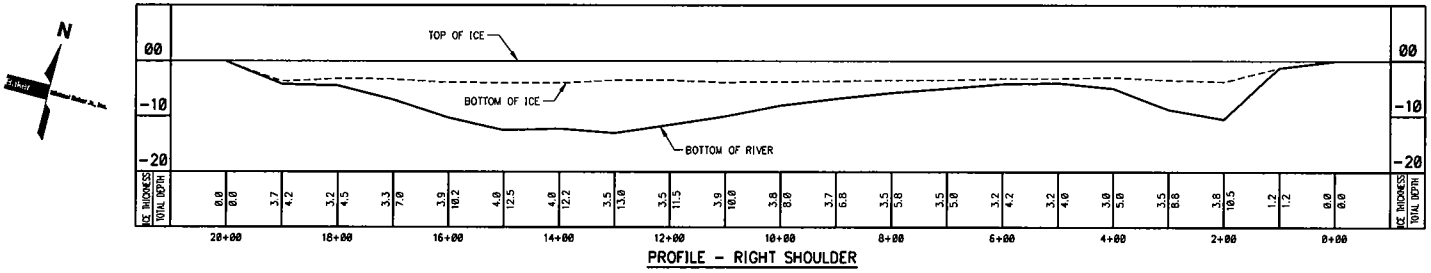
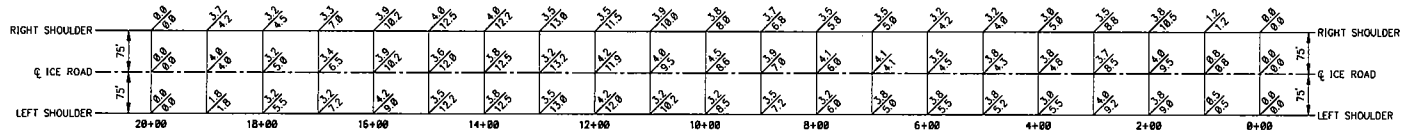
Winter 2001/2002

Colville River Ice Bridge Monitoring

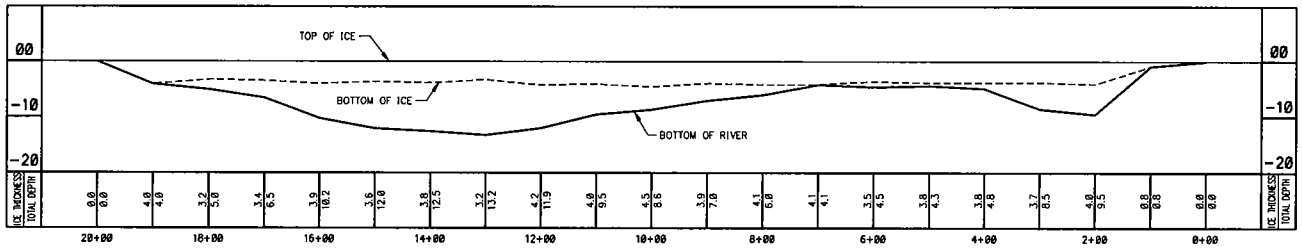
Baker



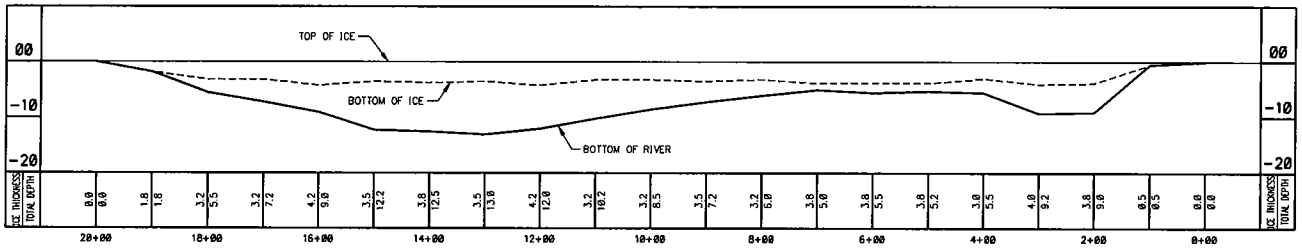
PROFILE - RIGHT SHOULDER



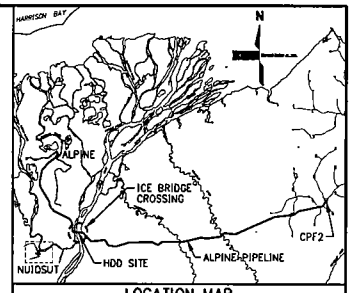
PLAN



PROFILE - ℄ ICE ROAD



PROFILE - LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED JANUARY 14 & 15, 2002 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C001 01/16/02

REFERENCE DWG NO/SHT NO.

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ ENGR	CNS ENGR	PROJ MGR	CLIENT

Baker Michael Baker Jr., Inc.

PHILLIPS 66 PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 01/18/02

FORM: 0508-ALP

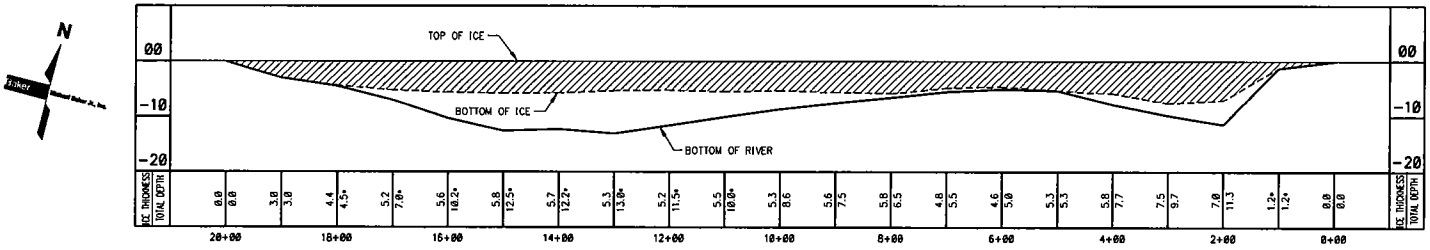
CONSULTANT DRAWING NUMBER:

DO NOT SCALE | ABOVE SCALE FOR REFERENCE ONLY

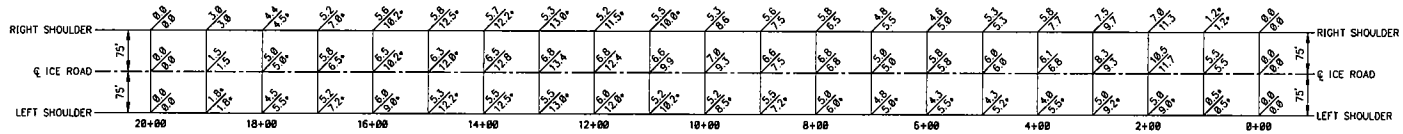
MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE - 01/15/02
ICE AND WATER DEPTHS

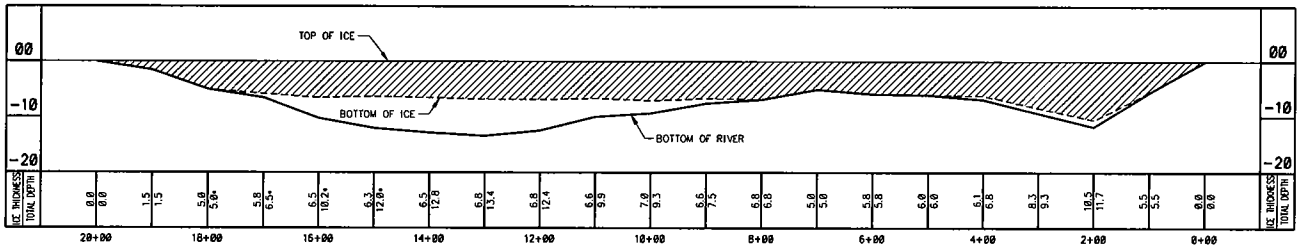
JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	



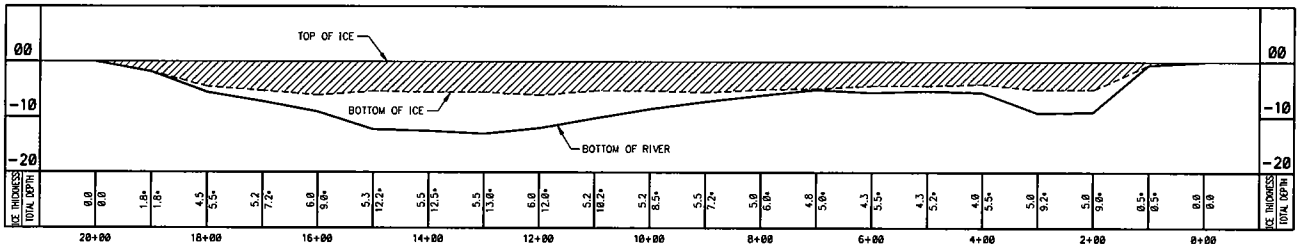
PROFILE – RIGHT SHOULDER



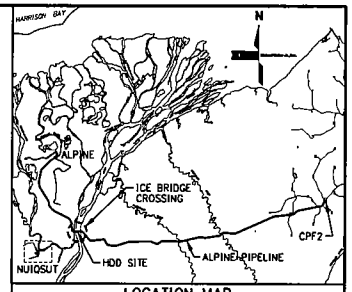
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED JANUARY 28–30, 2002 BY BILL ST. LAWRENCE.
3. ▸ DENOTES MEASUREMENT FROM 01/15/02 SURVEY.

100 0 100 200
HORIZONTAL SCALE IN FEET

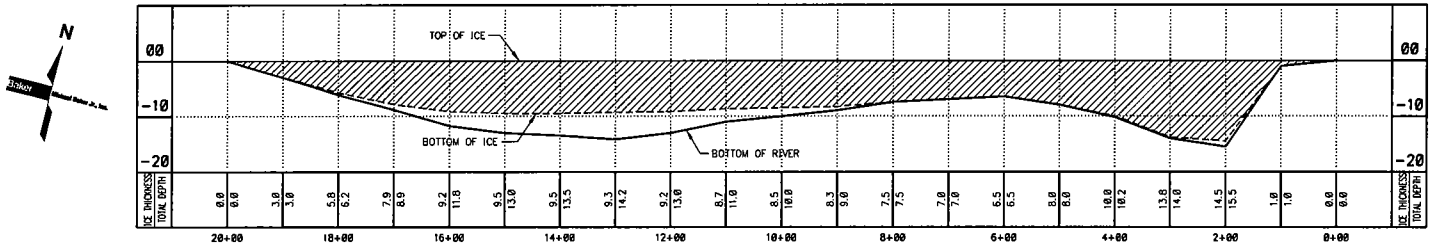
25288C002 02/05/02

Baker Michael Baker Jr., Inc.

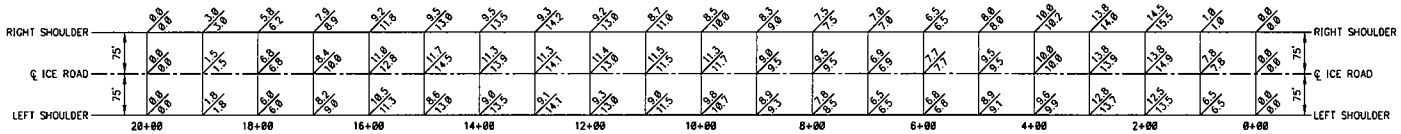
PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

MODULE: COLVILLE RIVER ICE BRIDGE
UNIT:
PROFILE – 01/30/02
ICE AND WATER DEPTHS

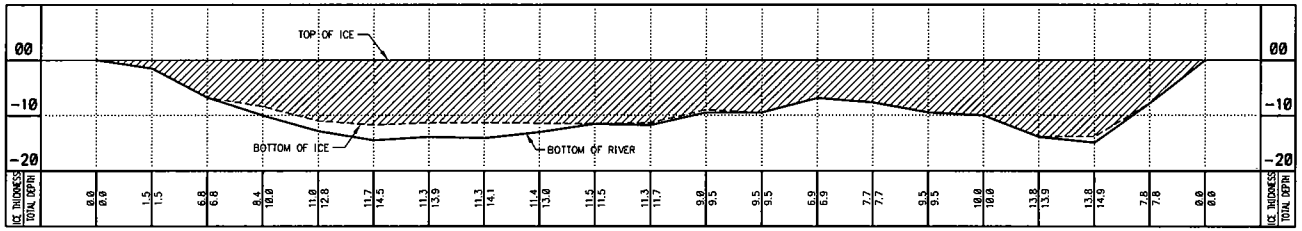
SCALE: AS NOTED
DRAWN: R. HOBBS
DATE: 02/05/02
SHEET: 1 or 1



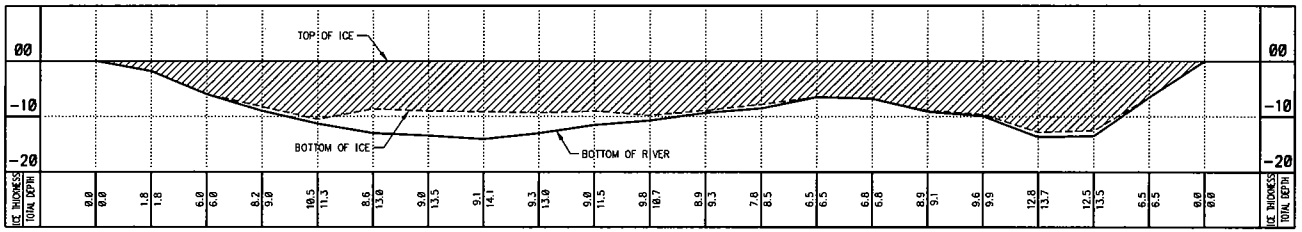
PROFILE – RIGHT SHOULDER



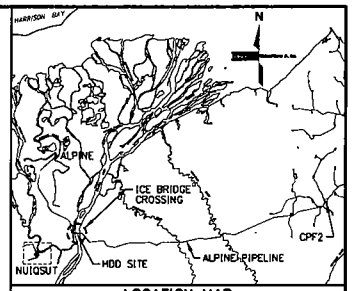
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 6-13, 2002 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C003 02/15/02

Baker Michael Baker Jr., Inc.

FORM: 0001-ALP

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ MGR	DRL	PROJ SUP	CLIENT

PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 02/18/02

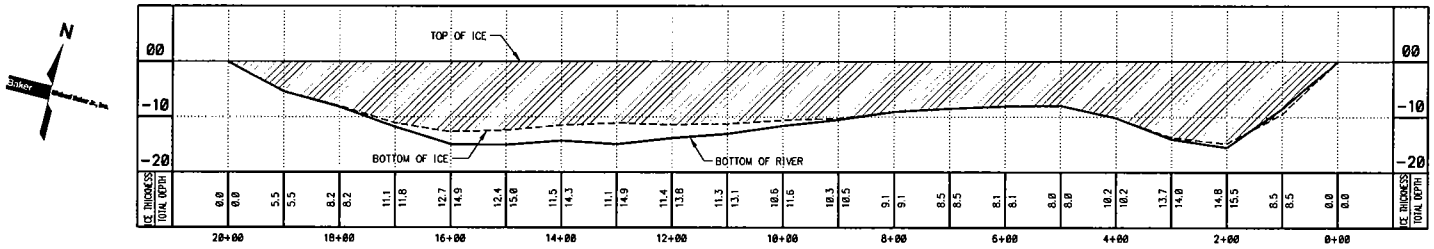
CONSULTANT DRAWING NUMBER:

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

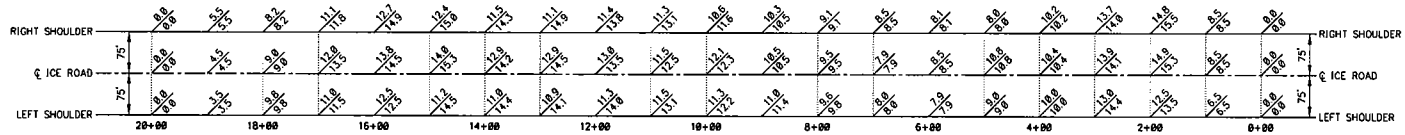
MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 02/13/02
ICE AND WATER DEPTHS

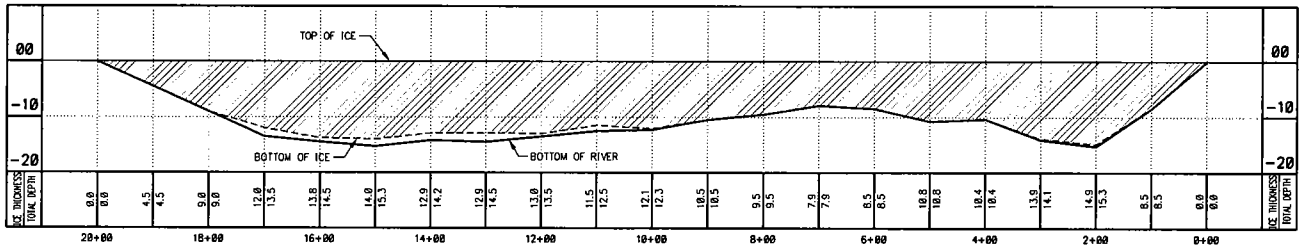
JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	



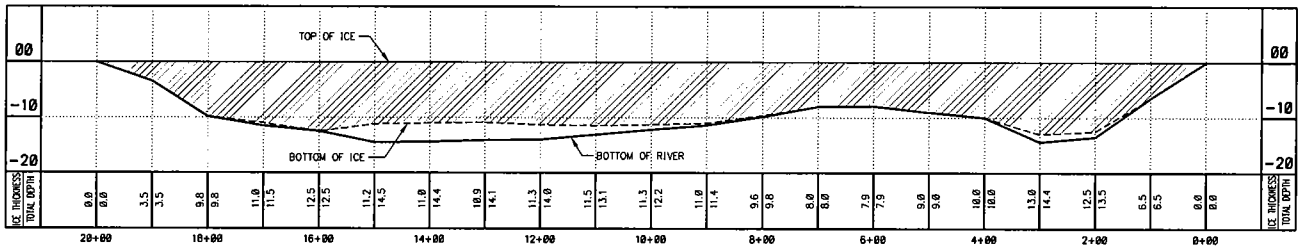
PROFILE – RIGHT SHOULDER



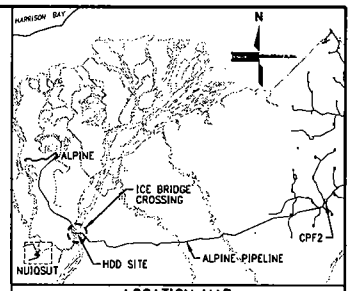
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 27, 2002 THRU MARCH 5, 2002 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C004 03/06/02

Baker Michael Baker Jr., Inc.

FORM 5808-ALP

REFERENCE DWG NO/SHT NO.

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ ENGR	CHK DOR	PROJ MGR	CLIENT

PHILLIPS 66 PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 03/06/02

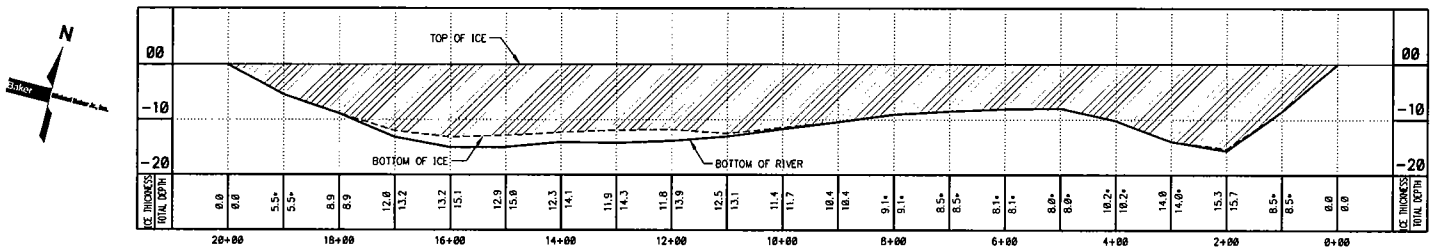
CONSULTANT DRAWING NUMBER:

DO NOT SCALE | ABOVE SCALE FOR REFERENCE ONLY

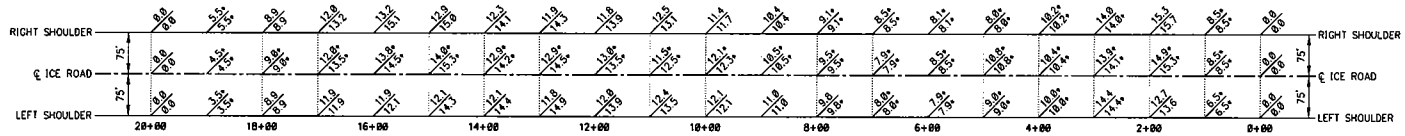
MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 03/05/02
ICE AND WATER DEPTHS

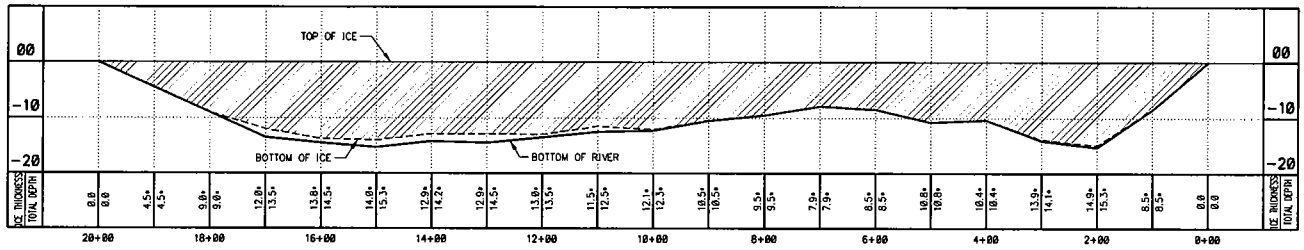
JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	



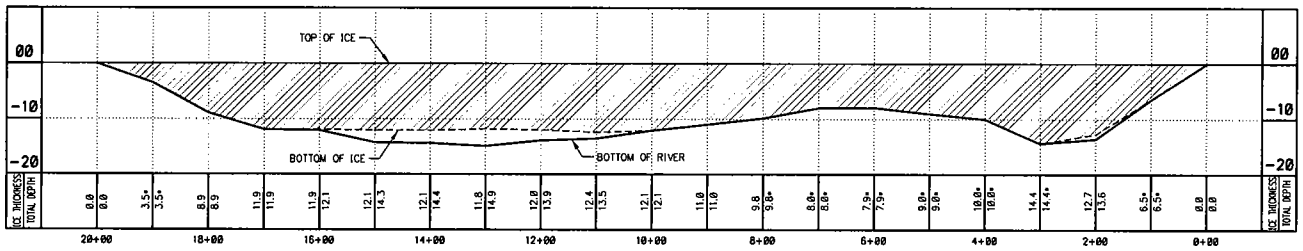
PROFILE – RIGHT SHOULDER



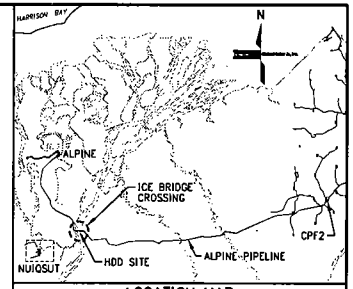
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS
TOTAL DEPTH (ICE + WATER)

* DENOTES MEASUREMENTS COMPLETED FEBRUARY 27 THRU MARCH 5, 2002.

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS WERE COMPLETED MARCH 27 & 28, 2002 UNLESS NOTED OTHERWISE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C005 04/02/02

Baker Michael Baker Jr., Inc.

PHILLIPS 66 PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 04/02/02

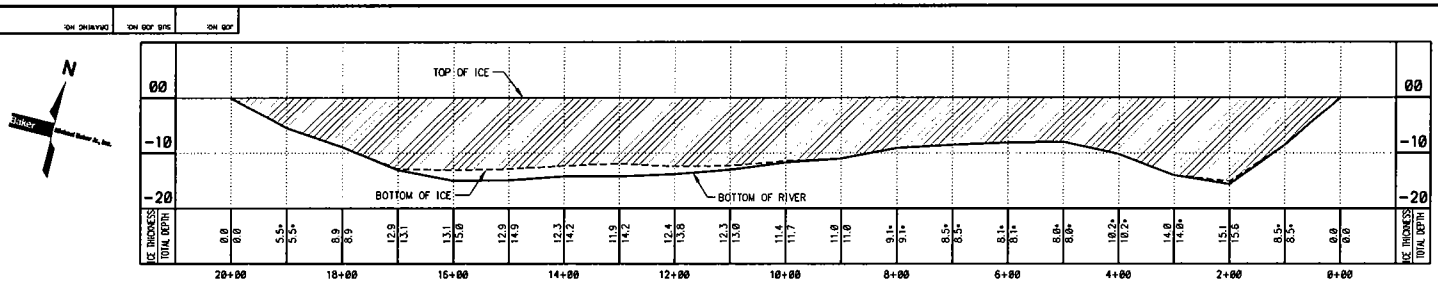
CONSULTANT DRAWING NUMBER:

MODULE: UNIT:

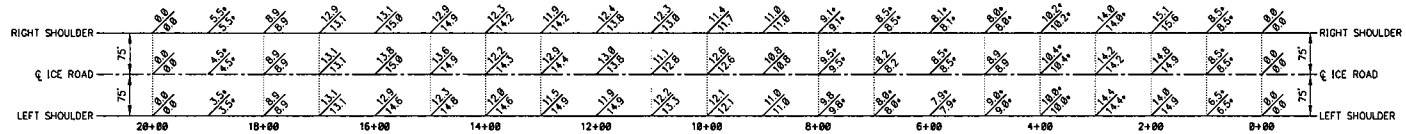
COLVILLE RIVER ICE BRIDGE
PROFILE – 03/28/02
ICE AND WATER DEPTHS

JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	

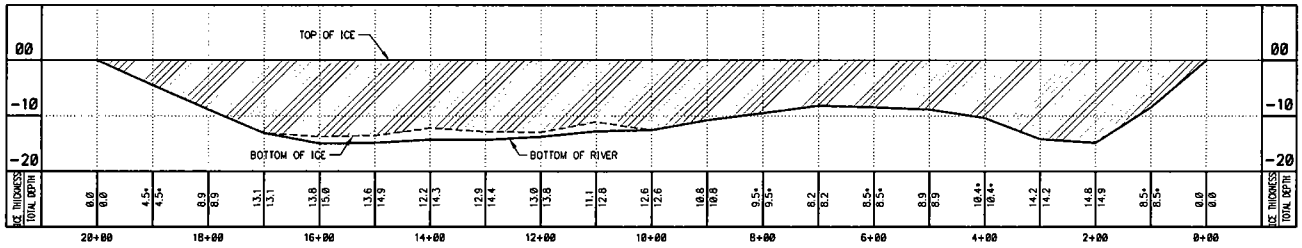
REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD MGR	PROJ ENGR	ENG MGR	PROJ MGR	CLIENT



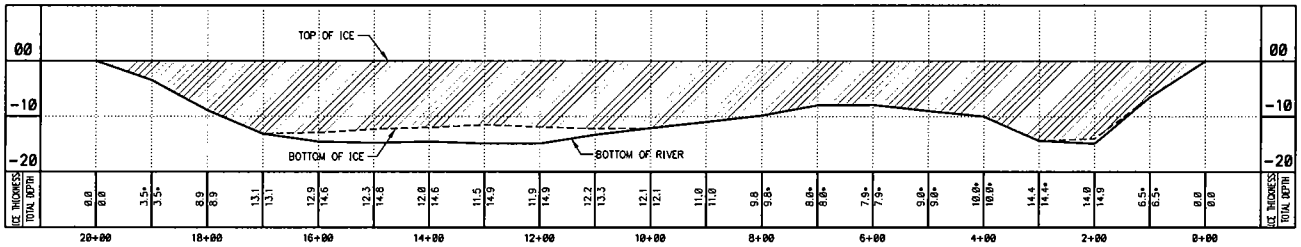
PROFILE – RIGHT SHOULDER



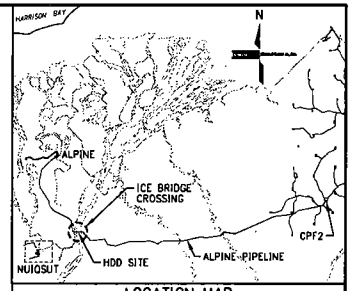
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

* DENOTES MEASUREMENTS COMPLETED FEBRUARY 27 THRU MARCH 5, 2002.

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS WERE COMPLETED APRIL 8, 2002 UNLESS NOTED OTHERWISE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C006 04/11/02

Baker Michael Baker Jr., Inc.

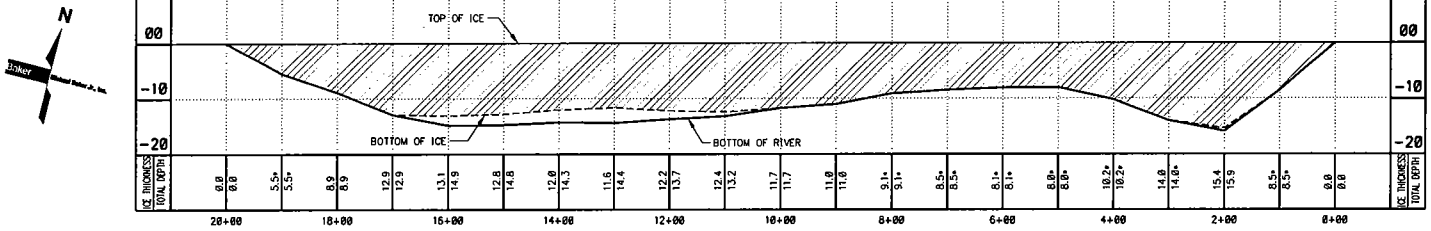
PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 04/11/02

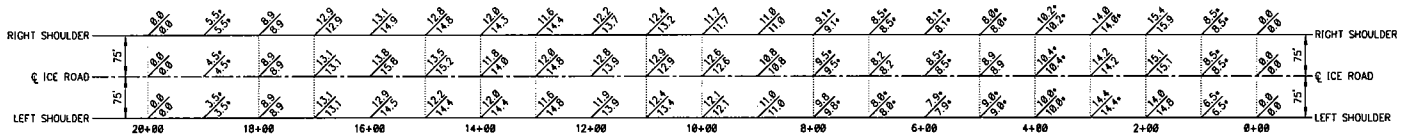
MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE – 04/08/02
ICE AND WATER DEPTHS

UNIT:

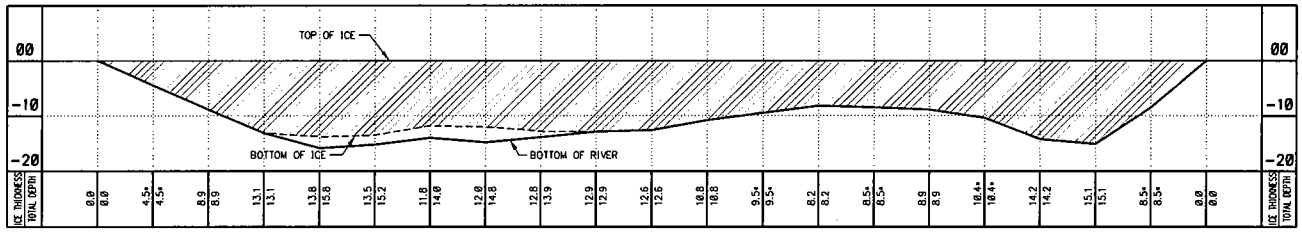
JOB NO: | SUB JOB NO: | DRAWING NO. | SHEET: 1 OF 1 | REV:



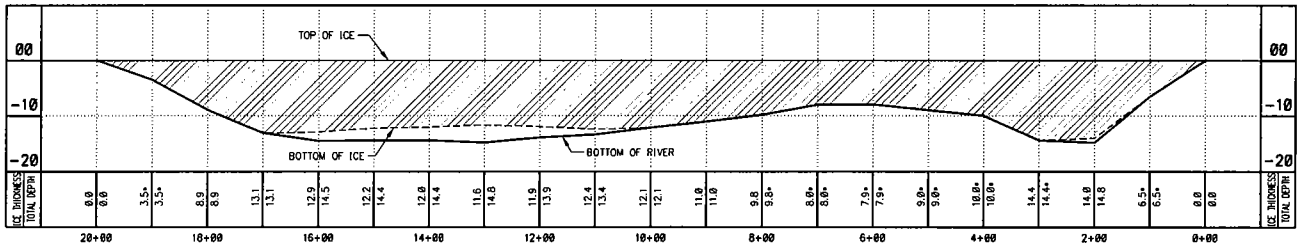
PROFILE – RIGHT SHOULDER



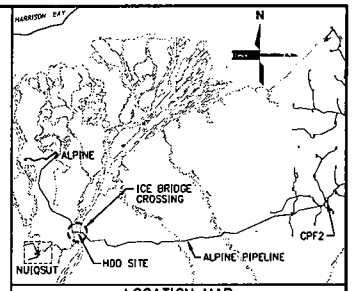
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

* DENOTES MEASUREMENTS COMPLETED FEBRUARY 27 THRU MARCH 5, 2002.

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS WERE COMPLETED APRIL 23, 2002 UNLESS NOTED OTHERWISE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C007 04/29/02

Baker Michael Baker Jr., Inc.

FORM: D80R-ALP

REFERENCE DWG NO/SHT NO.

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ ENGR	ENV	PROJ MGR	CLIENT

PHILLIPS 66 **PHILLIPS Alaska, Inc.**
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 04/29/02

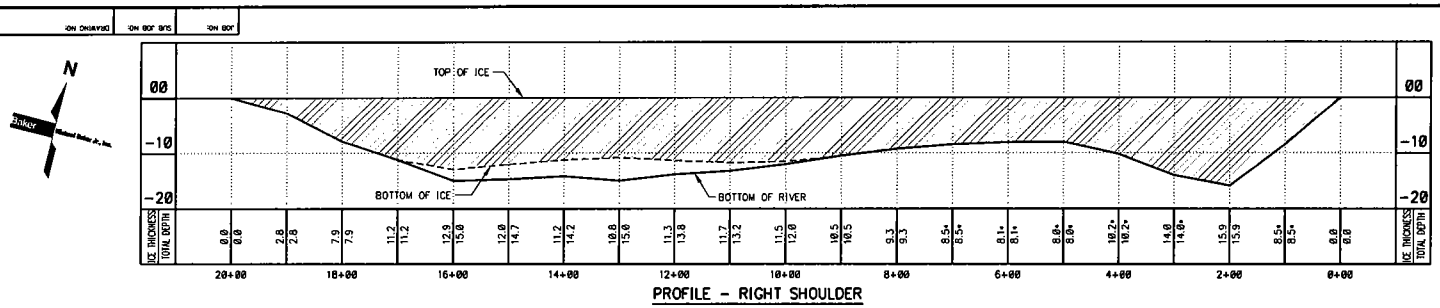
CONSULTANT DRAWING NUMBER:

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

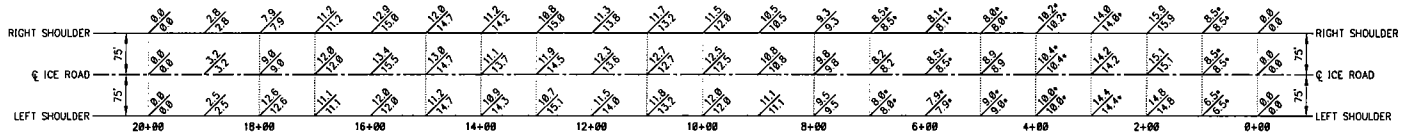
MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 04/23/02
ICE AND WATER DEPTHS

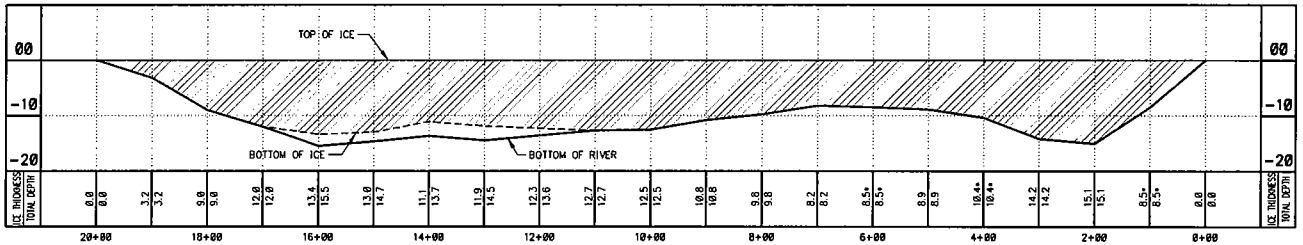
JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	



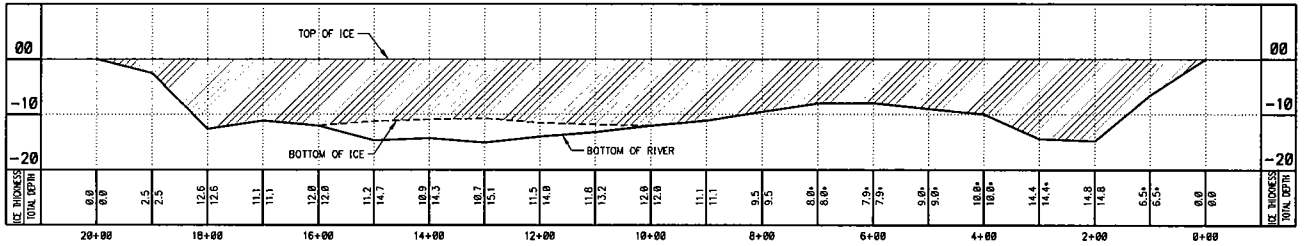
PROFILE – RIGHT SHOULDER



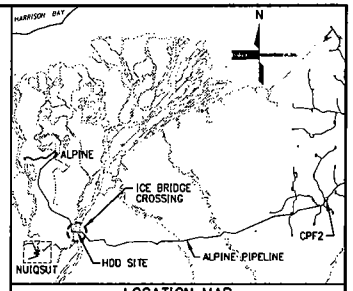
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

* DENOTES MEASUREMENTS COMPLETED FEBRUARY 27 THRU MARCH 5, 2002.

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS WERE COMPLETED MAY 7, 2002 UNLESS NOTED OTHERWISE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C008 05/13/02

Baker Michael Baker Jr., Inc.

PHILLIPS Alaska, Inc.
A Subsidiary of PHILLIPS PETROLEUM COMPANY

FOR NO:	SCALE: AS NOTED	DRAWN: R. HOBBS
REDRAWN FROM:		DATE: 05/13/02

MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 05/07/02
ICE AND WATER DEPTHS

JOB NO:	SUB JOB NO:	DRAWING NO.	SHEET:	REV:
			1 of 1	

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ ENGR	DIR ENGR	PROJ MGR	CLIENT

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: January 15, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 11:20	12.5	3.6	0.2	0.5	169.0	0.1
				2.0	158.4	0.1
				3.5	147.8	0.1
				5.0	146.2	0.1
				6.5	145.3	0.1
				8.0	144.6	0.1
				9.5	145.6	0.1
				11.0	145.7	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 11:35	12.4	3.8	0.2	0.5	176.1	0.2
				2.0	163.5	0.1
				3.5	147.8	0.1
				5.0	147.6	0.1
				6.5	147.6	0.1
				8.0	147.2	0.1
				9.5	152.1	0.1
				11.0	148.5	0.1
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 12:05	13.5	3.8	0.3	0.5	158.6	0.1
				2.0	149.6	0.1
				3.5	147.3	0.1
				5.0	147.0	0.1
				6.5	146.1	0.1
				8.0	145.7	0.1
				9.5	146.1	0.1
				11.0	146.4	0.1
				12.5	145.9	0.1

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 12:30	11.5	3.0	0.1	0.5	160.4	0.1
				2.0	150.3	0.1
				3.5	146.1	0.1
				5.0	145.1	0.1
				6.5	144.5	0.1
				8.0	143.7	0.1
				9.5	143.4	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 12:45	10.8	2.8	0.1	0.5	156.8	0.1
				2.0	147.8	0.1
				3.5	145.3	0.1
				5.0	144.9	0.1
				6.5	143.7	0.1
				8.0	143.1	0.1
				9.5	142.9	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 13:25	11.4	3.2	0.1	0.5	161.7	0.1
				2.0	150.8	0.1
				3.5	146.5	0.1
				5.0	145.5	0.1
				6.5	144.4	0.1
				8.0	143.4	0.1
				9.5	143.4	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: January 28, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 09:20	12.7	4.0	0.2	0.5	174.0	0.2
				2.0	170.5	0.1
				3.5	158.0	0.1
				5.0	152.5	0.1
				6.5	151.2	0.1
				8.0	150.0	0.1
				9.5	149.5	0.1
				11.0	149.1	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 09:00	12.6	4.1	0.25	0.5	214.0	0.2
				2.0	194.6	0.2
				3.5	158.7	0.1
				5.0	152.4	0.1
				6.5	151.0	0.1
				8.0	150.0	0.1
				9.5	149.9	0.1
				11.0	149.7	0.1
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 08:30	13.5	4.3	0.1	0.5	179.9	0.2
				2.0	171.9	0.2
				3.5	151.7	0.1
				5.0	152.8	0.1
				6.5	150.8	0.1
				8.0	150.2	0.1
				9.5	149.2	0.1
				11.0	149.3	0.1

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 09:30	11.6	3.5	0.1	0.5	179.2	0.2
				2.0	166.9	0.1
				3.5	154.7	0.1
				5.0	153.3	0.1
				6.5	151.4	0.1
				8.0	150.0	0.1
				9.5	149.0	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 09:40	11.0	3.1	0.2	0.5	164.3	0.1
				2.0	163.4	0.1
				3.5	155.2	0.1
				5.0	152.8	0.1
				6.5	151.3	0.1
				8.0	149.6	0.1
				9.5	149.0	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 10:00	11.5	3.6	0.15	0.5	174.6	0.2
				2.0	158.2	0.1
				3.5	151.7	0.1
				5.0	147.8	0.1
				6.5	146.4	0.1
				8.0	145.4	0.1
				9.5	148.8	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: February 8, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 10:20	12.85	4.3	0.3	0.5	177.5	0.2
				2.0	169.0	0.1
				3.5	163.2	0.1
				5.0	159.2	0.1
				6.5	158.6	0.1
				8.0	158.0	0.1
				9.5	157.0	0.1
				11.0	156.8	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 10:10	12.8	4.6	0.35	0.5	183.0	0.2
				2.0	175.3	0.2
				3.5	167.7	0.1
				5.0	159.3	0.1
				6.5	158.6	0.1
				8.0	157.9	0.1
				9.5	157.6	0.1
				11.0	157.0	0.1
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 09:50	13.6	4.8	0.18	0.5	182.0	0.2
				2.0	173.5	0.2
				3.5	163.8	0.1
				5.0	160.0	0.1
				6.5	159.1	0.1
				8.0	158.0	0.1
				9.5	157.4	0.1
				11.0	157.0	0.1

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 10:26	11.8	3.6	0.1	0.5	182.0	0.2
				2.0	165.9	0.1
				3.5	162.5	0.1
				5.0	160.6	0.1
				6.5	159.8	0.1
				8.0	159.5	0.1
				9.5	158.6	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 10:33	11.1	3.5	0.2	0.5	189.6	0.2
				2.0	170.0	0.1
				3.5	164.2	0.1
				5.0	160.0	0.1
				6.5	158.3	0.1
				8.0	157.3	0.1
				9.5	157.0	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 10:40	11.7	3.9	0.2	0.5	178.1	0.2
				2.0	167.8	0.1
				3.5	161.1	0.1
				5.0	160.1	0.1
				6.5	159.2	0.1
				8.0	158.0	0.1
				9.5	157.7	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: February 25, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 11:35	12.8	4.4	0.25	0.5	187.1	0.2
				2.0	175.9	0.2
				3.5	165.9	0.1
				5.0	168.8	0.1
				6.5	166.8	0.1
				8.0	166.3	0.1
				9.5	166.8	0.1
				11.0	167.2	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 10:55	12.9	5.35	0.45	0.5	189.4	0.2
				2.0	180.4	0.2
				3.5	174.4	0.2
				5.0	171.4	0.2
				6.5	169.2	0.1
				8.0	168.4	0.1
				9.5	167.8	0.1
				11.0	167.2	0.1
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 09:45	13.8	5.3	0.25	0.5	381.4	0.3
				2.0	274.9	0.2
				3.5	191.0	0.2
				5.0	171.2	0.2
				6.5	169.0	0.1
				8.0	168.4	0.1
				9.5	168.0	0.1
				11.0	167.6	0.1

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 11:50	11.9	4.2	0.25	0.5	203.8	0.2
				2.0	192.6	0.2
				3.5	174.8	0.2
				5.0	172.8	0.2
				6.5	170.9	0.1
				8.0	171.0	0.1
				9.5	170.6	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 12:02	11.3	4.1	0.3	0.5	191.1	0.2
				2.0	180.0	0.2
				3.5	176.8	0.2
				5.0	172.1	0.1
				6.5	170.9	0.1
				8.0	171.0	0.1
				9.5	171.2	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 12:15	11.65	4.2	0.2	0.5	184.1	0.2
				2.0	178.3	0.2
				3.5	176.6	0.2
				5.0	173.2	0.2
				6.5	171.2	0.1
				8.0	169.8	0.1
				9.5	170.0	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

Attempted to determine presence of flow under the ice on the Colville per request from Bill Morris/Jason/Chris. The attempt was unsuccessful, as the gas auger would not start. Hole drilled by the DeWalt drill was too small to get a good view of the flow indicator.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: March 12, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 12:50	13.01	5.0	0.36	0.5	220.2	0.2
				2.0	195.7	0.2
				3.5	183.5	0.2
				5.0	180.0	0.2
				6.5	178.7	0.2
				8.0	178.5	0.2
				9.5	178.3	0.2
				11.0	178.7	0.2
				12.5	180.2	0.2
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 12:10	13.05	5.47	0.53	0.5	208.0	0.2
				2.0	191.3	0.2
				3.5	171.9	0.2
				5.0	168.2	0.1
				6.5	171.4	0.2
				8.0	173.7	0.2
				9.5	175.9	0.2
				11.0	185.2	0.2
				12.5	180.6	0.2
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 11:45	13.87	5.56	0.54	0.5	187.4	0.2
				2.0	185.5	0.2
				3.5	185.1	0.2
				5.0	183.6	0.2
				6.5	181.9	0.2
				8.0	181.1	0.2
				9.5	180.7	0.2
				11.0	180.6	0.2
				12.5	180.4	0.2

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 14:00	12.04	4.50	0.27	0.5	229.4	0.2
				2.0	196.6	0.2
				3.5	184.3	0.2
				5.0	182.8	0.2
				6.5	180.2	0.2
				8.0	180.6	0.2
				9.5	181.2	0.2
				11.0	182.0	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 13:40	11.4	4.25	0.29	0.5	204.2	0.2
				2.0	190.9	0.2
				3.5	184.4	0.2
				5.0	184.1	0.2
				6.5	182.4	0.2
				8.0	181.6	0.2
				9.5	182.6	0.2
				11.0	183.1	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 13:20	11.92	4.65	0.29	0.5	180.3	0.2
				2.0	184.8	0.2
				3.5	184.1	0.2
				5.0	184.1	0.2
				6.5	182.6	0.2
				8.0	182.3	0.2
				9.5	183.0	0.2
				11.0	184.6	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

A flow indicator composed of surveyor's tape weighted with a small steel washer was lowered into an 8-inch auger hole drilled at the 1200 feet upstream monitoring location. The indicator suggested that there was little or no measurable flow velocity beneath the ice at that location.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: March 25, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 09:55	12.80	4.60	0.35	0.5	201.1	0.2
				2.0	199.4	0.2
				3.5	189.3	0.2
				5.0	184.7	0.2
				6.5	183.6	0.2
				8.0	183.2	0.2
				9.5	185.9	0.2
				11.0	187.4	0.2
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 09:35	13.00	N/A[5]	0.50	0.5	208.4	0.2
				2.0	204.8	0.2
				3.5	196.0	0.2
				5.0	185.8	0.2
				6.5	184.3	0.2
				8.0	183.3	0.2
				9.5	183.5	0.2
				11.0	183.5	0.2
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 09:20	13.95	5.15	0.35	0.5	212.5	0.2
				2.0	204.9	0.2
				3.5	195.0	0.2
				5.0	186.3	0.2
				6.5	183.7	0.2
				8.0	183.1	0.2
				9.5	183.0	0.2
				11.0	184.6	0.2

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 16:50	12.00	4.95	0.25	0.5	202.2	0.2
				2.0	195.8	0.2
				3.5	189.1	0.2
				5.0	187.1	0.2
				6.5	186.5	0.2
				8.0	186.6	0.2
				9.5	187.6	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 17:15	11.40	5.10	0.30	0.5	204.6	0.2
				2.0	197.2	0.2
				3.5	188.0	0.2
				5.0	186.7	0.2
				6.5	186.6	0.2
				8.0	186.9	0.2
				9.5	188.1	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 17:35	11.60	5.20	0.20	0.5	190.4	0.2
				2.0	190.2	0.2
				3.5	188.9	0.2
				5.0	188.1	0.2
				6.5	187.0	0.2
				8.0	187.0	0.2
				9.5	188.0	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

(5) Could not obtain an accurate ice thickness due to ice inconsistencies.

A flow indicator composed of string weighted with a small steel washer was lowered into an 8-inch auger hole drilled at the 1200 feet downstream monitoring location. The indicator suggested that there was little or no measurable flow velocity beneath the ice at that location.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: April 7, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 12:35	13.09	5.6	0.42	0.5	195.3	0.2
				2.0	194.4	0.2
				3.5	192.9	0.2
				5.0	191.7	0.2
				6.5	191.0	0.2
				8.0	189.6	0.2
				9.5	189.7	0.2
				11.0	190.3	0.2
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 11:50	13.06	5.9	0.46	0.5	194.7	0.2
				2.0	193.7	0.2
				3.5	191.4	0.2
				5.0	190.4	0.2
				6.5	189.2	0.2
				8.0	188.8	0.2
				9.5	198.8	0.2
				11.0	193.5	0.2
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 11:20	13.94	6.1	0.37	0.5	192.0	0.2
				2.0	191.8	0.2
				3.5	190.1	0.2
				5.0	189.1	0.2
				6.5	188.3	0.2
				8.0	188.0	0.2
				9.5	187.6	0.2
				11.0	187.7	0.2
				12.5	187.7	0.2

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 12:35	11.90	5.2	0.09	0.5	193.2	0.2
				2.0	192.8	0.2
				3.5	192.4	0.2
				5.0	191.9	0.2
				6.5	191.4	0.2
				8.0	192.1	0.2
				9.5	192.4	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 12:50	11.17	5.0	0.16	0.5	196.4	0.2
				2.0	195.2	0.2
				3.5	194.0	0.2
				5.0	193.7	0.2
				6.5	192.6	0.2
				8.0	192.2	0.2
				9.5	192.4	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 13:05	11.66	4.8	0.19	0.5	194.3	0.2
				2.0	195.1	0.2
				3.5	193.6	0.2
				5.0	192.5	0.2
				6.5	192.6	0.2
				8.0	193.2	0.2
				9.5	193.2	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

(5) A string weighted with steel washers was dropped into 8-inch holes at the 800-foot upstream and downstream sampling locations. No flow was detected at either site.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: April 22, 2002

Upstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 09:20	12.90	5.9	0.31	0.5	199.6	0.2
				2.0	196.9	0.2
				3.5	196.3	0.2
				5.0	195.2	0.2
				6.5	194.9	0.2
				8.0	194.1	0.2
				9.5	194.2	0.2
				11.0	194.2	0.2
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 09:05	12.80	6.2	0.40	0.5	198.7	0.2
				2.0	198.5	0.2
				3.5	199.4	0.2
				5.0	196.4	0.2
				6.5	195.9	0.2
				8.0	195.4	0.2
				9.5	195.4	0.2
				11.0	195.5	0.2
1200-ft Upstream N70°14'07.1" W150°49'47.2" Sampled at 08:50	14.03	6.4	0.33	0.5	196.9	0.2
				2.0	196.2	0.2
				3.5	194.8	0.2
				5.0	193.5	0.2
				6.5	196.4	0.2
				8.0	195.8	0.2
				9.5	195.9	0.2
				11.0	196.1	0.2
				12.5	196.0	0.2

Downstream Sample Location and Time	Total Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 09:35	11.92	5.3	0.12	0.5	200.9	0.2
				2.0	199.0	0.2
				3.5	198.7	0.2
				5.0	197.9	0.2
				6.5	197.0	0.2
				8.0	198.5	0.2
				9.5	200.2	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 09:50	11.67	6.3	0.54	0.5	200.5	0.2
				2.0	199.1	0.2
				3.5	197.2	0.2
				5.0	196.3	0.2
				6.5	197.3	0.2
				8.0	198.2	0.2
				9.5	199.7	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 10:05	11.39	5.65	0.27	0.5	200.4	0.2
				2.0	199.9	0.2
				3.5	199.3	0.2
				5.0	198.2	0.2
				6.5	198.3	0.2
				8.0	199.6	0.2
				9.5	200.5	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Total depth is measured from the top of ice to the channel bottom.

