Knik_air2 - Aerial view of bridges looking downstream
Knik_air3 - Aerial view of bridges looking downstream
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