(3) Freeboard is the distance from the top of ice to the water surface.

(4) Sample depth is measured from the top of ice.

(5) A string weighted with steel washers was dropped into 8-inch holes at the 800-foot upstream and downstream sites. No flow was detected at either site.

Baker

To: Jeff Baker, Jon Wolf, Baker Files	Date: January 18, 2002
From: Julene Abrams and Mike Alexander	Re: January 14 – 17, 2002 Field Trip

Monday, January 14, 2002

- Arrived at Alpine mid-morning.
- Met with Janice and Gene of LCMF.
- Gathered the gear we headed towards the Colville River in the Hagland.
- Hagland was not running properly, we turned around and went back to camp.

Tuesday, January 15, 2002

- Hagland was fixed, went to Colville River to do salinity measurements.
- Salinity and conductivity measurements were taken at 6 sights upstream and downstream of the ice road. The road was assumed to be 100 feet wide, and the distances were taken 350 feet from the staked shoulder, and then every 400 feet thereafter to 1200 feet. All sights were marked with either a snow pole or crossed lathe.
- Depth measurements were taken using a rag tape as the sonde was not reading the depth.
- The crew then proceeded to Alpine Lake L9275. A couple of holes were drilled to locate the deepest depth, as measured using a rag tape. All required measurements were obtained. The survey level loop did not close and will have to be redone. A snow pole was left at the sight for future reference.

Wednesday, January 16, 2002

- Crew was able to complete the water quality sampling at the other six lakes for the Alpine Lake survey (Lakes L9283, L9282, L9342, L9310, L9312 and L9313).
- Survey was completed on five of the lakes, L9283, L9282, L9342, L9310 and L9312. The lake L9313 survey will be completed by LCMF on Thursday.
- All total depths were measured using the rag tape and not the sonde before water quality measurements were taken.
- It was noted that lake L9312 sample location was different from the 1999 winter and summer water sampling location.

Thursday, January 17, 2002

- Crew cleaned up equipment and readied it for the next sampling trip.
- Left Alpine in afternoon.

Baker

To: Jeff Baker, Jon Wolf, Baker Files	Date: February 12, 2002
From: Julene Abrams	Re: January 27 – February 10, 2002 Field Trip

Sunday, January 27, 2002
- Arrived at Alpine in the evening.
- Met with Janice of LCMF to discuss next day's work.

Monday, January 28, 2002
- Using Hagglund, went to Colville River to do salinity measurements.
- Salinity and conductivity measurements were taken within a 4 foot radius of the 6 sights located during the January 14th trip.
- Depth measurements were taken using a rag tape.
- Crew then returned to Alpine and prepared for work and flight over to Kuparuk. During this time it was discovered that the big auger could not be shipped on the small plane and so arrangements were made to borrow an auger from the SRT in Kuparuk.
- Upon arrival in Kuparuk, met with Brian Mangold of Lounsbury and discussed lakes to be sampled. Sampling lakes were changed after discussions with Brian concerning lake depths and known pump lakes.

Tuesday, January 29, 2002
- Crew met gathered equipment and met with Lounsbury before heading up to Lake K309, just south of CPF3. Sampling was completed on this lake. Sampling location is the same location where the contractor proposes to pump the lake. This lake also has a pump house for CPF3. Jon talked with the Control Room Operator, and the Operator does not recall ever having pumped from this lake as it is used only for fire emergencies.
- Could not find water on Lake, K303 after drilling 7 to 10 holes around the lake.
- Proceeded to Lake, K214, just south of CPF2. This lake also has a pump house on it with similar purposes to Lake K309. The Operator at CPF2 also does not recall ever having pumped out of this lake. No pumping location had been sited and so once adequate depth was found, sampling was completed and a snow pole left to mark the location.
- Deepest locations on all lakes sampled in Kuparuk are not known by crew as no bathymetry data was available.

Wednesday, January 30, 2002
- Sampled lakes K204 and K203. Snow poles were left at sampling locations.
- All 4 sampling locations in Kuparuk were reach via snowmachine.
- Jon and I flew back to Alpine and prepared for work over in NPR-A. After Jon talked with Jeff Baker, there may be some additional lakes added, 1 in the Alpine area and 3 in NPR-A.

Thursday, January 31, 2002

- While waiting for Bell surveyors to arrive, Jon and I sampled Lake M9524 as per requested by Tom Mortenson.
- Bell crew did not arrive until late in the evening, and so crew remained at Alpine for the night.

Friday, February 1, 2002

- Left Alpine fairly early and headed out to NPR-A.
- Along the way to the camp, sampled lake L9807.
- Upon arrival at Peak NPR-A camp, talked with Peak superintendent Ron Gunderson about proposed pump lakes. Learned had missed being able to sample Lake L9815 by one day, and other lakes were changing daily.
- After discussion, went and sampled Lake L9823. Left snow pole at sampling location.
- After talking with Bell surveyors, it was discovered that crew is only placing 6 to 8 inch stakes for TBMs. Both Lounsbury and LCMF are using either 2-foot rebar placed a minimum of 18-inches into the ground or permanent fixtures such as HSM. Recommend that rebar be placed during next sampling trip at all NPR-A lakes.

Saturday, February 2, 2002

- Talked with Ron Gunderson and Doug Sanford, Peak Ice Road Superintendents, about pump and reference lakes. Lakes had changed again from yesterday. Ron provided us with Rev. 6 of the proposed lake locations and amounts that could be pumped out of the lakes.
- Sampled three lakes, M9914, M9922 and M9923. M9922 will probably be a reference lake, L9923 can only have ice chips taken off of it, and it is not known at this time whether L9914 will be a pump lake or a reference lake.
- Snow poles were left at all locations.

Sunday, February 3, 2002

- Decided to head for furthest Lake R0061/L9911 to do sampling on. Do not know if this lake will be pumped at this time, but sampled it just in case. Snow pole was left at sampling site.
- Started to head for Lake M0024 but were told that Hagglund was leaking diesel and antifreeze by other Bell crew. Leak source was found and plugged. Both crews headed back to Lake R0061/L9911 to clean up any spills there.
- Weather steadily worsened and after cleaning up R0061/L9911 both crews headed for camp.

Monday, February 4, 2002

- Phase III conditions, all work was shut down.

Tuesday, February 5, 2002

- Phase III conditions, all work was shut down.

Wednesday, February 6, 2002
- Winds have abated, cold weather is back.
- Sampled 2 lakes, M0024 and M9912. M0024 is currently considered a reference lake and M9912 will be pumped. Snow poles were left at sampling sites.
- Arrived back at camp early. Jon left with a surveyor for Kuparuk. I stayed with our crew and will head back for Alpine tomorrow.

Thursday, February 7, 2002
- Bell crew and I arrived at Alpine about noon. Bell left after lunch.
- I talked with Jeff and we determined that it was okay to sample the Colville 3 days early.
- Prepared equipment for doing the Colville survey and some Alpine lake surveys for tomorrow.
- Sampling kits did not arrive, but I have 3 kits left over from NPR-A, so I will just use those.

Friday, February 8, 2002
- Left Alpine with a couple of LCMF surveyors for the Colville. Sampling was completed about noon. Sampling locations were within a 5-foot radii of previously drilled sites. Attempted to determine presence of flow under the ice on the Colville per request from Bill Morris/Jason/Chris. The attempt was unsuccessful, as the gas auger would not start. Hole drilled by the DeWalt drill was too small to get a good view of the flow indicator.
- Discovered that a pick-up is able to drive to all 6 sites and recommend that once the ice road is in to Alpine that this method of transportation be used when only doing Colville sampling. I would still recommend using the Hagglund when doing both the Colville and Alpine lakes.
- After finishing the Colville, the crew and I sampled and surveyed Lakes L9275, L9283 and L9282. Lake sampling locations were within a 5-foot radii of previously drilled location.
- Sampling kits arrived today and so work can be completed tomorrow.
- Observed that it is probably best to change the big auger bits about every 5 or 6 holes.

Saturday, February 9, 2002
- Completed sampling and surveying the Alpine lakes, L9342, L9310, L9312 and L9313.
- Cleaned up office and prepared equipment for next trip.
- Left big auger with machinist to sharpen the starter bit. Also left a couple of the small auger bits to be sharpened. LCMF will retrieve them for us.

Sunday, February 10, 2002
- I talked with LCMF and asked that Keith help with the Alpine lakes on the next go around as he is the one that helped me on this trip and thus knows the routine and site locations.

- I left Slope in afternoon.

Baker

To: Jeff Baker, Jon Wolf, Baker Files	Date: April 1, 2002
From: Julene Abrams	Re: March 24 - 26, 2002 Field Trip

Sunday, March 24, 2002

- Arrived at Alpine in the evening.
- Met with Janice of LCMF to discuss next day's work.

Monday, March 25, 2002

- Using pick-up truck, went with and LCMF crew member (Lance) to Colville River to do salinity measurements.
- Salinity and conductivity measurements were taken within a 4 foot radius of the 6 sights located during the previous trips.
- Depth measurements were taken using a rag tape.
- After finishing the upstream sites, attempted to drive to downstream sites, but got stuck in snow bank.
- Another LCMF crew came and pulled us out with a pick-up. Lance and I returned to Alpine to get Hagglund to finish rest of sampling. Hagglund would not start.
- Borrowed the ACS Tucker to finish sampling of downstream locations.
- Drilled 8 inch hole at 1200 foot site to test for discharge. String with washer at end, did not move from middle of hole.
- Obtained some bridge width and GPS coordinates for LCMF.
- Returned to Alpine about 7:00 pm, did not make flight.

Tuesday, March 26, 2002

- Left Alpine for Anchorage in the morning.

Trip Report
NPR-A, Alpine, Kuparuk
August Sampling Event

The following is a summary of the work that was completed last week at the above-referenced locations. The August sampling event was conducted over a period of five days, the 12th-16th, and was the last in a four-part sampling series representing the field portion of the 2002 North Slope Lake Monitoring Program. Accompanying this report is a spreadsheet that provides latitude and longitude coordinates (NAD27) for sampling locations at all lakes sampled under the investigation, as well as the locations of temporary benchmarks used at those lakes for the survey portion of the program.

NPR-A

The NPR-A portion of the investigation consisted of:

(1) Measurement of water surface elevation using standard level loop survey techniques.

(2) Measurement of the following in-situ water quality parameters using a Horiba U-10 in-situ water quality meter:

- Temperature
- pH
- Conductivity
- Dissolved oxygen
- Turbidity

(3) Collection of water samples for the following laboratory analysis:

- Sodium
- Calcium
- Magnesium
- Potassium
- Chloride
- Sulfate
- Nitrate

NPR-A (continued)

- Iron
- Hardness
- Biochemical oxygen demand (BOD)
- Chemical oxygen demand (COD)
- Total dissolved solids (TDS)

(4) Aerial photography

Alpine

The Alpine portion of the investigation included:

(1) Measurement of water surface elevation using standard level loop survey techniques.

(2) Measurement of the following in-situ water quality parameters using a Horiba U-10 in-situ water quality meter:

- Temperature
- pH
- Conductivity
- Dissolved oxygen
- Turbidity

(3) Collection of water samples for the following laboratory analysis:

- Chemical oxygen demand (COD)
- Biochemical oxygen demand (BOD).

(4) Aerial photography

Kuparuk

The Kuparuk portion of the investigation included:

(1) Measurement of water surface elevation using standard level loop survey techniques.

(2) Measurement of the following in-situ water quality parameters using a Horiba U-10 in-situ water quality meter:

- Temperature
- pH
- Conductivity

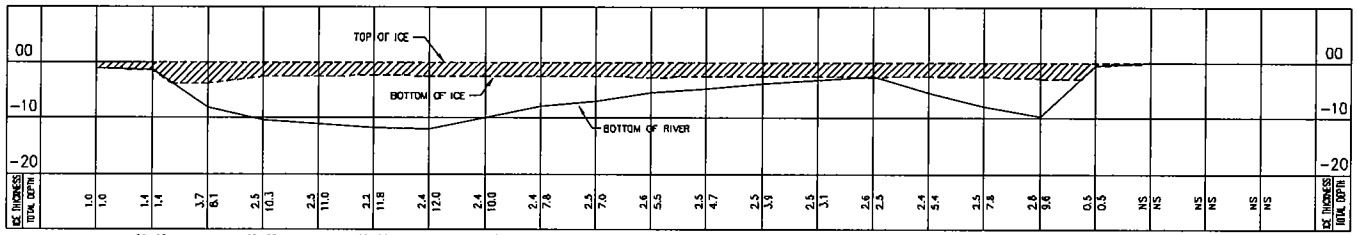
- Dissolved oxygen
- Turbidity

(3) Aerial photography

Winter 2002/2003

Colville River Ice Bridge Monitoring

Baker



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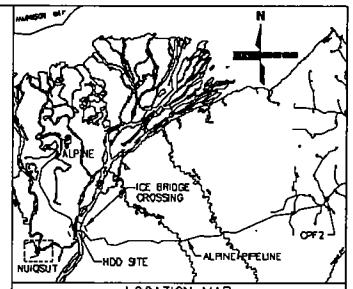
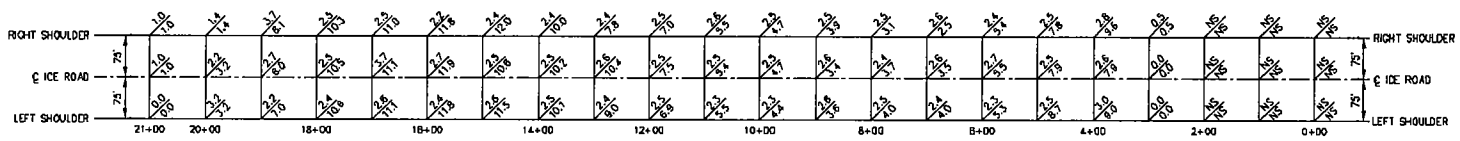
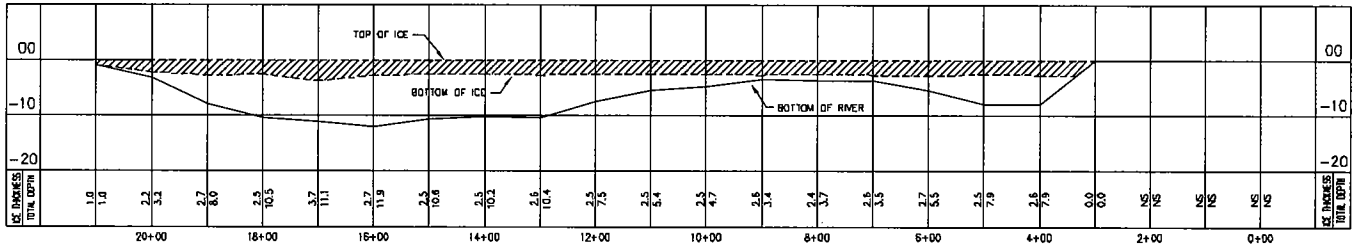


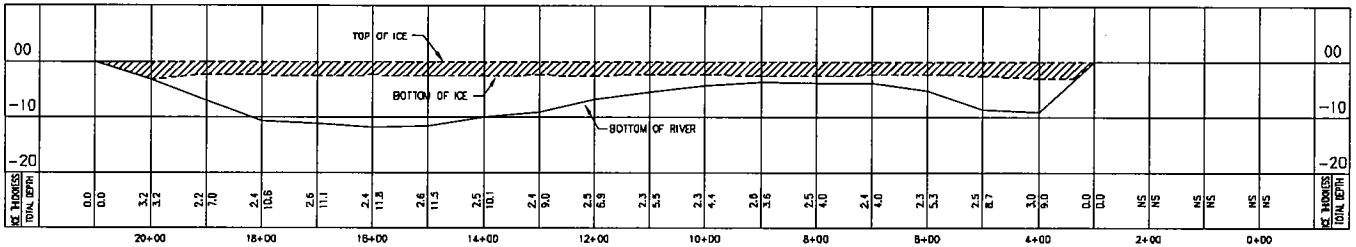
LOCATION MAP
NOT TO SCALE



PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. FREEBOARD (DIFFERENCE BETWEEN TOP OF ICE AND WATER SURFACE) RANGED BETWEEN 0.0 AND 0.2 FEET.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C016 02/20/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

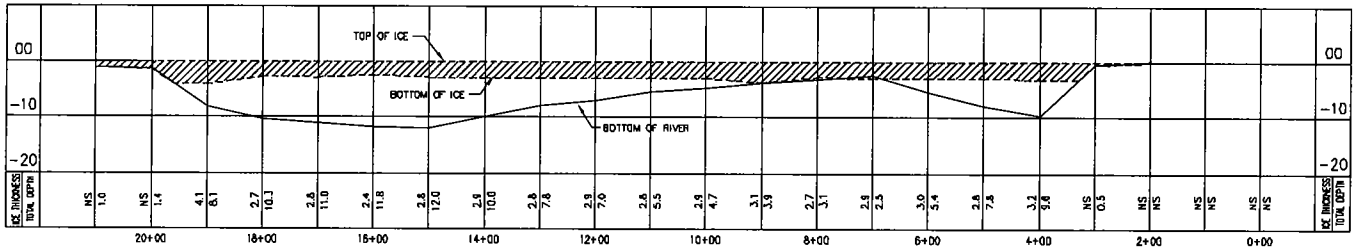
REV	DATE	REVISIONS	BY	CHK	ENGR

FOR RO: | SCALE: AS NOTED | DRAWN: M. COX | DATE: 02/20/03

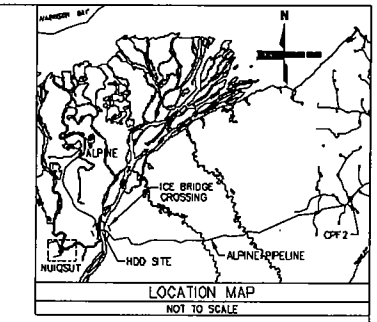
CONSULTANT DRAWING NUMBER: _

MODULE: COLVILLE RIVER ICE BRIDGE PROFILE – 01/22/03 ICE AND WATER DEPTHS | UNIT:

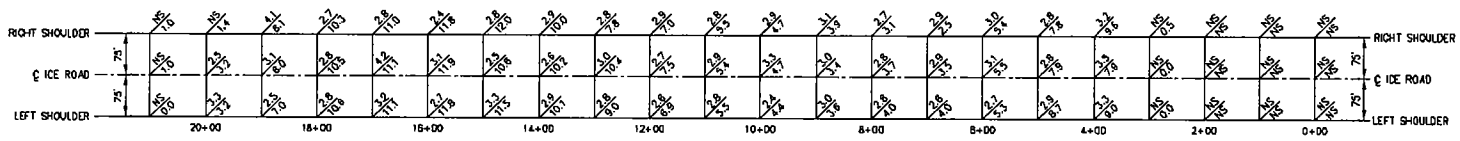
JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
25288		25288C016	1 of 1	



PROFILE – RIGHT SHOULDER



LOCATION MAP
NOT TO SCALE



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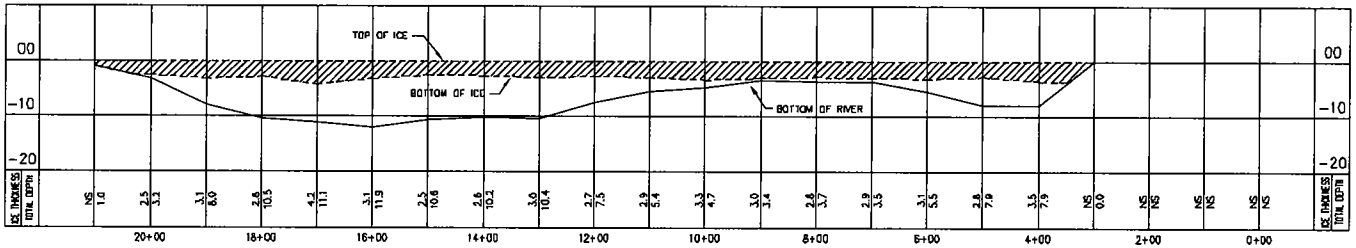
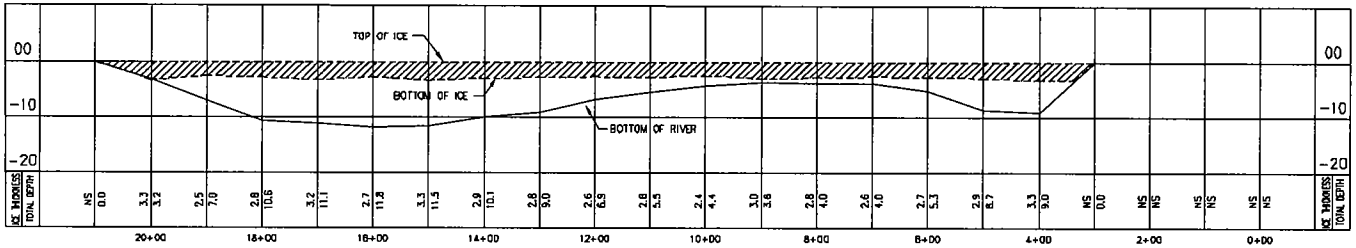


PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 03, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. RIVER BOTTOM PROFILE BASED ON DATA COLLECTED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
5. FREEBOARD (DIFFERENCE BETWEEN TOP OF ICE AND WATER SURFACE) RANGED BETWEEN 0.0 AND 0.2 FEET.

100 0 100 200

HORIZONTAL SCALE IN FEET

25288C017 02/20/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV	DATE	REVISIONS	BY	CHK	ENGR

FOR NO.: | SCALE: AS NOTED | DRAWN: M. COX | DATE: 02/20/03

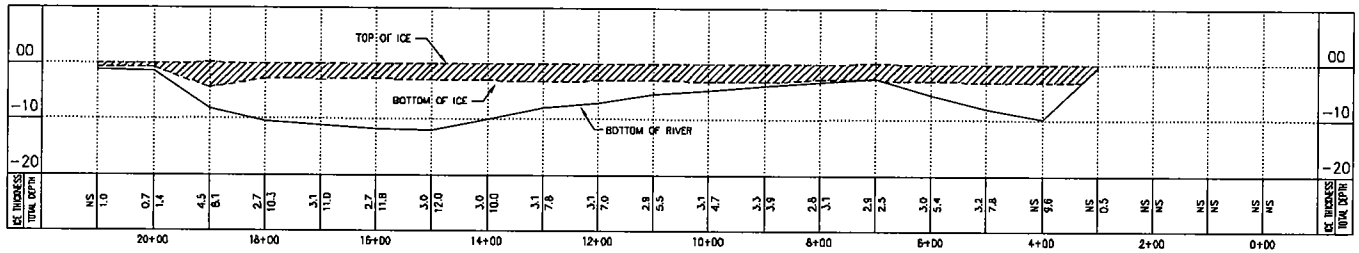
CONSULTANT DRAWING NUMBER:

DO NOT SCALE — WORK SCALE FOR REFERENCE ONLY

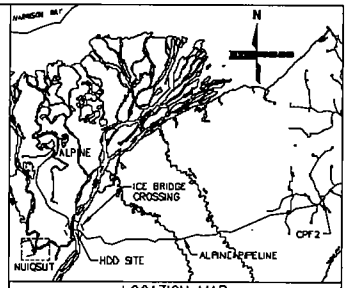
MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE – 02/03/03
ICE AND WATER DEPTHS

UNIT:

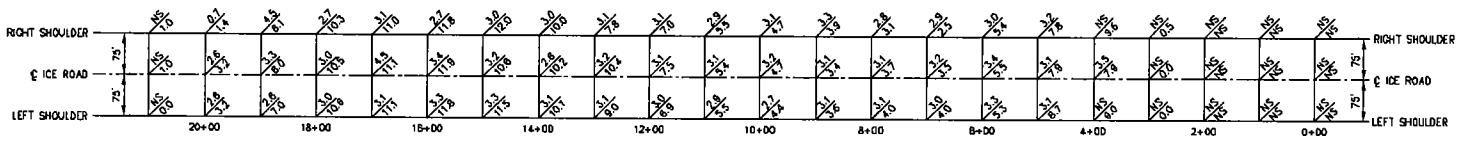
JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV
2528B		25288C017	1 of 1	



PROFILE – RIGHT SHOULDER



LOCATION MAP
NOT TO SCALE



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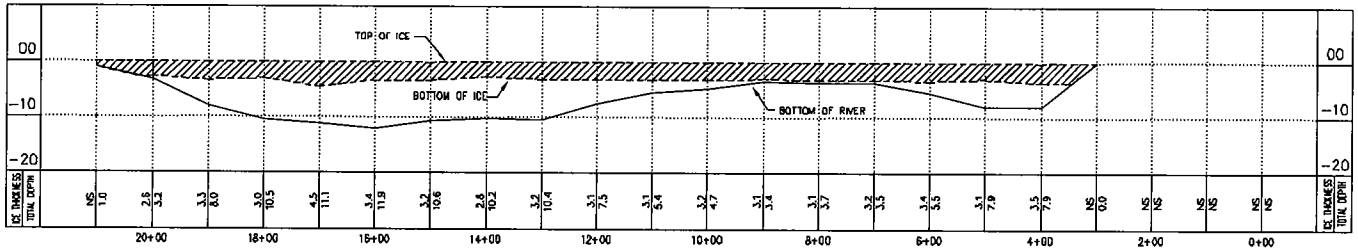
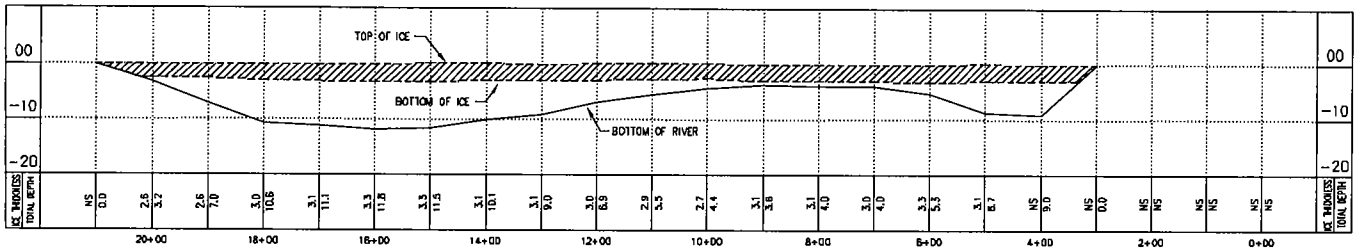


PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 11, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. RIVER BOTTOM PROFILE BASED ON DATA COLLECTED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
5. FREEBOARD DATA BASED ON DATA COLLECTED FEBRUARY 03, 2003 BY BILL ST. LAWRENCE.

100 0 100 200

HORIZONTAL SCALE IN FEET

25288C018 03/05/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

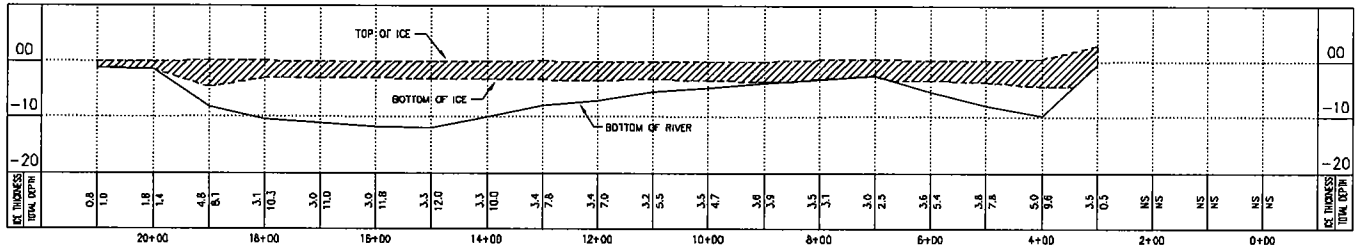
REV	DATE	REVISIONS	BY	CHK	ENGR

JOB NO: 25288 | SCALE: AS NOTED | DRAWN: M. COX | DATE: 03/05/03

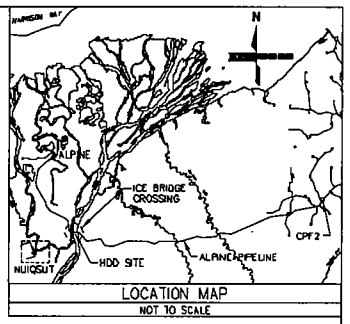
MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE – 02/11/03
ICE AND WATER DEPTHS

UNIT:

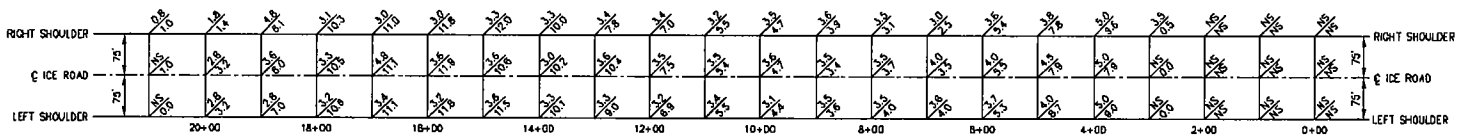
JOB NO: 25288 | SUB JOB NO: | DRAWING NO: 25288C018 | SHEET: 1 OF 1 | REV:



PROFILE – RIGHT SHOULDER



LOCATION MAP
NOT TO SCALE



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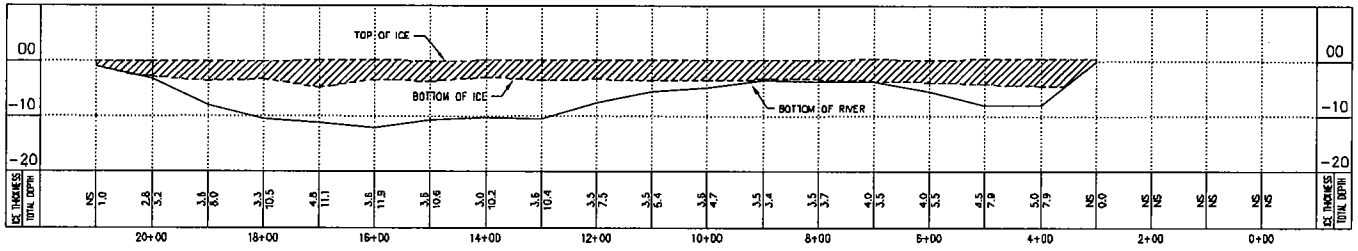


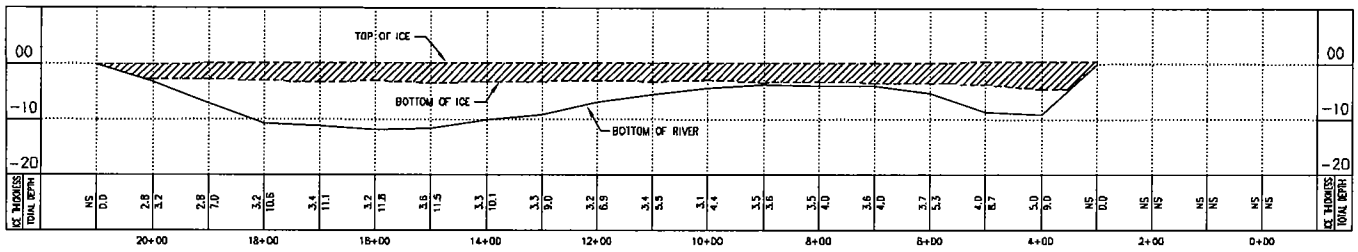
PROFILE – ℄ ICE ROAD

LEGEND

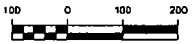
ICE THICKNESS
TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 19, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. RIVER BOTTOM PROFILE BASED ON DATA COLLECTED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
5. FREEBOARD DATA BASED ON DATA COLLECTED FEBRUARY 19, 2003 BY BILL ST. LAWRENCE.



PROFILE – LEFT SHOULDER



HORIZONTAL SCALE IN FEET

25288C019 03/05/03

Baker Michael Baker Jr., Inc.

REV	DATE	REVISIONS	BY	CHK	ENGR	LEAD ENGR	PROJ MGR	SUB MGR	CONST MGR	CLIENT

ConocoPhillips

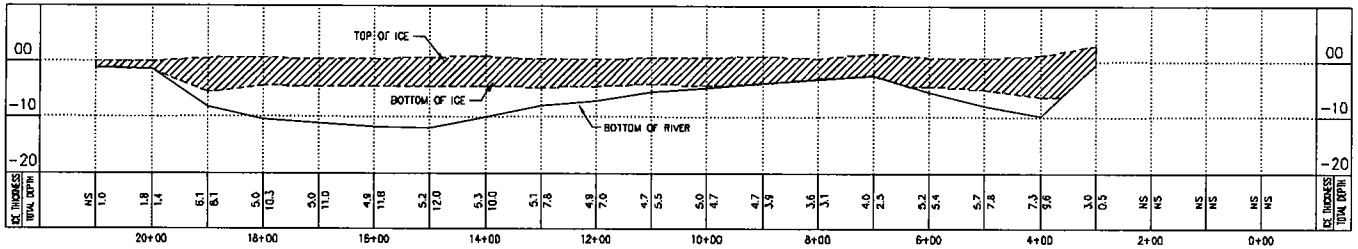
FOR NO:	SCALE: AS NOTED	DRAWN: M. COX
REDRAWN FROM:		DATE: 03/05/03

CONSULTANT DRAWING NUMBER:

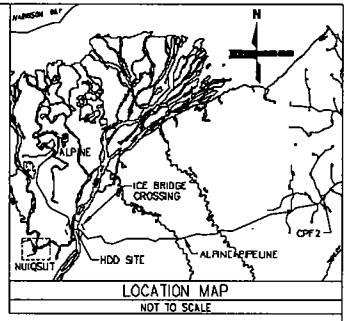
MODULE: COLVILLE RIVER ICE BRIDGE PROFILE – 02/19/03 ICE AND WATER DEPTHS

UNIT:

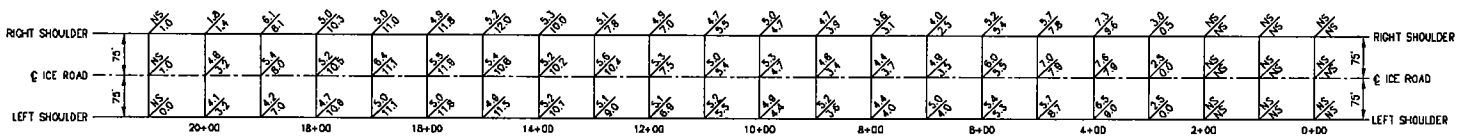
JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
25288		25288C019	1 OF 1	



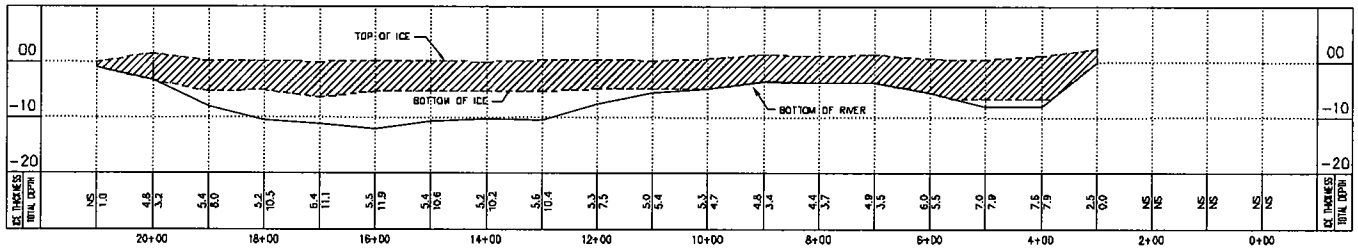
PROFILE – RIGHT SHOULDER



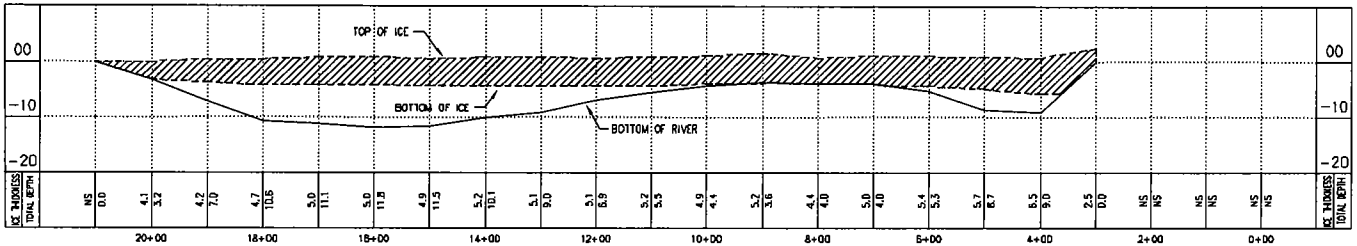
LOCATION MAP
NOT TO SCALE



PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED FEBRUARY 24-25, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. RIVER BOTTOM PROFILE BASED ON DATA COLLECTED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
5. FREEBOARD DATA BASED ON DATA COLLECTED FEBRUARY 24-25, 2003 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

2528BC020 03/05/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV	DATE	REVISIONS	BY	CHK	ENGR

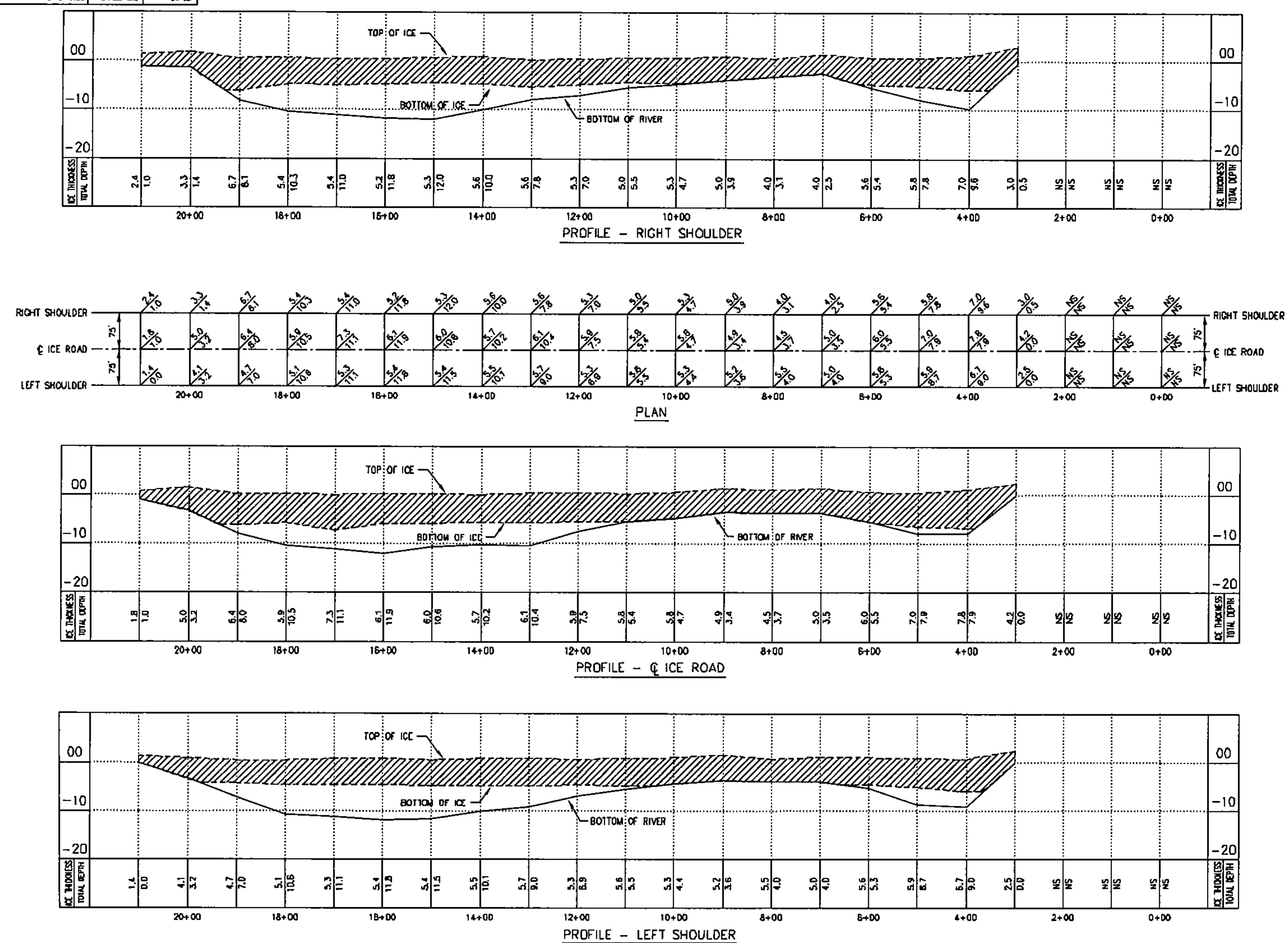
FOR NO: | SCALE: AS NOTED | DRAWN: M. COX
REDRAWN FROM | DATE: 03/05/03

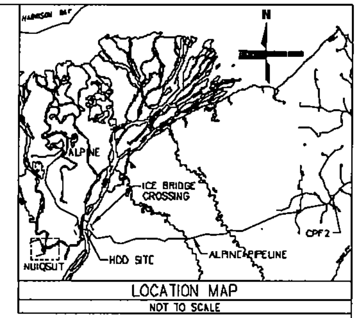
CONSULTANT DRAWING NUMBER:

MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE – 02/24/03
ICE AND WATER DEPTHS

UNIT:

JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
25288		2528BC020	1 of 1	





LEGEND

ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CROSSING PROFILE MEASUREMENTS COMPLETED MARCH 3, 2003 BY BILL ST. LAWRENCE.
3. NS - SAMPLE NOT COLLECTED.
4. RIVER BOTTOM PROFILE BASED ON DATA COLLECTED JANUARY 22, 2003 BY BILL ST. LAWRENCE.
5. FREEBOARD DATA BASED ON DATA COLLECTED FEBRUARY 24-25, 2003 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

2528BC021 03/05/03

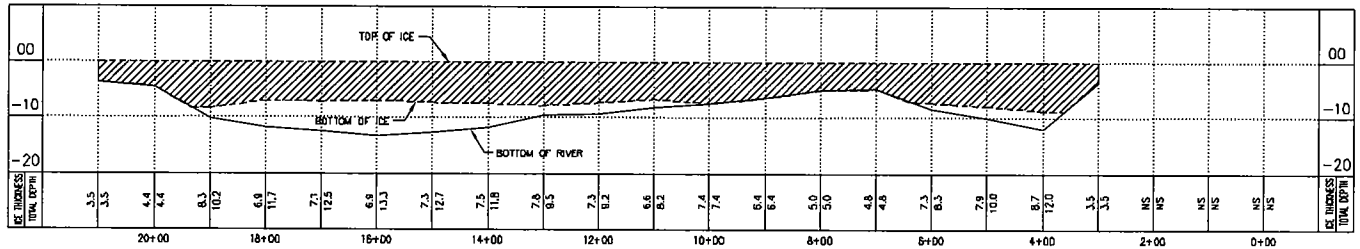
Baker Michael Baker Jr., Inc.

ConocoPhillips

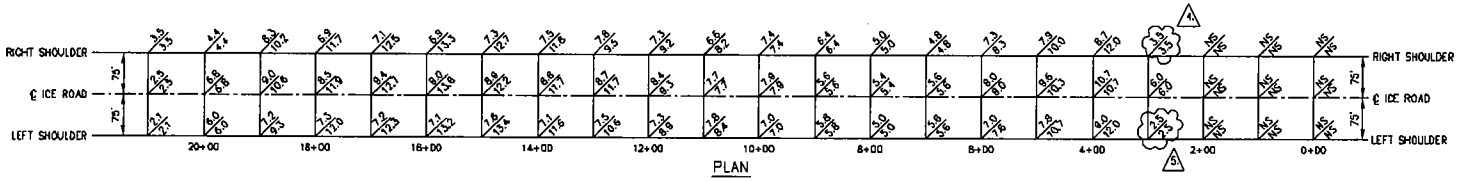
MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE - 03/03/03
ICE AND WATER DEPTHS

SCALE: AS NOTED | DRAWN: M. COX | DATE: 03/05/03

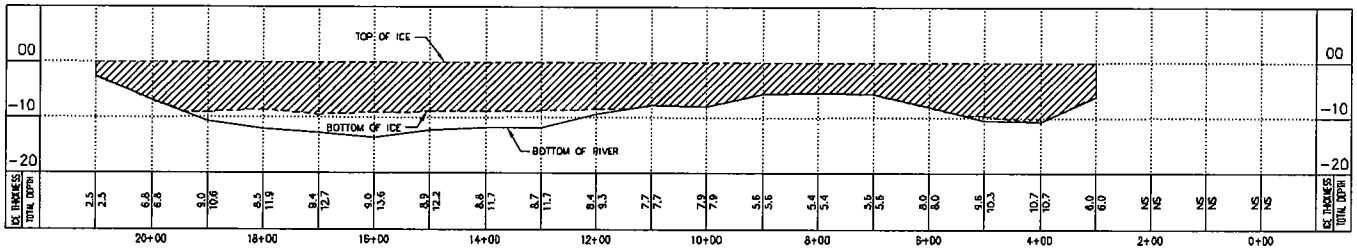
JOB NO. 2528B | DRAWING NO. 2528BC021 | SHEET 1 of 1



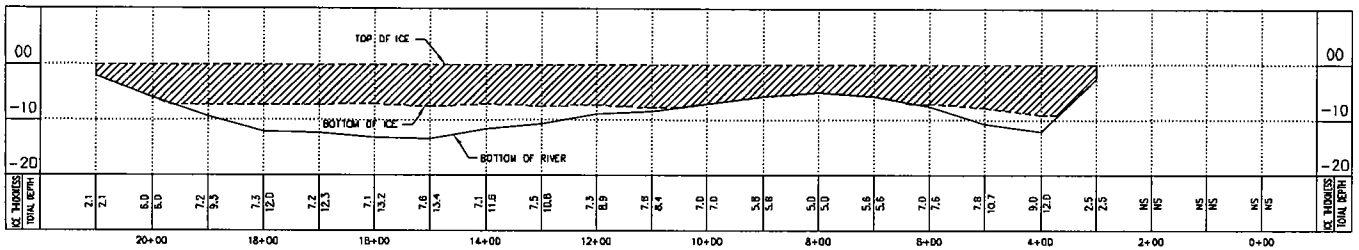
PROFILE – RIGHT SHOULDER



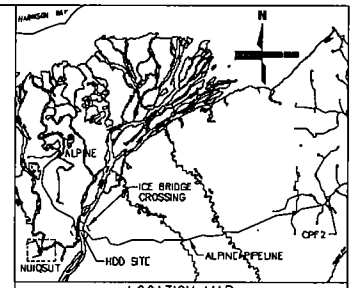
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



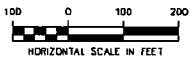
LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS
TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. PROFILE MEASUREMENTS COMPLETED MARCH 10, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. DATA COLLECTED AT STATION 3+00 ON THE RIGHT SHOULDER WAS COLLECTED ON MARCH 3, 2003.
5. DATA COLLECTED AT STATION 3+00 ON THE LEFT SHOULDER WAS COLLECTED ON FEBRUARY 25, 2003.



HORIZONTAL SCALE IN FEET

252BBC022 03/17/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV.	DATE	REVISIONS	BY	CHK	ENGR

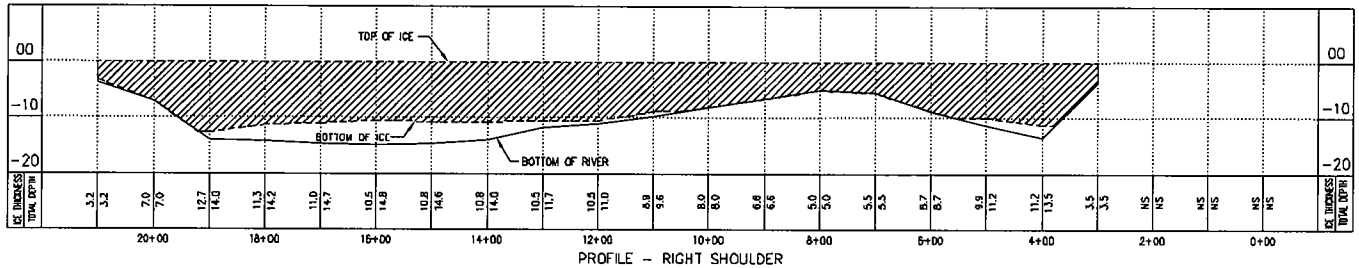
FOR BID: | SCALE: AS NOTED | DRAWN: M. COX | DESIGN FROM: | DATE: 03/17/03

CONSULTANT DRAWING NUMBER:

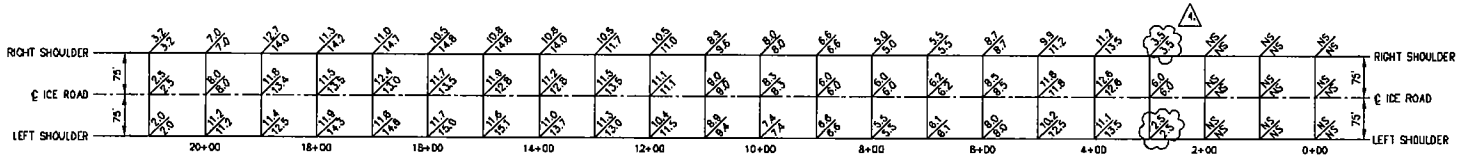
MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 03/10/03
ICE AND WATER DEPTHS

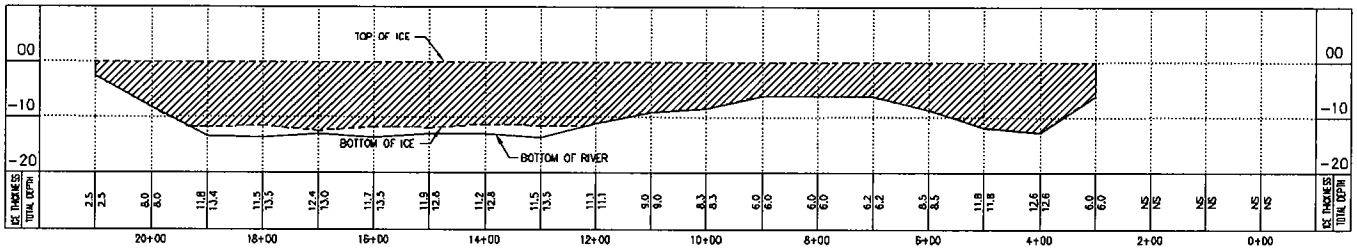
JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
252BB		252BBC022	1 OF 1	



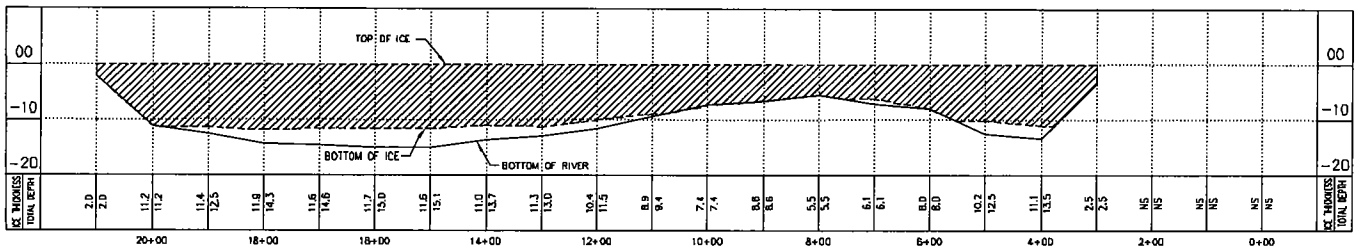
PROFILE – RIGHT SHOULDER



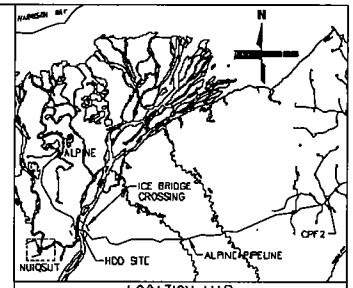
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



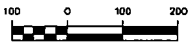
LOCATION MAP
NOT TO SCALE

LEGEND

ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. PROFILE MEASUREMENTS COMPLETED BETWEEN MARCH 13 – 17, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. DATA COLLECTED AT STATION 3+00 ON THE RIGHT AND LEFT SHOULDER WERE COLLECTED ON FEBRUARY 25, 2003.



HORIZONTAL SCALE IN FEET

2528BC023 03/18/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

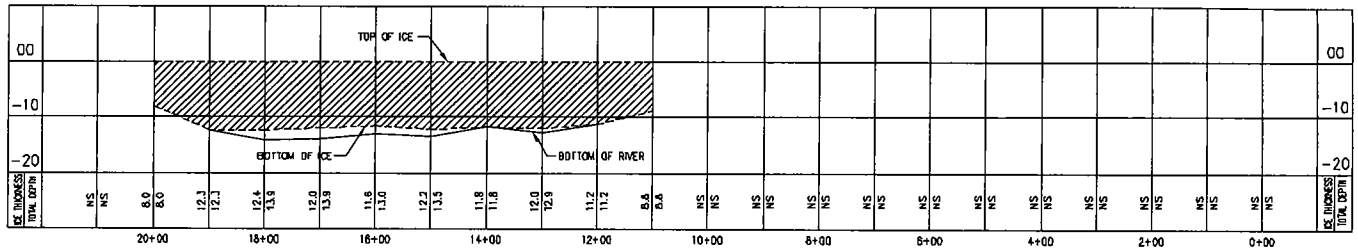
REV	DATE	REVISIONS	BY	CHK	ENGR

FOR NO: | SCALE: AS NOTED | DRAWN: M. COX | DATE: 03/18/03

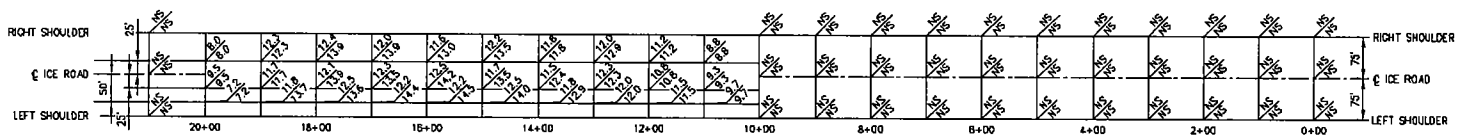
MODULE: COLVILLE RIVER ICE BRIDGE
PROFILE – 03/17/03
ICE AND WATER DEPTHS

UNIT:

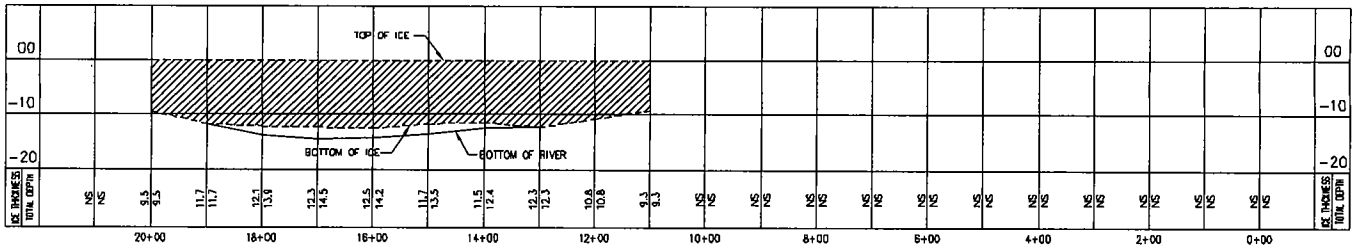
JOB NO: 2528B | SUB JOB NO: | DRAWING NO: 2528BC023 | SHEET: 1 OF 1 | REV:



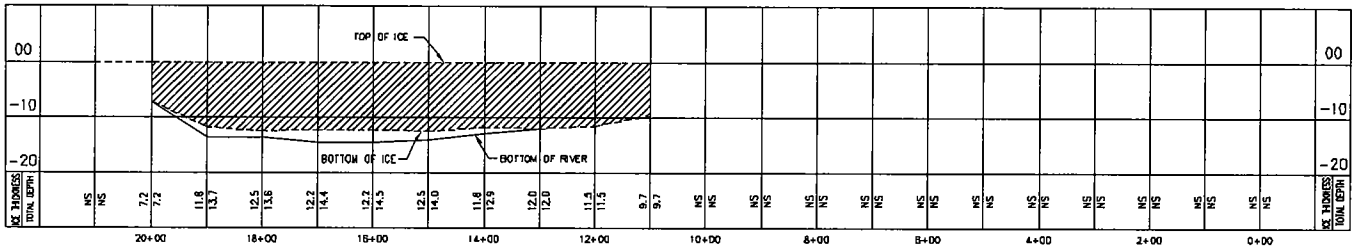
PROFILE – RIGHT SHOULDER



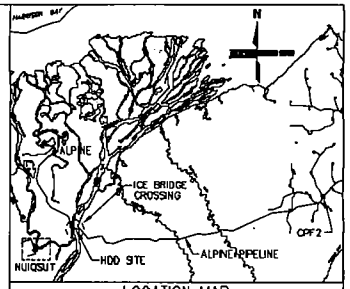
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

LEGEND

3.7 / 9.5 — ICE THICKNESS / TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. PROFILE MEASUREMENTS COMPLETED MARCH 25, 2003 BY BILL ST. LAWRENCE.
3. NS – SAMPLE NOT COLLECTED.
4. LEFT SHOULDER DATA COLLECTED 50 FEET SOUTH OF CENTERLINE.
5. CENTERLINE DATA COLLECTED 25 FEET SOUTH OF CENTERLINE.
6. RIGHT SHOULDER DATA COLLECTED 25 FEET NORTH OF CENTERLINE.
7. BILL ST. LAWRENCE REPORTED THE REMAINDER OF THE ICE BRIDGE IS GROUNDED AND SHOWED NO CHANGE IN ICE THICKNESS.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C024 04/10/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV	DATE	REVISIONS	BY	CHK	ENGR

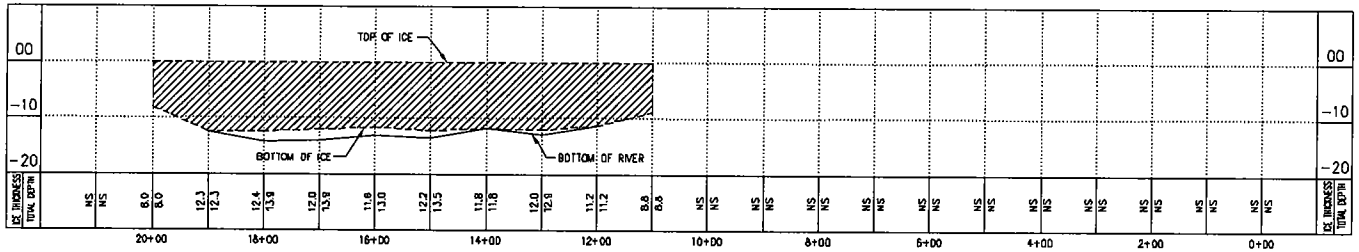
PCN NO:
SCALE: AS NOTED
DRAWN: M. ALEXANDER
REDRAWN FROM
DATE: 04/10/03

CONSULTANT DRAWING NUMBER:

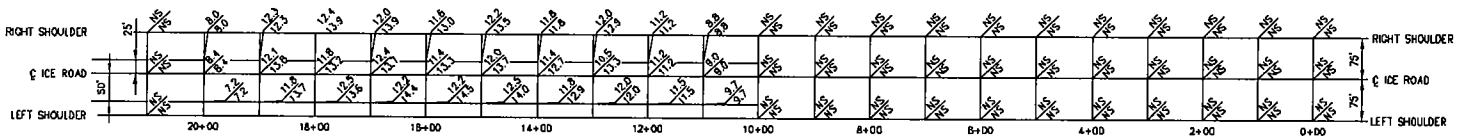
MODULE:
COLVILLE RIVER ICE BRIDGE
PROFILE – 03/25/03
ICE AND WATER DEPTHS

UNIT:

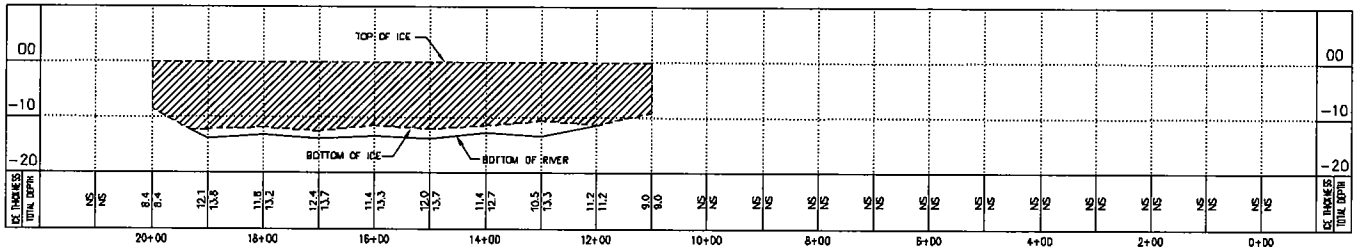
JOB NO: 25288
DRAWING NO: 25288C024
SHEET: 1 of 1



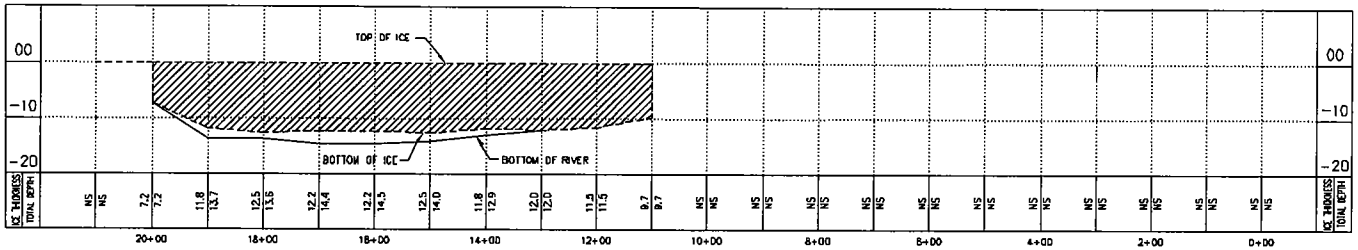
PROFILE – RIGHT SHOULDER



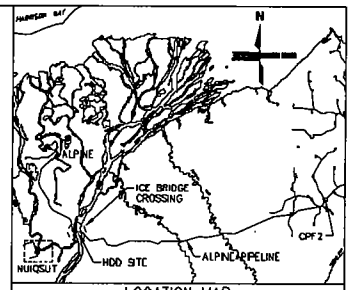
PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER



LOCATION MAP
NOT TO SCALE

N

LEGEND

ICE THICKNESS
TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CENTERLINE PROFILE MEASUREMENTS COMPLETED APRIL 9, 2003 BY ROBERT LEWELLEN.
3. NS – SAMPLE NOT COLLECTED.
4. LEFT SHOULDER DATA COLLECTED 50 FEET SOUTH OF CENTERLINE ON MARCH 25, 2003 BY BILL ST. LAWRENCE.
5. RIGHT SHOULDER DATA COLLECTED 25 FEET NORTH OF CENTERLINE ON MARCH 25, 2003 BY BILL ST. LAWRENCE.

100 0 100 200
HORIZONTAL SCALE IN FEET

25288C025 04/17/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV.	DATE	REVISIONS	BY	CHK	ENGR

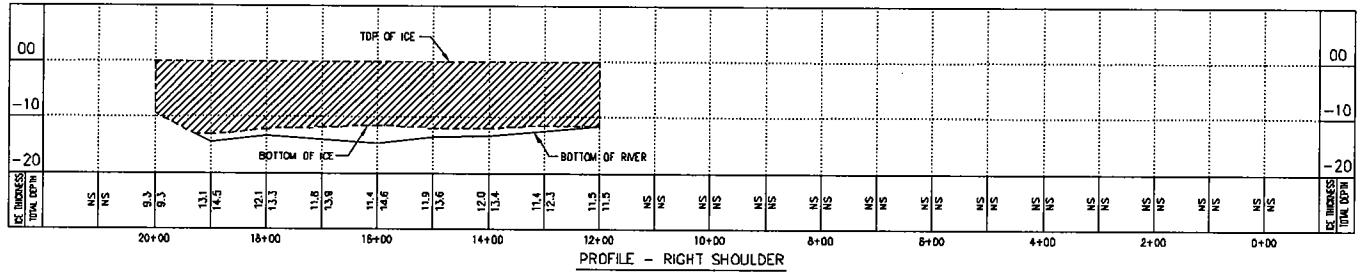
FOR BID: SCALE: AS NOTED DRAWN: M. COX
REDRAWN FROM: DATE: 04/17/03

CONSULTANT DRAWING NUMBER:

MODULE: UNIT:

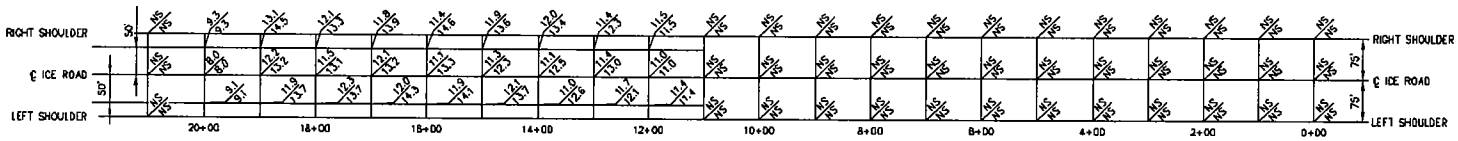
COLVILLE RIVER ICE BRIDGE
PROFILE – 04/09/03
ICE AND WATER DEPTHS

JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
252BB		25288C025	1 OF 1	

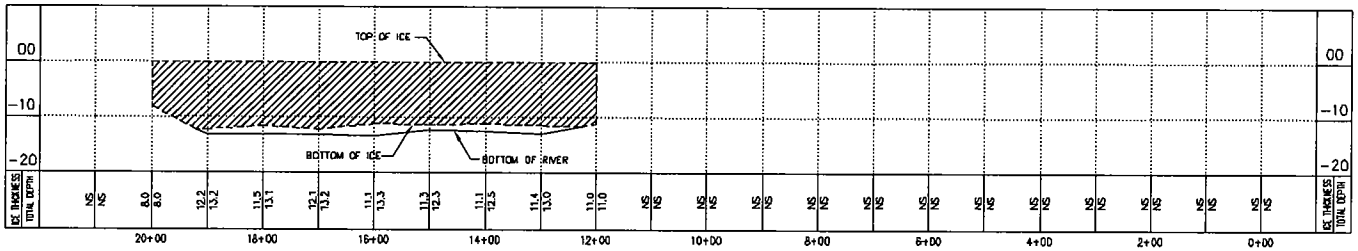


PROFILE – RIGHT SHOULDER

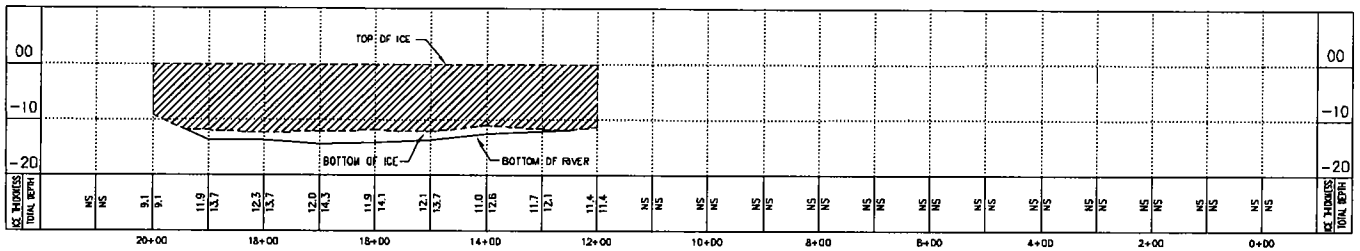
LOCATION MAP
NOT TO SCALE



PLAN



PROFILE – ℄ ICE ROAD



PROFILE – LEFT SHOULDER

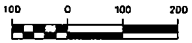
LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE + WATER)

NOTES

1. ALL MEASUREMENTS ARE FROM TOP OF ICE.
2. CENTERLINE PROFILE MEASUREMENTS COMPLETED APRIL 25, 2003 BY ROBERT LEWELLEN.
3. NS – SAMPLE NOT COLLECTED.
4. LEFT SHOULDER DATA COLLECTED 50 FEET SOUTH OF CENTERLINE ON APRIL 25, 2003 BY ROBERT LEWELLEN.
5. RIGHT SHOULDER DATA COLLECTED 50 FEET NORTH OF CENTERLINE ON APRIL 25, 2003 BY ROBERT LEWELLEN.



HORIZONTAL SCALE IN FEET

25288C026 04/29/03

Baker Michael Baker Jr., Inc.

ConocoPhillips

REV.	DATE	REVISIONS	BY	CHK	ENGR

FOR BID: | SCALE: AS NOTED | DRAWN: M. COX | REDRAWN FROM: | DATE: 04/29/03

CONSULTANT DRAWING NUMBER:

MODULE: UNIT:

COLVILLE RIVER ICE BRIDGE
PROFILE – 04/25/03
ICE AND WATER DEPTHS

JOB NO.	SUB JOB NO.	DRAWING NO.	SHEET	REV.
25288		2528BC026	1 OF 1	

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Salinity & Conductivity

Sample Date: February18, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 4:47 p.m.	10.5	3.2	0.2	0.5	187.8	0.2
				2.0	176.8	0.2
				3.5	156.3	0.1
				5.0	154.8	0.1
				6.5	153.8	0.1
				8.0	153.5	0.1
				9.5	152.2	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 4:30 p.m.	11.2	3.2	0.1	0.5	167.8	0.1
				2.0	160.6	0.1
				3.5	156.8	0.1
				5.0	156.0	0.1
				6.5	154.2	0.1
				8.0	153.5	0.1
				9.5	152.2	0.1
				11.0	153.3	0.1
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 4:17 p.m.	12.6	3.2	0.15	0.5	173.7	0.2
				2.0	165.0	0.1
				3.5	155.3	0.1
				5.0	154.8	0.1
				6.5	153.6	0.1
				8.0	153.6	0.1
				9.5	153.1	0.1
				11.0	152.8	0.1
				12.5	153.3	0.1

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 4:00 p.m.	11.2	3.2	0.2	0.5	170.6	0.1
				2.0	164.6	0.1
				3.5	157.5	0.1
				5.0	156.1	0.1
				6.5	155.0	0.1
				8.0	153.8	0.1
				9.5	153.5	0.1
				11.0	161.1	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 3:45 p.m	10.1	3.3	0.2	0.5	167.6	0.1
				2.0	156.2	0.1
				3.5	137.1	0.1
				5.0	135.0	0.1
				6.5	135.2	0.1
				8.0	136.3	0.1
				9.5	141.4	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 3:20 p.m.	11.7	3.0	0.1	0.5	170.9	0.1
				2.0	165.3	0.1
				3.5	157.4	0.1
				5.0	156.4	0.1
				6.5	155.2	0.1
				8.0	154.4	0.1
				9.5	157.8	0.1
				11.0	157.1	0.1

Notes:
(1) All sample location coordinates referenced to NAD27 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Salinity & Conductivity

Sample Date: March 3, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 12:20 p.m. No Apparent Flow	10.9	3.6	0.2	0.5	141.4	0.1
				2.0	135.5	0.1
				3.5	130.9	0.1
				5.0	131.2	0.1
				6.5	132.4	0.1
				8.0	134.9	0.1
				9.5	145.9	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 12:05 p.m. No Apparent Flow	11.6	3.5	0.2	0.5	142.7	0.1
				2.0	140.5	0.1
				3.5	139.1	0.1
				5.0	140.3	0.1
				6.5	143.2	0.1
				8.0	154.8	0.1
				9.5	166.2	0.1
				11.0	170.4	0.1
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 11:50 a.m. No Apparent Flow	12.7	3.7	0.2	0.5	194.0	0.2
				2.0	178.0	0.2
				3.5	168.7	0.1
				5.0	166.5	0.1
				6.5	165.0	0.1
				8.0	163.8	0.1
				9.5	162.3	0.1
				11.0	163.3	0.1
				12.5	165.7	0.1

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 12:35 p.m. No Apparent Flow	11.1	3.5	0.2	0.5	184.2	0.2
				2.0	174.1	0.2
				3.5	166.8	0.1
				5.0	164.9	0.1
				6.5	164.2	0.1
				8.0	162.9	0.1
				9.5	164.8	0.1
				11.0	166.6	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 12:50 p.m No Apparent Flow	10.0	3.7	0.1	0.5	178.3	0.2
				2.0	172.7	0.2
				3.5	168.2	0.1
				5.0	166.8	0.1
				6.5	165.7	0.1
				8.0	163.8	0.1
				9.5	164.3	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 1:00 p.m. No Apparent Flow	11.6	3.4	0.2	0.5	170.8	0.2
				2.0	170.1	0.1
				3.5	166.4	0.1
				5.0	166.0	0.1
				6.5	165.0	0.1
				8.0	164.2	0.1
				9.5	164.7	0.1
				11.0	164.9	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth and water depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Salinity & Conductivity

Sample Date: March 17, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 10:15 a.m. No Apparent Flow	11.1	3.5	0.2	0.5	172.5	0.2
				2.0	170.8	0.1
				3.5	168.2	0.1
				5.0	167.5	0.1
				6.5	166.3	0.1
				8.0	166.0	0.1
				9.5	165.5	0.1
				11.0	165.1	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 10:00 a.m. No Apparent Flow	11.6	3.6	0.1	0.5	150.5	0.1
				2.0	147.3	0.1
				3.5	147.3	0.1
				5.0	143.3	0.1
				6.5	142.2	0.1
				8.0	141.9	0.1
				9.5	141.4	0.1
				11.0	159.5	0.1
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 9:45 a.m. No Apparent Flow	12.8	3.8	0.2	0.5	175.8	0.2
				2.0	173.7	0.2
				3.5	171.7	0.2
				5.0	170.0	0.1
				6.5	169.1	0.1
				8.0	167.9	0.1
				9.5	167.0	0.1
				11.0	166.9	0.1
				12.5	167.1	0.1

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 10:25 a.m. No Apparent Flow	11.2	3.5	0.1	0.5	177.9	0.2
				2.0	175.7	0.2
				3.5	172.5	0.2
				5.0	169.9	0.1
				6.5	167.4	0.1
				8.0	169.3	0.1
				9.5	169.3	0.1
				11.0	169.5	0.1
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 10:45 a.m No Apparent Flow	10.3	3.7	0.2	0.5	181.5	0.2
				2.0	172.7	0.2
				3.5	172.8	0.2
				5.0	170.9	0.1
				6.5	170.0	0.1
				8.0	169.4	0.1
				9.5	169.0	0.1
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 11:00 a.m. No Apparent Flow	11.7	3.4	0.2	0.5	179.5	0.2
				2.0	174.6	0.2
				3.5	177.8	0.1
				5.0	170.2	0.1
				6.5	169.2	0.1
				8.0	168.9	0.1
				9.5	169.0	0.1
				11.0	172.5	0.1

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth and water depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Salinity & Conductivity

Sample Date: March 31, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 9:45 a.m. No Apparent Flow	11.1	4.2	0.2	0.5	184.6	0.2
				2.0	181.3	0.2
				3.5	179.3	0.2
				5.0	178.1	0.2
				6.5	176.6	0.2
				8.0	175.6	0.2
				9.5	174.0	0.2
				11.0	172.9	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 9:30 a.m. No Apparent Flow	11.5	4.2	0.2	0.5	180.8	0.2
				2.0	179.9	0.2
				3.5	178.0	0.2
				5.0	177.7	0.2
				6.5	175.5	0.2
				8.0	174.7	0.2
				9.5	173.8	0.1
				11.0	172.7	0.1
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 9:15 a.m. No Apparent Flow	12.7	4.0	0.2	0.5	186.9	0.2
				2.0	181.4	0.2
				3.5	179.0	0.2
				5.0	177.2	0.2
				6.5	176.3	0.2
				8.0	175.3	0.2
				9.5	174.1	0.2
				11.0	173.2	0.1
				12.5	176.4	0.2

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 10:00 a.m. No Apparent Flow	11.8	4.2	0.2	0.5	179.3	0.1
				2.0	178.0	0.2
				3.5	176.3	0.2
				5.0	176.2	0.2
				6.5	175.9	0.2
				8.0	176.6	0.2
				9.5	176.9	0.2
				11.0	179.3	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 10:15 a.m No Apparent Flow	10.7	4.3	0.2	0.5	191.7	0.2
				2.0	182.2	0.2
				3.5	181.9	0.2
				5.0	176.9	0.2
				6.5	176.3	0.2
				8.0	176.4	0.2
				9.5	176.0	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 10:30 a.m. No Apparent Flow	12.0	3.7	0.2	0.5	182.5	0.1
				2.0	181.5	0.2
				3.5	180.8	0.2
				5.0	179.1	0.2
				6.5	177.2	0.2
				8.0	176.5	0.2
				9.5	177.0	0.2
				11.0	178.5	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth and water depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: April 14, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 9:00 a.m. No Apparent Flow	11.7	4.3	0.3	0.5	187.3	0.1
				2.0	185.5	0.2
				3.5	183.2	0.2
				5.0	182.6	0.2
				6.5	181.4	0.2
				8.0	180.8	0.2
				9.5	180.4	0.2
				11.0	180.5	0.1
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 8:50 a.m. No Apparent Flow	11.9	4.3	0.2	0.5	185.1	0.2
				2.0	184.6	0.2
				3.5	183.5	0.2
				5.0	183.3	0.2
				6.5	182.8	0.2
				8.0	181.9	0.2
				9.5	181.5	0.2
				11.0	181.2	0.2
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 8:40 a.m. No Apparent Flow	12.6	4.4	0.3	0.5	187.0	0.1
				2.0	182.7	0.2
				3.5	182.2	0.2
				5.0	181.9	0.2
				6.5	180.4	0.2
				8.0	179.8	0.2
				9.5	179.5	0.2
				11.0	179.2	0.2
				12.5	180.7	0.2

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 9:15 a.m. No Apparent Flow	11.4	4.3	0.2	0.5	184.3	0.2
				2.0	183.7	0.2
				3.5	183.1	0.2
				5.0	183.4	0.2
				6.5	182.4	0.2
				8.0	182.3	0.2
				9.5	183.0	0.2
				11.0	185.9	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 9:25 a.m No Apparent Flow	10.2	4.5	0.3	0.5	189.9	0.2
				2.0	186.3	0.2
				3.5	184.5	0.2
				5.0	184.3	0.2
				6.5	183.0	0.2
				8.0	182.5	0.2
				9.5	183.0	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 9:30 a.m. No Apparent Flow	11.8	4.2	0.2	0.5	183.3	0.2
				2.0	185.9	0.2
				3.5	184.8	0.2
				5.0	184.3	0.2
				6.5	183.0	0.2
				8.0	182.9	0.2
				9.5	183.7	0.2
				11.0	184.2	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth and water depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program

Water Quality - Salinity & Conductivity

Sample Date: April 28, 2003

Upstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Upstream N70°14'14.8" W150°49'52.3" Sampled at 9:40 a.m. No Apparent Flow	11.6	4.6	0.2	0.5	195.7	0.2
				2.0	191.7	0.2
				3.5	190.0	0.2
				5.0	189.2	0.2
				6.5	188.4	0.2
				8.0	188.5	0.2
				9.5	188.0	0.2
				11.0	188.3	0.2
800-ft Upstream N70°14'10.9" W150°49'49.8" Sampled at 9:30 a.m. No Apparent Flow	11.9	4.6	0.2	0.5	194.5	0.2
				2.0	189.4	0.2
				3.5	188.0	0.2
				5.0	188.0	0.2
				6.5	187.4	0.2
				8.0	187.3	0.2
				9.5	187.1	0.2
				11.0	187.2	0.2
1200-ft Upstream N70°14'07.0" W150°49'47.2" Sampled at 9:15 a.m. No Apparent Flow	11.9	4.7	0.2	0.5	192.0	0.2
				2.0	187.1	0.2
				3.5	186.7	0.2
				5.0	185.9	0.2
				6.5	186.2	0.2
				8.0	186.5	0.2
				9.5	187.3	0.2
				11.0	187.4	0.2

Downstream Sample Location and Time	Water Depth (ft)	Ice Thickness (ft)	Free-board (ft)	Sample Depth (ft)	Conductivity (µS/cm)	Salinity (ppt)
400-ft Downstream N70°14'23.2" W150°49'58.9" Sampled at 9:50 a.m. No Apparent Flow	11.6	4.5	0.3	0.5	186.7	0.2
				2.0	183.7	0.2
				3.5	185.8	0.2
				5.0	186.5	0.2
				6.5	187.4	0.2
				8.0	188.3	0.2
				9.5	188.7	0.2
				11.0	189.7	0.2
800-ft Downstream N70°14'27.2" W150°50'01.0" Sampled at 9:55 a.m No Apparent Flow	10.5	4.4	0.2	0.5	195.7	0.2
				2.0	191.2	0.2
				3.5	187.5	0.2
				5.0	187.5	0.2
				6.5	187.5	0.2
				8.0	187.4	0.2
				9.5	188.2	0.2
1200-ft Downstream N70°14'31.0" W150°50'06.3" Sampled at 10:05 a.m. No Apparent Flow	11.3	4.7	0.3	0.5	183.7	0.2
				2.0	189.8	0.2
				3.5	187.3	0.2
				5.0	187.7	0.2
				6.5	187.5	0.2
				8.0	188.0	0.2
				9.5	190.0	0.2
				11.0	194.2	0.2

Notes:

(1) All sample location coordinates referenced to NAD27 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth and water depth is measured from the water surface.

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: February 9-10, 2003
Project Code: 100259	Submitted by: Michael T. Alexander

Weather: -10° F, Wind @ 30-35 mph, Blowing Snow

Michael Cox and Eric Goudey arrived at Alpine on Sunday, February 9, 2003 at 6:30 PM in order to initiate the baseline monitoring of the Colville River Ice Bridge. The Tucker was out of service, and the Hagland was unavailable. The only option for traveling to the ice bridge was snowmachines. It was decided that the blowing snow presented a safety concern, and the decision was made to return to Anchorage and await a break in the weather.

After discussions with Patrick Walsh at Peak, it was determined that it would be at least another 3 to 4 days until the beginning of construction of the ice bridge. At 12:30 on February 10, 2003, the crew returned to Anchorage with plans to return the following week.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: February 18-19, 2003
Project Code: 100259	Submitted by: Michael T. Alexander

Weather: -28° F, Wind @ 0-5 mph, Partly Cloudy

Michael Alexander and Eric Goudey arrived at Alpine on Tuesday, February 18, 2003 at 10:30 AM. The purpose of the trip was to initiate the baseline monitoring of the Colville River Ice Bridge. As the Casa flew over the bridge, it was noted that snow removal had not yet begun on the river. However, some work had been completed on the eastern ramp leading down the riverbank.

Gear was assembled and LCMF drove the crew to the ice bridge in the Tucker. Sample locations were identified based on the 2002 sampling coordinates. In the field it was confirmed that the bridge crossing was in the same location as last year. Salinity and Conductivity were measured at six locations and are tabulated in the attached spreadsheet. The snow was being removed from the centerline of the ice bridge during the sampling; however, ice road construction had not yet begun.

At 7:30 AM on February 19, 2003, the crew left Alpine and returned to Anchorage. A follow-up trip will be planned for March 4, 2003 in order to satisfy the permit stipulations as set forth by ADF&G.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: March 3-4, 2003
Project Code: 100259	Submitted by: Mike Cox, P.E.

Weather: 10° F, Wind @ 0-5 mph, Partly Cloudy

Mike Cox arrived at Alpine on Monday, March 3, 2003 at 9:10 AM. The purpose of the trip was to conduct the bi-weekly monitoring of the Colville River Ice Bridge.

Gear was assembled and LCMF drove Mr. Cox to the ice bridge in the Tucker. Salinity and Conductivity were measured at six locations and are tabulated in the attached spreadsheet. Construction of the ice bridge appeared to be complete.

At 8:30 AM on March 4, 2003, Mr. Cox left Alpine and returned to Anchorage. A follow-up trip will be planned for March 17, 2003 in order to satisfy the permit stipulations as set forth by ADF&G.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: March 16-17, 2003
Project Code: 100259	Submitted by: Jon Wolf

Weather: 5° F, Wind @ 5-7 mph, Mostly Clear.

Jon Wolf arrived at Alpine on Sunday, March 16, 2003 at 4:30 PM. The purpose of the trip was to conduct the bi-weekly monitoring of the Colville River Ice Bridge. Tony Hoffman of LCMF was contacted and a plan made for departure the following morning. An attempt was made to contact Alpine environmental coordinator Shellie Colegrove, but she was not in her office.

At 7:30 AM on March 17, gear was assembled and LCMF (Brad Lobdell) drove Mr. Wolf to the ice bridge in the Tucker. Water depth, ice thickness, freeboard, salinity and conductivity were measured at the predetermined upstream and downstream sampling locations. A qualitative flow determination was also made at each location. Results are tabulated in the attached spreadsheet. We learned that the bridge was due to open to traffic on the following day, March 18.

At 2:30 PM on March 17, 2003, Mr. Wolf left Alpine and returned to Anchorage via Deadhorse. Prior to departure, Mr. Wolf contacted Shellie Colegrove.

The next ice bridge monitoring event is planned for March 31, 2003. Jon Wolf is scheduled to conduct the monitoring.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: March 30-31, 2003
Project Code: 100259	Submitted by: Jon Wolf

Weather: -10°F, Wind @ 5-7 mph, Clear.

Jon Wolf arrived at Alpine on Sunday, March 30, 2003 at 9:30 pm. The purpose of the trip was to conduct the bi-weekly monitoring of the Colville River Ice Bridge.

At 7:00 am on March 31, gear was assembled and LCMF (Jack Tippleman) drove Mr. Wolf to the ice bridge in the Tucker. Water depth, ice thickness, freeboard, salinity and conductivity were measured at the predetermined upstream and downstream sampling locations. A qualitative flow determination was also made at each location. Results are tabulated in the attached spreadsheet. The bridge had been opened to traffic since March 18.

At 2:30 pm on March 31, Mr. Wolf departed Alpine and returned to Anchorage via Deadhorse.

The next ice bridge monitoring event is planned for April 14, 2003. Jon Wolf is again scheduled to conduct the monitoring.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: April 13-15, 2003
Project Code: 100259	Submitted by: Jon Wolf

Weather: 20°F, Wind @ 3-5 mph, Clear.

Jon Wolf arrived at Alpine on Sunday, April 13, 2003. The purpose of the trip was to conduct the bi-weekly monitoring of the Colville River Ice Bridge.

At 7:30 am on April 14, gear was assembled and LCMF (Jack Tippleman) drove Mr. Wolf to the ice bridge in the Hagglund. Water depth, ice thickness, freeboard, salinity and conductivity were measured at the predetermined upstream and downstream sampling locations. A qualitative flow determination was also made at each location. Results are tabulated in the attached spreadsheet.

At 8:30 am on April 15, Mr. Wolf departed Alpine and returned to Anchorage via Kuparuk. His planned departure on the afternoon of April 14 was cancelled due to fog.

The next ice bridge monitoring event is planned for April 28, 2003. Jon Wolf is again scheduled to conduct the monitoring.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: April 27-29, 2003
Project Code: 100259	Submitted by: Jon Wolf

Weather: 25°F, Wind @ 0-2 mph, Cloudy.

Jon Wolf arrived at Alpine on Sunday, April 27, 2003. The purpose of the trip was to conduct the final bi-weekly monitoring of the Colville River Ice Bridge. He learned upon arrival at Alpine that the ice road had been closed for the season the previous day.

At 8:00 am on April 28, gear was assembled and LCMF (Jack Tippleman) drove Mr. Wolf to the ice bridge in the Hagglund. Water depth, ice thickness, freeboard, salinity and conductivity were measured at the predetermined upstream and downstream sampling locations. A qualitative flow determination was also made at each location. Results are tabulated in the attached spreadsheet.

At 10:30 am on April 29, Mr. Wolf departed Alpine and returned to Anchorage via Kuparuk.

This was the last ice bridge monitoring event for the 2003 season.

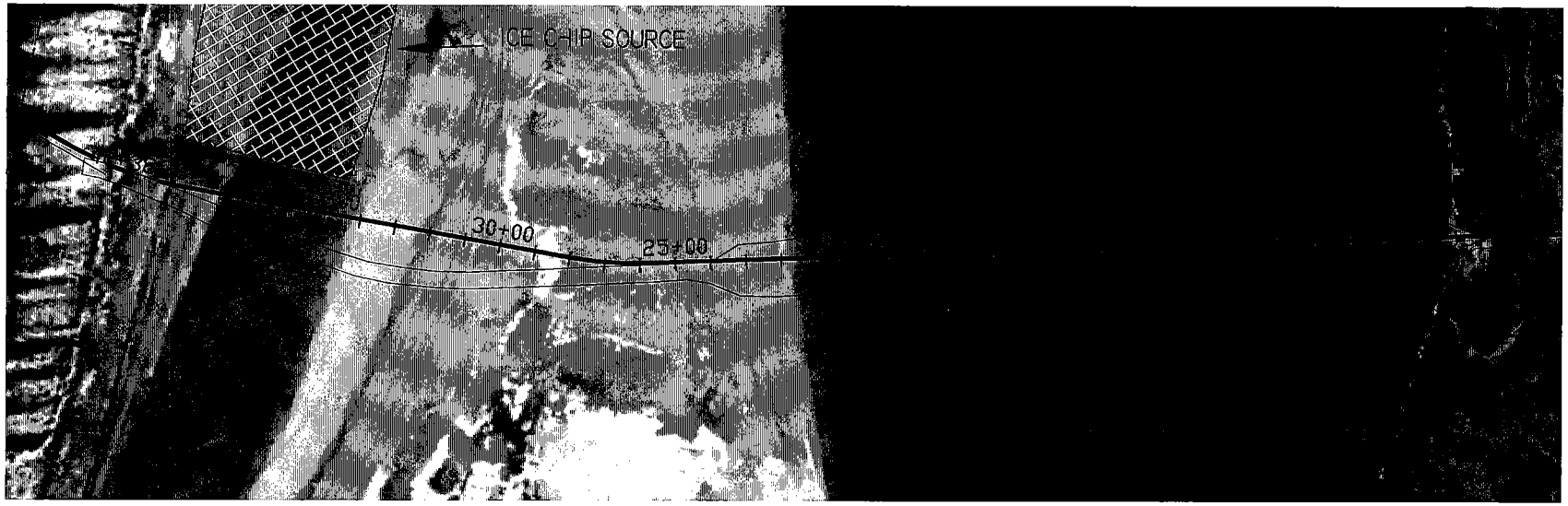
ConocoPhillips

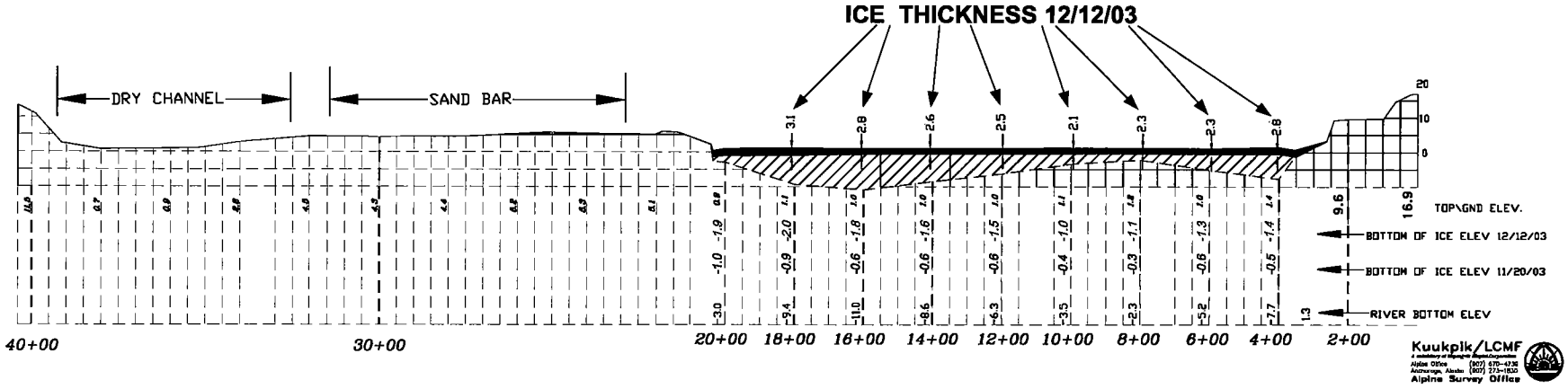
Winter 2003/2004

Colville River Ice Bridge Monitoring

Baker

Note:
Date of Survey 11/18/03 AND 12/12/03





Kuukpik/LCMF
Alpine Office (907) 670-4736
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

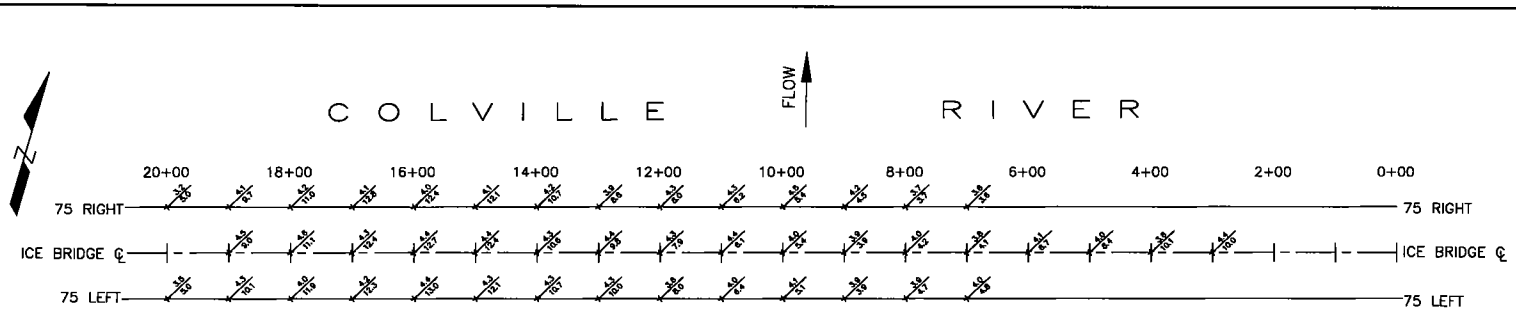
REV	DATE	REVISION	BY	CHK	JOB	PROJ
1	12/12/03	NEW ICE THICKNESS MEASEUREMENTS ADDED	TH	TH		

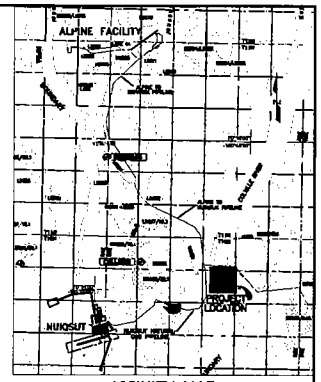
DRAWN:	DESIGN:	ECM NO:	
CHECKED:	APPROVAL:	CC NO:	
SCALE: as shown	DATE:	CADD FILENAME:	

ConocoPhillips Alaska, Inc.

COLVILLE RIVER PROFILE
2003-2004 Exploration

JOB NO:	SUB JOB NO:	DRAWING NO:	PART:	REV:
03-10-23-1C			OF	

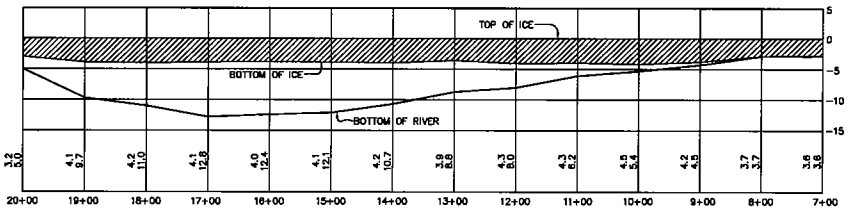




VICINITY MAP
NOT TO SCALE

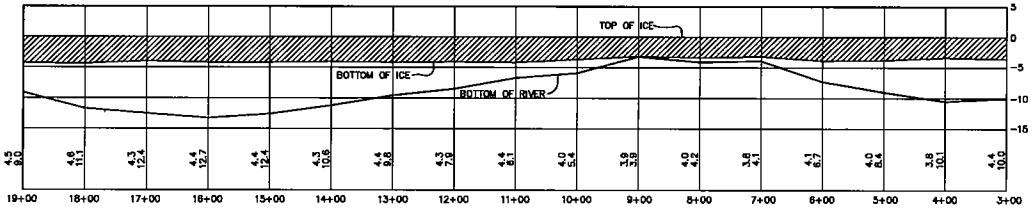
PROFILES

PROFILE 75' RIGHT (NORTH)



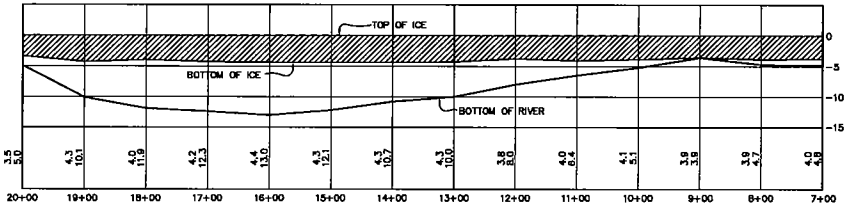
HORIZONTAL SCALE 1"=100'
VERTICAL SCALE 1"=10'

PROFILE CENTERLINE



HORIZONTAL SCALE 1"=100'
VERTICAL SCALE 1"=10'

PROFILE 75' LEFT (SOUTH)



HORIZONTAL SCALE 1"=100'
VERTICAL SCALE 1"=10'

LEGEND:
ICE THICKNESS
TOTAL DEPTH (ICE & WATER)

NOTES:
1. PROFILE DATA PROVIDED BY BOB LEWELLEN COMPLETED JANUARY 4, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

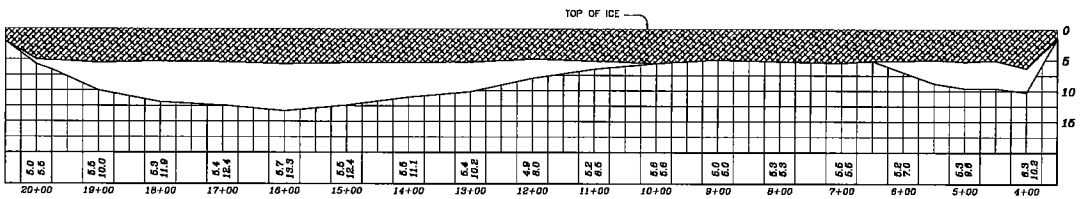
COLVILLE RIVER
ICE BRIDGE PROFILE
1/4/2004

ALPINE, ALASKA

Kuukpik/LCMF
Alpine Office (907) 670-4738
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

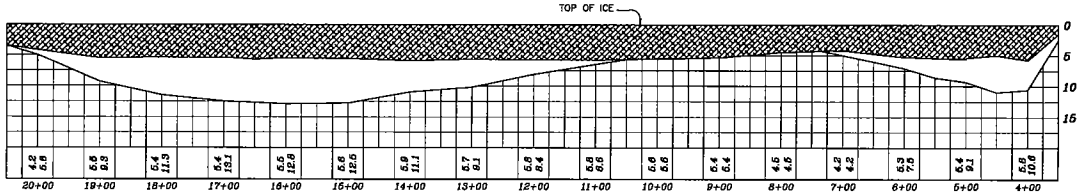
DATE:	1/8/04	SCALE:	1"=100'
CHECKED BY:	TH	SHEET:	1/1
DRAWN BY:	GD	SWR #:	03-10-23-1H

DRAWING: 03-10-23-1H REV1



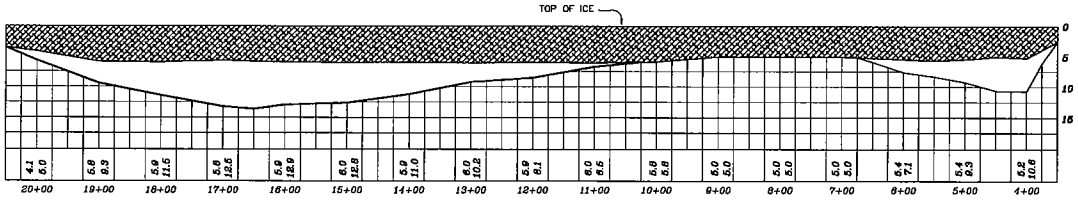
Left Shoulder (75 feet South) Profile

1"=100' Horiz
1"=10' Vertical



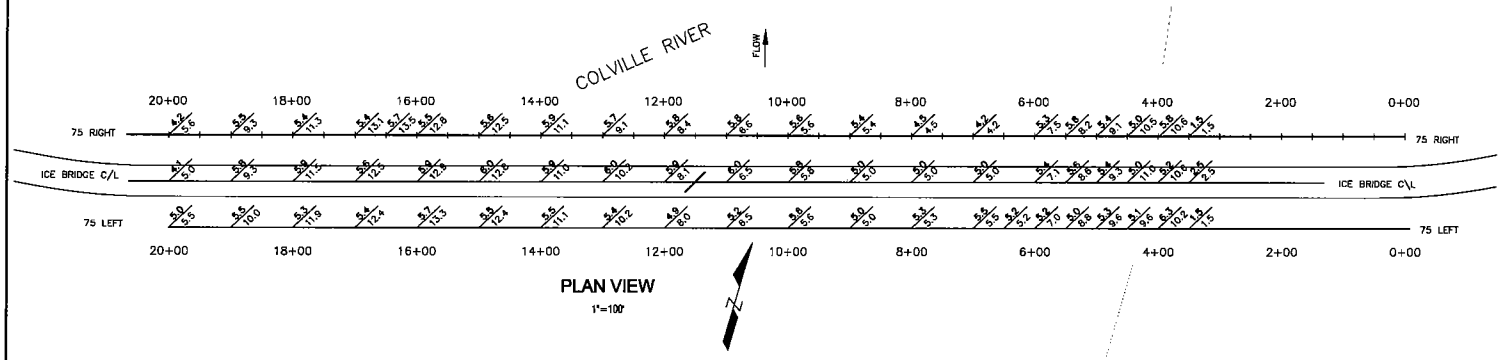
Right Shoulder (75 feet North) Profile

1"=100' Horiz
1"=10' Vertical



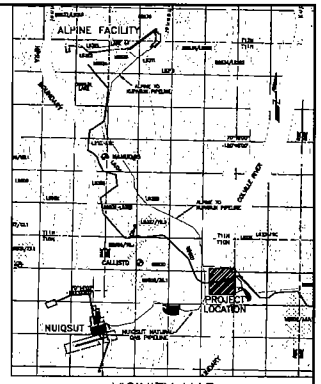
Centerline Profile

1"=100' Horiz
1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS
TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 5.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 15, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

1/15/2004

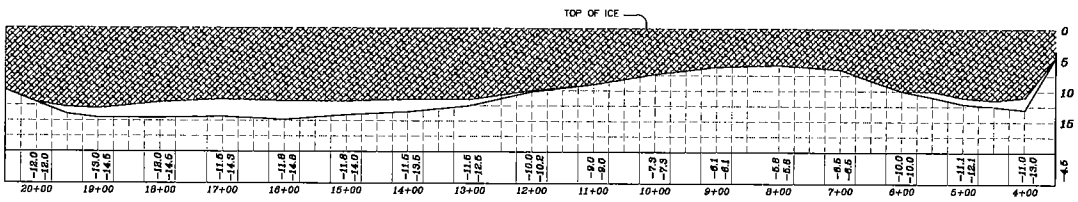
ALPINE, ALASKA

Kuukpik/LCMF
A subsidiary of Kuukpik Alaskan Corporation
Alpine Office (907) 670-4239
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

DATE:	1/15/2004	SCALE:	AS SHOWN
CHECKED BY:	JASON C.	SHEET:	1/1
DRAWN BY:	TH	SWR #:	03-10-23-1H

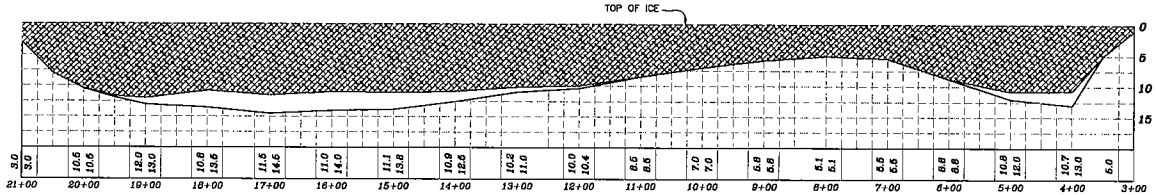
1

DRAWING: 03-10-23-1H REV3



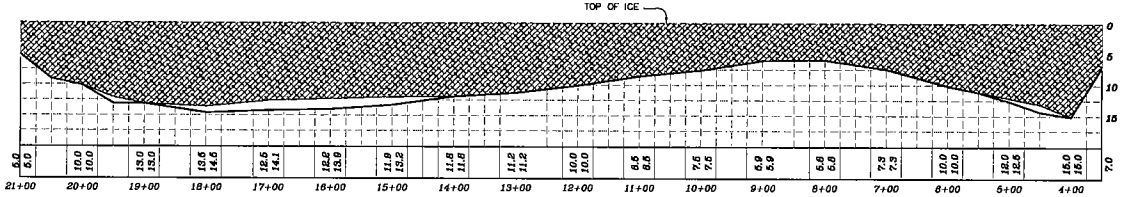
Left Shoulder (75 feet South) Profile

1" = 100' Horiz
1" = 10' Vertical



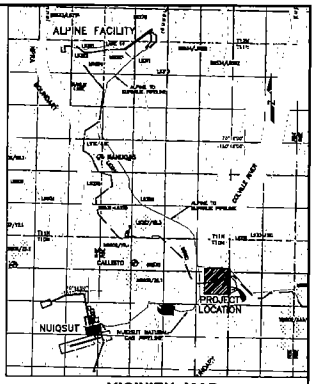
Right Shoulder (75 feet North) Profile

1" = 100' Horiz
1" = 10' Vertical



Centerline Profile

1" = 100' Horiz
1" = 10' Vertical



VICINITY MAP
NOT TO SCALE

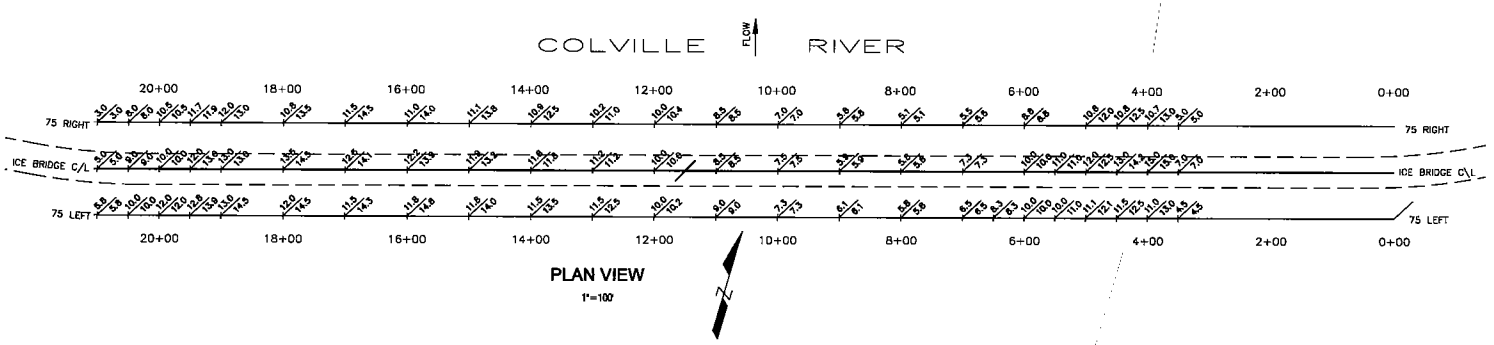
LEGEND

ICE THICKNESS
TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED FEBRUARY 23 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

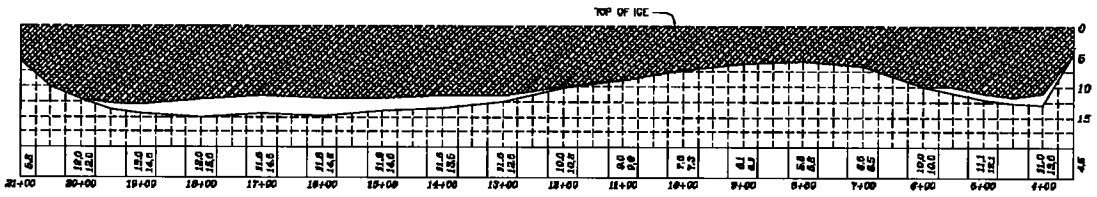


PLAN VIEW

1"=100'

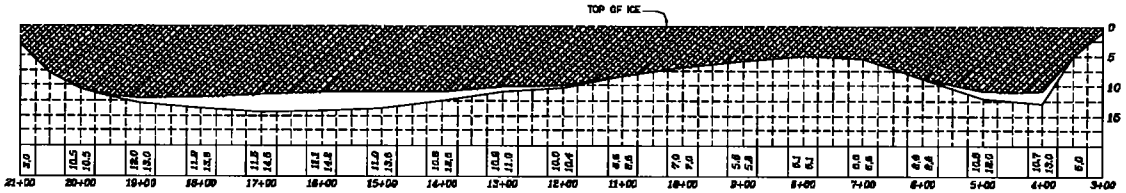
CONOCO PHILLIPS ALASKA		
COLVILLE RIVER ICE BRIDGE PROFILE 2/04/2004 ALPINE, ALASKA		
Kuukpik/LCMF Alpine Office (907) 670-4739 Anchorage, Alaska (907) 273-1830 Alpine Survey Office		
DATE: 2/25/2004	SCALE: AS SHOWN	1
CHECKED BY: TH	SHEET: 1/1	
DRAWN BY: CZ	SWR #: 03-10-23-1H	

DRAWING: 03-10-23-1H REV6



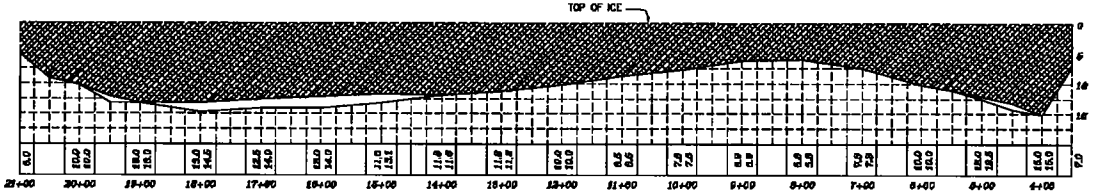
Left Shoulder (75 feet South) Profile

1"=100' Horiz
1"=10' Vertical



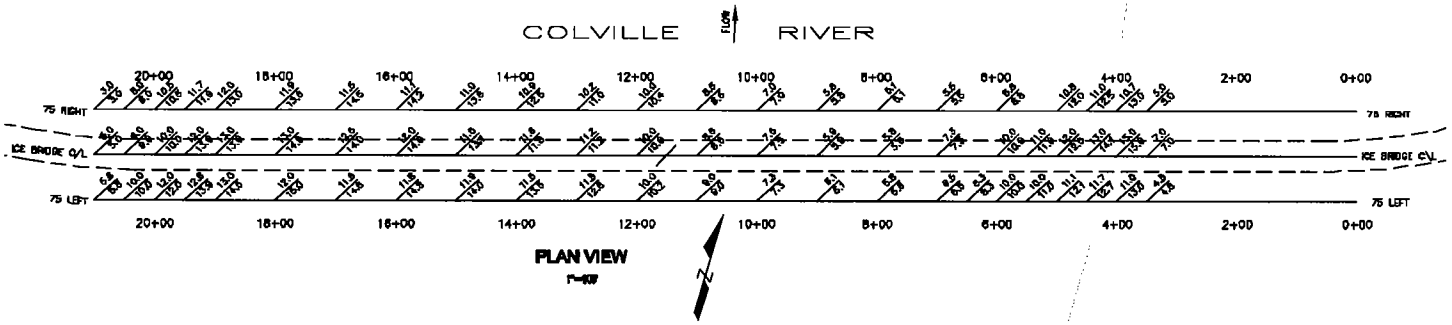
Right Shoulder (75 feet North) Profile

1"=100' Horiz
1"=10' Vertical

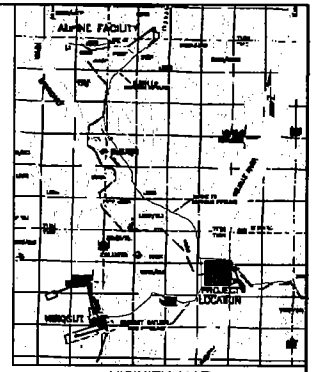


Centerline Profile

1"=100' Horiz
1"=10' Vertical

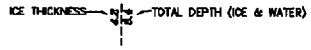


PLAN VIEW



VICINITY MAP
NOT TO SCALE

LEGEND



NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED MARCH 4, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

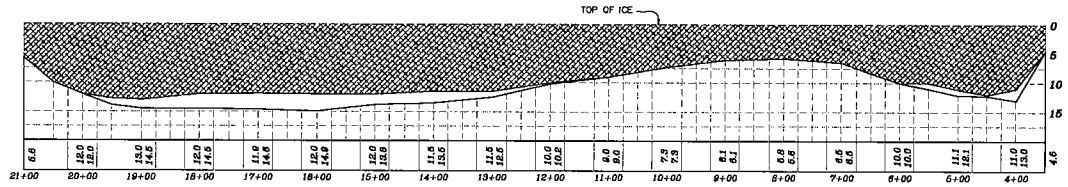
COLVILLE RIVER
ICE BRIDGE PROFILE
3/04/2004

ALPINE, ALASKA

Kuukpik/LCMF
Alpine Survey Office

DATE: 3/04/2004	SCALE: AS SHOWN		1
CHECKED BY: BD	SHEET: 1/1		
DRAWN BY: DZ	DWG #: 03-10-23-1H		

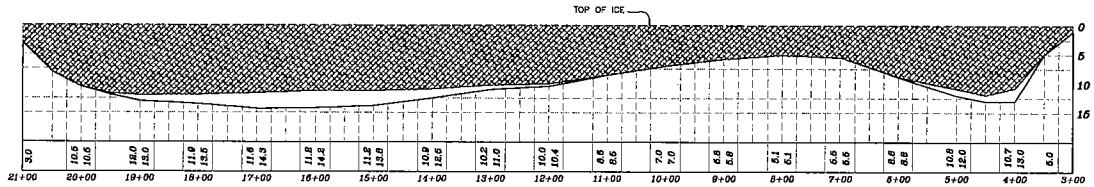
DRAWING: 03-10-23-1H REV7



Left Shoulder (75 feet South) Profile

1" = 100' Horiz

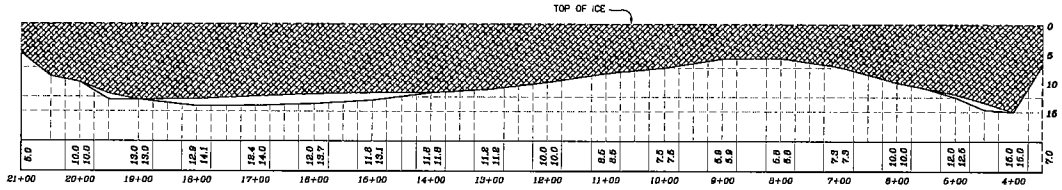
1" = 10' Vertical



Right Shoulder (75 feet North) Profile

1" = 100' Horiz

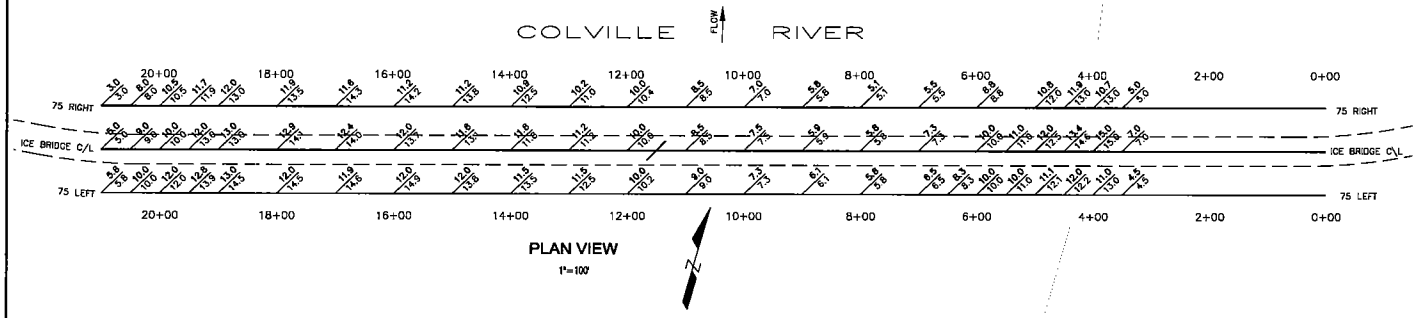
1" = 10' Vertical



Centerline Profile

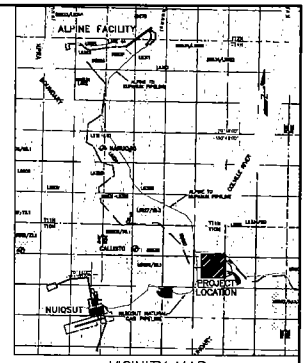
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1" = 100'



VICINITY MAP

NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LEWELLAN COMPLETED MARCH 15, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

3/15/2004

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Kuukpik Arctic Corporation

Alpine Office (907) 670-4739

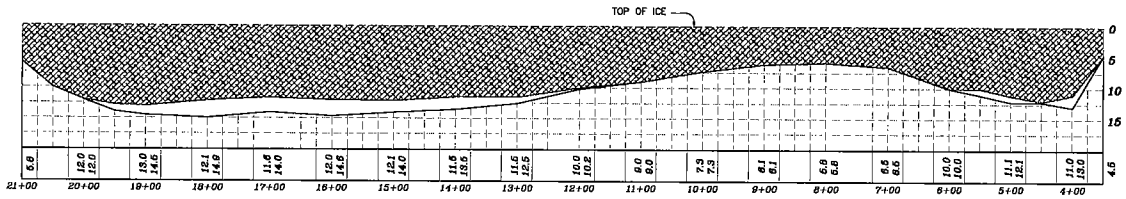
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	3/15/2004	SCALE:	AS SHOWN
CHECKED BY:	BO	SHEET:	1/1
DRAWN BY:	C2	SWR #:	03-10-23-1H

1

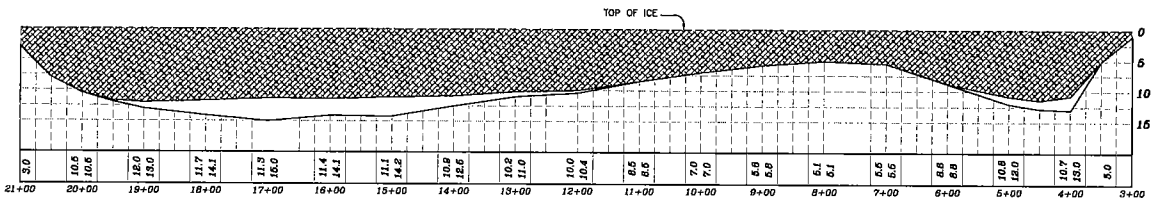
DRAWING: 03-10-23-1H REVB



Left Shoulder (75 feet South) Profile

1" = 100' Horiz

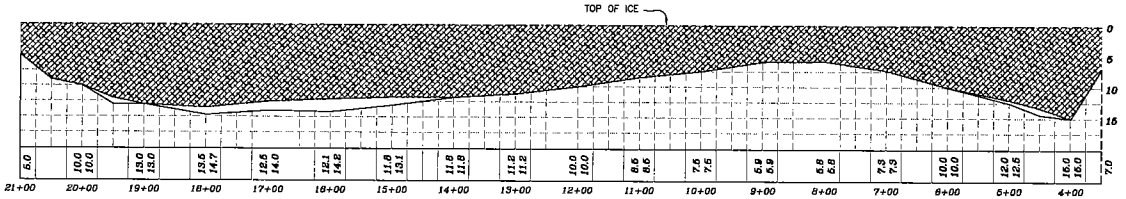
1" = 10' Vertical



Right Shoulder (75 feet North) Profile

1" = 100' Horiz

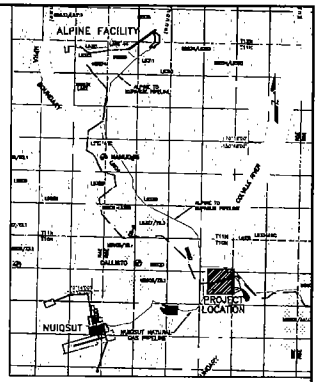
1" = 10' Vertical



Centerline Profile

1" = 100' Horiz

1" = 10' Vertical



VICINITY MAP

NOT TO SCALE

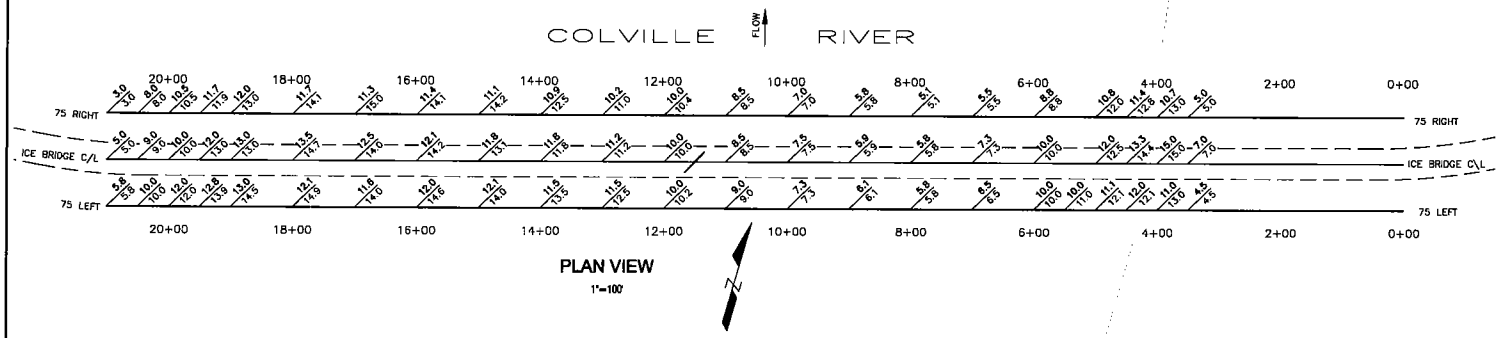
LEGEND

9.4 / 15 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LEWELLAN COMPLETED MARCH 27, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.



PLAN VIEW

1"=100'

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

3/27/2004

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Olgoonik Eskimo Corporation

Alpine Office (907) 670-4739

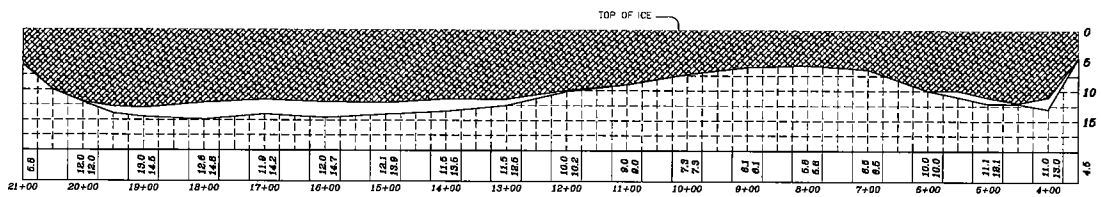
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	3/27/2004	SCALE:	AS SHOWN
CHECKED BY:	BD	SHEET:	1/1
DRAWN BY:	CZ	SWR #:	03-10-23-1H

1

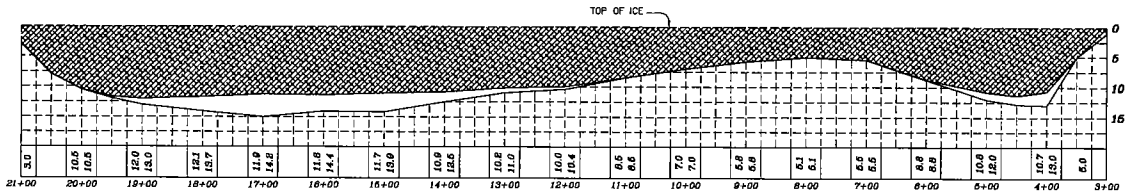
DRAWING: 03-10-23-1H REV9



Left Shoulder (75 feet South) Profile

1" = 100' Horiz

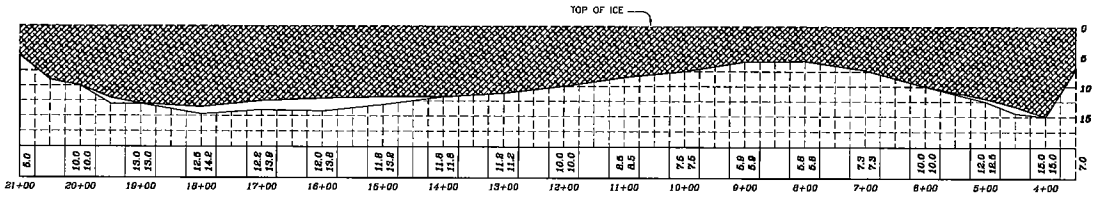
1" = 10' Vertical



Right Shoulder (75 feet North) Profile

1" = 100' Horiz

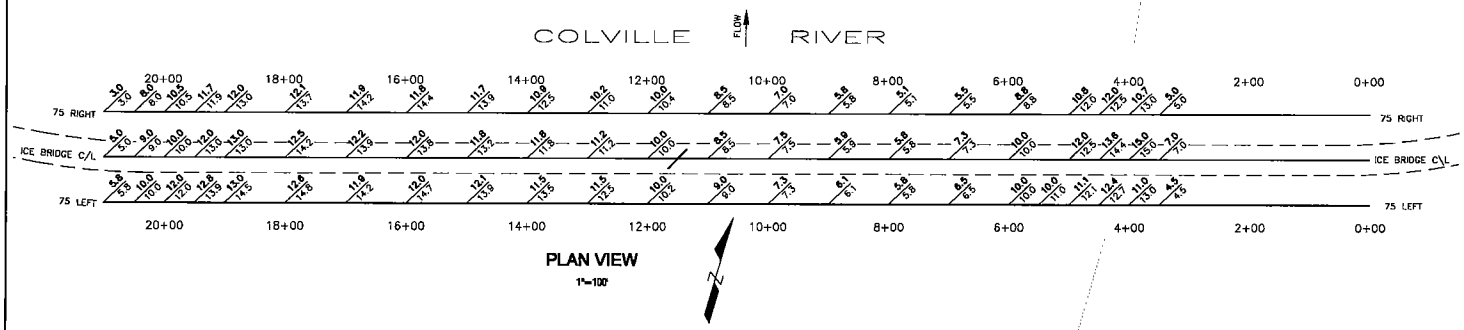
1" = 10' Vertical



Centerline Profile

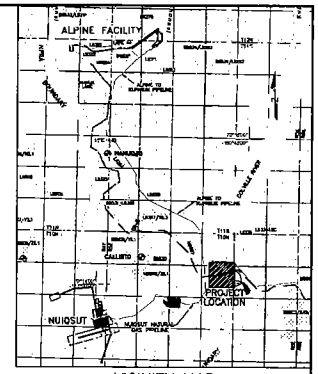
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LEWELLAN COMPLETED APRIL 10, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

4/10/2004

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Kuukpik Corporation

Alpine Office (907) 670-4338

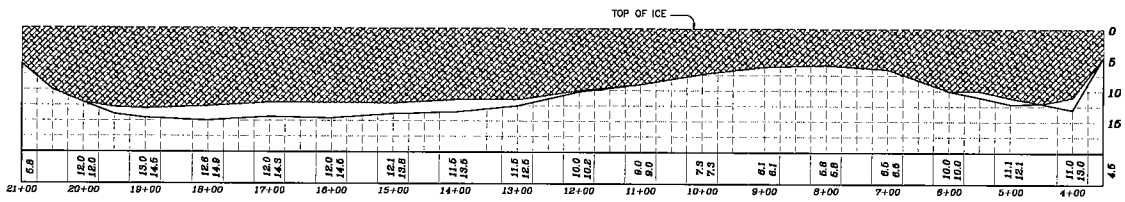
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	4/11/2004	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	AG	SWR #:	03-10-23-1H

1

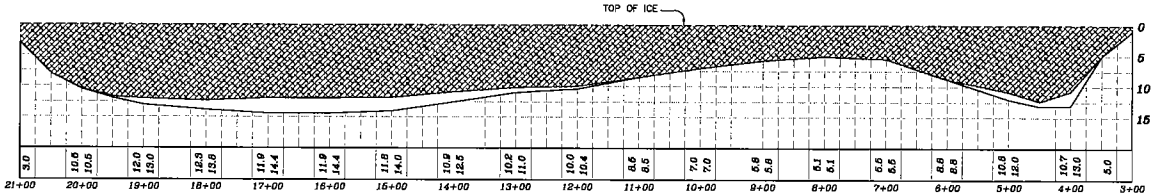
DRAWING: 03-10-23-1H REV10



Left Shoulder (75 feet South) Profile

1" = 100' Horiz

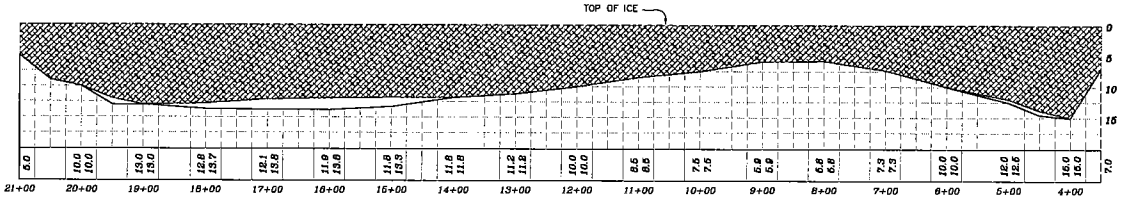
1" = 10' Vertical



Right Shoulder (75 feet North) Profile

1" = 100' Horiz

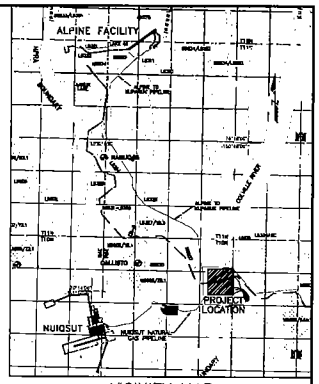
1" = 10' Vertical



Centerline Profile

1" = 100' Horiz

1" = 10' Vertical



VICINITY MAP
NOT TO SCALE

LEGEND

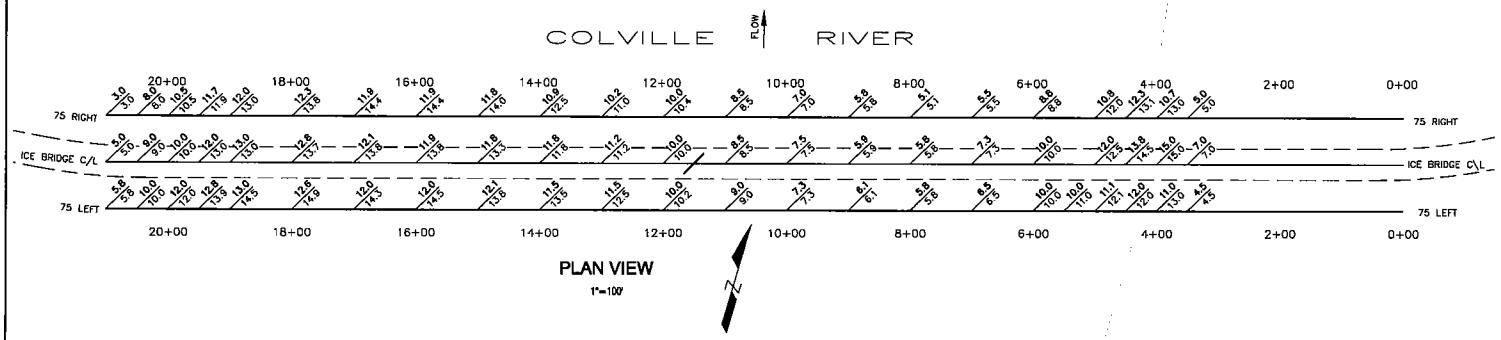
ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LEWELLAN COMPLETED APRIL 25, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.



PLAN VIEW

1"=100'

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

4/25/2004

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Kuukpik Corporation

Alpine Office (907) 670-4239

Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	4/25/2004	SCALE:	AS SHOWN
CHECKED BY:	BD	SHEET:	1/1
DRAWN BY:	CZ	SWR #:	03-10-23-1H

1

DRAWING: 03-10-23-1H REV11

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: April 15, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 12:49 PM	12.0	5.5	0.2	6.0	0.8	97.8	1045.0	0.01[3]
				7.0	0.4	76.8	1567.0	0.01[3]
				8.0	0.6	72.0	1946.0	ND[5]
				9.0	0.7	65.7	2685.0	0.01[3]
				10.0	0.6	58.7	4374.0	ND[5]
				11.0	0.8	59.7	4750.0	ND[5]
				12.0	1.0	64.5	5220.0	0.01[3]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 1:35 PM	13.0	6.5	0.5	7.0	0.7	82.4	1727.0	ND[5]
				8.0	0.7	69.8	2100.0	- 0.02[3]
				9.0	0.8	68.4	2941.0	- 0.01[3]
				10.0	0.8	66.0	4465.0	ND[5]
				11.0	1.0	71.7	5070.0	ND[5]
				12.0	1.1	64.0	5600.0	- 0.02[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 2:20 PM	12.0	6.4	0.4	7.0	0.8	73.0	1707.0	ND[5]
				8.0	0.7	71.2	2167.0	0.01[3]
				9.0	0.9	66.9	2937.0	- 0.01[3]
				10.0	1.0	65.5	4623.0	- 0.01[3]
				11.0	1.1	57.3	5260.0	0.01[3]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 11:26 AM	13.1	6.6	0.4	7.0	0.3	95.3	301.7	0.01[3]
				8.0	0.3	91.6	305.6	0.01[5]
				9.0	0.4	88.6	479.9	0.01[5]
				10.0	0.6	66.8	4069.0	0.02[3]
				11.0	0.6	59.9	4693.0	0.01[3]
				12.0	0.8	59.9	4980.0	0.01[3]
				13.0	1.1	63.2	5360.0	ND[5]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 10:20 AM	13.0	6.6	0.3	7.0	0.3	93.7	306.9	0.01[3]
				8.0	0.3	89.5	302.7	0.02[5]
				9.0	0.4	89.1	390.5	0.01[5]
				10.0	0.6	66.3	3687.0	0.01[3]
				11.0	0.8	58.5	4649.0	- 0.04[3]
				12.0	0.9	56.9	5010.0	0.01[3]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 9:50 AM	13.7	6.0	0.2	6.0	0.2	94.4	302.1	0.04[3]
				7.0	0.1	91.2	285.3	0.02[3]
				8.0	0.2	89.6	286.7	0.01[3]
				9.0	0.2	88.8	308.4	ND[5]
				10.0	0.4	74.8	2324.0	ND[5]
				11.0	0.6	64.3	4445.0	ND[5]
				12.0	0.8	59.1	4958.0	- 0.06[3]
				13.0	1.0	61.4	5140.0	0.02[3]

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using an YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: April 04, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 3:05 PM	11.8	5.3	0.3	6.0	0.3	82.8	1579	ND[5]
				7.0	0.5	64.8	1970	ND[5]
				8.0	0.6	57.0	3090	-0.02[3]
				9.0	0.6	57.6	4150	-0.01[3]
				10.0	0.8	54.4	4790	-0.01[3]
				11.0	0.9	54.3	4730	-0.02[3]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 4:05 PM	12.8	6.3	0.4	7.0	0.5	60.0	1564	ND[5]
				8.0	0.6	60.7	2021	-0.01[3]
				9.0	0.8	55.3	3056	-0.01[3]
				10.0	0.9	59.6	4118	-0.01[3]
				11.0	1.0	57.9	4940	-0.02[3]
				12.0	1.1	55.8	6020	-0.02[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 2:00 PM	11.0	6.3	0.3	6.0	-	-	-	-
				7.0	0.4	57.1	1475	0.03[3]
				8.0	0.6	63.0	1889	-0.01
				9.0	0.7	57.8	2742	0.09
				10.0	0.9	61.1	4075	0.20
				11.0	-	-	-	-
				12.0	-	-	-	-

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 1:30 PM	12.1	5.4	0.3	6.0	0.3	87.7	274.5	0.01[3]
				7.0	0.3	85.8	278.7	ND[3]
				8.0	0.4	87.0	308.7	0.01[5]
				9.0	0.5	86.8	470.9	ND[5]
				10.0	0.6	48.1	4198	-0.02[3]
				11.0	0.9	44.1	4860	ND[5]
				12.0	0.9	43.7	5010	-0.01[5]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 12:25 PM	12.9	6.5	0.5	7.0	0.1	83.6	272.4	0.01[3]
				8.0	0.2	99.7	276.3	ND[3]
				9.0	0.4	92.0	479.3	0.01[5]
				10.0	0.6	54.5	4096	-0.01[3]
				11.0	0.8	46.7	4757	-0.02[3]
				12.0	0.9	50.8	5070	-0.01[3]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 11:25 AM	14.1	5.3	0.2	6.0	0.1	94.5	268.3	0.09[3]
				7.0	0.1	83.2	269.5	-0.06[3]
				8.0	0.1	84.0	272.5	-0.19[3]
				9.0	0.4	86.6	324.8	ND[5]
				10.0	0.6	53.1	3500	-0.01[3]
				11.0	0.8	45.9	4722	-0.02[3]
				12.0	1.0	49.9	5050	-0.13[3]
				13.0	1.1	55.6	5220	-0.05[3]
				14.0	-	-	-	-

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using an YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: March 21, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 3:15 PM	12.0	5.5	0.4	6.0	0.2	95.7	821.0	ND[5]
				7.0	0.2	72.3	1420.0	ND[5]
				8.0	0.5	63.3	1990.0	- 0.01[3]
				9.0	0.5	53.4	3664.0	- 0.01[3]
				10.0	0.6	51.1	4600.0	- 0.02[3]
				11.0	0.8	52.0	4849.0	- 0.03[3]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 2:45 PM	12.8	6.0	0.5	7.0	0.3	73.4	1477.0	0.01[3]
				8.0	0.5	68.8	2072.0	- 0.01[3]
				9.0	0.5	54.5	3827.0	- 0.02[3]
				10.0	0.7	50.5	4640.0	- 0.02[3]
				11.0	0.9	52.3	5110.0	- 0.03[3]
				12.0	1.0	45.5	6250.0	- 0.03[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 2:00 PM	12.5	5.5	0.3	6.0	0.1	98.6	713.0	-0.02[3]
				7.0	0.4	75.5	1473.0	0.01[3]
				8.0	0.6	69.7	2013.0	ND[5]
				9.0	0.6	58.3	3519.0	- 0.02[3]
				10.0	0.8	49.2	4667.0	- 0.02[3]
				11.0	1.0	44.4	6130.0	-0.04[3]
				12.0	1.0	42.3	6340.0	-0.05[3]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 4:00 PM	12.5	5.4	0.4	6.0	0.1	87.3	256.1	0.01[3]
				7.0	0.3	82.6	254.0	-0.01[3]
				8.0	0.3	83.2	251.4	ND[5]
				9.0	0.4	79.1	288.5	0.01[3]
				10.0	0.6	62.8	3969.0	0.01[3]
				11.0	0.6	59.6	4771.0	ND[5]
				12.0	0.8	56.1	5020.0	ND[5]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 5:00 PM	13.0	6.0	0.4	7.0	0.3	91.7	251.1	0.03[3]
				8.0	0.4	83.6	248.6	0.01[3]
				9.0	0.5	77.3	276.7	ND[5]
				10.0	0.6	62.5	4054.0	0.01[3]
				11.0	0.7	52.7	4729.0	0.04[3]
				12.0	0.9	51.6	4986.0	0.01[3]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 5:40 PM	14.1	5.3	0.1	6.0	0.1	93.2	248.3	-0.01[3]
				7.0	0.1	85.3	245.7	ND[5]
				8.0	0.2	83.9	247.8	ND[5]
				9.0	0.4	82.7	279.9	0.02[3]
				10.0	0.6	60.5	4062.0	0.01[3]
				11.0	0.7	55.8	4744.0	- 0.01[3]
				12.0	0.9	54.2	5020.0	- 0.02[3]
				13.0	1.0	51.7	5400.0	0.01[3]
				14.0	1.1	44.8	6210.0	- 0.01[3]

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using an YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: March 7, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 5:13 PM	11.6	4.8	0.2	5.0	0.5	82.4	502.0	- 0.21[3]
				6.0	0.3	74.5	548.0	- 0.14[3]
				7.0	0.4	72.8	1072.0	- 0.06[3]
				8.0	0.5	71.5	1713.0	- 0.04[3]
				9.0	0.6	62.5	3387.0	- 0.02[3]
				10.0	0.7	59.3	4525.0	- 0.02[3]
				11.0	0.7	58.2	4858.0	- 0.01[3]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 5:58 PM	12.5	5.8	0.4	6.0	1.0	79.3	589.0	ND[5]
				7.0	0.7	72.5	1469.0	- 0.01[3]
				8.0	0.7	69.6	2123.0	- 0.02[3]
				9.0	0.7	60.4	4139.0	ND[5]
				10.0	0.8	57.7	4640.0	ND[5]
				11.0	0.9	52.7	4898.0	- 0.02[3]
				12.0	1.1	46.7	6230.0	- 0.01[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 6:30 PM	11.4	5.4	0.3	6.0	0.3	76.2	595.0	0.02[3]
				7.0	0.5	71.9	1386.0	0.01[3]
				8.0	0.6	67.1	2104.0	0.01[3]
				9.0	0.6	56.0	4028.0	- 0.01[3]
				10.0	0.9	49.2	4646.0	- 0.03[3]
				11.0	1.0	45.0	6380.0	ND[5]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 4:33 PM	12.5	5.0	0.3	6.0	0.1	85.9	233.0	ND[5]
				7.0	0.4	87.8	222.6	ND[5]
				8.0	0.4	85.1	222.5	ND[5]
				9.0	0.4	79.3	249.9	ND[5]
				10.0	0.6	60.6	3047.0	0.01[3]
				11.0	0.7	56.8	4505.0	- 0.02[3]
				12.0	0.9	53.2	4937.0	- 0.01[3]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 3:55 PM	13.1	5.6	0.3	6.0	0.1	75.6	216.2	ND[5]
				7.0	0.2	83.8	210.3	- 0.01[3]
				8.0	0.3	78.9	216.9	- 0.01[3]
				9.0	0.4	73.2	234.5	ND[5]
				10.0	0.7	69.4	1778.0	0.02[3]
				11.0	0.9	63.3	4637.0	0.01[3]
				12.0	0.9	59.9	4947.0	0.01[3]
				13.0	1.0	55.4	5270.0	0.01[3]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 3:15 PM	13.1	5.0	0.2	6.0	0.2	76.9	214.1	0.20[3]
				7.0	0.2	76.6	213.8	- 0.20[3]
				8.0	0.3	84.2	216.2	- 0.30[3]
				9.0	0.5	80.4	257.3	- 0.25[3]
				10.0	0.7	68.5	2227.0	- 0.04[3]
				11.0	0.8	61.6	4459.0	ND[5]
				12.0	1.0	56.4	4952.0	ND[5]
				13.0	1.0	52.9	5230.0	ND[5]

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using an YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: February 18, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 11:30 AM	11.5	3.7	0.0	4.0	0.3	19.6	240.1	-
				5.0	0.2	19.3	238.1	0.02[3]
				6.0	0.3	19.1	382.5	0.01[3]
				7.0	0.5	18.3	844.0	0.01[3]
				8.0	0.6	16.8	1762.0	0.02[3]
				9.0	0.7	15.5	3630.0	0.03[3]
				10.0	0.6	51.0	4253.0	ND[5]
				11.0	0.7	54.3	4649.0	ND[5]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 12:10 PM	12.8	4.9	0.3	5.0	0.4	95.2	261.0	0.02[3]
				6.0	0.5	82.2	387.5	0.01[3]
				7.0	0.6	82.9	876.0	0.01[3]
				8.0	0.7	73.6	1876.0	0.01[3]
				9.0	0.8	67.0	3889.0	0.01[3]
				10.0	1.0	60.2	4416.0	0.02[3]
				11.0	1.1	56.4	5630.0	0.01[3]
				12.0	1.1	52.8	6170.0	0.02[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 12:45 PM	12.0	4.9	0.3	5.0	0.3	92.7	253.3	0.02[3]
				6.0	0.4	82.8	335.7	0.01[3]
				7.0	0.5	83.1	708.0	0.03[3]
				8.0	0.7	74.4	1847.0	0.03[3]
				9.0	0.8	63.2	3868.0	0.03[3]
				10.0	0.9	58.3	5140.0	0.04[3]
				11.0	1.0	58.3	6200.0	0.03[3]
				12.0	1.0	53.5	6070.0	0.01[3]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (% Saturation)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 10:50 AM	12.4	4.0	0.2	5.0	0.0	84.2	184.0	0.01[3]
				6.0	0.1	82.2	183.6	0.01[3]
				7.0	0.1	88.1	183.2	ND[5]
				8.0	0.2	82.1	184.1	ND[5]
				9.0	0.3	84.7	212.8	ND[5]
				10.0	0.5	71.8	3296.0	0.01[3]
				11.0	0.6	56.0	4579.0	0.02[3]
				12.0	0.8	54.8	5010.0	0.02[3]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 10:10 AM	13.3	4.5	0.3	5.0	0.1	88.5	180.6	0.06[3]
				6.0	0.1	90.6	179.4	0.02[3]
				7.0	0.2	84.0	179.4	0.03[3]
				8.0	0.3	86.9	180.2	0.02[3]
				9.0	0.5	87.3	210.0	0.02[3]
				10.0	0.5	74.2	3290.0	0.01[3]
				11.0	0.6	50.3	4487.0	0.01[3]
				12.0	0.6	57.8	4693.0	ND[5]
				13.0	0.6	50.2	4925.0	ND[5]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 9:40 AM	13.7	4.4	0.2	5.0	0.0	83.4	175.7	0.15[3]
				6.0	0.0	86.2	175.0	0.09[3]
				7.0	0.0	88.0	176.0	0.05[3]
				8.0	0.1	89.0	177.5	0.07[3]
				9.0	0.3	89.6	223.2	0.04[3]
				10.0	0.3	88.1	1500.0	0.04[3]
				11.0	0.6	61.0	4315.0	0.01[3]
				12.0	0.7	61.7	4758.0	-0.02[3]
				13.0	0.9	58.0	5090.0	ND[5]

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using a YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Conductivity and Water Velocity
Sample Date: February 4, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 2:30 PM	12.5	3.9	0.1	4.0	0.1	181.3	ND[5]
				5.0	0.1	184.9	ND[5]
				6.0	0.2	240.1	ND[5]
				7.0	0.3	553	ND[5]
				8.0	0.3	1160	0.02[3]
				9.0	0.5	4062	ND[5]
				10.0	0.8	4867	ND[5]
				11.0	-	-	ND[5]
				12.0	-	-	ND[5]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 1:57 PM	13.7	4.6	0.2	5.0	0.2	188.2	0.20
				6.0	0.2	220.6	0.18
				7.0	0.3	400	ND[5]
				8.0	0.4	902	ND[5]
				9.0	0.6	3620	ND[5]
				10.0	0.6	4778	0.40[3]
				11.0	-	-	0.25[3]
				12.0	-	-	0.34[3]
				13.0	-	-	0.53[3]
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 12:50 PM	13.0	4.5	0.2	5.0	0.1	185.0	ND[5]
				6.0	0.2	198.0	ND[5]
				7.0	0.3	315	ND[5]
				8.0	0.5	1003	ND[5]
				9.0	0.6	3282	0.01[3]
				10.0	0.7	4608	0.01[3]
				11.0	-	-	ND[5]
				12.0	-	-	ND[5]
				13.0	-	-	ND[5]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 3:30 PM	13.6	4.5	0.2	5.0	0.0	168.1	0.02
				6.0	0.1	168.1	0.03
				7.0	0.1	172.8	0.01
				8.0	0.2	204.1	3.13
				9.0	0.4	481	2.92
				10.0	0.4	3210	2.31
				11.0	-	-	1.32
				12.0	-	-	2.39
				13.0	-	-	3.83
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 3:58 PM	14.1	4.4	0.2	5.0	0.1	167.1	0.17[3]
				6.0	0.1	167.9	0.19[3]
				7.0	0.2	170.1	0.12[3]
				8.0	0.2	197.6	0.02[3]
				9.0	0.3	390.4	0.16[3]
				10.0	0.6	3840	0.23[3]
				11.0	-	-	0.33[3]
				12.0	-	-	0.27[3]
				13.0	-	-	0.22[3]
				14.0	-	-	0.20[3]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 4:24 PM	14.3	4.3	0.2	5.0	0.1	165.8	0.03[3]
				6.0	0.1	167.8	0.03[3]
				7.0	0.1	173.4	0.02[3]
				8.0	0.2	212.2	0.01[3]
				9.0	0.5	422.7	0.03[3]
				10.0	0.6	3360	ND[5]
				11.0	-	-	ND[5]
				12.0	-	-	0.01[3]
				13.0	-	-	0.01[3]
				14.0	-	-	0.14[3]

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.

Colville River Ice Bridge Monitoring: Dissolved Oxygen Resample at 400 ft Downstream
Sample Date: February 21, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (%)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Resample 9:40 AM				4.0		69.6		
				5.0		76.3		
				6.0		66.1		
				7.0		64.2		
				8.0		64.1		
				9.0		52.7		
				10.0		50.7		
				11.0		49.8		
800 ft Downstream N 70°14'25.9" W150°50'04.9"				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				
1200 ft Downstream N 70°14'30.2" W150°50'08.8"				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp[7] (C^0)	Dissolved Oxygen[6] (%)	Conductivity[7] (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6"								
800 ft Upstream N 70°14'11.8" W150°49'52.1"								
1200 ft Upstream N 70°14'08.0" W150°49'49.6"								

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Fixed Point Averaging (FPA) function was used on the meter for a period of 10 seconds.
[4]Water velocity measurements were taken using a Marsh-McBirney Flo-Mate 2000 portable meter.
[5]ND = Not Detected
[6]Dissolved oxygen measurements were taken using a YSI Model 55 meter.
[7]Temperature and Conductivity measurements were taken using an YSI Model 30 meter.

Colville River Ice Bridge Monitoring: Temperature, Conductivity and Water Velocity
Sample Date: January 20, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 12:00 PM	11.3	3.4	0.1	4.0	0.3	149.5	ND[5]
				5.0	0.3	149.9	0.05
				6.0	0.3	149.9	ND[5]
				7.0	0.3	150.0	0.05[3]
				8.0	0.3	163.4	0.05[3]
				9.0	0.4	630.0	0.1
				10.0	0.6	1045.0	ND[5]
				11.0	-	-	ND[5]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 12:19 PM	12.5	3.7	0.1	4.0	0.3	150.6	0.1
				5.0	0.4	149.5	0.1
				6.0	0.4	149.7	ND[5]
				7.0	0.4	158.6	0.05[3]
				8.0	0.4	164.0	ND[5]
				9.0	0.5	657.0	0.05[3]
				10.0	0.6	1053.0	ND[5]
				11.0	-	-	0.1
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 12:27 PM	11.8	3.7	0.2	4.0	0.4	128.8	0.05[3]
				5.0	0.3	147.8	0.05[3]
				6.0	0.4	148.6	0.03[3]
				7.0	0.4	150.6	ND[5]
				8.0	0.5	154.9	ND[5]
				9.0	0.5	338.5	0.05[3]
				10.0	0.7	1040.0	0.05[3]
				11.0	-	-	ND[5]

Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 11:45 AM	12.5	3.4	0.2	4.0	0.2	145.6	0.1
				5.0	0.2	146.4	0.05[3]
				6.0	0.2	146.2	ND[5]
				7.0	0.2	146.2	0.5
				8.0	0.3	148.0	ND[5]
				9.0	0.5	663.0	0.1
				10.0	0.6	1035.0	0.1
				11.0	-	-	ND[5]
				12.0	-	-	ND[5]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 11:15 AM	13.7	4.4	0.1	4.0	0.2	152.8	0.1
				5.0	0.2	147.9	0.1
				6.0	0.2	146.3	0.1
				7.0	0.2	145.8	0.1
				8.0	0.3	150.0	ND[5]
				9.0	0.4	170.9	0.1
				10.0	0.5	750.0	0.1
				11.0	-	-	0.1
				12.0	-	-	0.1
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 10:15 AM	14.2	3.5	0.1	4.0	0	119.7	ND[5]
				5.0	0	118.7	ND[5]
				6.0	0	118.0	ND[5]
				7.0	0	116.9	0.7
				8.0	0	117.0	0.6
				9.0	0	119.0	0.6
				10.0	0	335.0	0.1
				11.0	-	-	0.1
				12.0	-	-	0.1
				13.0	-	-	0.4
				14.0	-	-	0.1

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Measurement estimate of value between two known values listed on meter scale.
[4]Water velocity measurements were taken using a Marsh-McBirney Model 201 meter.
[5]ND = Not Detected

Colville River Ice Bridge Monitoring: Conductivity and Water Velocity
Sample Date: December 23, 2003

Downstream Sample Location[1] and Time	Water Depth[3] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[3] (ft)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 5:55 PM	11.4	2.6	0.1	4	137.4	ND[5]
				5	137.2	ND[5]
				6	137.6	ND[5]
				7	135.9	ND[5]
				8	135.6	ND[5]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 5:35 PM	12.9	3.1	0.1	4.0	98.9	Not Sampled
				5.0	98.9	Not Sampled
				6.0	99.0	Not Sampled
				7.0	99.2	Not Sampled
				8.0	99.2	Not Sampled
				9.0	99.0	Not Sampled
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 5:00 PM	12.0	3.0	0.1	4.0	108.1	ND[5]
				5.0	108.7	ND[5]
				6.0	109.4	ND[5]
				7.0	116.4	ND[5]
				8.0	116.3	ND[5]
				9.0	116.5	ND[5]

Upstream Sample Location[1] and Time	Water Depth[3] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[3] (ft)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 3:45 PM	12.1	2.9	0.1	3.0	135.3	ND[5]
				4.0	134.4	ND[5]
				5.0	136.7	ND[5]
				6.0	137.0	ND[5]
				7.0	136.7	ND[5]
				8.0	137.0	ND[5]
				9.0	136.2	ND[5]
				10.0	135.4	ND[5]
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 4:00 PM	13.0	3.0	0.1	4.0	141.9	ND[5]
				5.0	139.4	ND[5]
				6.0	137.2	ND[5]
				7.0	137.8	ND[5]
				8.0	136.8	ND[5]
				9.0	136.7	ND[5]
				10.0	136.2	ND[5]
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 4:30 PM	13.8	3.1	0.1	4.0	124.1	Not Sampled
				5.0	124.4	Not Sampled
				6.0	124.1	Not Sampled
				7.0	124.6	Not Sampled
				8.0	125.4	Not Sampled
				9.0	125.4	Not Sampled
				10.0	125.4	Not Sampled

Notes:
[1]Sample location coordinates are in NAD 27 datum.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Sample and water depth is measured from the water surface.
[4]Water velocity measurements were taken using a Marsh-McBirney Model 201 meter.
[5]Measurable flow was not detected.

Colville River Ice Bridge Monitoring: Temperature, Dissolved Oxygen, Conductivity and Water Velocity
Sample Date: January 5, 2004

Downstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Dissolved Oxygen[3] (ppm)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Downstream N 70°14'22.9" W150°50'02.2" Sampled 11:01 AM	11.3	2.8	0.1	3.0	0.2	5.0	141.5	ND[5]
				4.0	0.3		141.1	ND[5]
				5.0	0.3		141.0	ND[5]
				6.0	0.3		141.0	ND[5]
				7.0	0.4		143.0	ND[5]
				8.0	0.5		144.7	ND[5]
				9.0	0.5		145.3	ND[5]
				10.0	0.5		145.7	ND[5]
				11.0	-		-	ND[5]
800 ft Downstream N 70°14'25.9" W150°50'04.9" Sampled 11:29 AM	12.6	3.4	0.1	4.0	0.2	5.0	141.2	1.5
				5.0	0.2		141.1	2.5
				6.0	0.2		141.1	3.0
				7.0	0.2		141.2	3.0
				8.0	0.2		141.2	3.0
				9.0	0.4		141.5	2.5
				10.0	0.4		141.5	2.0
				11.0	-		-	1.0
1200 ft Downstream N 70°14'30.2" W150°50'08.8" Sampled 11:46 AM	11.7	3.1	0.1	4.0	0.1	3.0	141.4	ND[5]
				5.0	0.1		141.2	ND[5]
				6.0	0.1		141.2	ND[5]
				7.0	0.1		141.2	ND[5]
				8.0	0.2		144.1	ND[5]
				9.0	0.3		146.8	ND[5]
				10.0	0.3		146.8	0.7
				11.0	0.3		146.7	0.5

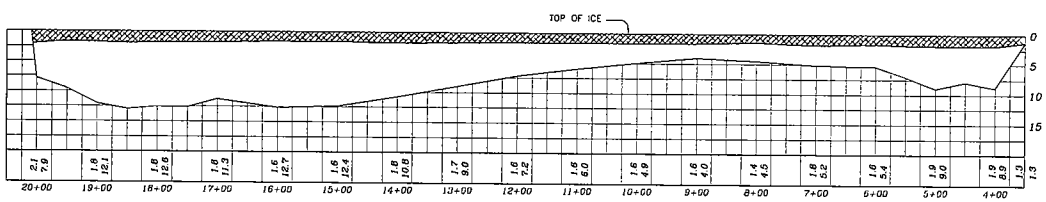
Upstream Sample Location NAD 27	Water Depth[1] (ft)	Ice Thickness (ft)	Free Board[2] (ft)	Sample Depth[1] (ft)	Temp (C^0)	Dissolved Oxygen[3] (ppm)	Conductivity (µS/cm)	Water Velocity[4] (ft/sec)
400 ft Upstream N 70°14'15.8" W150°49'55.6" Sampled 12:05 PM	12.2	3.0	0.1	4.0	0.2	5.0	141.1	ND[5]
				5.0	0.2		141.1	ND[5]
				6.0	0.2		141.1	0.2
				7.0	0.2		141.1	0.2
				8.0	0.4		143.2	0.3
				9.0	0.4		143.4	0.4
				10.0	0.4		143.8	0.5
				11.0	-		-	0.7
				12.0	-		-	0.3
800 ft Upstream N 70°14'11.8" W150°49'52.1" Sampled 12:18 PM	12.7	3.2	0.1	4.0	0.3	4.0	144.8	ND[5]
				5.0	0.2		142.2	ND[5]
				6.0	0.2		141.4	ND[5]
				7.0	0.2		141.1	0.2
				8.0	0.2		141.0	0.4
				9.0	0.4		142.3	0.3
				10.0	0.4		142.3	0.5
				11.0	-		-	0.6
				12.0	-		-	1.0
1200 ft Upstream N 70°14'08.0" W150°49'49.6" Sampled 12:30 PM	13.5	3.2	0.1	4.0	0.3	4.0	142.3	ND[5]
				5.0	0.3		141.5	ND[5]
				6.0	0.2		141.2	ND[5]
				7.0	0.3		141.2	ND[5]
				8.0	0.3		141.2	ND[5]
				9.0	0.3		141.4	0.4
				10.0	0.3		141.4	0.6
				11.0	-		-	0.7
				12.0	-		-	0.4
				13.0	-		-	0.4

[1]Sample and water depth is measured from the water surface.
[2]Freeboard is the distance from the top of the ice to the water surface.
[3]Grab sample taken at water surface and analyzed using a CHEMets K-7512 Dissolved Oxygen Kit.
[4]Water velocity measurements were taken using a Marsh-McBirney Model 201 meter.
[5]ND = Not Detected

Winter 2004/2005

Colville River Ice Bridge Monitoring

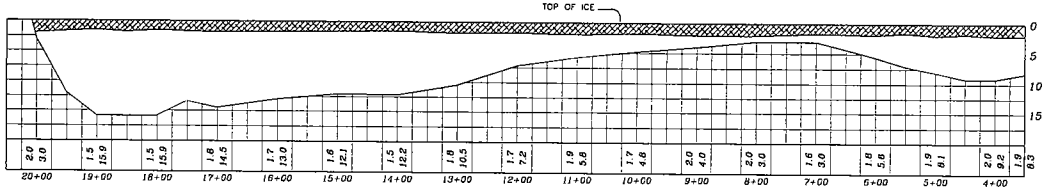
Baker



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

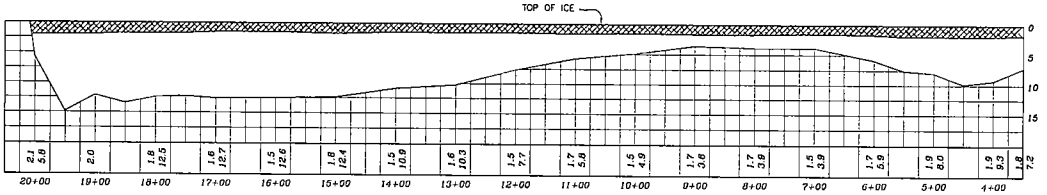
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

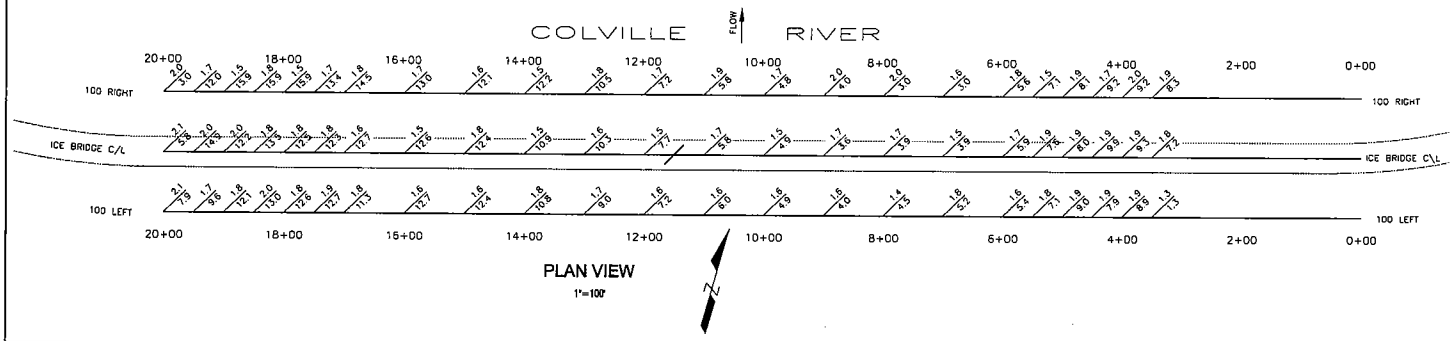
1" = 10' Vertical



Centerline Profile

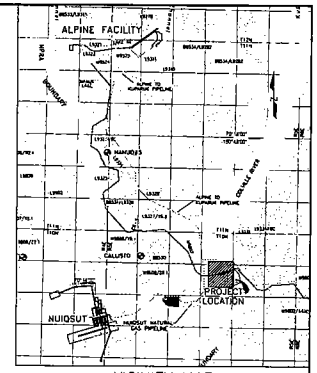
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LCMF COMPLETED NOVEMBER 20, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

11/20/2004

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Kuukpik Eskimo Corporation

Alpine Office (907) 670-4730

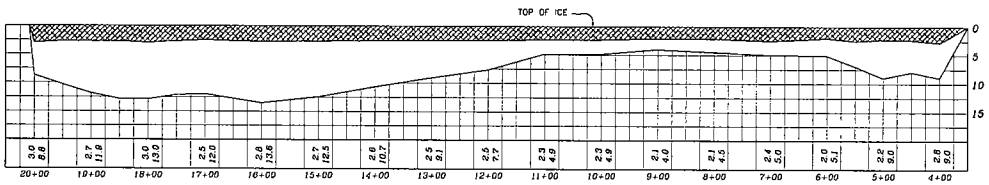
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	4/25/2004	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	KHE	SWR #:	04-11-19-1A

1

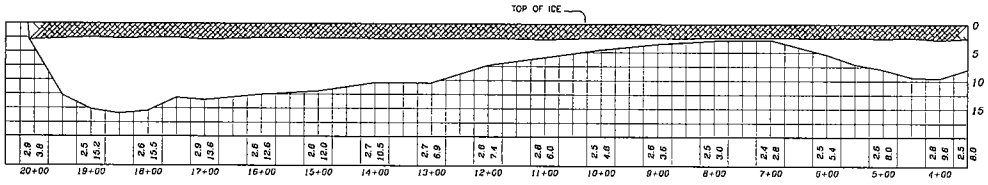
DRAWING: 04-11-19-1A



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

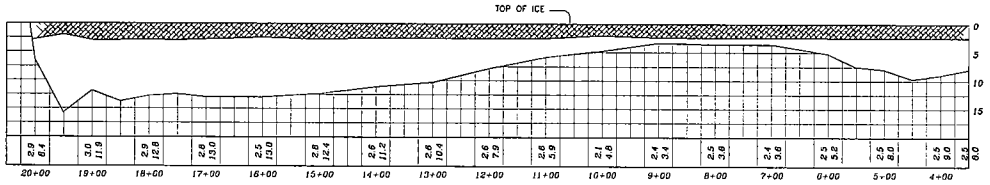
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

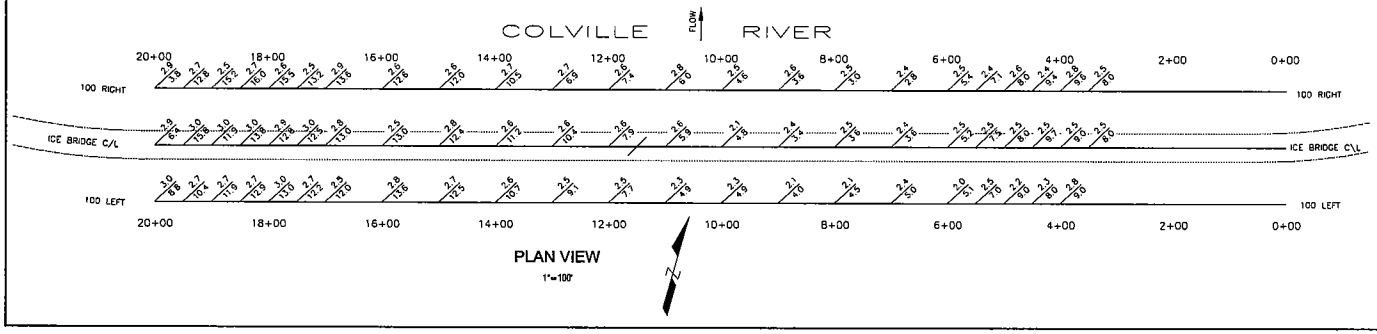
1" = 10' Vertical



Centerline Profile

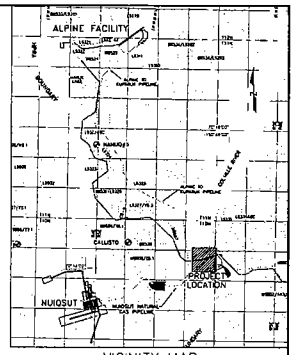
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BOB LCMF COMPLETED DECEMBER 6, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

11/20/2004

ALPINE, ALASKA

Kuukpik/LCMF

A Joint Venture of Kuukpik Corporation and LCMF

Alpine Office (907) 670-4739

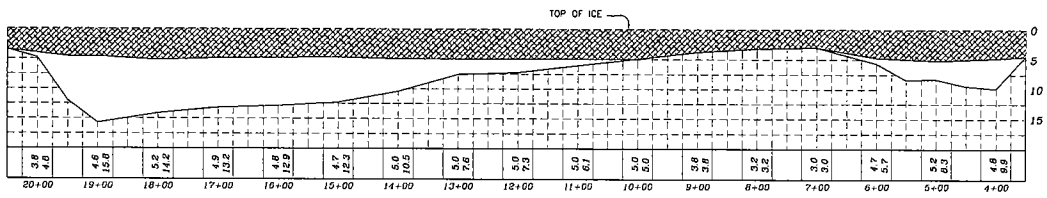
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	12/6/2004	SCALE:	AS SHOWN
CHECKED BY:	DB	SHEET:	1/1
DRAWN BY:	KHE	SWR #:	04-11-19-1A

1

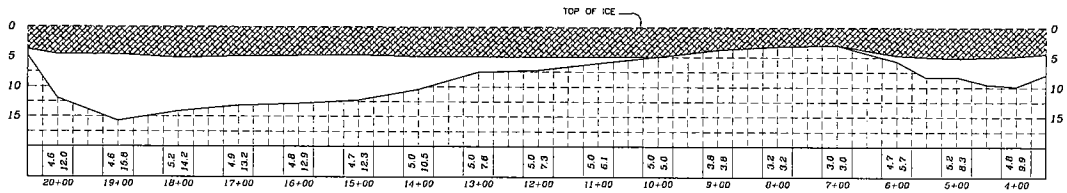
DRAWING: 04-11-19-1ARev2



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

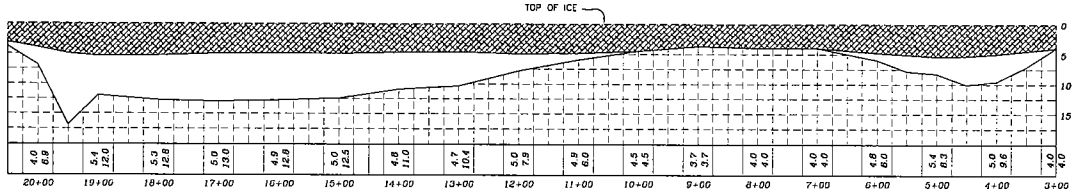
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

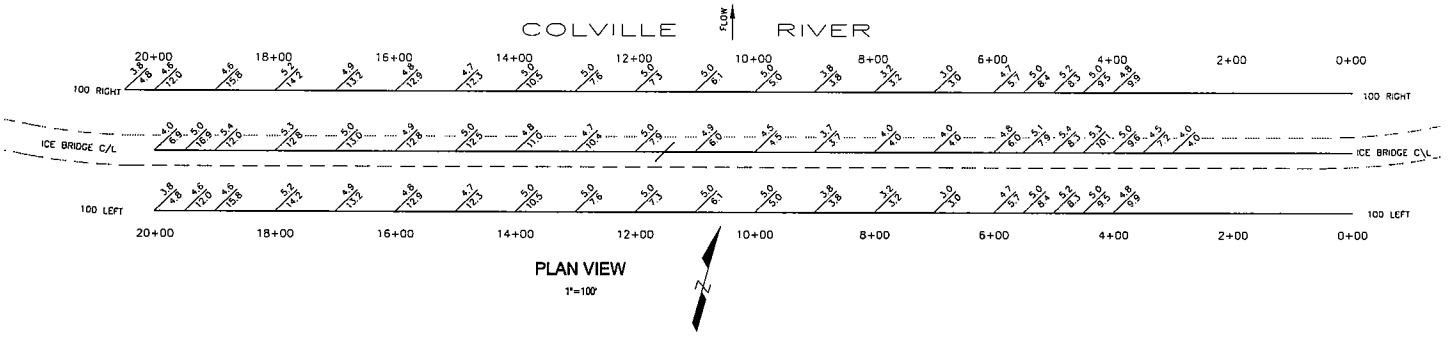
1" = 10' Vertical



Centerline Profile

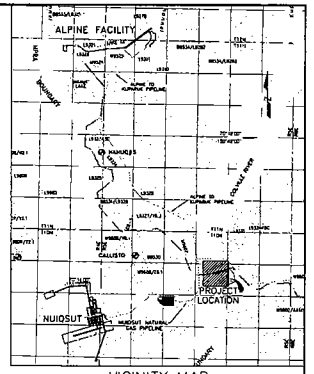
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

8.4 / 13.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.7 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED DECEMBER 19, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

12/19/2004

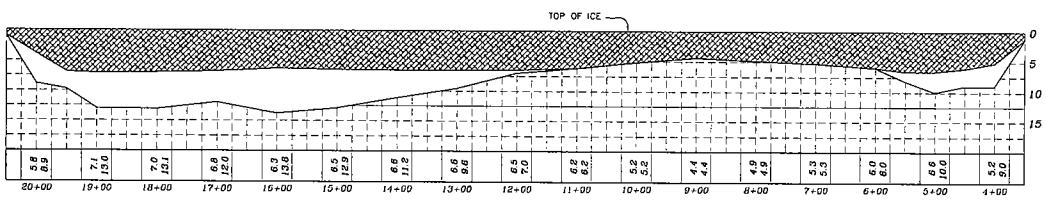
ALPINE, ALASKA

Kuukpik/LCMF
A subsidiary of Kuukpik Arctic Corporation
Alpine Office (907) 670-4739
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

DATE:	12/22/2004	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	CZ	SWR #:	04-11-19-1A

1

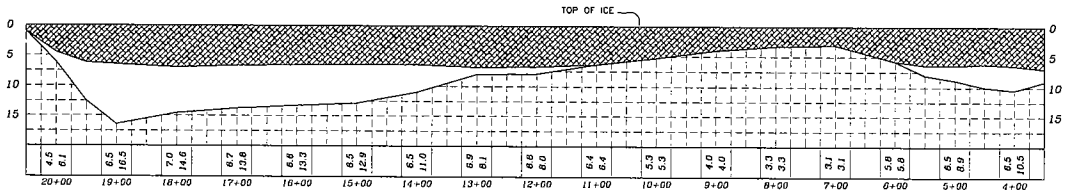
DRAWING: 04-11-19-1ARev3



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

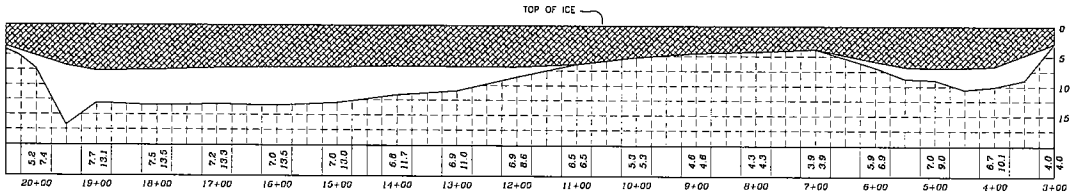
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

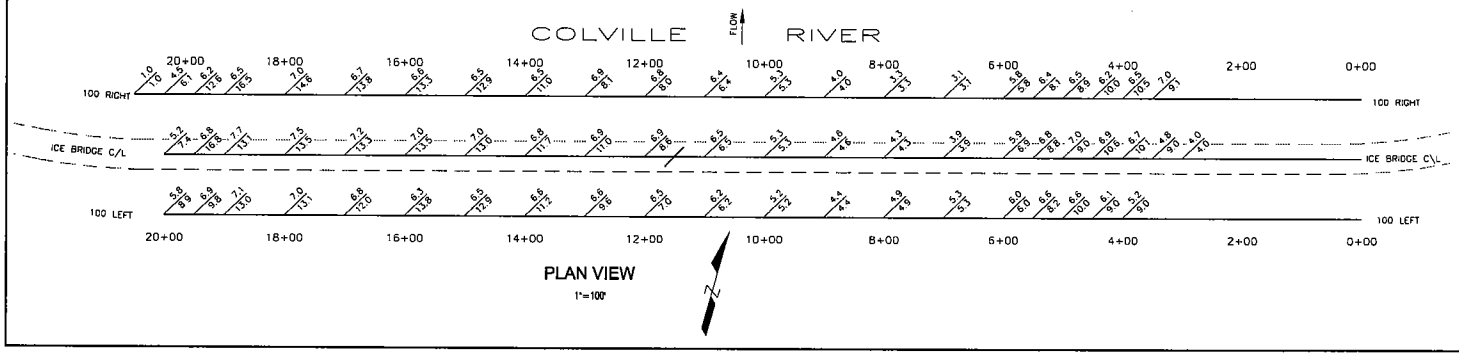
1" = 10' Vertical



Centerline Profile

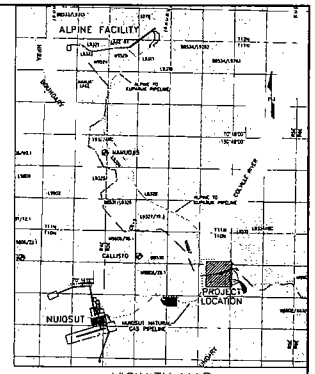
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 15.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED DECEMBER 31, 2004.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

12/19/2004

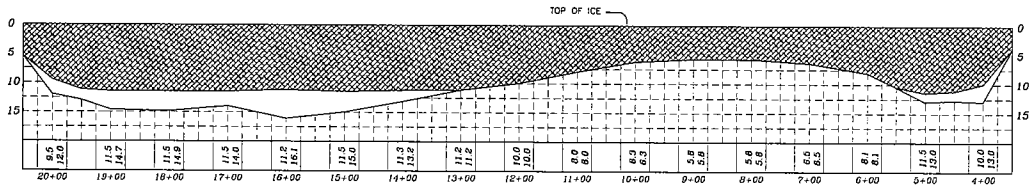
ALPINE, ALASKA

Kuukpik/LCMF
A Subsidiary of Kuukpik Corporation
Alpine Office (907) 670-4730
Anchorage, Alaska (907) 273-1830
Alpine Survey Office

DATE:	01/02/05	SCALE:	AS SHOWN
CHECKED BY:	DB	SHEET:	1/1
DRAWN BY:	AC	SWR #:	04-11-19-1A

1

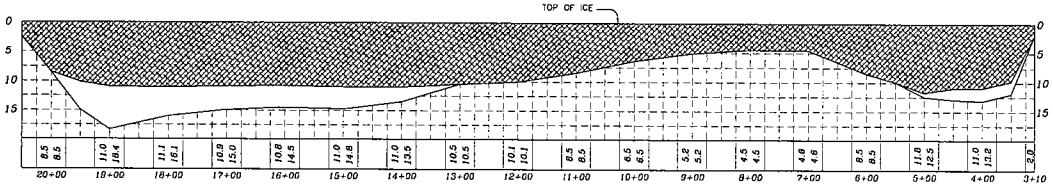
DRAWING: 04-11-19-1ARev4



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

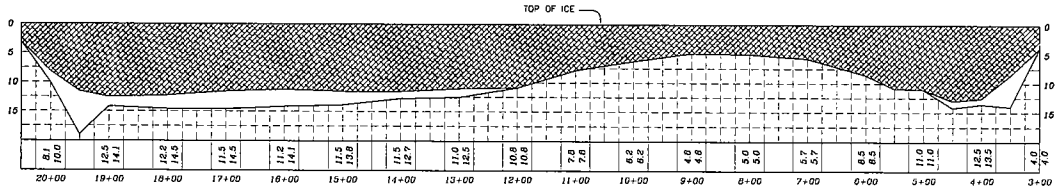
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

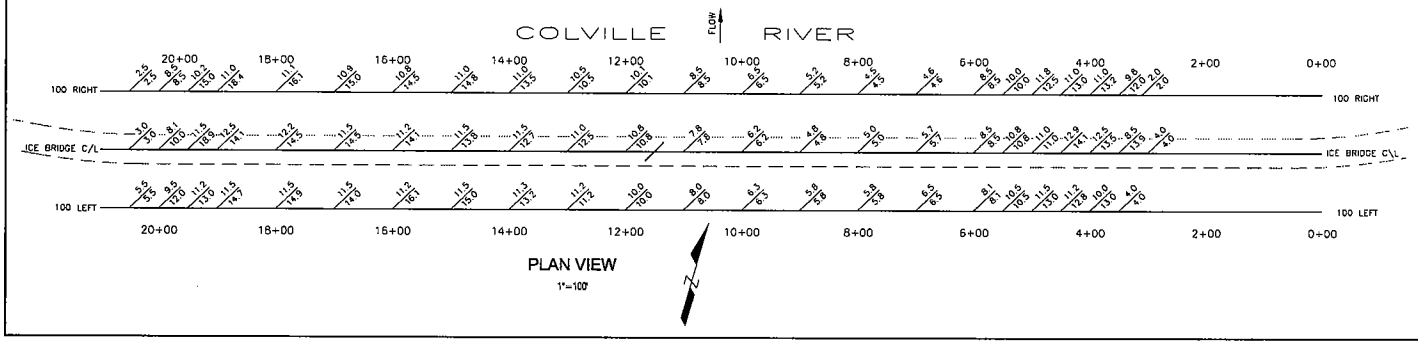
1" = 10' Vertical



Centerline Profile

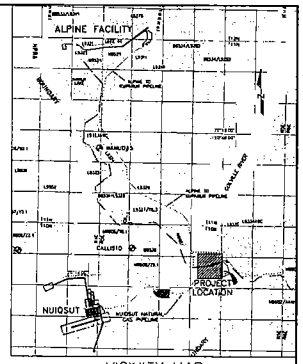
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 26, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

1/26/2005

ALPINE, ALASKA

Kuukpik/LCMF

A subsidiary of Kuukpik Alaska Corporation

Alpine Office (907) 670-4739

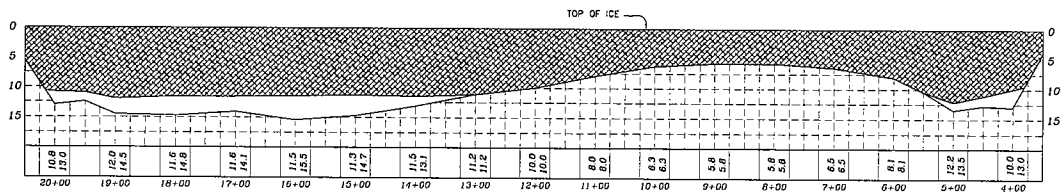
Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	01/29/05	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	AG	SWR #:	04-11-19-1A

6

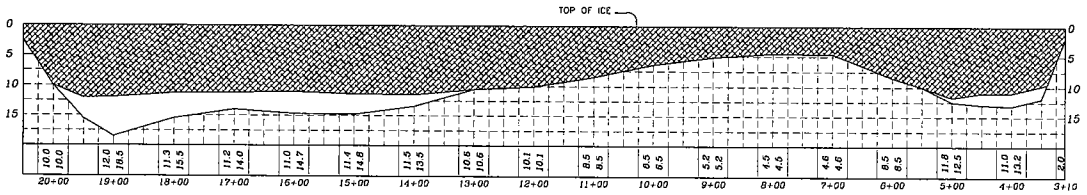
DRAWING: 04-11-19-1ARev6



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

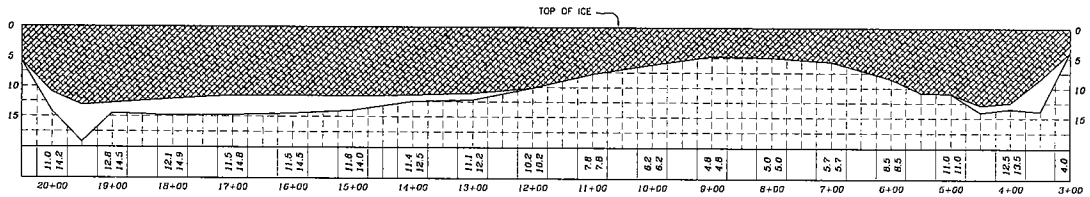
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

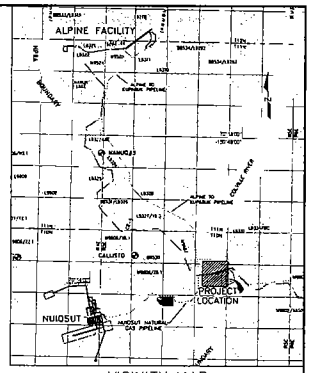
1" = 10' Vertical



Centerline Profile

1" = 100' Horiz

1" = 10' Vertical



VICINITY MAP

NOT TO SCALE

LEGEND

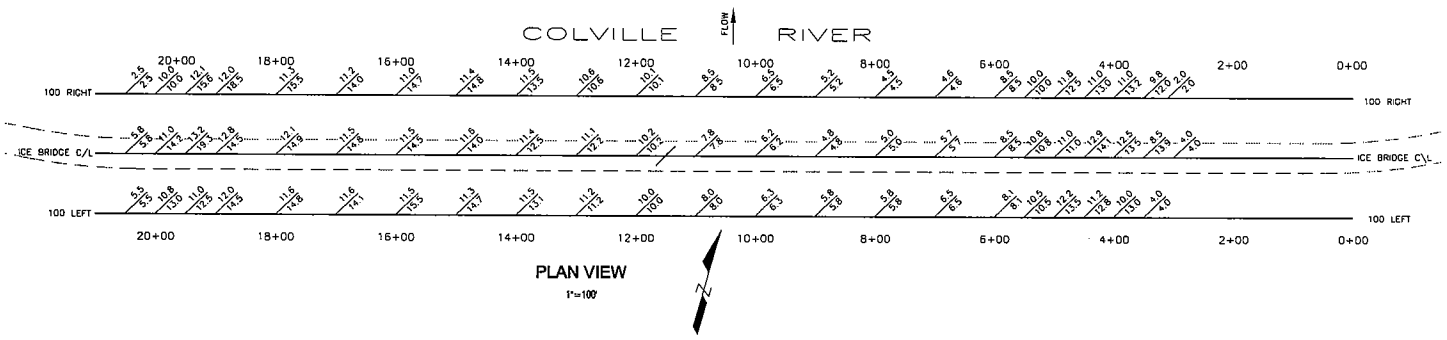
ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED FEBRUARY 23, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.



PLAN VIEW

1"=100'

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

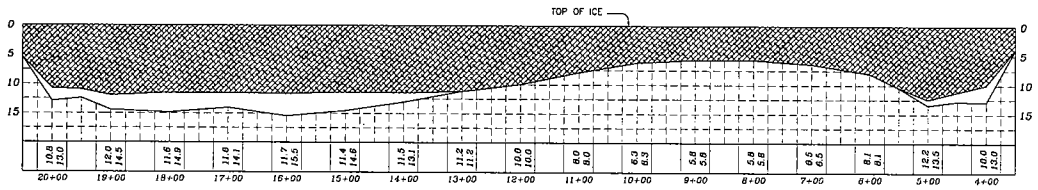
2/23/2005

ALPINE, ALASKA

KUUKPIK LCMF LLC Alpine Survey Office

DATE: 01/24/2005	SCALE: AS SHOWN	7
CHECKED BY: DB	SHEET: 1 of 1	
DRAWN BY: CZ	SWR #: 04-11-19-1A	

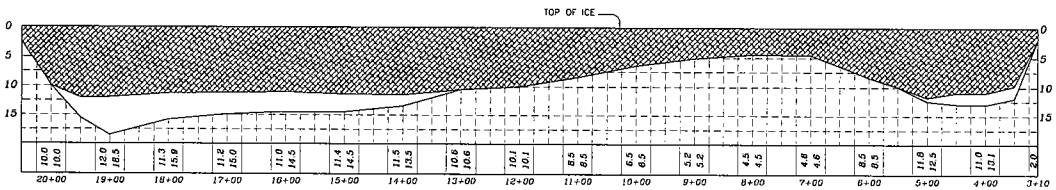
DRAWING: 04-11-19-1ARev7



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

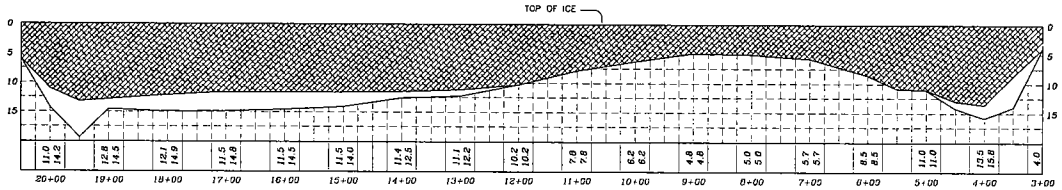
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

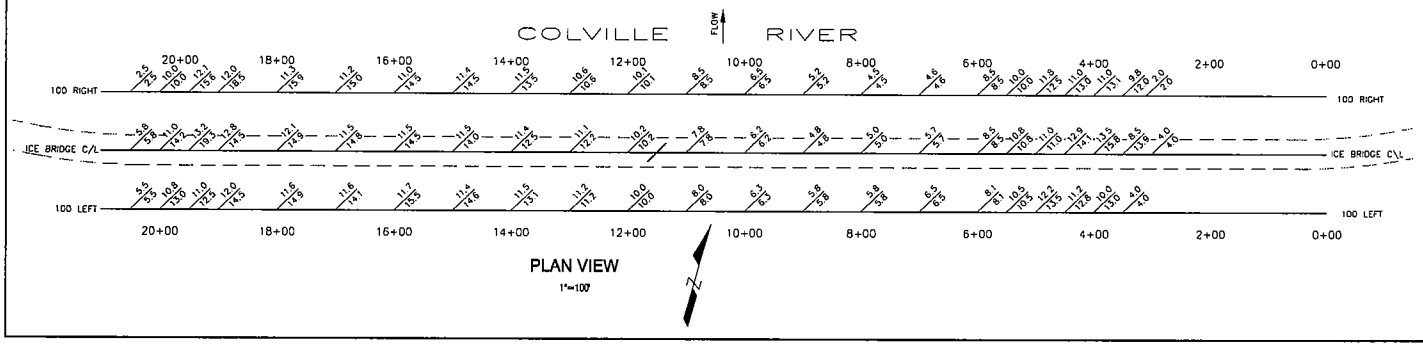
1" = 10' Vertical



Centerline Profile

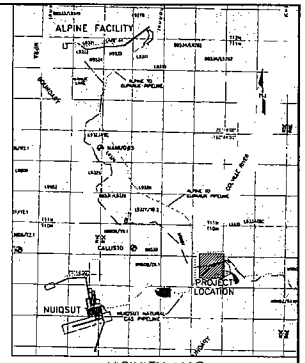
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED FEBRUARY 28, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

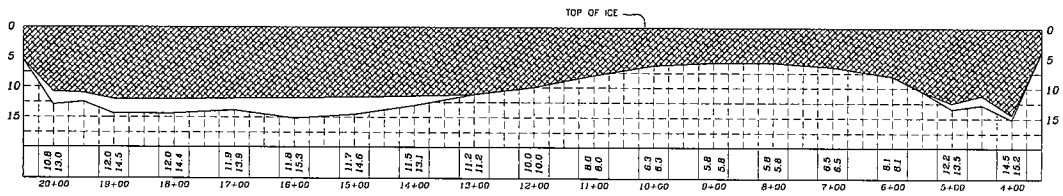
2/28/2005

ALPINE, ALASKA

KUUKPIK LCMF LLC Alpine Survey Office

DATE: J/9/2005	SCALE: AS SHOWN		8
CHECKED BY: DB	SHEET: 1 of 1		
DRAWN BY: AC	SWR #: 04-11-19-1A		

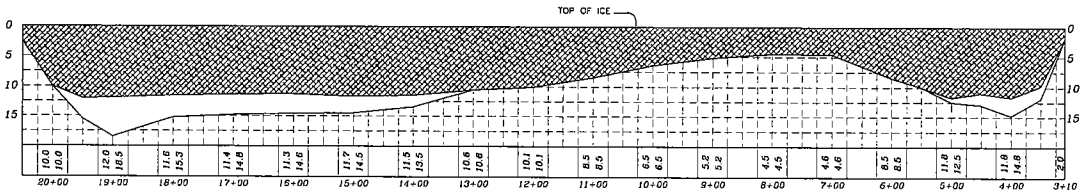
DRAWING: 04-11-19-1ARev8



Left Shoulder (100 feet South) Profile

1"=100' Horiz

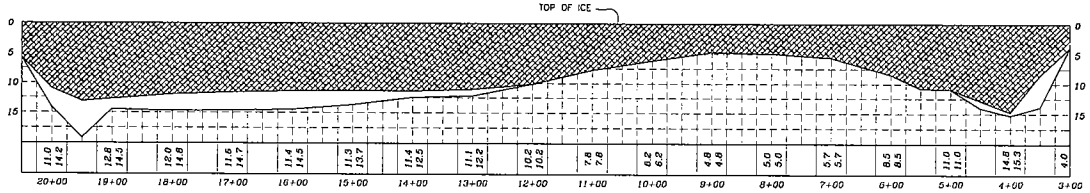
1"=10' Vertical



Right Shoulder (100 feet North) Profile

1"=100' Horiz

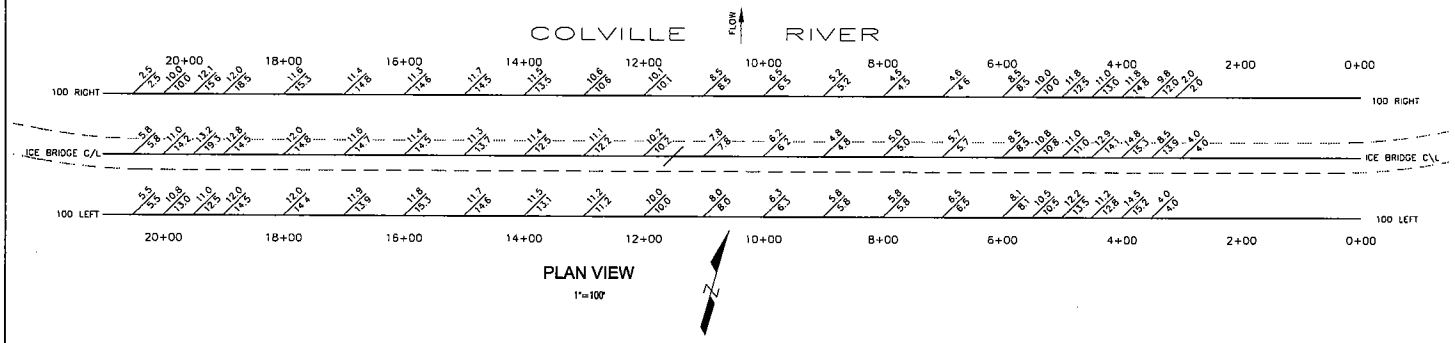
1"=10' Vertical



Centerline Profile

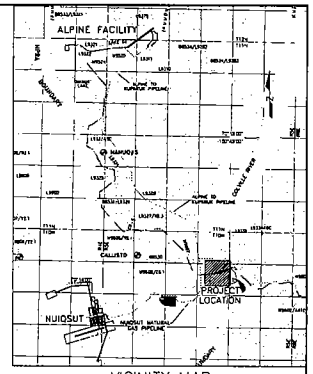
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED APRIL 5, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

4/5/2005

ALPINE, ALASKA

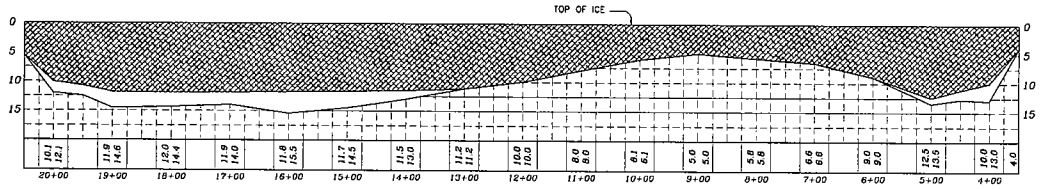
KUUKPIK LCMF

Alpine Survey Office

DATE:	4/8/2005	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1 of 1
DRAWN BY:	CZ	SWR #:	04-11-19-1A

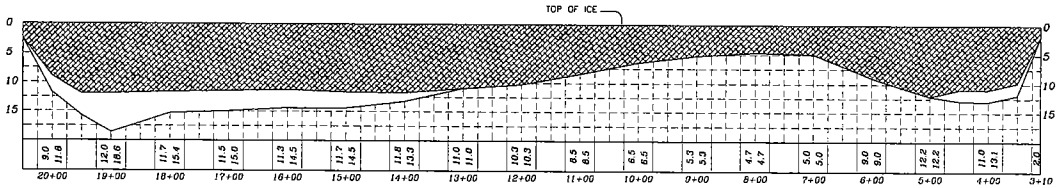
9

DRAWING: 04-11-19-1ARev9



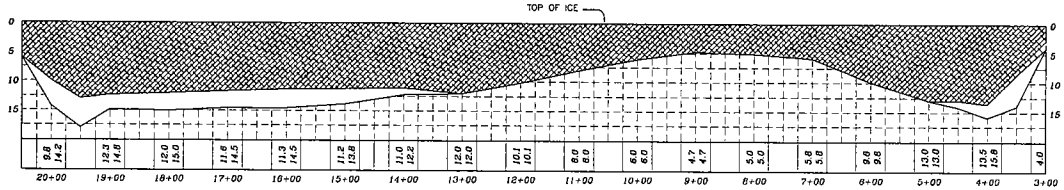
Left Shoulder (100 feet South) Profile

1" = 100' Horiz
1" = 10' Vertical



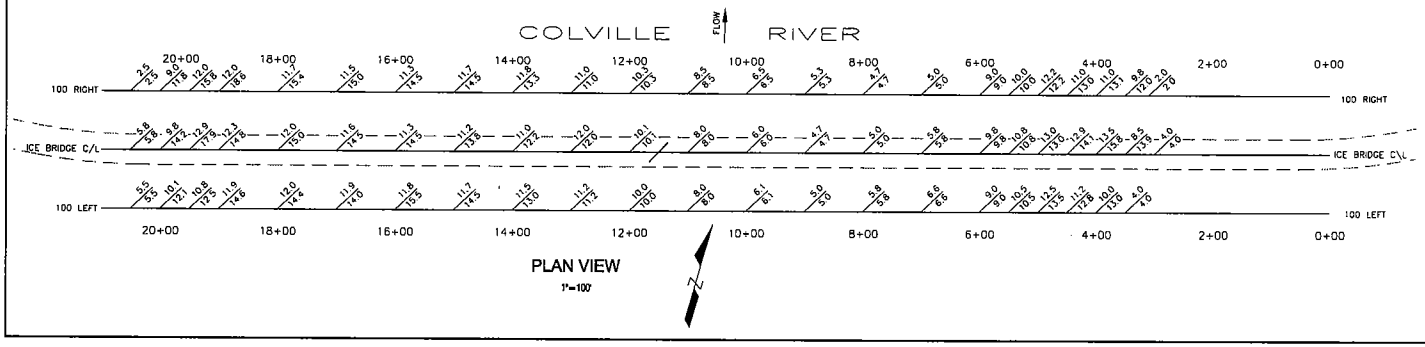
Right Shoulder (100 feet North) Profile

1" = 100' Horiz
1" = 10' Vertical



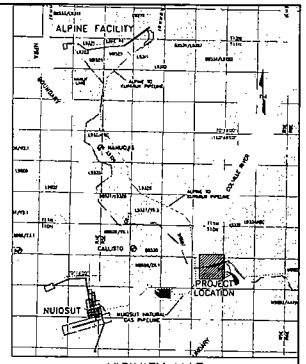
Centerline Profile

1" = 100' Horiz
1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

9.8 / 14.8 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 9.8 / 14.8 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED APRIL 26, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

4/26/2005

ALPINE, ALASKA

KUUKPIK LCMF LLC
Alpine Survey Office

DATE:	5/3/2005	SCALE:	AS SHOWN
CHECKED BY:	CD	SHEET:	1 of 1
DRAWN BY:	AG	SWR #:	04-11-19-1A

10

DRAWING: 04-11-19-1ARev10

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: April 4, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 9:15 a.m.	13.5	5.7	0.3	0-5	-	-	-	-	-	-
				6	0.2	933	12.0	84.8%	0.9	0.04
				7	0.5	2,189	11.5	83.3%	2.1	0.01
				8	0.7	6,104	9.0	65.1%	6.3	0.04
				9	0.8	7,965	8.9	64.4%	8.4	0.04
				10	0.7	9,935	8.9	64.6%	10.7	0.04
				11	1.1	11,057	7.1	51.3%	11.8	0.03
				12	1.2	11,388	6.9	50.3%	12.1	0.02
				13	1.5	11,603	6.9	51.3%	12.3	0.04
800-ft Upstream N70°14'10.7" W150°50'03.6" 10:25 a.m.	13.3	5.1	0.3	0-5	-	-	-	-	-	-
				6	0.0	641	13.5	95.0%	0.6	0.02
				7	0.3	960	12.2	86.0%	0.9	0.01
				8	0.6	3,886	8.3	60.6%	3.9	0.02
				9	0.8	6,602	8.7	63.0%	6.9	0.00
				10	0.9	8,476	8.8	64.1%	8.9	0.00
				11	1.0	10,590	8.5	61.4%	11.3	0.02
				12	1.2	11,056	7.4	54.0%	11.8	0.00
				13	1.3	11,387	7.0	50.8%	12.1	0.01
1200-ft Upstream N70°14'06.9" W150°50'01.1" 11:29 a.m.	13.9	5.5	0.2	0-5	-	-	-	-	-	-
				6	0.0	649	13.7	96.6%	0.6	0.01
				7	0.2	879	13.2	92.9%	0.9	0.03
				8	0.5	3,370	10.1	73.6%	3.4	0.02
				9	0.8	6,448	8.8	63.8%	6.7	0.02
				10	0.9	8,276	8.8	64.1%	8.7	0.02
				11	1.0	10,236	8.5	61.6%	10.9	0.02
				12	1.1	11,086	7.6	54.9%	11.7	0.02
				13	1.3	11,364	7.4	53.9%	12.1	0.04

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) NM - Not Measured

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: April 4, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 12:43 p.m.	12.5	6.4	0.50	0-6	-	-	-	-	-	-
				7	0.5	4,564	10.3	75.0%	4.7	0.02
				8	0.8	5,700	9.5	68.7%	5.9	0.00
				9	0.9	6,571	8.0	58.2%	6.8	0.01
				10	1.2	8,060	7.6	55.3%	8.4	0.01
				11	1.3	10,152	7.6	55.0%	10.7	0.02
				12	1.3	10,517	7.1	51.4%	11.1	0.01
800-ft Downstream N70°14'24.8" W150°50'16.4" 1:20 p.m.	12.9	5.8	0.25	0-5	-	-	-	-	-	-
				6	0.0	2,416	12.5	88.3%	2.4	0.02
				7	0.5	4,703	9.8	71.4%	4.8	0.02
				8	0.8	5,778	8.8	63.8%	5.9	0.03
				9	1.0	6,676	8.9	64.6%	6.9	0.02
				10	1.3	8,589	9.6	69.8%	9.0	0.02
				11	1.3	10,170	9.9	72.2%	10.7	0.03
				12	1.4	11,203	9.4	68.6%	11.9	0.01
1200-ft Downstream N70°14'29.1" W150°50'20.3" 1:55 p.m.	12.9	6.2	0.35	0-6	-	-	-	-	-	-
				7	0.6	4,978	9.3	67.4%	5.1	0.02
				8	0.9	5,830	8.9	64.4%	6.0	0.03
				9	1.1	6,646	9.0	65.2%	6.8	0.02
				10	1.2	8,730	8.8	64.1%	9.1	0.02
				11	1.3	9,793	8.6	62.5%	10.3	0.01
				12	1.4	10,936	7.9	57.5%	11.5	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) NM - Not Measured

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: March 1, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 9:15 a.m.	13.1	5.5	0.4	0-5	-	-	-	-	-	-
				6	-0.1	334	14.5	102.4%	0.3	0.00
				7	-0.1	332	NM	NM	0.3	0.00
				8	0.0	345	12.8	90.4%	0.3	0.00
				9	0.2	726	NM	NM	0.7	0.00
				10	0.5	4,266	11.5	82.3%	4.3	0.00
				11	0.5	7,130	NM	NM	7.4	0.00
				12	0.5	8,503	9.1	65.1%	9.0	0.00
				13	0.7	10,827	NM	NM	11.7	0.00
800-ft Upstream N70°14'10.7" W150°50'03.6" 10:25 a.m.	13.4	4.6	0.3	0-4	-	-	-	-	-	-
				5	0.0	340	12.5	88.3%	0.3	0.00
				6	0.0	327	NM	NM	0.3	0.03
				7	0.0	329	11.8	83.3%	0.3	0.00
				8	0.1	455	NM	NM	0.4	0.00
				9	0.4	2,317	10.4	74.2%	2.2	0.01
				10	0.5	4,968	NM	NM	5.1	0.00
				11	0.6	7,670	9.8	70.3%	8.1	0.00
				12	0.6	9,569	NM	NM	10.5	0.00
				13	0.6	10,654	9.2	66.1%	11.5	0.00
1200-ft Upstream N70°14'06.9" W150°50'01.1" 11:29 a.m.	14.9	4.3	0.3	0-4	-	-	-	-	-	-
				5	0.3	341	14.7	92.0%	0.3	0.00
				6	0.1	331	NM	NM	0.3	0.00
				7	0.1	338	13.6	96.2%	0.3	0.00
				8	0.2	561	NM	NM	0.5	0.00
				9	0.3	3,534	7.8	55.6%	3.6	0.00
				10	0.4	5,433	NM	NM	5.3	0.03
				11	0.5	8,004	7.1	50.9%	8.4	0.00
				12	0.6	9,805	NM	NM	10.9	0.00
				13	0.7	10,925	6.9	49.7%	11.8	0.00
				14	0.8	11,236	NM	NM	12.1	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) NM - Not Measured

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: March 1, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 12:43 p.m.	12.7	5.3	0.4	0-5	-	-	-	-	-	-
				6	-0.1	1,790	12.4	87.2%	1.7	0.00
				7	0.2	2,303	NM	NM	2.3	0.00
				8	0.5	3,933	10.4	74.4%	4.0	0.00
				9	0.6	5,077	NM	NM	5.2	0.00
				10	0.8	7,528	6.5	47.2%	7.9	0.00
				11	0.8	8,429	NM	NM	8.9	0.00
				12	0.9	10,107	5.9	42.7%	10.9	0.00
800-ft Downstream N70°14'24.8" W150°50'16.4" 1:20 p.m.	13.1	5.5	0.4	0-5	-	-	-	-	-	-
				6	-0.1	1,736	9.7	68.6%	1.7	0.01
				7	0.0	2,113	NM	NM	2.2	0.00
				8	0.4	3,649	6.9	49.1%	3.7	0.00
				9	0.5	4,902	NM	NM	5.1	0.00
				10	0.7	7,174	6.7	48.3%	7.4	0.03
				11	0.9	8,501	NM	NM	9.0	0.00
				12	0.9	9,507	7.3	53.1%	10.5	0.00
				13	0.9	10,700	NM	NM	11.7	0.00
1200-ft Downstream N70°14'29.1" W150°50'20.3" 1:55 p.m.	12.9	5.4	0.3	0-5	-	-	-	-	-	-
				6	-0.2	1,775	14.2	100.1%	1.8	0.00
				7	-0.1	2,067	NM	NM	2.1	0.00
				8	0.4	3,840	13.9	99.0%	3.9	0.00
				9	0.5	4,727	NM	NM	4.9	0.00
				10	0.7	7,017	10.2	73.5%	7.3	0.00
				11	0.8	8,231	NM	NM	8.6	0.00
				12	0.8	9,736	8.6	62.4%	10.5	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) NM - Not Measured

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: February 11, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 4:20 p.m.	13.4	4.5	0.2	0-4	-	-	-	-	-	-
				5	0.0	279	13.8	94.5%	0.3	0.02
				6	0.1	311	13.6	93.2%	0.3	0.00
				7	0.3	562	11.2	77.1%	0.5	0.01
				8	0.5	3,061	8.8	67.7%	3.0	0.03
				9	0.5	5,364	8.5	61.4%	5.5	0.03
				10	0.4	9,825	7.0	52.3%	10.7	0.02
				11	0.5	11,537	6.9	52.3%	12.6	0.02
				12	0.7	12,089	6.9	52.6%	13.2	0.00
				13	0.9	12,613	7.2	55.5%	13.7	0.00
800-ft Upstream N70°14'10.7" W150°50'03.6" 3:20 p.m.	13.2	3.7	0.2	0-3	-	-	-	-	-	-
				4	-0.1	265	13.4	92.1%	0.2	0.00
				5	0.0	279	13.2	90.1%	0.3	0.01
				6	0.1	334	12.2	84.0%	0.3	0.00
				7	0.2	580	11.0	75.8%	0.6	0.01
				8	0.4	2,807	9.6	67.8%	2.8	0.02
				9	0.5	5,717	8.2	59.3%	5.9	0.02
				10	0.5	10,542	7.2	54.1%	11.5	0.02
				11	0.6	11,823	7.2	54.8%	12.9	0.01
				12	0.8	12,308	7.5	57.5%	13.4	0.01
				13	1.0	12,582	7.9	61.1%	13.6	0.02
1200-ft Upstream N70°14'06.9" W150°50'01.1" 2:20 p.m.	14.3	4.4	0.3	0-4	-	-	-	-	-	-
				5	-0.1	271	13.4	92.0%	0.3	0.01
				6	0.0	323	12.4	85.1%	0.3	0.01
				7	0.2	604	11.1	76.6%	0.6	0.01
				8	0.4	3,261	9.1	64.0%	3.3	0.00
				9	0.5	5,943	8.2	59.0%	6.2	0.03
				10	0.4	10,377	7.2	54.2%	11.3	0.04
				11	0.6	11,710	7.0	53.7%	12.7	0.01
				12	0.8	12,277	7.0	53.7%	13.3	0.03
				13	0.9	12,583	7.2	55.6%	13.7	0.01
				14	1.0	12,806	7.3	56.5%	13.9	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: February 11, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 5:10 p.m.	12.4	4.6	0.3	0-4	-	-	-	-	-	-
				5	0.1	1,160	13.1	90.7%	1.1	0.01
				6	0.1	1,413	11.9	82.7%	1.4	0.02
				7	0.4	3,039	9.6	67.7%	3.0	0.01
				8	0.5	4,889	9.0	64.8%	5.0	0.01
				9	0.7	8,467	7.1	52.6%	9.0	0.03
				10	0.7	10,071	7.0	52.8%	10.8	0.02
				11	0.7	11,731	6.9	52.7%	12.7	0.02
				12	0.7	12,168	7.4	56.5%	13.3	0.03
800-ft Downstream N70°14'24.8" W150°50'16.4" 6:35 p.m.	13.3	4.4	0.3	0-4	-	-	-	-	-	-
				5	-0.1	1,170	15.0	102.8%	1.1	0.01
				6	0.2	1,813	11.4	79.6%	1.8	0.02
				7	0.4	3,513	9.4	66.7%	3.5	0.02
				8	0.4	5,147	8.7	62.2%	5.3	0.02
				9	0.6	8,393	7.6	56.5%	8.9	0.03
				10	0.7	10,032	7.1	53.0%	10.8	0.03
				11	0.6	11,799	8.1	60.9%	12.9	0.03
				12	0.8	12,328	7.2	55.3%	13.4	0.03
				13	1.0	12,891	7.7	59.9%	14.0	0.02
1200-ft Downstream N70°14'29.1" W150°50'20.3" 7:40 p.m.	13.2	4.5	0.4	0-4	-	-	-	-	-	-
				5	0.0	1,161	13.9	95.3%	1.1	0.05
				6	0.2	1,849	10.8	74.9%	1.8	0.00
				7	0.4	3,329	9.7	68.3%	3.4	0.02
				8	0.5	5,714	8.7	63.0%	5.9	0.01
				9	0.6	8,686	7.1	52.8%	9.2	0.02
				10	0.6	10,095	7.1	53.2%	10.9	0.02
				11	0.6	11,805	7.1	53.6%	12.9	0.01
				12	0.8	12,441	7.0	54.0%	13.5	0.01
				13	0.9	12,893	7.0	54.0%	14.0	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: January 31, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 4:00 p.m.	13.2	4.5	0.2	0-4	-	-	-	-	-	-
				5	0.0	240	15.4	104.1%	0.2	0.02
				6	0.2	283	15.0	102.2%	0.3	0.02
				7	0.3	485	13.3	92.0%	0.4	0.01
				8	0.5	1,801	12.6	88.1%	1.7	0.00
				9	0.5	4,614	11.7	83.3%	4.7	0.00
				10	0.6	11,021	10.0	75.5%	11.8	0.02
				11	0.7	11,356	9.9	75.8%	12.3	0.01
				12	0.8	11,992	9.9	76.2%	13.0	0.02
				13	1.0	12,976	9.9	77.2%	14.1	0.04
800-ft Upstream N70°14'10.7" W150°50'03.6" 3:20 p.m.	13.4	3.8	0.1	0-3	-	-	-	-	-	-
				4	-0.1	226	21.2	145.2%	0.2	0.01
				5	0.1	242	20.5	139.7%	0.2	0.00
				6	0.1	289	19.9	137.0%	0.3	0.01
				7	0.3	476	19.4	134.0%	0.4	0.01
				8	0.4	1,493	18.9	131.9%	1.4	0.02
				9	0.5	4,842	17.7	126.8%	4.9	0.03
				10	0.6	10,689	15.2	113.8%	11.5	0.02
				11	0.7	11,239	15.0	113.9%	12.2	0.03
				12	0.8	11,928	14.9	114.2%	12.9	0.05
				13	0.9	12,369	15.1	116.1%	13.4	0.02
1200-ft Upstream N70°14'06.9" W150°50'01.1" 2:30 p.m.	14.3	3.8	0.1	0-3	-	-	-	-	-	-
				4	-0.1	223	20.9	142.7%	0.2	0.01
				5	0.0	225	20.6	140.7%	0.2	0.01
				6	0.0	236	20.3	139.9%	0.2	0.01
				7	0.2	410	19.4	134.0%	0.4	0.02
				8	0.4	1,375	18.8	131.2%	1.3	0.02
				9	0.5	3,900	17.4	124.4%	4.1	0.03
				10	0.6	10,382	15.6	117.5%	11.2	0.02
				11	0.6	10,958	15.9	119.8%	11.9	0.04
				12	0.8	11,615	16.2	123.4%	12.6	0.03
				13	0.8	12,034	16.2	124.2%	13.0	0.02
				14	0.9	12,800	16.1	123.7%	13.9	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: January 31, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 4:43 p.m.	12.1	4.5	0.1	0-4	-	-	-	-	-	-
				5	0.0	614	14.3	96.6%	0.6	0.00
				6	0.3	1,292	12.7	88.6%	1.2	0.00
				7	0.3	2,295	12.5	87.4%	2.3	0.02
				8	0.3	4,490	11.8	84.1%	4.6	0.03
				9	0.5	9,004	9.6	71.3%	9.7	0.01
				10	0.6	10,430	9.7	72.5%	11.3	0.01
				11	0.7	11,169	9.7	73.3%	12.1	0.01
				12	0.8	11,738	9.9	76.0%	12.7	0.02
800-ft Downstream N70°14'24.8" W150°50'16.4" 5:15 p.m.	12.8	4.4	0.2	0-4	-	-	-	-	-	-
				5	-0.1	471	14.7	100.7%	0.4	0.01
				6	0.3	475	14.5	99.4%	0.4	0.02
				7	0.4	557	14.5	98.9%	0.6	0.02
				8	0.5	5,960	10.7	76.0%	6.2	0.02
				9	0.7	9,382	9.3	69.3%	10.0	0.03
				10	0.7	10,533	9.1	68.3%	11.4	0.03
				11	0.7	11,327	8.0	61.2%	12.3	0.02
				12	1.0	12,694	10.0	78.1%	13.8	0.00
1200-ft Downstream N70°14'29.1" W150°50'20.3" 6:15 p.m.	13.1	4.4	0.2	0-4	-	-	-	-	-	-
				5	0.0	691	14.0	96.3%	0.7	0.02
				6	0.2	1,158	12.7	88.1%	1.1	0.02
				7	0.4	2,610	11.9	83.1%	2.5	0.02
				8	0.5	5,412	10.5	75.5%	5.6	0.02
				9	0.6	8,900	9.5	70.8%	9.5	0.03
				10	0.7	10,330	9.3	70.3%	11.1	0.03
				11	0.7	10,522	9.4	71.2%	11.3	0.02
				12	0.7	10,990	9.7	73.4%	11.9	0.03
				13	0.7	11,450	10.1	76.8%	13.5	0.05

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: January 17, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 4:45 p.m.	13.3	3.7	0.2	0-3	-	-	-	-	-	-
				4	-0.1	193	14.4	99.6%	0.2	0.02
				5	-0.1	199	13.8	94.7%	0.2	0.02
				6	0.0	195	13.9	95.1%	0.2	0.04
				7	0.0	192	14.0	95.5%	0.2	0.01
				8	0.0	197	14.0	95.5%	0.2	0.03
				9	0.2	212	14.1	97.3%	0.2	0.03
				10	0.2	256	11.8	101.7%	0.2	0.01
				11	0.3	4,350	14.7	104.3%	4.5	0.03
				12	0.5	9,138	17.3	129.1%	9.8	0.02
				13	0.3	9,180	NM	NM	9.8	0.06
800-ft Upstream N70°14'10.7" W150°50'03.6" 4:15 p.m.	13.9	3.3	0.2	0-3	-	-	-	-	-	-
				4	0.0	193	16.5	113.1%	0.2	0.01
				5	0.0	194	16.7	114.8%	0.2	0.02
				6	0.0	197	17.1	117.3%	0.2	0.01
				7	0.0	199	17.5	120.0%	0.2	0.03
				8	0.3	240	17.6	121.3%	0.2	0.04
				9	0.3	305	17.7	122.2%	0.3	0.04
				10	0.4	3,150	17.0	120.2%	3.2	0.02
				11	0.5	8,400	16.3	120.7%	8.7	0.03
				12	0.6	9,700	16.8	126.3%	10.4	0.07
				13	0.6	9,500	NM	NM	9.6	0.07
1200-ft Upstream N70°14'06.9" W150°50'01.1" 12:25 p.m.	14.4	3.4	0.2	0-3	-	-	-	-	-	-
				4	-0.1	199	15.6	106.5%	0.2	0.01
				5	-0.1	194	15.8	107.8%	0.2	0.01
				6	-0.1	193	16.0	109.2%	0.2	0.00
				7	-0.1	194	16.1	109.9%	0.2	0.02
				8	0.0	193	16.3	111.7%	0.2	0.01
				9	0.1	200	16.3	111.5%	0.2	0.04
				10	0.3	243	16.2	111.5%	0.2	0.04
				11	0.3	530	16.3	112.5%	0.5	0.03
				12	0.5	9,360	15.0	112.0%	10.0	0.04
				13	0.7	10,370	15.6	118.5%	11.2	0.03
				14	0.8	10,400	NM	NM	11.1	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: January 17, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 5:30 p.m.	12.5	4.0	0.3	0-4	-	-	-	-	-	-
				5	-0.1	233	15.5	106.1%	0.2	0.02
				6	0.0	232	15.5	106.1%	0.2	0.03
				7	0.0	230	15.7	107.4%	0.2	0.03
				8	0.0	242	16.1	110.1%	0.2	0.03
				9	0.1	510	16.7	115.3%	0.5	0.02
				10	0.3	1,182	17.5	122.3%	1.1	0.02
				11	0.4	3,200	NM	NM	3.2	0.04
				12	0.6	8,200	NM	NM	8.7	0.01
800-ft Downstream N70°14'24.8" W150°50'16.4" 7:00 p.m.	13.0	4.0	0.2	0-3	-	-	-	-	-	-
				4	0.0	223	14.6	99.7%	0.2	0.01
				5	0.0	230	14.6	99.8%	0.2	0.01
				6	0.0	238	14.6	100.0%	0.2	0.02
				7	0.0	256	14.9	102.0%	0.2	0.03
				8	0.3	1,142	15.1	105.4%	1.1	0.03
				9	0.4	2,322	15.2	106.9%	2.3	0.03
				10	0.6	7,280	14.4	106.3%	7.7	0.03
				11	0.6	9,280	16.2	121.5%	9.9	0.02
				12	0.7	9,512	NM	NM	10.2	0.02
				13	0.8	11,450	NM	NM	12.4	0.04
1200-ft Downstream N70°14'29.1" W150°50'20.3" 7:30 p.m.	13.6	4.2	0.2	0-4	-	-	-	-	-	-
				5	0.0	232	13.9	94.9%	0.2	0.03
				6	0.0	286	13.8	94.6%	0.3	0.03
				7	0.1	442	13.8	94.8%	0.4	0.03
				8	0.2	860	13.8	95.5%	0.8	0.02
				9	0.3	1,360	13.8	96.2%	1.3	0.02
				10	0.4	3,130	13.3	94.5%	3.2	0.03
				11	0.6	8,690	12.1	90.0%	9.3	0.07
				12	0.7	10,158	13.0	98.1%	10.9	0.04
				13	0.7	>11,000	14.0	107.7%	12.0	0.01

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: January 03, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 5:00 p.m.	12.5	3.5	0.3	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.1	176	10.5	74.4%	0.2	0.02
				5	0.1	175	N/M	N/M	0.2	0.02
				6	0.2	175	10.5	74.6%	0.2	0.02
				7	0.4	176	N/M	N/M	0.2	0.02
				8	0.4	175	10.5	75.0%	0.2	0.00
				9	0.6	178	N/M	N/M	0.2	0.02
				10	0.7	183	10.8	77.6%	0.2	0.02
				11	0.8	194	N/M	N/M	0.2	0.01
				12	0.8	217	12.0	86.2%	0.2	0.02
800-ft Upstream N70°14'10.7" W150°50'03.6" 4:00 p.m.	12.9	2.7	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.1	174	N/M	N/M	0.2	0.00
				4	0.1	173	10.7	75.8%	0.2	0.01
				5	0.2	172	N/M	N/M	0.2	0.02
				6	0.3	171	10.7	76.2%	0.2	0.00
				7	0.5	172	N/M	N/M	0.2	0.02
				8	0.6	172	10.7	76.6%	0.2	0.00
				9	0.6	174	N/M	N/M	0.2	0.02
				10	0.7	176	10.6	75.9%	0.2	0.02
				11	0.8	179	N/M	N/M	0.2	0.00
				12	0.8	188	11.4	81.9%	0.2	0.01
1200-ft Upstream N70°14'06.9" W150°50'01.1" 2:30 p.m.	13.9	2.9	0.1	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.0	178	N/M	N/M	0.2	0.01
				4	0.0	177	10.7	75.6%	0.2	0.03
				5	0.1	177	10.9	77.2%	0.2	0.03
				6	0.2	176	11.1	78.8%	0.2	0.03
				7	0.4	176	10.9	77.9%	0.2	0.01
				8	0.5	177	11.4	81.7%	0.2	0.02
				9	0.6	180	11.3	80.9%	0.2	0.03
				10	0.7	182	12.3	88.4%	0.2	0.00
				11	0.7	187	13.0	93.4%	0.2	0.01
				12	0.7	188	13.0	93.4%	0.2	0.03
				13	0.8	197	13.2	94.8%	0.2	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: January 03, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 1:45 p.m.	11.9	3.5	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.0	182	9.5	67.1%	0.2	0.00
				5	0.0	182	9.5	67.1%	0.2	0.00
				6	0.1	182	9.6	68.0%	0.2	0.00
				7	0.3	182	9.6	68.4%	0.2	0.01
				8	0.5	182	9.7	69.5%	0.2	0.00
				9	0.5	187	10.2	73.1%	0.2	0.01
				10	0.7	195	11.3	81.2%	0.2	0.00
				11	0.8	202	11.4	81.9%	0.2	0.02
800-ft Downstream N70°14'24.8" W150°50'16.4" 1:30 p.m.	12.3	3.2	0.1	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.1	180	10.3	72.9%	0.2	0.00
				5	0.1	180	10.3	72.9%	0.2	0.02
				6	0.2	181	10.3	73.2%	0.2	0.02
				7	0.4	183	10.2	72.9%	0.2	0.01
				8	0.5	185	10.2	73.1%	0.2	0.02
				9	0.7	185	10.3	74.0%	0.2	0.03
				10	0.7	185	10.2	73.3%	0.2	0.01
				11	0.7	205	10.0	71.8%	0.2	0.00
				12	0.6	237	10.3	73.8%	0.2	0.03
1200-ft Downstream N70°14'29.1" W150°50'20.3" 12:00 p.m.	12.8	3.1	0.4	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.2	180	10.2	72.4%	0.2	0.00
				5	0.2	179	10.3	73.2%	0.2	0.00
				6	0.2	178	10.4	73.9%	0.2	0.00
				7	0.4	181	10.3	73.6%	0.2	0.02
				8	0.6	183	10.3	73.8%	0.2	0.00
				9	0.6	183	10.3	73.8%	0.2	0.00
				10	0.6	202	10.2	73.1%	0.2	0.01
				11	0.5	228	10.4	74.5%	0.2	0.00
				12	0.7	231	10.5	75.4%	0.2	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: December 07, 2004

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 12:00 p.m.	12.5	2.6	0.2	1	-	-	-	-	-	-
				2	0.2	152	11.2	79.5%	0.1	0.00
				3	0.2	151	11.0	78.1%	0.1	0.02
				4	0.1	152	10.9	77.2%	0.1	0.01
				5	0.1	152	10.9	77.2%	0.1	0.02
				6	0.1	153	10.9	77.2%	0.1	0.02
				7	0.2	153	10.8	76.7%	0.1	0.03
				8	0.3	153	10.7	76.2%	0.1	0.02
				9	0.3	157	10.7	76.2%	0.1	0.02
				10	0.4	159	10.6	75.7%	0.1	0.02
				11	0.4	164	12.5	89.3%	0.1	0.01
				12	0.4	172	12.3	87.9%	0.1	0.01
800-ft Upstream N70°14'10.7" W150°50'03.6" 11:20 p.m.	12.6	2.0	0.1	1	-	-	-	-	-	-
				2	0.1	157	11.1	78.6%	0.1	0.00
				3	0.1	154	11.1	78.6%	0.1	0.00
				4	0.1	153	11.1	78.6%	0.1	0.01
				5	0.1	152	11.0	77.9%	0.1	0.00
				6	0.1	152	10.9	77.2%	0.1	0.01
				7	0.2	151	10.9	77.4%	0.1	0.01
				8	0.2	150	10.9	77.4%	0.1	0.02
				9	0.2	150	10.8	76.7%	0.1	0.02
				10	0.3	151	10.8	76.9%	0.1	0.01
				11	0.4	153	10.7	76.4%	0.1	0.01
				12	0.5	155	11.0	78.8%	0.1	0.01
1200-ft Upstream N70°14'06.9" W150°50'01.1" 10:25 p.m.	13.4	2.0	0.1	1	-	-	-	-	-	-
				2	0.1	157	10.9	77.2%	0.1	0.00
				3	0.1	156	10.9	77.2%	0.1	0.00
				4	0.1	155	10.9	77.2%	0.1	0.00
				5	0.1	155	10.9	77.2%	0.1	0.00
				6	0.1	155	10.8	76.5%	0.1	0.00
				7	0.1	155	10.9	77.2%	0.1	0.00
				8	0.2	154	10.9	77.4%	0.1	0.00
				9	0.3	154	10.8	76.9%	0.1	0.00
				10	0.3	155	10.8	76.9%	0.1	0.00
				11	0.4	159	10.9	77.9%	0.1	0.00
				12	0.4	161	11.2	80.0%	0.1	0.00
				13	0.5	163	11.4	81.7%	0.1	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: December 07, 2004

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 1:17 p.m.	11.5	2.7	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.0	155	11.0	77.7%	0.1	0.00
				4	0.0	155	11.0	77.7%	0.1	0.00
				5	0.0	155	10.9	77.0%	0.1	0.00
				6	0.1	155	10.8	76.5%	0.1	0.00
				7	0.2	154	10.7	76.0%	0.1	0.00
				8	0.3	154	10.7	76.2%	0.1	0.00
				9	0.4	155	10.8	77.1%	0.1	0.00
				10	0.4	158	12.1	86.4%	0.1	0.00
				11	0.4	164	12.2	87.1%	0.1	0.00
800-ft Downstream N70°14'24.8" W150°50'16.4" 2:15 p.m.	12.1	2.5	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.1	156	11.1	78.6%	0.1	0.00
				4	0.1	156	11.0	77.9%	0.1	0.00
				5	0.1	156	11.0	77.9%	0.1	0.00
				6	0.1	156	11.0	77.9%	0.1	0.00
				7	0.1	156	11.0	77.9%	0.1	0.00
				8	0.3	154	11.1	79.1%	0.1	0.00
				9	0.4	155	11.3	80.7%	0.1	0.00
				10	0.4	160	11.5	82.1%	0.1	0.00
				11	0.5	160	11.9	85.2%	0.1	0.00
				12	0.6	162	11.9	85.2%	0.1	0.00
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:50 p.m.	12.7	2.2	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.1	156	11.0	77.9%	0.1	0.00
				4	0.1	156	11.0	77.9%	0.1	0.00
				5	0.1	156	11.0	77.9%	0.1	0.00
				6	0.1	156	11.0	77.9%	0.1	0.00
				7	0.1	156	10.9	77.2%	0.1	0.00
				8	0.3	157	10.7	76.2%	0.1	0.00
				9	0.5	156	10.7	76.6%	0.1	0.00
				10	0.5	156	10.9	78.1%	0.1	0.00
				11	0.5	158	11.4	81.7%	0.1	0.00
				12	0.6	160	11.3	80.9%	0.1	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: November 22, 2004

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 1:30 p.m.	13.1	2.0	0.1	1.0	0.2	156.4	11.45	81.3%	0.10	0.00
				2.0	0.1	152.6	10.93	77.4%	0.10	0.00
				3.0	0.2	149.7	10.60	75.3%	0.10	0.00
				4.0	0.1	149.3	10.56	74.8%	0.10	0.00
				5.0	0.1	148.7	10.45	74.0%	0.10	0.00
				6.0	0.1	148.7	10.57	74.9%	0.10	0.00
				7.0	0.2	148.4	10.33	73.4%	0.10	0.00
				8.0	0.2	148.4	10.39	73.8%	0.10	0.00
				9.0	0.2	148.5	10.34	73.4%	0.10	0.00
				10.0	0.2	150.1	10.31	73.2%	0.10	0.00
				11.0	0.3	151.8	10.11	72.0%	0.10	0.00
				12.0	0.3	152.2	10.07	71.7%	0.10	0.00
				13.0	0.3	152.2	10.13	72.2%	0.10	0.00
800-ft Upstream N70°14'10.7" W150°50'03.6" 12:50 p.m.	13.2	1.9	0.1	1.0	0.3	156.7	10.16	72.4%	0.10	0.00
				2.0	0.3	150.4	10.52	74.9%	0.10	0.00
				3.0	0.2	149.3	10.47	74.4%	0.10	0.00
				4.0	0.2	149.2	10.65	75.6%	0.10	0.00
				5.0	0.2	148.8	10.55	74.9%	0.10	0.00
				6.0	0.2	148.7	10.62	75.4%	0.10	0.00
				7.0	0.2	148.6	10.58	75.1%	0.10	0.00
				8.0	0.2	148.1	10.56	75.0%	0.10	0.00
				9.0	0.3	148.3	10.34	73.6%	0.10	0.00
				10.0	0.3	149.4	10.46	74.5%	0.10	0.00
				11.0	0.3	150.2	10.43	74.3%	0.10	0.00
				12.0	0.3	150.7	10.27	73.1%	0.10	0.00
				13.0	0.3	150.9	10.41	74.1%	0..01	0.00
1200-ft Upstream N70°14'06.9" W150°50'01.1" 12:05 p.m.	14.4	1.8	0.1	1.0	0.6	154.2	11.70	84.0%	0.10	0.00
				2.0	0.1	149.5	11.90	84.3%	0.10	0.01
				3.0	0.1	149.5	12.00	85.0%	0.10	0.01
				4.0	0.1	149.2	12.00	85.0%	0.10	0.00
				5.0	0.1	149.3	12.00	85.0%	0.10	0.00
				6.0	0.1	149.2	12.00	85.0%	0.10	0.00
				7.0	0.2	149.0	11.90	84.5%	0.10	0.00
				8.0	0.2	148.7	10.06	71.4%	0.10	0.00
				9.0	0.2	148.4	10.37	73.7%	0.10	0.00
				10.0	0.3	149.4	10.39	74.0%	0.10	0.00
				11.0	0.3	149.8	10.36	73.8%	0.10	0.00
				12.0	0.3	150.7	10.39	74.0%	0.10	0.00
				13.0	0.3	151.3	10.43	74.3%	0.10	0.00
				14.0	0.3	151.4	10.51	74.9%	0.10	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: November 22, 2004

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 2:00 p.m.	12.5	1.7	0.1	1.0	0.3	159.8	9.53	67.9%	0.1	0.00
				2.0	0.2	151.1	10.20	72.4%	0.1	0.00
				3.0	0.1	149.6	10.26	72.7%	0.1	0.01
				4.0	0.1	148.9	10.36	73.4%	0.1	0.01
				5.0	0.1	147.9	10.29	72.9%	0.1	0.02
				6.0	0.1	148.3	10.32	73.1%	0.1	0.02
				7.0	0.2	147.7	10.28	73.0%	0.1	0.02
				8.0	0.2	147.9	10.20	72.4%	0.1	0.02
				9.0	0.2	148.7	10.41	73.9%	0.1	0.00
				10.0	0.2	152.3	10.18	72.3%	0.1	0.01
				11.0	0.2	152.7	10.34	73.4%	0.1	0.00
				12.0	0.2	152.8	10.32	73.3%	0.1	0.00
800-ft Downstream N70°14'24.8" W150°50'16.4" 2:30 p.m	12.9	1.7	0.1	1.0	0.2	153.9	11.48	81.5%	0.1	0.00
				2.0	0.2	150.7	10.81	76.8%	0.1	0.00
				3.0	0.1	148.3	10.62	75.2%	0.1	0.03
				4.0	0.1	148.8	10.61	75.1%	0.1	0.00
				5.0	0.1	147.9	10.42	73.8%	0.1	0.00
				6.0	0.1	147.9	10.52	74.5%	0.1	0.01
				7.0	0.1	147.9	10.40	73.7%	0.1	0.00
				8.0	0.2	148.2	10.35	73.5%	0.1	0.00
				9.0	0.2	149.8	10.43	74.1%	0.1	0.00
				10.0	0.2	152.3	10.51	74.6%	0.1	0.00
				11.0	0.2	152.7	10.57	75.1%	0.1	0.00
				12.0	0.2	152.7	10.49	74.5%	0.1	0.00
1200-ft Downstream N70°14'29.1" W150°50'20.3" 3:00 p.m.	13.2	1.7	0.1	1.0	0.1	147.4	10.08	71.4%	0.1	0.00
				2.0	0.1	150.2	9.71	68.8%	0.1	0.00
				3.0	0.1	149.8	9.73	68.9%	0.1	0.00
				4.0	0.1	148.7	9.87	69.9%	0.1	0.00
				5.0	0.1	148.7	9.90	70.1%	0.1	0.00
				6.0	0.1	148.4	9.86	69.8%	0.1	0.00
				7.0	0.2	148.3	9.94	70.6%	0.1	0.00
				8.0	0.2	149.1	10.04	71.3%	0.1	0.00
				9.0	0.2	150.4	9.90	70.3%	0.1	0.00
				10.0	0.2	152.3	9.95	70.7%	0.1	0.00
				11.0	0.2	153.1	10.03	71.2%	0.1	0.00
				12.0	0.2	152.9	9.89	70.2%	0.1	0.00
				13.0	0.3	152.4	10.03	71.4%	0.1	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: December 7, 2004
Project Code: 104916	Submitted by: Mike Alexander, PE

Weather: Temp. between –30° and -15° F, Wind @ 5 to 10 mph, Mostly Clear.

Mike Alexander arrived at Alpine on Monday, December 6, 2004 at 4:00 PM. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge. Matt Whitman and Richard Kemnitz of the BLM were at Alpine and participated in the collection of data at the ice bridge with Michael Baker Jr. Inc.

On December 7, at 8:00 AM, the gear was assembled and LCMF (AJ) drove Mr. Alexander, Mr. Whitman, and Mr. Kemnitz to the ice bridge in the Haggland. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200-feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

Water pumping activities were underway at the bridge site. In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, temperature) and a Marsh McBirney Model 2000 velocity meter. Dissolved oxygen (DO) measurements were recorded using a HACH HQ10 meter using non-membrane technology. Measurements were made from the below the ice surface to the rivers bottom at one-foot intervals.

All data collected indicated water quality parameters at the Colville River to be within AK DNR permit stipulation limitations. On December 7, 2004, at 5:00 PM, Mr. Alexander left Alpine to return to Anchorage via Kuparuk. Based on permit stipulations, the next ice bridge monitoring event is planned for December 20, 2004.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: November 22, 2004
Project Code: 104916	Submitted by: Mike Cox, PE

Weather: 5° F, Wind @ 19 mph, Mostly Clear.

Mike Cox arrived at Alpine on Monday, November 22, 2004 at 10:30 AM. The purpose of the trip was to conduct the pre-water withdrawal survey of the Colville River Ice Bridge. Gene Diamond of LCMF was contacted on November 18, 2004 and a plan was made for departure on November 22, 2004. Mr. Cox met with Alpine environmental coordinator Shellie Colegrove and obtained the velocity meter provided by Exploration Environmental Coordinators Leigh McDaniel and Chris Brown. Shellie Colegrove confirmed that she had contacted Gene Diamond and that travel on the tundra was authorized.

At 11:30 AM, the gear was assembled and LCMF (Gene Diamond) drove Mr. Cox to the ice bridge in the Haggland. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites located 400, 800 and 1200-feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

In-situ water quality parameters were collected using a YSI meter (conductivity, salinity, temperature) and a Marsh McBirney Model 2000 velocity meter. Dissolved oxygen (DO) measurements were recorded using a Horiba U10 meter. Attempts to collect DO with a HACH HQ10 meter utilizing non-membrane technology failed. Measurements were made from the water surface to the rivers bottom at one-foot intervals.

On November 23, 2004, Mr. Cox returned to Anchorage via Kuparuk. Based on permit stipulations, the next ice bridge monitoring event is planned for December 6, 2004. Mike Alexander is scheduled to conduct the monitoring. Richard Kemnitz and Matt Whitman from the BLM are scheduled to accompany Mr. Alexander on the December 6 monitoring event.

ConocoPhillips

Project Trip Report

Baker

Project Name:	Date of Trip:
Colville River Ice Bridge Monitoring	December 20, 2004
Project Code:	**Submitted by:**
104916	Mike Alexander, PE

Weather: Temperatures ranged between –5° and 0° F, Wind @ 5 to 10 mph, Mostly Clear.

Mike Alexander and Wilden Paulino arrived at Alpine on Monday, December 20, 2004 at 10:00 AM. Upon arrival, we met up with Gene Diamond and Chris Zeimet of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring site. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge.

At 11:00 AM, Mr. Alexander and Mr. Paulino assembled and calibrated the equipment and gear. LCMF (Chris Zeimet) drove Mr. Alexander and Mr. Paulino to the ice bridge monitoring site in an off road vehicle (Haggland). Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

Water pumping activities were underway at the bridge site. In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, temperature) and a Marsh McBirney Model 2000 velocity meter. Dissolved oxygen (DO) measurements were recorded using a HACH HQ10 meter using non-membrane technology. Measurements were made from below the ice surface to the river bottom at one-foot intervals.

All data collected indicated water quality parameters at the Colville River to be within AK DNR permit stipulation limitations. On December 21, 2004, at 8:30 AM, Mr. Alexander and Mr. Paulino left Alpine to return to Anchorage via Kuparuk. Based on permit stipulations, the next ice bridge monitoring event is planned for January 03, 2005.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: January 03, 2005
Project Code: 105175	Submitted by: Mike Alexander, PE

Weather: Temperatures ranged between 25° and 30° F, Wind @ 5 to 10 mph, Mostly Clear.

Wilden Paulino arrived at Alpine on Monday, January 03, 2005 at 10:00 AM. Upon arrival, he met up with A.J. Griffin of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring site. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge.

At 11:00 AM, Mr. Paulino assembled and calibrated the equipment and gear. LCMF (A.J. Griffin) drove Mr. Paulino to the ice bridge monitoring site in an off road vehicle (Suburban). Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

Water pumping activities were underway at the bridge site. In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, temperature) and a Marsh McBirney Model 2000 velocity meter. Dissolved oxygen (DO) measurements were recorded using a HACH HQ10 meter using non-membrane technology; however at 2:30 p.m. the meter ceased functioning and the back up HORIBA U-10 was used for the remaining analysis. Because the HORIBA U-10 is slower at gathering data than the HACH HQ10, measurements were taken at two feet increments for the last three locations. All other measurements were made from below the ice surface to the river bottom at one-foot intervals.

All data collected indicated water quality parameters at the Colville River to be within AK DNR permit stipulation limitations. On January 04, 2005, at 8:30 AM, Mr. Paulino left Alpine to return to Anchorage via Kuparuk. Based on permit stipulations, the next ice bridge monitoring event is planned for January 17, 2005.

ConocoPhillips

Project Trip Report

Baker

Project Name:	Date of Trip:
Colville River Ice Bridge Monitoring	January 17, 2005
Project Code:	**Submitted by:**
105175	Mike Cox, PE

Weather: Ambient Air Temperature –32°F, Wind @ 12 to 15 mph, Wind Chill Temperature –62°F, Clear Skies.

Mike Cox arrived at Alpine on Monday, January 17, 2005 at 10:00 a.m. Upon arrival, Mr. Cox met up with Gene Diamond and Chris Zeimet of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring site. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge. Gear was assembled and water quality monitoring equipment was calibrated.

At 11:50 a.m. Mr. Zeimet and Mr. Cox traveled the ice road to the ice bridge monitoring sites in an off road vehicle (Haggland). Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

In-situ water quality parameters were recorded using a YSI-556 meter (conductivity, salinity, temperature, and dissolved oxygen) and a Marsh McBirney Model 2000 velocity meter (water velocity). Dissolved oxygen (DO) measurements were recorded using membrane technology. Measurements were made from below the ice surface to the river bottom at one-foot intervals. In-situ water quality parameters were verified using both a YSI-30 meter (conductivity, salinity, temperature) and a HACH U10 meter (conductivity, salinity, temperature, and DO).

Increased salinity and conductivity concentrations were observed along the bottom of the river channel at all six monitoring sites. Concentrations of salinity and conductivity in the lower two to five feet of the river channel ranged from 0.5 to 12.4 PPT and 530 to over 11,000 uS/cm, respectively. Conductivity at and below approximately 10 to 11 feet (upstream) and 8 to 9 feet (downstream) exceeded the Alaska Department of Natural Resources (AKDNR) Fish Habitat Permit FH04-III-0135, issued May 18, 2004.

AKDNR permit stipulations state, *if specific conductance measurements are above 500 uS/cm water withdrawl from the Colville River will not be authorized.* Mr. Cox contacted Chris Brown of ConocoPhillips on January 18, 2005 and informed her of the monitoring results.

On January 18, 2005, at 8:30 a.m., Mr. Cox left Alpine to return to Anchorage via Kuparuk. Based on permit stipulations, the next ice bridge monitoring event is planned for January 31, 2005.

ConocoPhillips

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: January 17, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 4:45 p.m.	13.3	3.7	0.2	0-3	-	-	-	-	-	-
				4	-0.1	193	14.4	99.6%	0.2	0.02
				5	-0.1	199	13.8	94.7%	0.2	0.02
				6	0.0	195	13.9	95.1%	0.2	0.04
				7	0.0	192	14.0	95.5%	0.2	0.01
				8	0.0	197	14.0	95.5%	0.2	0.03
				9	0.2	212	14.1	97.3%	0.2	0.03
				10	0.2	256	11.8	101.7%	0.2	0.01
				11	0.3	4,350	14.7	104.3%	4.5	0.03
				12	0.5	9,138	17.3	129.1%	9.8	0.02
				13	0.3	9,180	NM	NM	9.8	0.06
800-ft Upstream N70°14'10.7" W150°50'03.6" 4:15 p.m.	13.9	3.3	0.2	0-3	-	-	-	-	-	-
				4	0.0	193	16.5	113.1%	0.2	0.01
				5	0.0	194	16.7	114.8%	0.2	0.02
				6	0.0	197	17.1	117.3%	0.2	0.01
				7	0.0	199	17.5	120.0%	0.2	0.03
				8	0.3	240	17.6	121.3%	0.2	0.04
				9	0.3	305	17.7	122.2%	0.3	0.04
				10	0.4	3,150	17.0	120.2%	3.2	0.02
				11	0.5	8,400	16.3	120.7%	8.7	0.03
				12	0.6	9,700	16.8	126.3%	10.4	0.07
				13	0.6	9,500	NM	NM	9.6	0.07
1200-ft Upstream N70°14'06.9" W150°50'01.1" 12:25 p.m.	14.4	3.4	0.2	0-3	-	-	-	-	-	-
				4	-0.1	199	15.6	106.5%	0.2	0.01
				5	-0.1	194	15.8	107.8%	0.2	0.01
				6	-0.1	193	16.0	109.2%	0.2	0.00
				7	-0.1	194	16.1	109.9%	0.2	0.02
				8	0.0	193	16.3	111.7%	0.2	0.01
				9	0.1	200	16.3	111.5%	0.2	0.04
				10	0.3	243	16.2	111.5%	0.2	0.04
				11	0.3	530	16.3	112.5%	0.5	0.03
				12	0.5	9,360	15.0	112.0%	10.0	0.04
				13	0.7	10,370	15.6	118.5%	11.2	0.03
				14	0.8	10,400	NM	NM	11.1	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: January 17, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 5:30 p.m.	12.5	4.0	0.3	0-4	-	-	-	-	-	-
				5	-0.1	233	15.5	106.1%	0.2	0.02
				6	0.0	232	15.5	106.1%	0.2	0.03
				7	0.0	230	15.7	107.4%	0.2	0.03
				8	0.0	242	16.1	110.1%	0.2	0.03
				9	0.1	510	16.7	115.3%	0.5	0.02
				10	0.3	1,182	17.5	122.3%	1.1	0.02
				11	0.4	3,200	NM	NM	3.2	0.04
				12	0.6	8,200	NM	NM	8.7	0.01
800-ft Downstream N70°14'24.8" W150°50'16.4" 7:00 p.m.	13.0	4.0	0.2	0-3	-	-	-	-	-	-
				4	0.0	223	14.6	99.7%	0.2	0.01
				5	0.0	230	14.6	99.8%	0.2	0.01
				6	0.0	238	14.6	100.0%	0.2	0.02
				7	0.0	256	14.9	102.0%	0.2	0.03
				8	0.3	1,142	15.1	105.4%	1.1	0.03
				9	0.4	2,322	15.2	106.9%	2.3	0.03
				10	0.6	7,280	14.4	106.3%	7.7	0.03
				11	0.6	9,280	16.2	121.5%	9.9	0.02
				12	0.7	9,512	NM	NM	10.2	0.02
				13	0.8	11,450	NM	NM	12.4	0.04
1200-ft Downstream N70°14'29.1" W150°50'20.3" 7:30 p.m.	13.6	4.2	0.2	0-4	-	-	-	-	-	-
				5	0.0	232	13.9	94.9%	0.2	0.03
				6	0.0	286	13.8	94.6%	0.3	0.03
				7	0.1	442	13.8	94.8%	0.4	0.03
				8	0.2	860	13.8	95.5%	0.8	0.02
				9	0.3	1,360	13.8	96.2%	1.3	0.02
				10	0.4	3,130	13.3	94.5%	3.2	0.03
				11	0.6	8,690	12.1	90.0%	9.3	0.07
				12	0.7	10,158	13.0	98.1%	10.9	0.04
				13	0.7	>11,000	14.0	107.7%	12.0	0.01

Notes:

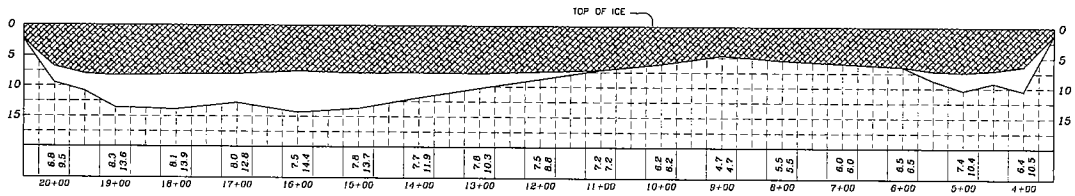
(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) N/M - Not Measured.

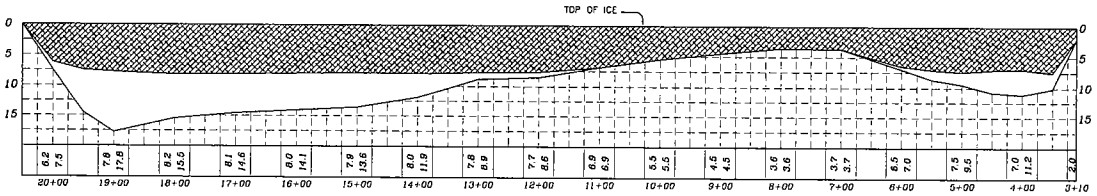
Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004



Left Shoulder (100 feet South) Profile

1" = 100' Horiz

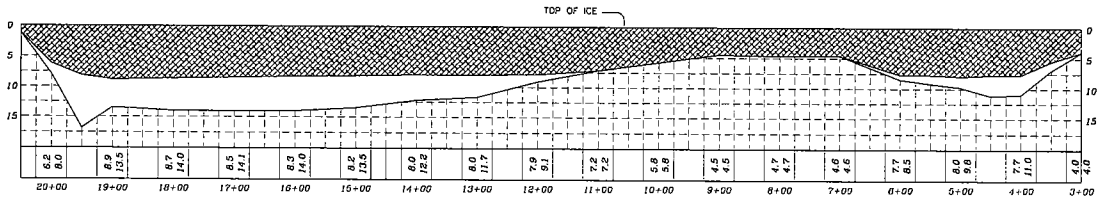
1" = 10' Vertical



Right Shoulder (100 feet North) Profile

1" = 100' Horiz

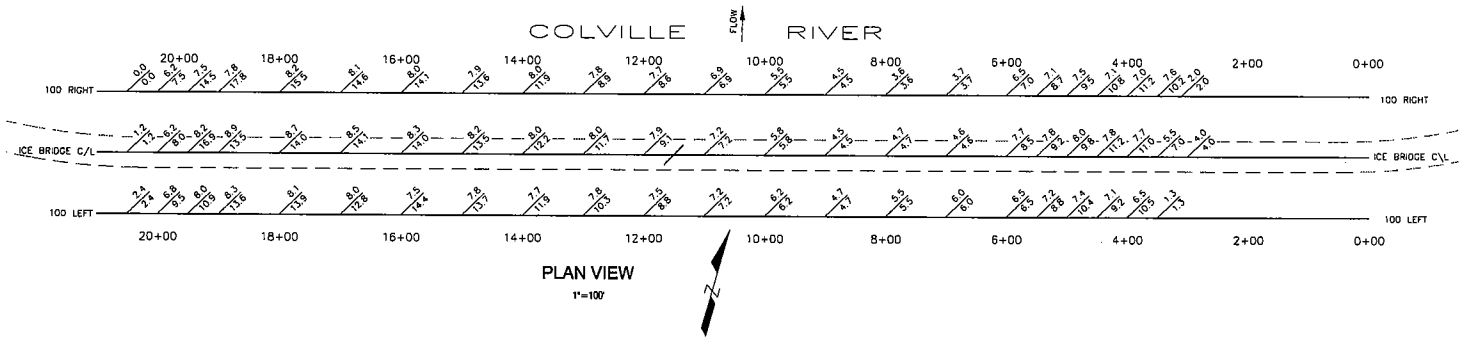
1" = 10' Vertical



Centerline Profile

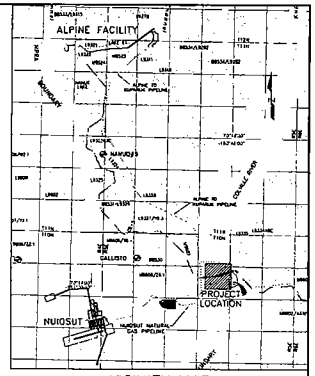
1" = 100' Horiz

1" = 10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

9.4 / 13.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 16, 2005.
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

1/16/2005

ALPINE, ALASKA

Kuukpik/LCMF

A Subsidiary of Kuukpik Arctic Corporation

Alpine Office (907) 670-4739

Anchorage, Alaska (907) 273-1830

Alpine Survey Office

DATE:	01/19/05	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	CZ	SWR #:	04-11-19-1A

1

DRAWING: 04-11-19-1ARev5

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: January 31, 2005
Project Code: 105175	Submitted by: Mike Cox, PE

Weather: Temperatures ranged between -32° and -25° F, with windchill ranging from -48° and -40° F, Partly Cloudy.

Mike Cox and Wilden Paulino arrived at Alpine on Monday, January 31, 2005 at 10:00 AM. Upon arrival, they met up with A.J. Griffin of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring site. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge.

At 11:00 AM, equipment was assembled, calibrated and loaded into the Haggland. LCMF (A.J. Griffin) drove Mr. Cox and Mr. Paulino to the ice bridge monitoring site in the Haggland. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheet.

In-situ water quality parameters were recorded using a YSI-556 meter (conductivity, salinity, temperature, and dissolved oxygen) and a Marsh McBirney Model 2000 velocity meter. All measurements were made from below the ice surface to the river bottom at one-foot intervals.

Concentrations of conductivity remained above 500 us/cm in each of the six monitoring locations with values ranging from 223 to 12,976 us/cm. The conductivity was greater than 500 us/cm between the 8 foot depth and the river bottom in all three upstream monitoring locations. Excluding sample locations at 5 and 6 feet in monitoring location 800-feet downstream, conductivity values were greater than 500 us/cm in all three monitoring locations downstream of the ice bridge centerline.

Based on permit stipulations, the next ice bridge monitoring event is planned for February 12, 2005.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: February 11, 2005
Project Code: 105175	Submitted by: Mike Cox, PE

Weather: Temperatures ranged between -15° and -8° F, with windchill ranging between -30° and -20° F, Partly Cloudy.

Wilden Paulino arrived at Alpine on Friday, February 11, 2005 at 11:35 AM. Upon arrival, he met up with A.J. Griffin of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring site. The purpose of the trip was to continue water withdrawal monitoring of the Colville River Ice Bridge.

At 12:00 PM, equipment was assembled, calibrated and loaded into the Haggland. LCMF (A.J. Griffin) drove Mr. Paulino to the ice bridge monitoring site in the Haggland. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-556 meter (conductivity, salinity, temperature, and dissolved oxygen) and a Marsh McBirney Model 2000 velocity meter. All measurements were made from below the ice surface to the river bottom at one-foot intervals.

Concentrations of conductivity were recorded above 500 us/cm in each of the six monitoring locations with values ranging from 265 to 12,891 us/cm. The conductivity was greater than 500 us/cm between the 7 foot depth and the river bottom in all three upstream monitoring locations. Conductivity values were greater than 500 us/cm at each interval in all three monitoring locations downstream of the ice bridge centerline.

Based on permit stipulations, the next ice bridge monitoring event is planned for February 28, 2005.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	Date of Trip: March 1, 2005
Project Code: 105175	Submitted by: Mike Alexander, PE

Weather: Temperatures ranged between -25° and -30° F. Winds 10-15 mph, with windchill about -45° F, Clear and Sunny.

Mr. Alexander arrived at Alpine on Monday, February 28, 2005 at 4:00 PM. Upon arrival, he met up with Mike Rourick and A.J. Griffin of LCMF, and coordinated the procedures that were going to be followed at the Ice Bridge Monitoring sites. The purpose of the trip was to continue monitoring of the Colville River and Nechelik Channel Ice Bridges.

At 7:00 AM on March 1, equipment was assembled, calibrated and loaded into the pickup truck. LCMF (Mike Rourick) drove Mr. Alexander to the ice bridge monitoring site in the truck. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-556 meter (conductivity, salinity, and temperature) and a Marsh McBirney Model 2000 velocity meter. Dissolved oxygen was recorded using a Horiba U-10 Water Quality Checker. All measurements were made from below the ice surface to the river bottom at one and two-foot intervals.

Concentrations of conductivity were recorded above 500 us/cm in each of the six monitoring locations with values ranging from 334 to 11,236 us/cm. Conductivity values were greater than 500 us/cm at all intervals in each of the three monitoring locations downstream of the ice bridge centerline.

Based on permit stipulations, the next Colville ice bridge monitoring event is planned for March 14, 2005.

ConocoPhillips

Project Trip Report

Baker

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** April 4, 2005
Project Code: 105175	**Submitted by:** Mike Cox, PE

Weather: Temperature -14° F with wind-chill at -21° F, Clear and Sunny.

Mr. Cox arrived at Alpine on Monday, April 4, 2005 at 10:00 AM. Upon arrival, he met up with Mike Rourick of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to continue monitoring of the Colville River Ice Bridge.

At 12:00 PM, equipment was assembled, calibrated and loaded into the pickup truck. LCMF (Mr. Rourick) drove Mr. Cox to the ice bridge monitoring site in the truck. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined upstream and downstream sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-556 meter (conductivity, salinity, dissolved oxygen, and temperature) and a Marsh McBirney Model 2000 velocity meter. All measurements were made from below the ice surface to the river bottom at one-foot intervals.

Concentrations of conductivity were recorded above 500 us/cm in each of the six monitoring locations with values ranging from 641 to 11,603 us/cm.

ConocoPhillips

Winter 2005/2006

Colville River Ice Bridge Monitoring

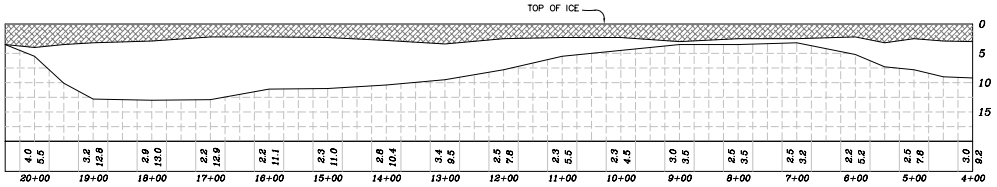
Submitted to

ConocoPhillips

Baker

107341-MBJ-001
April 2006

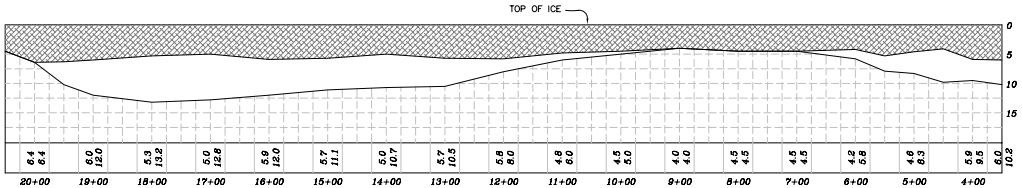
Profiles



Right Shoulder (100 feet North) Profile

1"=100' Horiz

1"=10' Vertical



Centerline Profile

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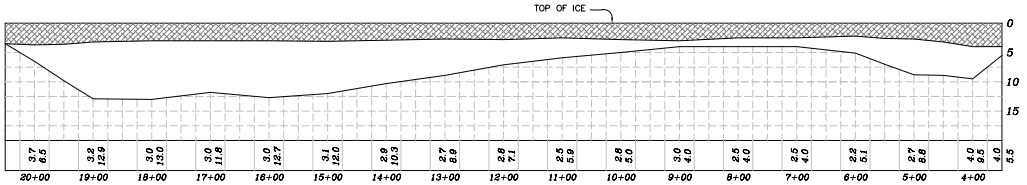
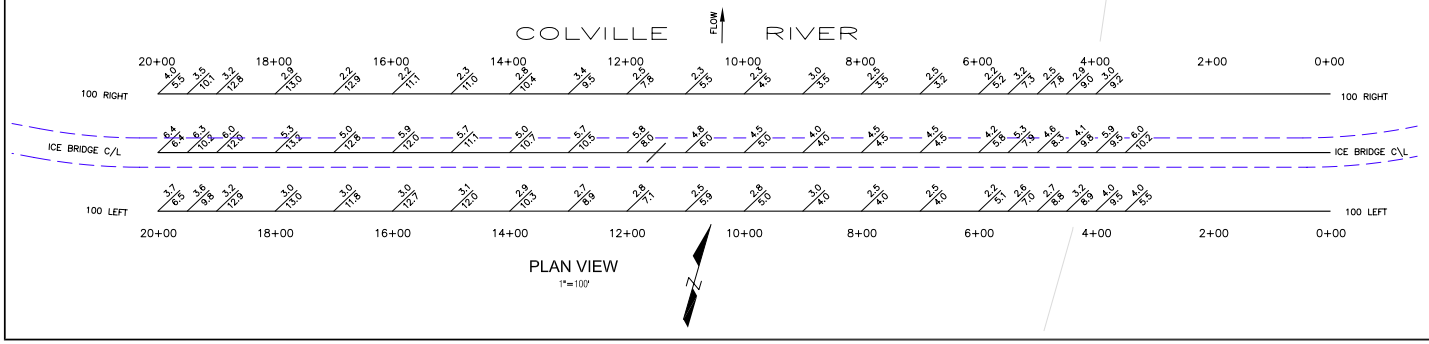
1"=10' Vertical



Left Shoulder (100 feet South) Profile

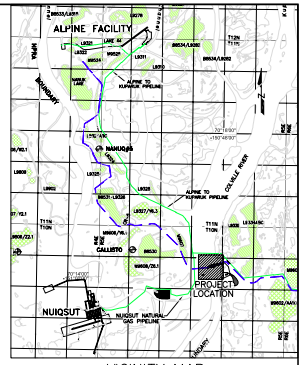
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

ICE THICKNESS

TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 5, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO PHILLIPS ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

01/05/2006

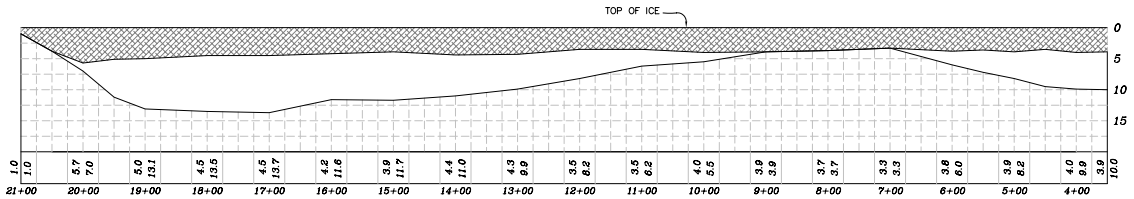
ALPINE, ALASKA

KUUKPIK LCMF LLC Alpine Survey Office

DATE:	01/08/2006	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1/1
DRAWN BY:	AG	SWR #:	05-11-02-1A

1

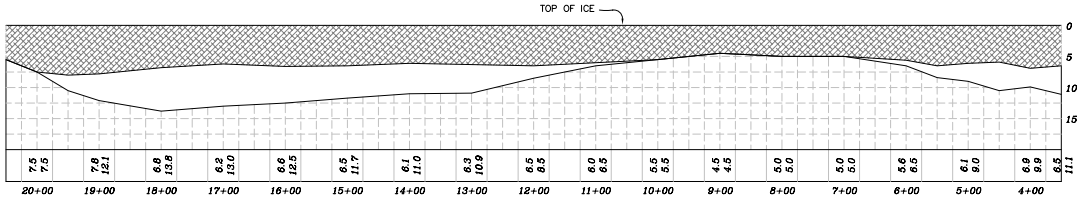
DRAWING: 05-11-02-1A-Rev1



Right Shoulder (100 feet North) Profile

1"=100' Horiz

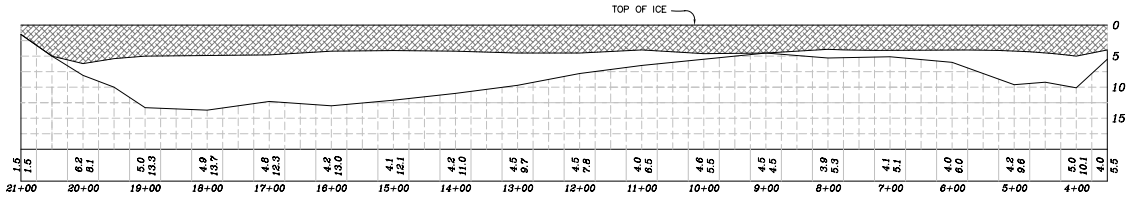
1"=10' Vertical



Centerline Profile

1"=100' Horiz

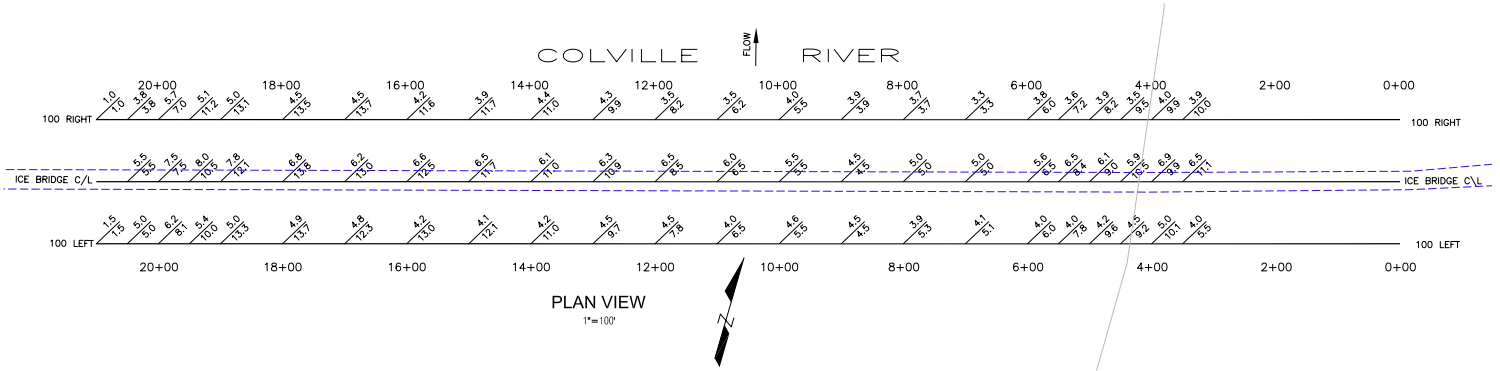
1"=10' Vertical



Left Shoulder (100 feet South) Profile

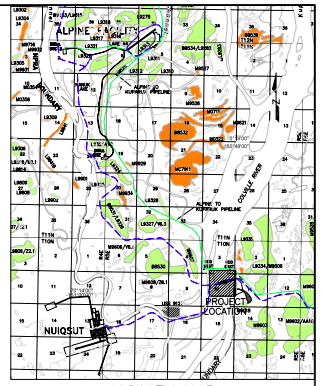
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

9.4 / 13.5 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 11, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCEDTO THE TOP OF ICE.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

01/11/2006

ALPINE, ALASKA

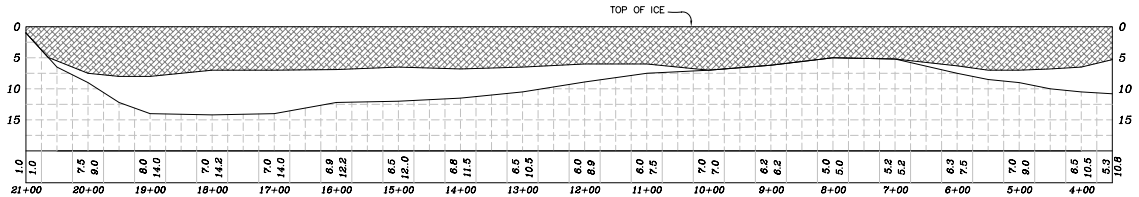
KUUKPIK LCMF Alpine Survey Office

DATE:	1/11/2006	SCALE:	AS SHOWN
CHECKED BY:	GD	SHEET:	1 OF 1
DRAWN BY:	CZ	W.O. No:	05-11-02-1A

2

DRAWING: 05-11-02-1A-Rev2

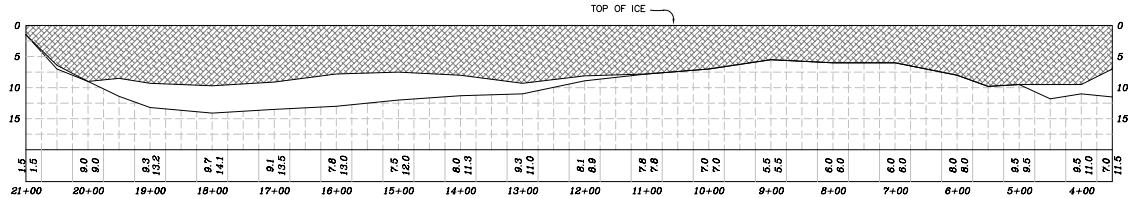
PLOTTING DATE: 01/13/06 (07:37)
FIELD BOOK(S):
AUTOCAD DRAWING NAME: 05-11-02-1A_REV2.DWG



Right Shoulder (100 feet North) Profile

1"=100' Horiz

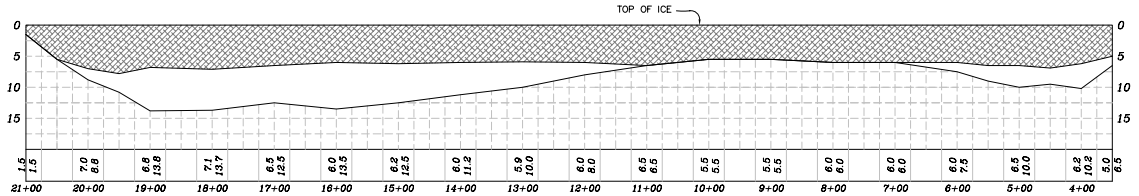
1"=10' Vertical



Centerline Profile

1"=100' Horiz

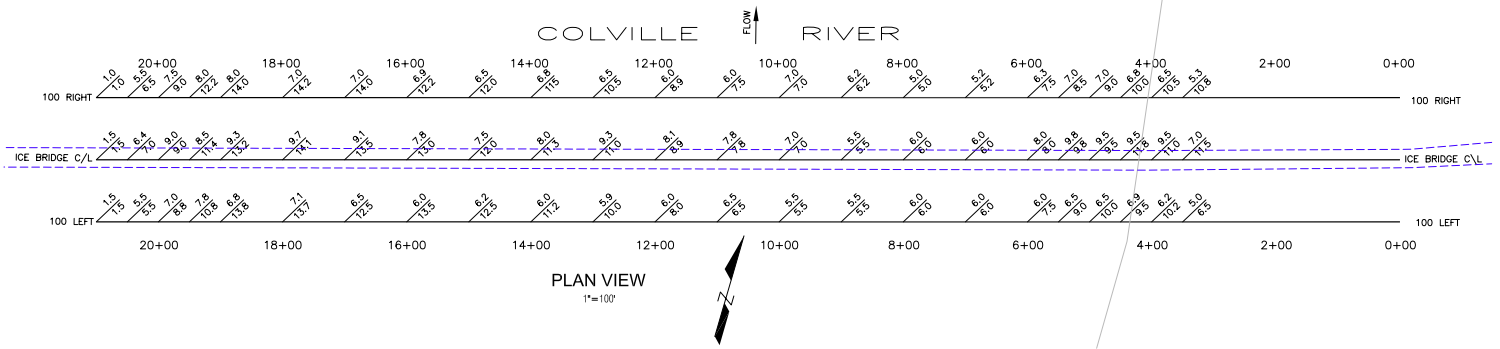
1"=10' Vertical

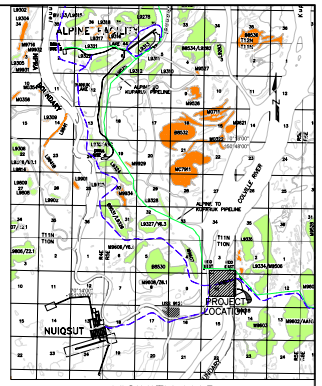


Left Shoulder (100 feet South) Profile

1"=100' Horiz

1"=10' Vertical





VICINITY MAP
NOT TO SCALE

LEGEND

9.4 / 13.8 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 17, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

01/17/2006

ALPINE, ALASKA

KUUKPIK LCMF Alpine Survey Office

DATE: 1/17/2006	SCALE: AS SHOWN		3
CHECKED BY: DB	SHEET: 1 OF 1		
DRAWN BY: CZ	W.O. No: 05-11-02-1A		

DRAWING: 05-11-02-1A-Rev3

PLOTTING DATE: 01/20/06 (12:44)
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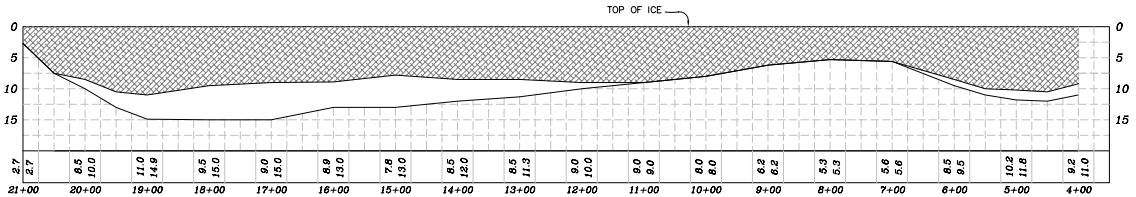
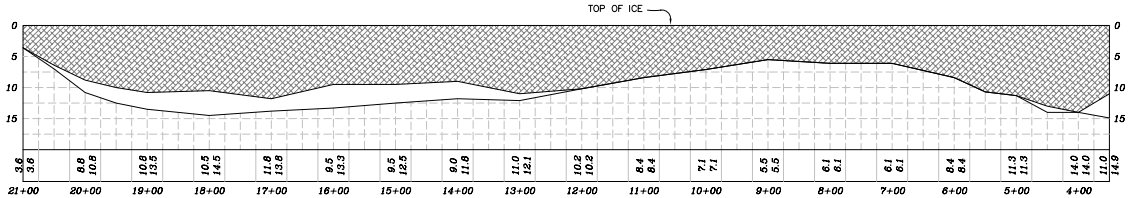


Right Shoulder (100 feet North) Profile

1"=100' Horiz

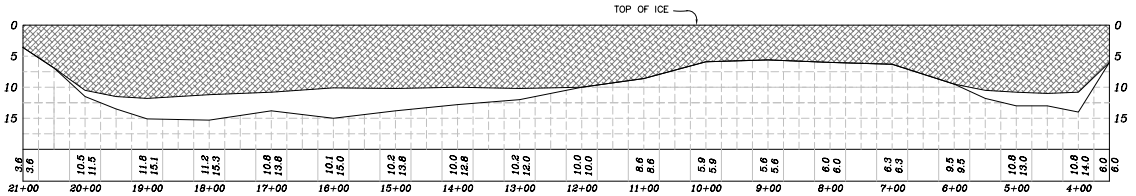
1"=10' Vertical



Centerline Profile

1"=100' Horiz

1"=10' Vertical



Left Shoulder (100 feet South) Profile

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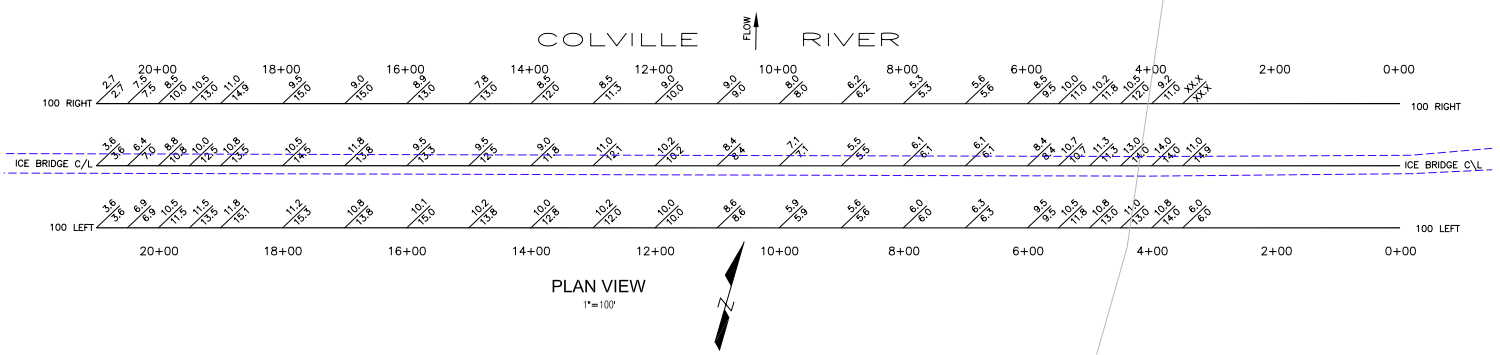
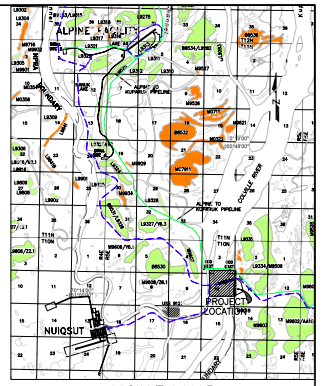
1"=10' Vertical





VICINITY MAP
NOT TO SCALE

LEGEND

9.4 / 13.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 24, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

01/24/2006

ALPINE, ALASKA

KUUKPIK LCMF Alpine Survey Office

DATE:	1/26/2006	SCALE:	AS SHOWN
CHECKED BY:	DB	SHEET:	1 OF 1
DRAWN BY:	AG	W.O. No:	05-11-02-1A

4

DRAWING: 05-11-02-1A-Rev4

PLOTTING DATE: 01/26/06 (16:41)
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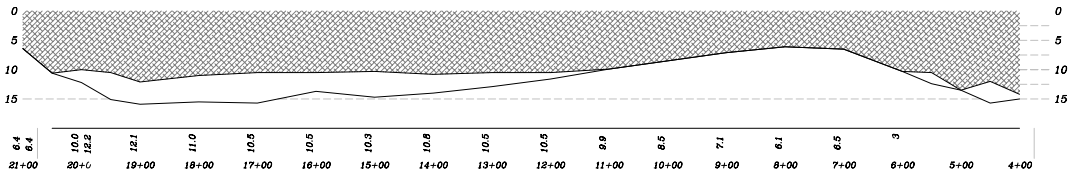
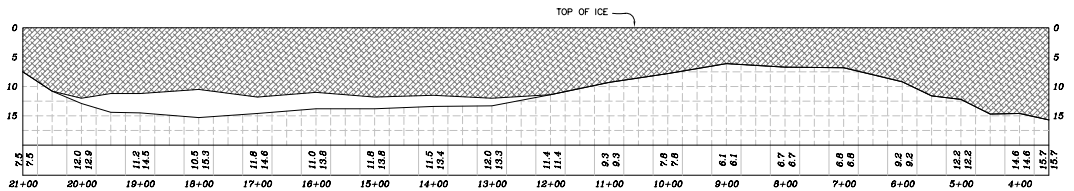
AUTOCAD DRAWING NAME: 05-11-02-1A_REV4.DWG



Right Shoulder (100 feet North) Profile

1"=100' Horiz

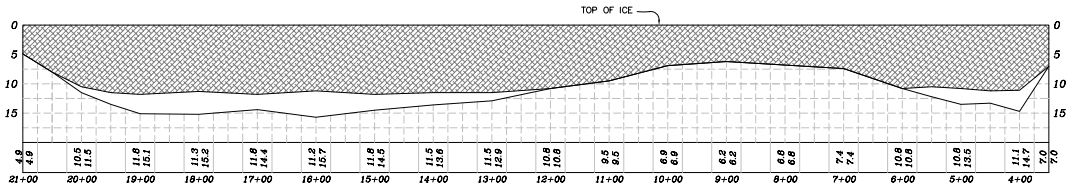
1"=10' Vertical



Centerline Profile

1"=100' Horiz

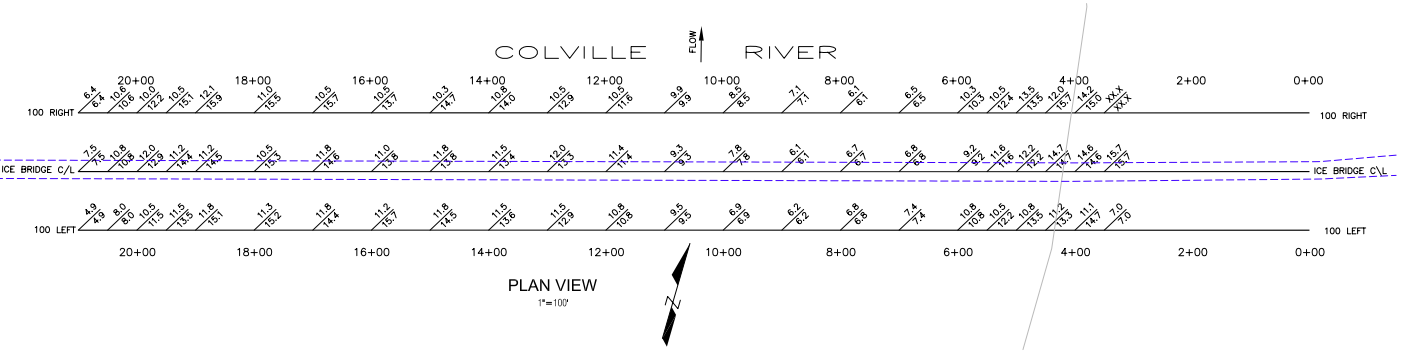
1"=10' Vertical



Left Shoulder (100 feet South) Profile

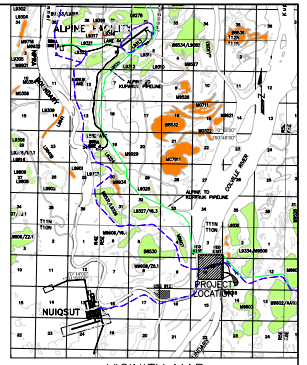
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

9.4 / 10.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED JANUARY 31, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

01/31/2006

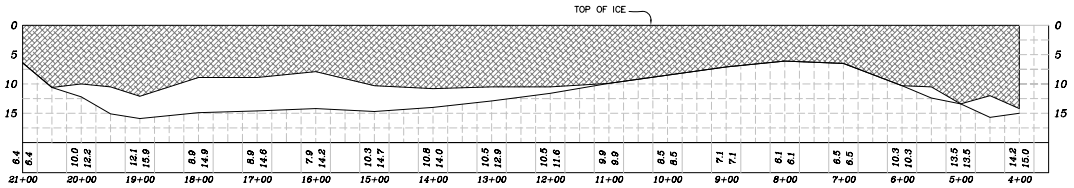
ALPINE, ALASKA

KUUKPIK LCMF Alpine Survey Office

DATE: 2/4/2006	SCALE: AS SHOWN		5
CHECKED BY: GD	SHEET: 1 OF 1		
DRAWN BY: AG	W.O. No: 05-11-02-1A		

DRAWING: 05-11-02-1A-Rev5

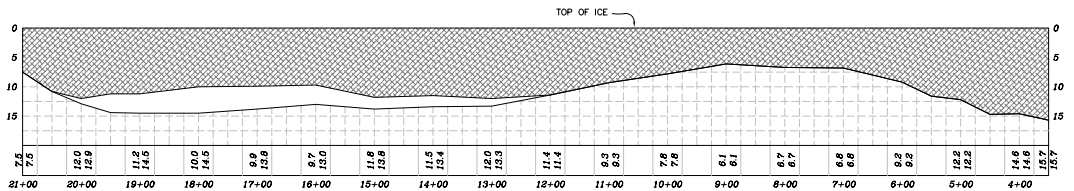
PLOTTING DATE: 02/04/06 (18:21)
FIELD BOOK(S):
AUTOCAD DRAWING NAME: 05-11-02-1A_REV5.DWG



Right Shoulder (100 feet North) Profile

1"=100' Horiz

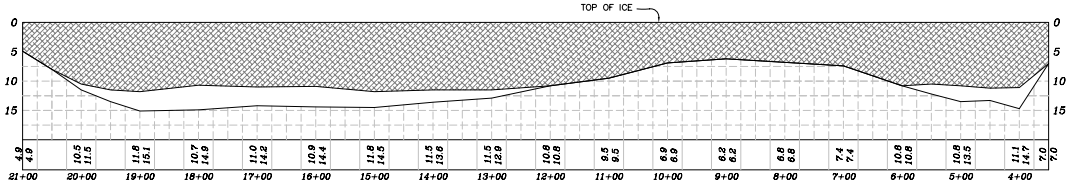
1"=10' Vertical



Centerline Profile

1"=100' Horiz

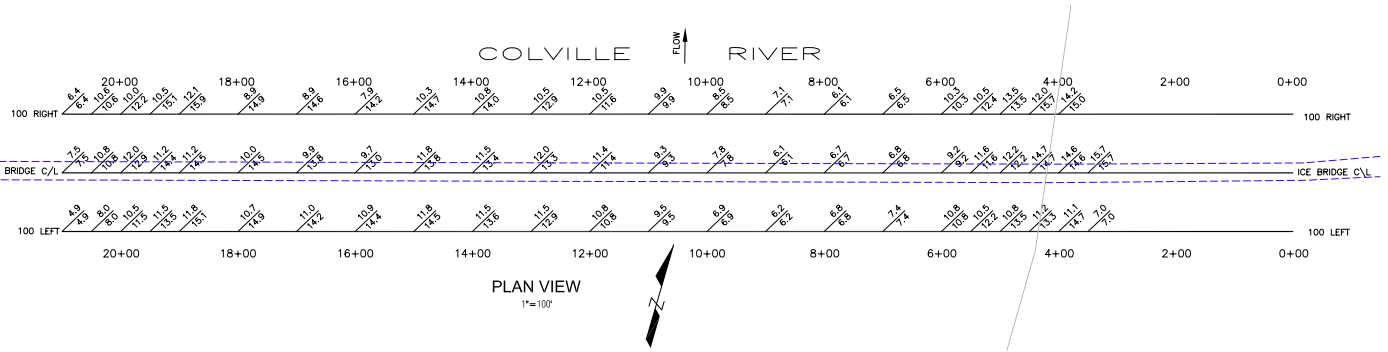
1"=10' Vertical



Left Shoulder (100 feet South) Profile

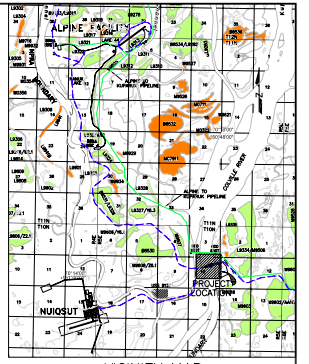
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

9.4 / 13.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS 4.2 / 8.4 TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED FEBRUARY 17, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.
4. ONLY STATIONS 16+00 THROUGH 18+00 WERE UPDATED 2/17/2006.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

02/17/2006

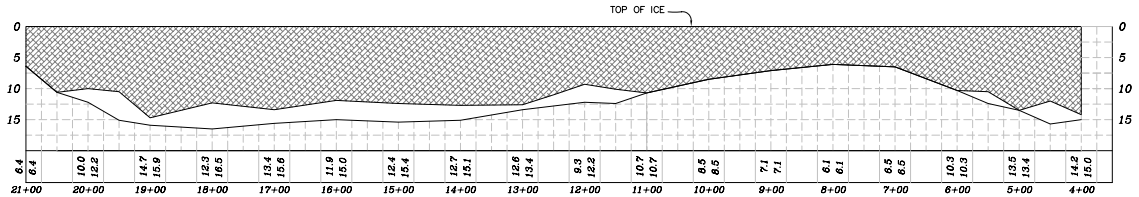
ALPINE, ALASKA

KUUKPIK LCMF Joint Venture — Alpine Survey Office

DATE: 2/17/2006	SCALE: AS SHOWN		6
CHECKED BY: DB	SHEET: 1 OF 1		
DRAWN BY: CZ	W.O. No: 05-11-02-1A		

DRAWING: 05-11-02-1A-Rev6

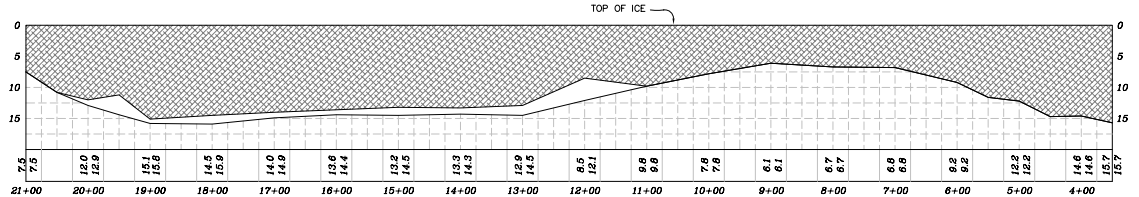
PLOTTING DATE: 02/19/06 (10:43)
FIELD BOOK(S):
AUTOCAD DRAWING NAME: 05-11-02-1A_REV6.DWG



Right Shoulder (100 feet North) Profile

1"=100' Horiz

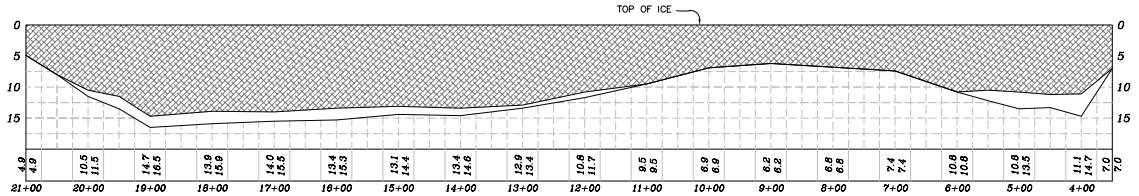
1"=10' Vertical



Centerline Profile

1"=100' Horiz

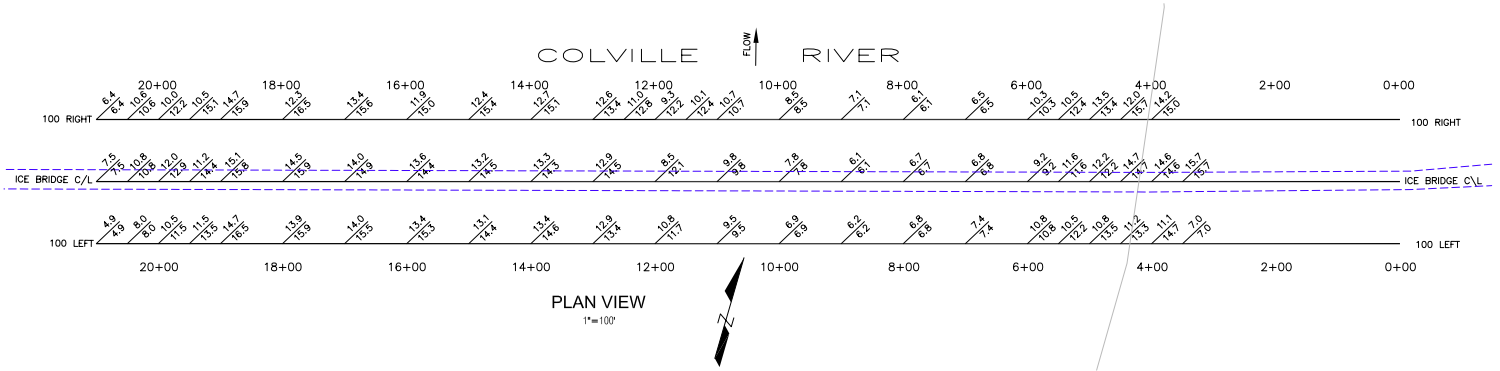
1"=10' Vertical



Left Shoulder (100 feet South) Profile

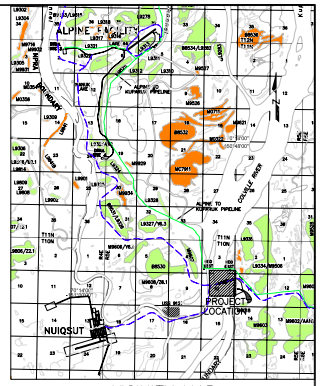
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP
NOT TO SCALE

LEGEND

9.4 / 13.0 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED MARCH 15, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.
4. ONLY STATIONS 11+00 THROUGH 19+00 WERE UPDATED 3/15/2006.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

03/15/2006

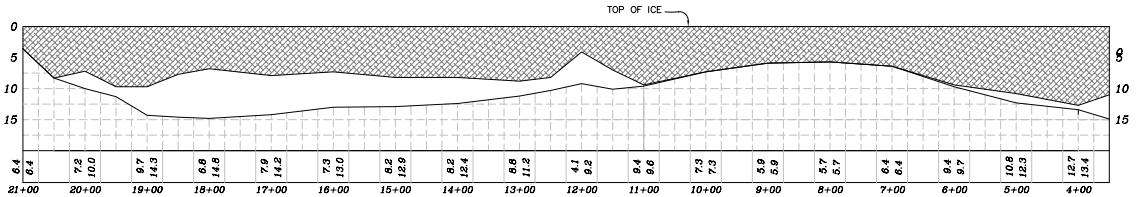
ALPINE, ALASKA

KUUKPIK LCMF Alpine Survey Office

DATE: 3/15/2006	SCALE: AS SHOWN		7
CHECKED BY: DB	SHEET: 1 OF 1		
DRAWN BY: JK	W.O. No: 05-11-02-1A		

DRAWING: 05-11-02-1A-Rev7

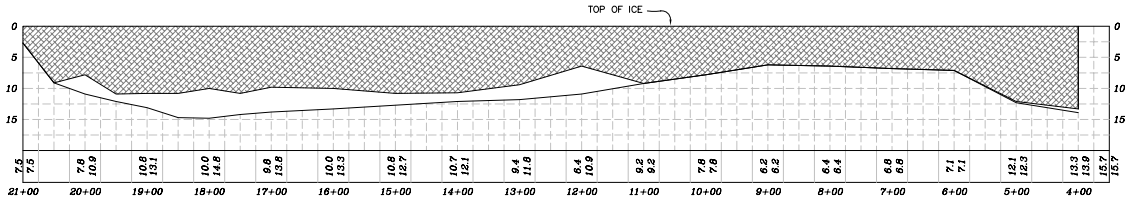
PLOTTING DATE: 03/20/06 (07:14)
FIELD BOOK(S):
AUTOCAD DRAWING NAME: 05-11-02-1A_REV7.DWG



Right Shoulder (100 feet North) Profile

1"=100' Horiz

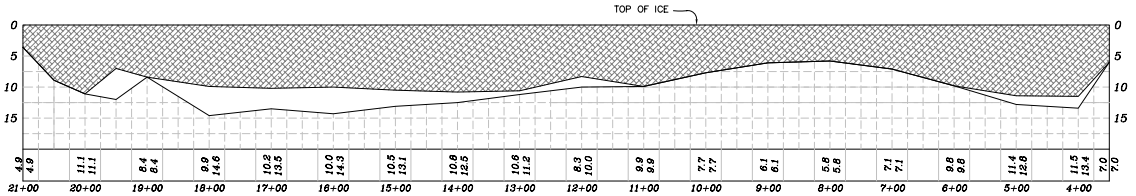
1"=10' Vertical



Centerline Profile

1"=100' Horiz

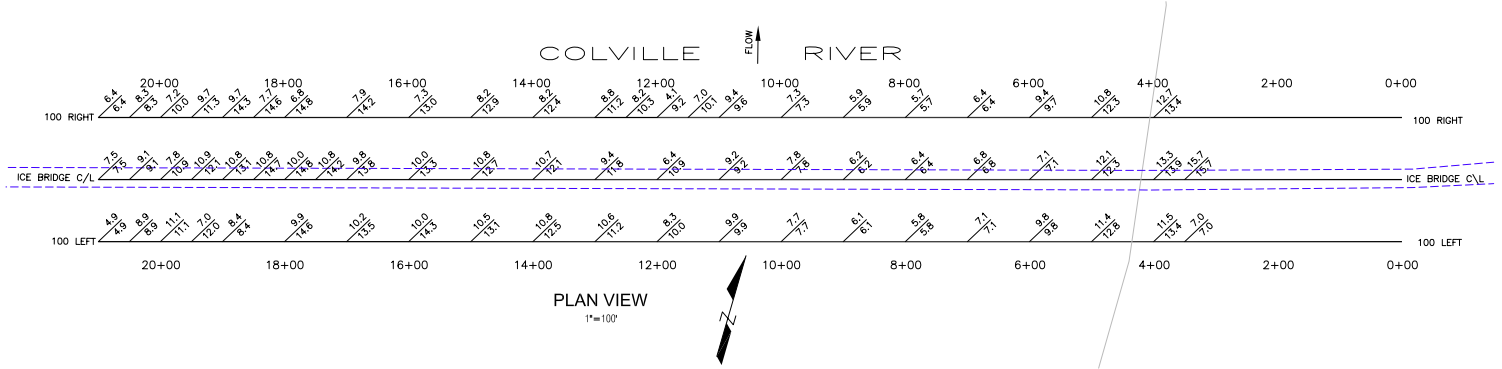
1"=10' Vertical



Left Shoulder (100 feet South) Profile

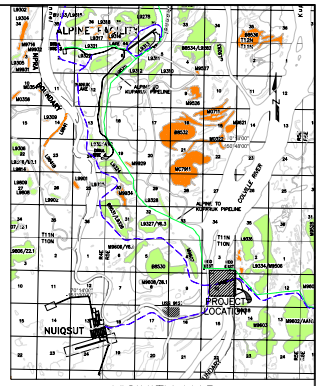
1"=100' Horiz

1"=10' Vertical



PLAN VIEW

1"=100'



VICINITY MAP

NOT TO SCALE

LEGEND

9.4 / 13.3 — ICE THICKNESS / TOTAL DEPTH (ICE & WATER)

ICE THICKNESS — 4.2 / 8.4 — TOTAL DEPTH (ICE & WATER)

NOTES:

1. PROFILE DATA PROVIDED BY BILL ST. LAWRENCE COMPLETED MARCH 7-8, 2006
2. TOTAL DEPTH = THE DISTANCE FROM THE TOP OF ICE TO THE BOTTOM OF THE RIVER.
3. ALL MEASUREMENTS SHOWN HEREON ARE REFERENCED TO THE TOP OF ICE.

CONOCO/PHILLIPS OF ALASKA

COLVILLE RIVER

ICE BRIDGE PROFILE

03/08/2006

ALPINE, ALASKA

KUUKPIK LCMF Alpine Survey Office

DATE: 3/08/2006	SCALE: AS SHOWN		8
CHECKED BY: AG	SHEET: 1 OF 1		
DRAWN BY: JK	W.O. No: 05-11-02-1A		

DRAWING: 05-11-02-1A-Rev8

PLOTTING DATE: 03/23/06 (08:50)
FIELD BOOK(S):
AUTOCAD DRAWING NAME: 05-11-02-1A_REV8.DWG

Data Tables

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Upstream of Bridge

Sample Date: November 21, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.7" W150°50'07.1" 11:40 a.m.	11.2	1.3	0	1	-	-	-	-	-	-
				2	0.4	212	10.8	72.8%	0.2	0.04
				3	0.3	212	10.8	73.1%	0.2	0.05
				4	0.4	212	10.8	73.0%	0.2	0.05
				5	0.4	212	10.8	73.0%	0.2	0.06
				6	0.4	212	10.8	73.0%	0.2	0.06
				7	0.4	212	10.8	72.9%	0.2	0.05
				8	0.4	214	10.8	72.9%	0.2	0.05
				9	0.6	809	10.8	72.7%	1.0	-0.05
				10	0.7	1199	10.9	73.1%	1.1	-0.01
				11	1.0	3388	10.9	73.2%	3.0	-0.01
800-ft Upstream N70°14'10.7" W150°50'03.6" 11:00 a.m.	11.3	1.3	0	1	-	-	-	-	-	-
				2	0.1	212	11.4	76.8%	0.2	-0.02
				3	0.2	212	10.9	73.6%	0.2	-0.02
				4	0.2	212	10.9	73.5%	0.2	-0.02
				5	0.2	212	10.9	73.4%	0.2	-0.03
				6	0.2	212	10.9	73.3%	0.2	-0.04
				7	0.2	215	10.9	73.3%	0.2	-0.01
				8	0.3	222	10.8	72.8%	0.2	-0.01
				9	0.3	300	10.8	72.7%	0.3	-0.07
				10	0.5	1185	10.8	72.8%	1.3	-0.03
				11	0.7	3000	10.7	72.9%	3.0	0.02
1200-ft Upstream N70°14'06.9" W150°50'01.1" 10:00 p.m.	10.7	1.4	0	1	-	-	-	-	-	-
				2	0.0	213	10.8	75.0%	0.2	0.02
				3	0.0	212	11.0	75.2%	0.2	0.03
				4	0.0	212	11.1	75.2%	0.2	0.03
				5	0.0	212	11.1	75.2%	0.2	0.0.3
				6	0.0	212	11.1	75.3%	0.2	0.03
				7	0.0	212	11.1	75.4%	0.2	0.02
				8	0.1	213	11.1	75.4%	0.2	0.02
				9	0.1	216	11.1	75.3%	0.2	0.03
				10	0.3	1178	11.0	75.4%	1.1	0.01

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was measured using a Hach HQ10 meter

(6) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Downstream of Bridge

Sample Date: November 21, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.8" W150°50'13.7" 1:15 p.m.	10.9	1.0	0	1	0.0	214	10.7	74.7%	0.2	0.06
				2	0.0	214	10.8	74.7%	0.2	0.08
				3	0.1	213	10.9	74.8%	0.2	0.08
				4	0.1	213	10.9	74.8%	0.2	0.06
				5	0.0	213	10.9	74.7%	0.2	0.05
				6	0.0	213	10.9	74.7%	0.2	0.05
				7	0.1	214	10.9	74.7%	0.2	0.04
				8	0.1	216	10.9	74.4%	0.2	0.05
				9	0.3	709	10.9	74.5%	0.7	0.01
				10	0.4	1120	10.6	72.8%	1.0	0.01
800-ft Downstream N70°14'24.8" W150°50'16.4" 1:45 p.m.	10.6	1.0	0.0	1	0.1	213	11.2	76.3%	0.2	0.03
				2	0.1	213	11.0	74.8%	0.2	0.02
				3	0.1	213	11.0	74.7%	0.2	0.03
				4	0.1	213	11.0	74.5%	0.2	0.03
				5	0.1	213	11.0	74.4%	0.2	0.04
				6	0.1	213	11.0	74.3%	0.2	0.03
				7	0.2	213	10.9	74.1%	0.2	0.04
				8	0.2	215	10.9	74.0%	0.2	0.01
				9	0.4	813	10.7	73.9%	0.8	-0.02
				10	0.5	1148	10.8	73.2%	1.1	-0.01
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:15 p.m.	11.4	1.2	0	1	-	-	-	-	-	-
				2	0.1	200	10.3	73.3%	0.2	0.02
				3	0.1	199	10.9	75.0%	0.2	0.03
				4	0.2	199	10.9	75.1%	0.2	0.03
				5	0.2	199	11.0	75.4%	0.2	0.03
				6	0.2	199	11.0	75.2%	0.2	0.04
				7	0.2	200	11.1	75.6%	0.2	0.04
				8	0.2	204	11.1	75.8%	0.2	0.05
				9	0.3	730	11.1	75.9%	0.7	-0.02
				10	0.6	1110	11.1	75.9%	1.0	-0.01
				11	0.7	3400	9.9	68.3%	3.3	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was measured using a Hach HQ10 meter

(6) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 30, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 3:40 p.m.	12.4	1.4	0	1	-	-	-	-
				2	0.3	214	0.2	0.01
				3	-	-	-	-
				4	0.3	214	0.2	0.05
				5	-	-	-	-
				6	0.3	215	0.2	0.05
				7	-	-	-	-
				8	0.4	265	0.2	0.02
				9	0.5	530	0.5	-0.04
				10	0.6	1140	1.1	-0.02
				11	0.7	2070	2.0	-0.03
				12	1.0	8940	9.4	-0.03
800-ft Upstream N70°14'10.7" W150°50'06.5" 3:20 p.m.	13.0	1.4	0	1	-	-	-	-
				2	0.3	214	0.2	-0.02
				3	-	-	-	-
				4	0.3	214	0.2	0.03
				5	-	-	-	-
				6	0.3	215	0.2	0.07
				7	-	-	-	-
				8	0.3	238	0.2	0.06
				9	0.5	533	0.5	0.06
				10	0.6	1001	0.9	0.02
				11	0.7	2335	2.3	-0.05
				12	0.9	5610	5.7	-0.10
				13	1.0	9410	9.9	-0.05
1200-ft Upstream N70°14'06.6" W150°50'03.4" 4:10 p.m.	12.7	1.4	0	1	-	-	-	-
				2	0.3	214	0.2	0.00
				3	-	-	-	-
				4	0.3	214	0.2	-0.02
				5	-	-	-	-
				6	0.3	214	0.2	0.05
				7	-	-	-	-
				8	0.3	219	0.2	0.06
				9	0.5	420	0.4	0.03
				10	0.6	983	0.9	-0.01
				11	0.7	1958	1.9	-0.03
				12	0.9	3860	3.9	-0.09

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was not measured due to equipment limitations

(6) Velocity was measured using a Marsh-McBirney Flow Mate 2000.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 30, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:00 p.m.	13.4	1.4	0	1	-	-	-	-
				2	0.0	215	0.2	-0.13
				3	-	-	-	-
				4	0.1	215	0.2	-0.30
				5	-	-	-	-
				6	0.1	215	0.2	-0.30
				7	-	-	-	-
				8	0.2	258	0.2	-0.10
				9	0.5	503	0.5	-0.10
				10	0.6	1247	1.2	-0.01
				11	0.7	3548	3.4	-0.05
				12	0.7	9400	10.0	0.00
				13	0.6	10200	11.0	-0.02
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:50 p.m.	12.8	1.1	0	1	-	-	-	-
				2	0.2	215	0.2	0.04
				3	-	-	-	-
				4	0.2	215	0.2	-0.08
				5	-	-	-	-
				6	0.2	215	0.2	0.06
				7	-	-	-	-
				8	0.5	335	0.3	0.08
				9	0.6	523	0.5	-0.02
				10	0.6	1608	1.6	-0.04
				11	0.7	3780	3.8	-0.32
				12	0.7	7280	7.8	-0.15
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:30 p.m.	12.0	1.4	0	1	-	-	-	-
				2	0.2	214	0.2	-0.09
				3	-	-	-	-
				4	0.3	215	0.2	-0.09
				5	-	-	-	-
				6	0.3	216	0.2	-0.03
				7	-	-	-	-
				8	0.5	300	0.3	0.00
				9	0.6	747	0.7	-0.02
				10	0.7	1170	1.1	-0.02
				11	0.8	4168	4.2	-0.13
				12	0.7	10300	11.0	-0.07

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was not measured due to equipment limitations

(6) Velocity was measured using a Marsh-McBirney Flow Mate 2000.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - East Bank

Sample Date: November 30, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
EB 400-ft Upstream N70°14'17.8" W150°49'36.5" 5:45 p.m.	7.2	1.2	0	1	-	-	-	-
				2	0.3	182	0.2	0.02
				3	-	-	-	-
				4	0.3	183	0.2	0.04
				5	-	-	-	-
				6	0.3	185	0.2	0.01
				7	0.5	186	0.2	0.03
EB Ice Bridge Centerline (4+00) N70°14'21.3" W150°49'37.0" 5:10 p.m.	9.0	1.4	0	1	-	-	-	-
				2	0.3	214	0.2	0.05
				3	-	-	-	-
				4	0.3	216	0.2	0.02
				5	-	-	-	-
				6	0.3	221	0.2	-0.02
				7	-	-	-	-
				8	0.4	233	0.2	0.00
				9	0.6	238	0.2	-0.02
EB 400-ft Downstream N70°14'24.0" W150°49'40.0" 5:30 p.m.	9.6	1.4	0	1	-	-	-	-
				2	0.3	215	0.2	0.04
				3	-	-	-	-
				4	0.3	216	0.2	0.04
				5	-	-	-	-
				6	0.4	222	0.2	0.04
				7	-	-	-	-
				8	0.4	252	0.2	0.01
				9	0.7	401	0.4	0.00

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter
(5) Dissolved oxygen was not measured due to equipment limitations
(6) Velocity was measured using a Marsh-McBirney Flow Mate 2000.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - East Channel

Sample Date: December 6, 2005

Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
EB 800-ft Upstream N70°14'13.9" W150°49'44.0" 4:15 p.m.	7.0	1.5	0	1	-	-	-	-	-	-
				2	0.4	170	-	-	0.1	-
				3	0.4	171	9.4	63%	0.1	-
				4	0.4	172	-	-	0.1	-
				5	0.4	170	9.3	63%	0.1	-
				6	0.4	163	-	-	0.1	-
				7	-	-	-	-	-	-
EB 400-ft Upstream N70°14'17.8" W150°49'36.5" 3:30 p.m.	6.9	2.0	0	1	-	-	-	-	-	-
				2	0.4	215	-	-	0.2	-
				3	0.4	214	9.4	63%	0.2	-
				4	0.4	214	-	-	0.2	-
				5	0.4	214	9.2	62%	0.2	-
				6	0.4	214	-	-	0.2	-
				7	-	-	-	-	-	-
EB 400-ft Downstream N70°14'24.0" W150°49'40.0" 3:00 p.m.	9.2	1.5	0	1	-	-	-	-	-	-
				2	0.4	215	-	-	0.2	-
				3	0.4	215	9.2	62%	0.2	0.03
				4	0.4	215	-	-	0.2	-
				5	0.4	215	9.1	61%	0.2	0.04
				6	0.4	216	-	-	0.2	-
				7	0.5	219	9.0	61%	0.2	0.00
				8	0.5	234	-	-	0.2	-
				9	0.6	316	8.7	59%	0.3	-0.03
EB 800-ft Downstream N70°14'27.8" W150°49'45.9" 2:00 p.m.	9.6	1.5	0	1	-	-	-	-	-	-
				2	0.3	215	9.3	63%	0.2	-
				3	0.2	216	-	-	0.2	-0.04
				4	0.2	216	9.3	63%	0.2	-
				5	0.2	218	-	-	0.2	-0.05
				6	0.3	220	9.1	62%	0.2	-
				7	0.4	230	-	-	0.2	-0.02
				8	0.6	449	8.7	59%	0.4	-
				9	0.7	638	8.3	57%	0.6	-0.01
EB 1200-ft Downstream N70°14'31.6" W150°49'46.9" 1:15 p.m.	7.9	1.4	0	1	-	-	-	-	-	-
				2	0.1	215	9.3	64%	0.2	-
				3	0.1	216	9.2	63%	0.2	-
				4	0.1	216	9.2	63%	0.2	-
				5	0.2	216	9.1	62%	0.2	-
				6	0.2	217	9.0	62%	0.2	-
				7	0.2	227	8.9	62%	0.2	-0.04
				8	0.4	256	8.9	62%	0.2	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter
(5) Dissolved oxygen was measured using a Hach HQ10 meter.
(6) Velocity was measured using a Marsh-McBirney
Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 7, 2005

Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.4" 12:45 p.m.	11.4	1.5	0	1	-	-	-	-	-	-
				2	0.1	216	9.6	68%	0.2	-
				3	0.0	215	-	-	0.2	-
				4	0.0	215	9.6	68%	0.2	-
				5	0.0	215	-	-	0.2	-
				6	0.0	215	9.6	67%	0.2	-
				7	0.1	219	-	-	0.2	-
				8	0.2	252	9.6	68%	0.2	-
				9	0.4	785	-	-	0.7	-
				10	0.5	1743	10.0	71%	1.3	-
				11	0.7	3866	-	-	3.5	-
800-ft Upstream N70°14'10.6" W150°50'06.8" 1:15 p.m.	12.4	1.5	0	1	-	-	-	-	-	-
				2	0.1	216	9.4	67%	0.2	-
				3	0.0	215	-	-	0.2	-
				4	0.1	215	9.4	67%	0.2	-
				5	0.0	215	-	-	0.2	-
				6	0.1	215	9.4	66%	0.2	-
				7	0.1	218	-	-	0.2	-
				8	0.2	230	9.6	68%	0.2	-
				9	0.4	887	-	-	0.8	-
				10	0.5	1493	9.8	70%	1.5	-
				11	0.8	3583	-	-	3.5	-
				12	1.0	4884	-	-	4.7	-
1200-ft Upstream N70°14'06.7" W150°50'04.2" 1:35 p.m.	12.7	1.5	0	1	-	-			-	-
				2	0.2	216	9.3	66%	0.2	-
				3	0.2	215	-	-	0.2	-
				4	0.2	215	9.3	66%	0.2	-
				5	0.2	215	-	-	0.2	-
				6	0.2	215	9.3	66%	0.2	-
				7	0.2	217	-	-	0.2	-
				8	0.3	240	9.9	70%	0.2	-
				9	0.6	852	-	-	0.8	-
				10	0.7	1778	9.4	67%	1.5	-
				11	0.9	3668	-	-	3.6	-
				12	1.1	5060	-	-	4.8	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was measured using a Hach HQ10 meter.

(6) Velocity was not measured due to equipment limitations.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 7, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'19.0" 11:10 a.m.	13.2	1.5	0	1	-	-	-	-	-	-
				2	0.3	216	9.2	65%	0.2	-
				3	0.3	215	-	-	0.2	-
				4	0.3	214	9.3	65%	0.2	-
				5	0.3	214	-	-	0.2	-
				6	0.3	214	9.3	65%	0.2	-
				7	0.4	219	-	-	0.2	-
				8	0.5	399	9.6	67%	0.3	-
				9	0.7	749	-	-	0.7	-
				10	0.8	1730	9.6	68%	1.6	-
				11	1.1	3829	-	-	3.8	-
				12	1.2	8290	-	-	8.6	-
				13	1.4	10530	-	-	11.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:45 a.m.	12.4	1.9	0	1	-	-	-	-	-	-
				2	0.2	222	9.8	68%	0.2	-
				3	0.2	214	-	-	0.2	-
				4	0.2	215	9.5	67%	0.2	-
				5	0.2	214	-	-	0.2	-
				6	0.2	214	9.6	67%	0.2	-
				7	0.2	221	-	-	0.2	-
				8	0.5	339	9.6	67%	0.3	-
				9	0.6	811	-	-	0.7	-
				10	0.8	1718	9.6	67%	1.6	-
				11	0.9	3807	-	-	3.5	-
				12	1.1	8060	9.2	65%	8.4	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:15 a.m.	11.5	1.7	0	1	-	-	-	-	-	-
				2	0.0	208	-	-	0.2	-
				3	0.0	205	10.3	72%	0.2	-
				4	0.0	215	-	-	0.2	-
				5	0.0	215	10.0	70%	0.2	-
				6	0.0	216	-	-	0.2	-
				7	0.1	220	10.0	70%	0.2	-
				8	0.4	557	-	-	0.5	-
				9	0.5	756	9.9	69%	0.7	-
				10	0.6	1991	-	-	1.6	-
				11	0.8	3867	10.8	76%	3.8	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was measured using a Hach HQ10 meter.

(6) Velocity was not measured due to equipment limitations.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - East Channel

Sample Date: December 7, 2005

Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	DO (mg/L)	DO (Percent)	Salinity (ppt)	Velocity (ft/sec)
EB 1200-ft Upstream N70°14'10.2" W150°49'41.0" 2:45 p.m.	7.7	1.5	0	1	-	-	-	-	-	-
				2	0.1	216	9.5	68%	0.2	-
				3	0.1	214	-	-	0.2	-
				4	0.2	214	9.3	66%	0.2	-
				5	0.2	214	-	-	0.2	-
				6	0.2	215	9.2	65%	0.2	-
				7	0.2	215	-	-	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Dissolved oxygen was measured using a Hach HQ10 meter.

(6) Velocity was not measured due to equipment limitations.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 19, 2005

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 2:45 p.m.	12.1	1.7	0	1	-	-	-	-	-	-	-
				2	0.2	219	426	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	219	427	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	242	469	-	-	0.2	-
				7	0.5	1157	2226	-	-	1.1	-
				8	0.8	2316	4406	-	-	2.3	-
				9	-	-	-	-	-	-	-
				10	0.9	12410	23520	-	-	13.5	-
				11	-	-	-	-	-	-	-
				12	1.0	14760	27870	-	-	16.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 3:30 p.m.	12.5	1.7	0	1	-	-	-	-	-	-	-
				2	0.2	218	425	-	-	0.2	-
				3	0.2	219	426	-	-	0.2	-
				4	-	-	-	-	-	-	-
				5	0.2	221	431	-	-	0.2	-
				6	-	-	-	-	-	-	-
				7	0.5	475	914	-	-	0.4	-
				8	0.6	2251	4314	-	-	2.2	-
				9	-	-	-	-	-	-	-
				10	0.9	12320	23349	-	-	13.4	-
				11	-	-	-	-	-	-	-
				12	0.2	14730	28662	-	-	16.5	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 4:10 p.m.	12.7	1.4	0	1	-	-	-	-	-	-	-
				2	0.2	219	426	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	219	427	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	242	469	-	-	0.2	-
				7	0.5	1157	2226	-	-	-	-
				8	0.8	2316	4406	-	-	0.2	-
				9	-	-	-	-	-	0.4	-
				10	0.9	12410	23520	-	-	0.9	-
				11	-	-	-	-	-	1.9	-
				12	1.0	14760	27870	-	-	3.9	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were terminated due to conditions related equipment failure.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 19, 2005

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:45 p.m.	12.9	1.5	0	1	-	-	-	-	-	-	-
				2	0.2	220	428	-	-	0.2	0.04
				3	-	-	-	-	-	-	-
				4	0.2	221	430	-	-	0.2	0.05
				5	-	-	-	-	-	-	-
				6	0.3	273	530	-	-	0.2	-0.30
				7	0.5	1263	2430	-	-	1.2	-
				8	0.6	2584	4952	-	-	2.5	-0.04
				9	0.8	8470	16112	-	-	8.9	-
				10	0.9	12760	24183	-	-	13.9	-0.09
				11	-	-	-	-	-	-	-
				12	0.9	13900	26344	-	-	15.2	-0.05
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:00 p.m.	12.8	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	220	428	-	-	0.2	-
				4	0.2	220	429	9.0	59.3	0.2	-
				5	0.2	220.7	429	9.0	59.6	0.2	-
				6	0.3	239	464	9.2	61.4	0.2	-
				7	0.4	669	1292	9.4	63.1	0.6	-
				8	0.5	1646	3167	9.2	62.5	1.6	-
				9	0.7	6720	12831	8.1	55.7	7.0	-
				10	0.8	12630	24026	7.6	52.2	13.7	-
				11	-	-	-	-	-	-	-
				12	1.0	14850	28040	7.3	49.9	16.3	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 12:05 p.m.	12.0	1.9	0	1	-	-	-	-	-	-	-
				2	0.2	220	428	8.6	58.3	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	221	431	8.6	58.6	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	241	470	8.6	59.2	0.2	-
				7	0.3	1098	2128	9.1	62.3	1.0	-
				8	0.5	1947	3746	8.9	61.3	1.9	-
				9	-	-	-	-	-	-	-
				10	0.8	13180	25072	7.5	52.2	14.4	-
				11	1.1	14360	27015	6.9	48.5	15.8	-
				12	1.5	15050	27901	6.8	48.0	16.5	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were terminated due to conditions related equipment failure.

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 4, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 11:00 a.m.	12.5	2.1	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.4	226	436	7.6	51.3	0.2	-
				4	0.4	226	437	7.6	51.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.5	292	563	7.7	52.3	0.3	-
				7	-	-	-	-	-	-	-
				8	0.9	5180	9817	7.0	48.2	5.2	-
				9	-	-	-	-	-	-	-
				10	1.2	14740	27628	7.1	48.6	16.1	-
				11	-	-	-	-	-	-	-
				12	1.2	15720	29465	7.2	48.5	17.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 11:45 a.m.	12.4	2.2	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.4	225	435	7.6	51.0	0.2	-
				4	0.4	228	440	7.6	51.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.5	273	525	7.6	51.8	0.2	-
				7	-	-	-	-	-	-	-
				8	1.0	6080	11480	7.1	48.9	6.3	-
				9	-	-	-	-	-	-	-
				10	1.3	14870	27769	7.1	48.8	16.2	-
				11	-	-	-	-	-	-	-
				12	1.3	15950	29786	7.1	49.2	17.5	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 11:25 a.m.	12.5	2.0	0	1	-	-	-	-	-	-	-
				2	0.4	225	434	7.6	51.4	0.2	-
				3	-	-	-	-	-	-	-
				4	0.4	225	435	7.6	51.6	0.2	-
				5	-	-	-	-	-	-	-
				6	0.6	269	515	7.7	52.4	0.2	-
				7	-	-	-	-	-	-	-
				8	1.0	5100	9630	7.7	53.0	5.2	-
				9	-	-	-	-	-	-	-
				10	1.3	14840	27713	7.2	49.2	16.2	-
				11	-	-	-	-	-	-	-
				12	1.3	15840	29581	7.7	51.9	17.3	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 4, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:45 a.m.	12.8	2.2	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.3	270	524	7.7	52.2	0.2	0.05
				4	0.4	327	631	7.7	52.3	0.3	0.13
				5	-	-	-	-	-	-	-
				6	0.6	1286	2465	7.8	53.3	1.2	0.00
				7	-	-	-	-	-	-	-
				8	0.9	5480	10386	7.1	49.0	5.5	-0.12
				9	-	-	-	-	-	-	-
				10	1.1	1470	2765	6.9	47.8	16.0	0.09
				11	-	-	-	-	-	-	-
				12	1.1	16050	30194	6.8	46.6	17.7	0.02
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:15 a.m.	12.8	2.4	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	279	543	7.7	52.3	0.2	-
				4	0.2	336	654	7.8	53.0	0.3	-
				5	-	-	-	-	-	-	-
				6	0.4	1088	2101	7.8	53.1	1.0	-
				7	-	-	-	-	-	-	-
				8	0.7	5620	10731	7.1	49.0	5.8	-
				9	-	-	-	-	-	-	-
				10	0.9	16200	30703	7.1	48.6	16.1	-
				11	-	-	-	-	-	-	-
				12	1.0	16020	30249	7.4	49.4	17.7	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 9:00 a.m.	12.1	2.1	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.1	285	-	7.8	53.0	0.3	-
				4	0.1	342	668	7.9	53.7	0.3	-
				5	-	-	-	-	-	-	-
				6	0.2	1058	2059	8.1	55.3	1.0	-
				7	-	-	-	-	-	-	-
				8	0.6	4950	9487	7.1	49.6	5.1	-
				9	-	-	-	-	-	-	-
				10	0.9	14780	28012	7.1	49.9	16.3	-
				11	-	-	-	-	-	-	-
				12	1.0	16880	31873	7.1	50.4	18.7	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 17, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 1:00 p.m.	12.4	2.3	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	246	479	7.2	59.0	0.2	-
				4	0.2	248	483	7.1	48.8	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	278	538	7.1	48.4	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	2020	3901	7.5	51.3	2.0	-
				9	-	-	-	-	-	-	-
				10	1.1	10630	19998	6.5	45.2	11.3	-
				11	-	-	-	-	-	-	-
				12	1.0	17680	33384	6.8	47.1	19.6	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 12:30 p.m.	12.4	2.2	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	249	484	7.1	48.2	0.2	-
				4	0.2	250	486	7.1	48.2	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	273	532	6.9	47.2	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	2177	4204	6.8	47.1	2.1	-
				9	-	-	-	-	-	-	-
				10	1.0	11000	20770	5.9	40.8	11.8	-
				11	-	-	-	-	-	-	-
				12	1.1	16630	31285	6.6	45.7	18.4	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:50 a.m.	13	2.4	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	249	484	7.1	48.5	0.2	0.01
				4	0.2	249	485	7.1	48.2	0.2	0.01
				5	-	-	-	-	-	-	-
				6	0.0	288	565	6.9	47.6	0.3	0.01
				7	-	-	-	-	-	-	-
				8	0.0	1319	2583	6.8	46.9	1.3	0.00
				9	-	-	-	-	-	-	-
				10	0.8	10190	19384	6.2	43.3	10.9	0.10
				11	-	-	-	-	-	-	-
				12	1.0	16810	31741	6.6	46.4	18.6	0.08
				13	1.0	17080	32251	6.8	47.8	19.0	0.01

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 17, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:25 p.m.	13.8	2.4	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.4	794	1533	6.9	47.3	0.7	-
				4	-	-	-	-	-	-	-
				5	0.7	7880	15046	6.0	41.6	8.3	-
				6	-	-	-	-	-	-	-
				7	0.9	11780	22326	6.0	41.7	12.7	-
				8	-	-	-	-	-	-	-
				9	1.1	16130	30345	6.3	44.1	17.7	-
				10	-	-	-	-	-	-	-
				11	1.1	16830	31662	6.7	46.2	18.6	-
				12	-	-	-	-	-	-	-
				13	1.0	18010	34007	6.8	46.6	20.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 2:00 p.m.	13.2	2.7	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	707	1376	7.4	50.5	0.7	-
				4	-	-	-	-	-	-	-
				5	0.6	6890	13205	6.2	42.8	7.2	-
				6	-	-	-	-	-	-	-
				7	0.9	11500	21795	6.1	42.2	12.4	-
				8	-	-	-	-	-	-	-
				9	1.1	15990	30081	6.4	44.4	17.6	-
				10	-	-	-	-	-	-	-
				11	1.1	16870	31737	6.7	46.2	18.6	-
				12	-	-	-	-	-	-	-
				13	1.1	18100	34013	6.8	46.6	20.1	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:20 p.m.	12.7	2.2	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.3	640	1241	6.5	44.8	0.6	-
				4	0.5	3291	6331	6.5	44.5	3.3	-
				5	-	-	-	-	-	-	-
				6	0.9	10230	19388	6.1	42.3	10.9	-
				7	-	-	-	-	-	-	-
				8	1.1	13960	26262	6.3	43.9	15.2	-
				9	-	-	-	-	-	-	-
				10	1.1	16480	31003	6.5	45.0	18.2	-
				11	-	-	-	-	-	-	-
				12	1.1	18160	34164	6.7	47.0	20.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 31, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 2:50 p.m.	12.7	2.6	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-0.1	266	524	6.9	48.0	0.2	-
				4	-0.1	267	526	6.9	48.6	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	275	539	6.6	46.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	445	863	6.3	44.0	0.6	-
				9	-	-	-	-	-	-	-
				10	0.5	10080	19392	5.4	38.2	10.7	-
				11	-	-	-	-	-	-	-
				12	0.6	16370	31375	5.7	41.0	18.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 2:25 p.m.	13.2	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-0.1	263	518	6.7	46.9	0.2	-
				4	-	-	-	-	-	-	-
				5	0.0	266	522	6.7	46.7	0.2	-
				6	-	-	-	-	-	-	-
				7	0.2	326	634	6.3	44.0	0.3	-
				8	-	-	-	-	-	-	-
				9	0.3	2839	5503	5.8	40.9	2.0	-
				10	-	-	-	-	-	-	-
				11	0.5	13930	26799	5.6	39.9	15.7	-
				12	-	-	-	-	-	-	-
				13	0.9	17060	32333	5.8	41.4	19.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 1:10 p.m.	14	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	262	514	6.7	46.4	0.2	0.01
				4	0.1	263	514	6.6	46.3	0.2	-0.01
				5	-	-	-	-	-	-	-
				6	0.2	280	545	6.5	45.8	0.2	-0.01
				7	-	-	-	-	-	-	-
				8	0.3	340	659	6.3	44.3	0.3	-0.03
				9	-	-	-	-	-	-	-
				10	0.5	6280	12082	5.7	40.0	7.0	-0.01
				11	-	-	-	-	-	-	-
				12	0.7	15330	29271	6.2	43.6	17.2	0.05
				13	-	-	-	-	-	-	-
				14	0.9	17390	32958	6.8	47.1	19.4	-0.04

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 31, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 3:16 p.m.	13.9	2.6	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-0.1	1476	2905	8.2	57.4	1.5	-
				4	-	-	-	-	-	-	-
				5	0.2	6240	12142	6.0	42.2	6.5	-
				6	-	-	-	-	-	-	-
				7	0.3	8200	15895	5.7	40.3	9.1	-
				8	-	-	-	-	-	-	-
				9	0.4	15100	29160	5.6	39.5	16.9	-
				10	-	-	-	-	-	-	-
				11	0.7	16460	31429	5.8	41.3	18.3	-
				12	-	-	-	-	-	-	-
				13	0.9	17900	33925	6.0	42.8	20.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 3:35 p.m.	13.3	3.6*	0.3*	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	2301	4512	6.3	44.1	2.4	-
				4	-	-	-	-	-	-	-
				5	0.2	5080	9885	5.8	41.0	5.4	-
				6	-	-	-	-	-	-	-
				7	0.3	10450	20257	5.5	39.0	11.4	-
				8	-	-	-	-	-	-	-
				9	0.5	15100	29050	5.6	39.3	16.8	-
				10	-	-	-	-	-	-	-
				11	0.6	16270	31183	5.7	40.3	18.2	-
				12	-	-	-	-	-	-	-
				13	0.9	18180	34455	5.9	41.8	20.4	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 4:00 p.m.	12.8	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-0.1	1571	3092	8.8	61.1	1.6	-
				4	0.1	2564	5008	6.5	45.3	2.8	-
				5	-	-	-	-	-	-	-
				6	0.3	7710	14945	5.8	40.6	8.1	-
				7	-	-	-	-	-	-	-
				8	0.4	13960	26958	5.5	39.1	15.5	-
				9	-	-	-	-	-	-	-
				10	0.6	15800	30282	5.7	40.3	17.7	-
				11	-	-	-	-	-	-	-
				12	0.9	17190	32579	5.8	41.6	19.4	-

Notes:

*Sample hole located over past sampling overflow, increasing ice thickness and freeboard

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ10 meter

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 14, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 2:10 p.m.	12.3	2.8	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	280	546	0.3	-
				5	-	-	-	-	-
				6	0.1	292	571	0.3	-
				7	-	-	-	-	-
				8	0.3	536	1039	0.5	-
				9	-	-	-	-	-
				10	0.7	15750	30073	17.5	-
				11	-	-	-	-	-
				12	0.9	17560	33280	19.6	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 1:25 p.m.	13.7	3.2	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	278	542	0.2	-
				5	-	-	-	-	-
				6	0.2	294	572	0.3	-
				7	-	-	-	-	-
				8	0.4	541	1045	0.5	-
				9	-	-	-	-	-
				10	0.8	15860	30170	17.6	-
				11	-	-	-	-	-
				12	1.0	17580	33195	19.6	-
				13	1.0	18160	34290	20.3	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:45 p.m.	14.2	2.8	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	277	541	0.2	0.01
				5	-	-	-	-	-
				6	0.2	309	601	0.3	0.01
				7	-	-	-	-	-
				8	0.4	545	1052	0.5	0.00
				9	-	-	-	-	-
				10	0.8	15740	29942	17.5	-0.01
				11	-	-	-	-	-
				12	0.9	17500	33167	19.6	-0.02
				13	-	-	-	-	-
				14	1.0	18210	34384	20.3	-0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were not obtained due to equipment failure.

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 14, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 12:05 p.m.	14.0	3.0	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	2634	5145	2.6	-
				5	-	-	-	-	-
				6	0.4	9640	18616	10.4	-
				7	-	-	-	-	-
				8	0.3	15270	29600	17.2	-
				9	-	-	-	-	-
				10	0.8	16930	32206	18.9	-
				11	-	-	-	-	-
				12	1.0	18130	34233	20.3	-
				13	-	-	-	-	-
				14	1.0	18360	34668	20.5	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:20 a.m.	13.5	3.4	0.2	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.0	2541	4982	2.6	-
				5	-	-	-	-	-
				6	0.4	8270	15970	9.7	-
				7	-	-	-	-	-
				8	0.5	15150	29146	16.9	-
				9	-	-	-	-	-
				10	0.8	16780	31921	18.7	-
				11	-	-	-	-	-
				12	0.9	17800	33735	19.9	-
				13	1.0	18390	34724	20.5	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:46 p.m.	12.8	3.2	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	3183	6217	3.2	-
				5	-	-	-	-	-
				6	0.4	9690	18712	10.5	-
				7	-	-	-	-	-
				8	0.5	15400	29627	17.2	-
				9	-	-	-	-	-
				10	0.8	16610	31597	18.5	-
				11	-	-	-	-	-
				12	1.0	18380	34705	20.5	-

Notes:

*Sample hole located over past sampling overflow, increasing ice thickness and freeboard

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were not obtained due to equipment failure.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 28, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:20 a.m.	13.3	3.3	0.1	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	-0.1	353	694	0.3	-
				5	-	-	-	-	-
				6	0.0	433	848	0.4	-
				7	-	-	-	-	-
				8	0.3	2144	4156	2.1	-
				9	-	-	-	-	-
				10	0.8	17290	32891	19.7	-
				11	-	-	-	-	-
				12	0.9	18050	34209	20.2	-
				13	0.9	19070	36142	21.4	
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:00 a.m.	13.6	3.1	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	-0.1	359	706	0.3	-
				5	-	-	-	-	-
				6	0.0	434	850	0.4	-
				7	-	-	-	-	-
				8	0.4	4518	8725	4.7	-
				9	-	-	-	-	-
				10	0.8	17550	33385	19.6	-
				11	-	-	-	-	-
				12	0.9	18170	34436	20.3	-
				13	0.9	19150	36294	21.6	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:05 p.m.	13.5	3.2	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	-0.1	358	704	0.3	0.02
				5	-	-	-	-	-
				6	0.0	510	1000	0.5	0.03
				7	-	-	-	-	-
				8	0.4	7650	14773	7.9	0.02
				9	-	-	-	-	-
				10	0.8	17760	33785	19.9	0.04
				11	-	-	-	-	-
				12	0.9	18250	34588	20.4	0.06
				13	1.0	19140	36140	21.5	0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were not obtained due to equipment failure.

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 28, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:40 a.m.	13.7	3.2	0.1	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	4589	8964	4.7	-
				5	-	-	-	-	-
				6	0.5	13240	25471	14.6	-
				7	-	-	-	-	-
				8	0.6	15960	30589	17.9	-
				9	-	-	-	-	-
				10	0.7	17540	33491	19.7	-
				11	-	-	-	-	-
				12	0.8	18230	34679	20.5	-
				13	-	-	-	-	-
				14	0.9	19270	36521	21.7	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:58 a.m.	13.4	4.3	0.3	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	-	-	-	-	-
				5	0.2	7290	14185	8.0	-
				6	-	-	-	-	-
				7	0.6	15300	29324	17.0	-
				8	-	-	-	-	-
				9	0.7	16830	32135	18.8	-
				10	-	-	-	-	-
				11	0.8	17820	33899	20.0	-
				12	-	-	-	-	-
				13	0.9	19500	36957	21.9	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 11:17 p.m.	13.1	3.2	0	1	-	-	-	-	-
				2	-	-	-	-	-
				3	-	-	-	-	-
				4	0.1	4504	8798	5.0	-
				5	-	-	-	-	-
				6	0.5	13670	26299	15.2	-
				7	-	-	-	-	-
				8	0.7	16260	31047	18.1	-
				9	-	-	-	-	-
				10	0.7	17430	33281	19.6	-
				11	-	-	-	-	-
				12	0.9	19230	36445	21.6	
				13	0.8	19320	36752	21.8	-

Notes:

*Sample hole located over past sampling overflow, increasing ice thickness and freeboard

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were not obtained due to equipment failure.

Value exceeds 500 µS/cm, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: April 4, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	DO (mg/L)	DO (%)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:30 a.m.	12.6	3.5	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.9	436	826	0.4	5.9	41.2	-
				5	-	-	-	-	-	-	-
				6	0.2	446	868	0.5	4.9	33.9	-
				7	-	-	-	-	-	-	-
				8	0.3	15160	29387	16.4	4.2	28.9	-
				9	-	-	-	-	-	-	-
				10	0.4	18080	34914	20.7	4.0	27.2	-
				11	-	-	-	-	-	-	-
				12	0.6	18900	36224	21.4	3.6	25.2	-
				13	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:15 a.m.	13.4	3.9	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.4	426	823	0.4	6.4	44.1	-
				6	-	-	-	-	-	-	-
				7	0.3	8140	15779	8.4	4.4	30.2	-
				8	-	-	-	-	-	-	-
				9	0.5	16740	32205	18.8	4.3	29.5	-
				10	-	-	-	-	-	-	-
				11	0.6	18810	36051	21.3	4.2	29.1	-
				12	-	-	-	-	-	-	-
				13	0.6	18950	36319	21.5	3.9	27.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:35 p.m.	13.5	3.7	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.1	404	790	0.4	6.3	43.6	-
				5	0.1	451	881	0.4	5.3	36.4	-
				6	-	-	-	-	-	-	-
				7	0.4	14830	28638	16.7	4.8	32.8	-
				8	-	-	-	-	-	-	-
				9	0.5	17910	34456	20.1	4.7	32.4	-
				10	-	-	-	-	-	-	-
				11	0.6	18940	36300	21.4	4.5	31.0	-
				12	-	-	-	-	-	-	-
				13	0.9	19120	36237	21.5	4.3	29.9	

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements was recorded using Hach HQ10 meter.

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm specific conductance, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: April 4, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	DO (mg/L)	DO (%)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:50 a.m.	13.8	4.1	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.1	6530	12755	6.9	5.4	36.9	-
				6	-	-	-	-	-	-	-
				7	0.4	14520	28040	16.1	5.2	35.7	-
				8	-	-	-	-	-	-	-
				9	0.7	17280	32995	19.3	5.1	35.5	-
				10	-	-	-	-	-	-	-
				11	0.3	18720	36288	21.4	5.0	34.6	-
				12	-	-	-	-	-	-	-
				13	0.9	19200	36388	21.6	4.9	33.7	-
				14	-	-	-	.	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:15 a.m.	12.9	3.9	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-0.4	6210	12367	6.7	5.3	36.1	-
				5	-	-	-	-	-	-	-
				6	0.1	8570	16740	9.4	4.3	29.5	-
				7	-	-	-	-	-	-	-
				8	0.4	14660	28310	16.3	3.9	26.6	-
				9	-	-	-	-	-	-	-
				10	0.7	17740	33873	20.0	3.7	25.5	-
				11	-	-	-	-	-	-	-
				12	0.9	19070	36142	21.5	3.3	23.0	-
				13	-	-	-	.	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 12:55 p.m.	12.9	4.0	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	8860	17240	9.7	5.0	33.6	-0.02
				7	-	-	-	-	-	-	-
				8	0.6	14790	28346	16.1	4.3	29.3	0.01
				9	-	-	-	-	-	-	-
				10	0.8	17270	32853	19.3	4.4	30.5	-0.01
				11	-	-	-	-	-	-	-
				12	0.8	18920	35991	21.0	4.3	29.6	-0.03
				13	-	-	-	.	-	-	-

Notes:

*Sample hole located over past sampling overflow, increasing ice thickness and freeboard

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements was recorded using Hach HQ10 meter.

(7) Velocity was measured using a Marsh-McBirney

Value exceeds 500 µS/cm specific conductance, as specified in ADNR Fish Habitat Permit FH04-III-0135, Issued May 18, 2004

Trip Reports

Project Trip Report

Project Name:	Date of Trip:
Colville River Ice Bridge Monitoring	November 21, 2005
Project Code:	**Submitted by:**
107341	Mike Alexander, PE/Mark McBroom, EIT

Weather: Temperature –22 to -27^{o} F with light wind, clear with fog on horizon.

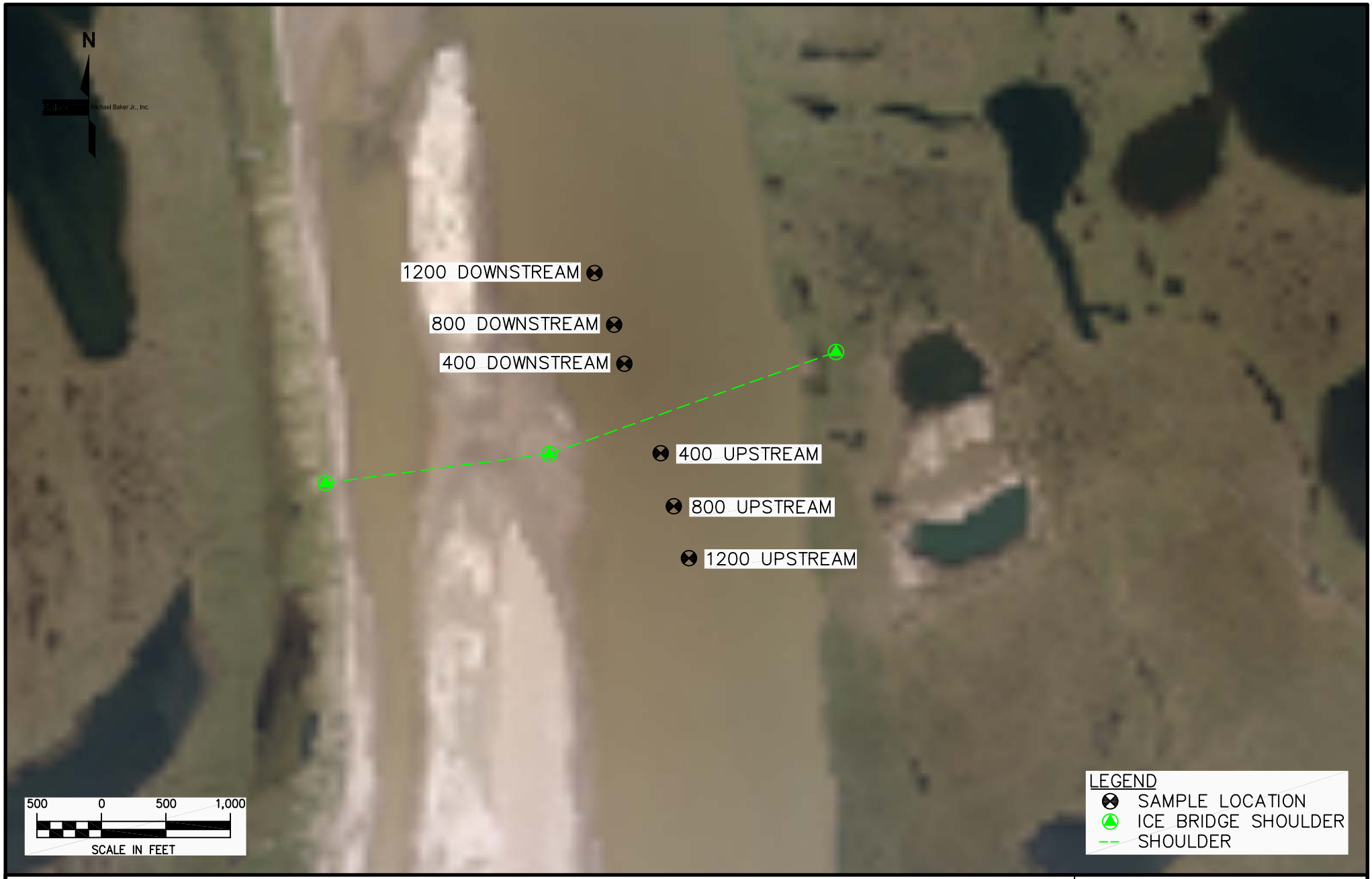
Mr. Alexander and Mr. McBroom arrived at Alpine on Sunday, November 20, 2005 at 5:00 PM. Upon arrival, they met up with Gene Diamond of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct initial seasonal monitoring of the Colville River Ice Bridge.

At 6:00 AM on November 21, LCMF conducted their weekly health and safety meeting which was attended by Mr. Alexander and Mr. McBroom. At 7:30, equipment was assembled, calibrated and loaded into the Tucker. Mr. Chris Zeimet of LCMF drove Mr. Alexander and Mr. McBroom to the ice bridge monitoring site leaving Alpine at 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at the predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), Hach HQ10 (dissolved oxygen,) and a Marsh McBirney Model 2000 (water velocity). All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of November 21 by Mr. Alexander and Mr. McBroom.

Mr. Alexander, Mr. McBroom and Mr. Zeimet returned to Alpine at 4:30 PM. At 8:30 AM on Tuesday, November 22, Mr. Alexander and Mr. McBroom departed Alpine for Anchorage, arriving at 4:00 PM.

Concentrations of conductivity were recorded above 500 us/cm in each of the six monitoring locations at or below nine feet of depth, with values above this limit ranging from 730 to 3,400 us/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.



ConocoPhillips Alaska, Inc.

DATE:	11/23/05	PROJECT:	107341
DRAWN:	WAP	FILE:	ICE BRIDGE MONITORING SITES
CHECKED:	MTA	SCALE:	1" = 1000'

Baker

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2005/2006 ICE BRIDGE MONITORING LOCATIONS

1-1

(SHEET 1 OF 1)

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 30, 2005
Project Code: 107634	**Submitted by:** Mark McBroom, EIT

Weather: Temperature –5° F with light wind, clear.

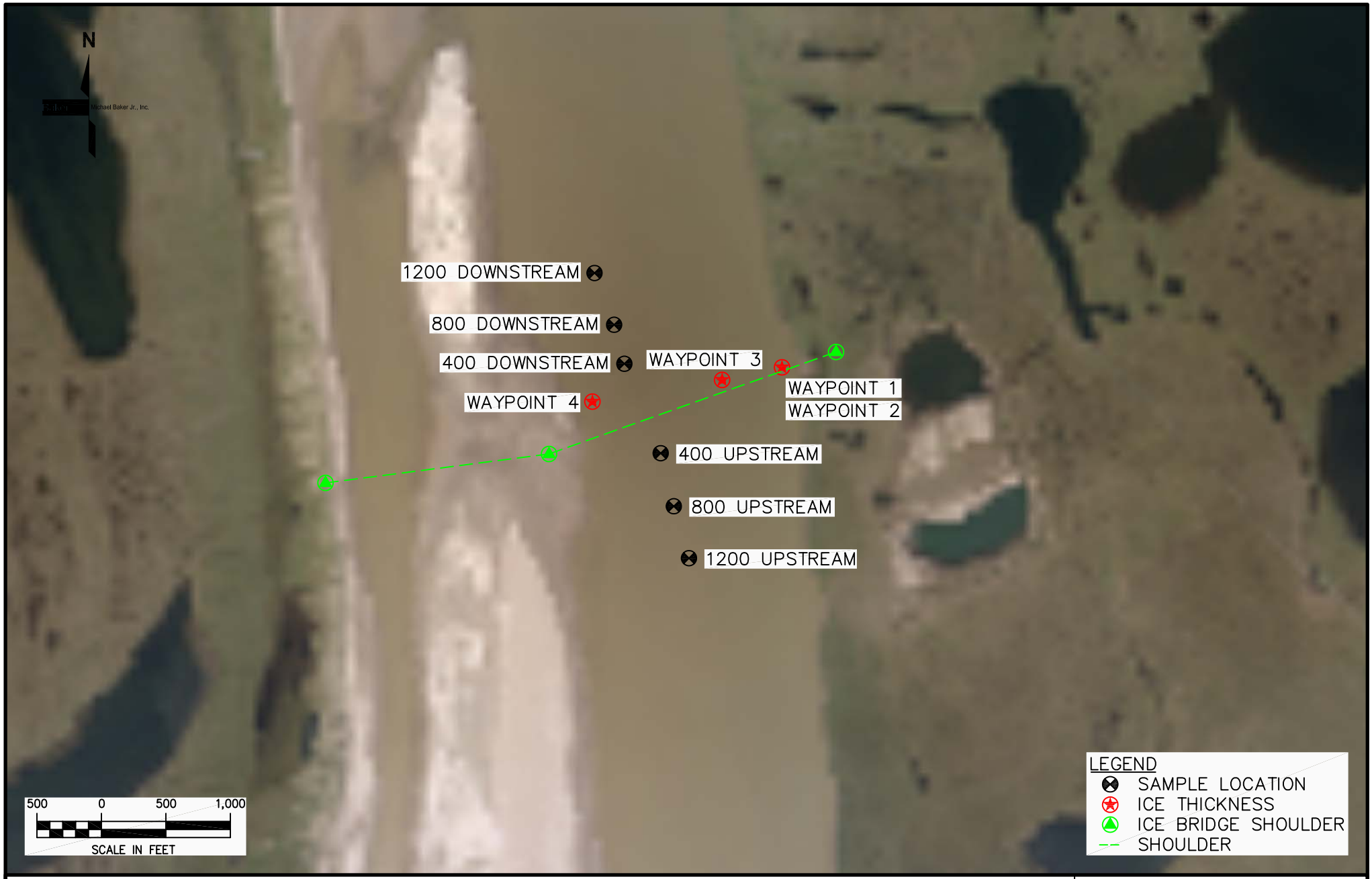
Mr. McBroom arrived at Kuparuk on Tuesday, November 29, 2005 at 3:00 PM. Prior to departure for Alpine, Mr. McBroom met with Environmental Exploration Coordinator Chris Brown and Exploration Coordinator Moose to discuss the sampling regime at the Colville River Ice Bridge. Mr. McBroom arrived at Alpine 5:00 PM, met with LCMF (Don Bruce), and coordinated the access and procedures for ice bridge monitoring on the Colville River. The purpose of the trip was to monitor water chemistry at locations in the Main Channel, establish additional monitoring sites in the low-flow East Channel and conduct monitoring at these locations near the Colville River Ice Bridge.

At 6:00 AM on November 30, Mr. McBroom attended the daily LCMF health and safety meeting. At 7:30, equipment was assembled, calibrated and loaded into the Tucker. LCMF (Mr. Templeman) drove Mr. McBroom to the ice bridge monitoring site, accompanied by Mr. Rourick (LCMF) on snow machine, leaving Alpine at 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature and water velocities were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Lateral locations were modified from previous investigations to identify and monitor the deepest portion of the Main Channel.

At the request of Moose and Chris Brown of ConocoPhillips, Mr. McBroom established new locations in the east channel, specifically at the ice bridge centerline (Station 4+00), 400 feet upstream and 400 feet downstream of the ice bridge centerline. Again, the deepest portion of this low-flow channel was identified prior to investigations. Water depth, ice thickness, freeboard, salinity, conductivity, temperature and water velocities were measured at the three sampling locations. Results of Main Channel and East Channel investigations are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and a Marsh McBirney Model 2000 (water velocity). Dissolved oxygen was not measured during this monitoring event due to equipment failure of the primary DO meter (Hach HQ10). The backup DO meter (YSI-556) was not used for DO because sampling was conducted via snowmachine due to ice access limitations and the ambient temperature precluded the use of DO membrane technology.

Specific conductivity above 500 uS/cm was encountered in each of the six Main Channel monitoring locations with values above this limit ranging from 503 to 10,300 uS/cm. East Channel concentrations were below 500 uS/cm in each of the three holes.



ConocoPhillips Alaska, Inc.

DATE:	11/23/05	PROJECT:	107341
DRAWN:	WAP	FILE:	ICE BRIDGE MONITORING SITES
CHECKED:	MTA	SCALE:	1" = 1000'

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2005/2006 ICE BRIDGE MONITORING LOCATIONS

1-1

(SHEET 1 OF 1)

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 6 and 7, 2005
Project Code: 107634	**Submitted by:** Mike Alexander, PE

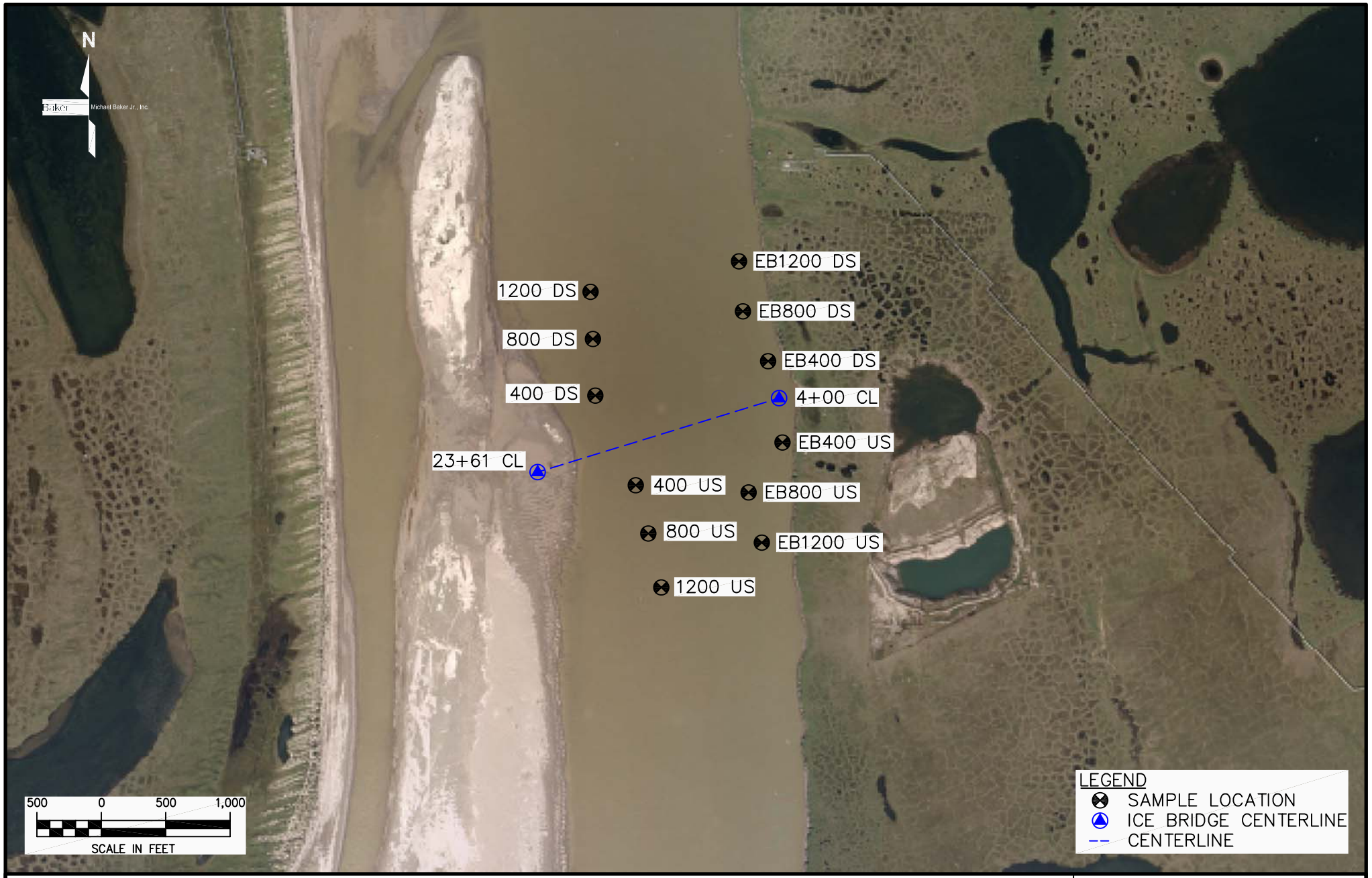
Weather: Ambient Temperature ranged –20° to –32° F with wind 25-35 mph (12/6/2005)
Ambient Temperature –9° F with wind 20-25 mph (12/7/2005)

Mr. Alexander arrived at Alpine on Monday December 5, 2005 at 6:00 PM. Upon arrival, he met with Don Bruce of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct additional seasonal monitoring of the Colville River Ice Bridge in the Main Channel, establish new sites in the low-flow East Channel upstream and downstream and conduct monitoring at these locations.

At 6:00 AM on December 6, LCMF conducted their daily health and safety meeting, which was attended by Mr. Alexander. At 7:30 AM, equipment was assembled, calibrated and loaded into the Haggland. Mr. Mike Rourick of LCMF drove Mr. Alexander to the ice bridge-monitoring site leaving Alpine at 8:30 AM and arriving at the ice bridge about 9:50 AM. Ice thickness did not allow access to the ice with the Haggland, so all sampling was completed via snow machine transportation. The approximate deepest location at the east bank was determined at 800 and 1200-feet downstream and 800-feet upstream of the bridge centerline. Water depth, ice thickness, freeboard, salinity, conductivity, temperature and water velocities were measured at these sampling locations as well as 400-feet upstream and downstream. At 4:30 sampling activities were stopped due to low temperatures, blowing snow and equipment limitations.

At 6:00 AM on December 7, LCMF conducted their daily health and safety meeting, which was attended by Mr. Alexander. At 7:30 AM, equipment was assembled, calibrated and loaded into the Haggland. Mr. Mike Rourick of LCMF drove Mr. Alexander to the ice bridge-monitoring site leaving Alpine at 8:30 AM. The approximate deepest location at the east bank was determined at 1200-feet upstream. Water depth, ice thickness, freeboard, salinity, conductivity, and temperature were measured at 400, 800 and 1200-feet upstream and downstream sites in the main channel. At 3:00 all sampling was completed. Water velocities were not recorded due to difficulties in auguring larger holes and due to problems maintaining meter ice-free.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and a Marsh McBirney Model 2000 (water velocity). Dissolved Oxygen was recorded using a Hach HQ10 meter. Concentrations of conductivity were recorded above 500 uS/cm in each of the six Main Channel monitoring locations with values above this limit ranging from 557 to 10,530 uS/cm. East Channel concentrations were below 500 uS/cm in five of the six holes. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.



ConocoPhillips Alaska, Inc.

DATE:	12/12/05	PROJECT:	107341
DRAWN:	WAP	FILE:	12/12/05 ICE BRIDGE MONITORING
CHECKED:	MTA	SCALE:	1" = 1000'

Baker

Michael Baker Jr., Inc.
A Unit of Michael Baker Corporation
1400 West Benson Blvd., Suite 200
Anchorage, Alaska 99503
Phone: (907) 273-1600
Fax: (907) 273-1699

DECEMBER 6 & 7, 2005

ICE BRIDGE MONITORING LOCATIONS

1-1

(SHEET 1 OF 1)

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 19, 2005
Project Code: 107341	**Submitted by:** Mark McBroom, EIT

Weather: Temperature 8° F, 10-15 mph wind, minor snowfall in AM.

Mr. McBroom arrived at Alpine on Sunday, December 18, 2005 at 4:30 PM. Upon arrival, he met up with Gene Diamond and Chris Zeimet of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

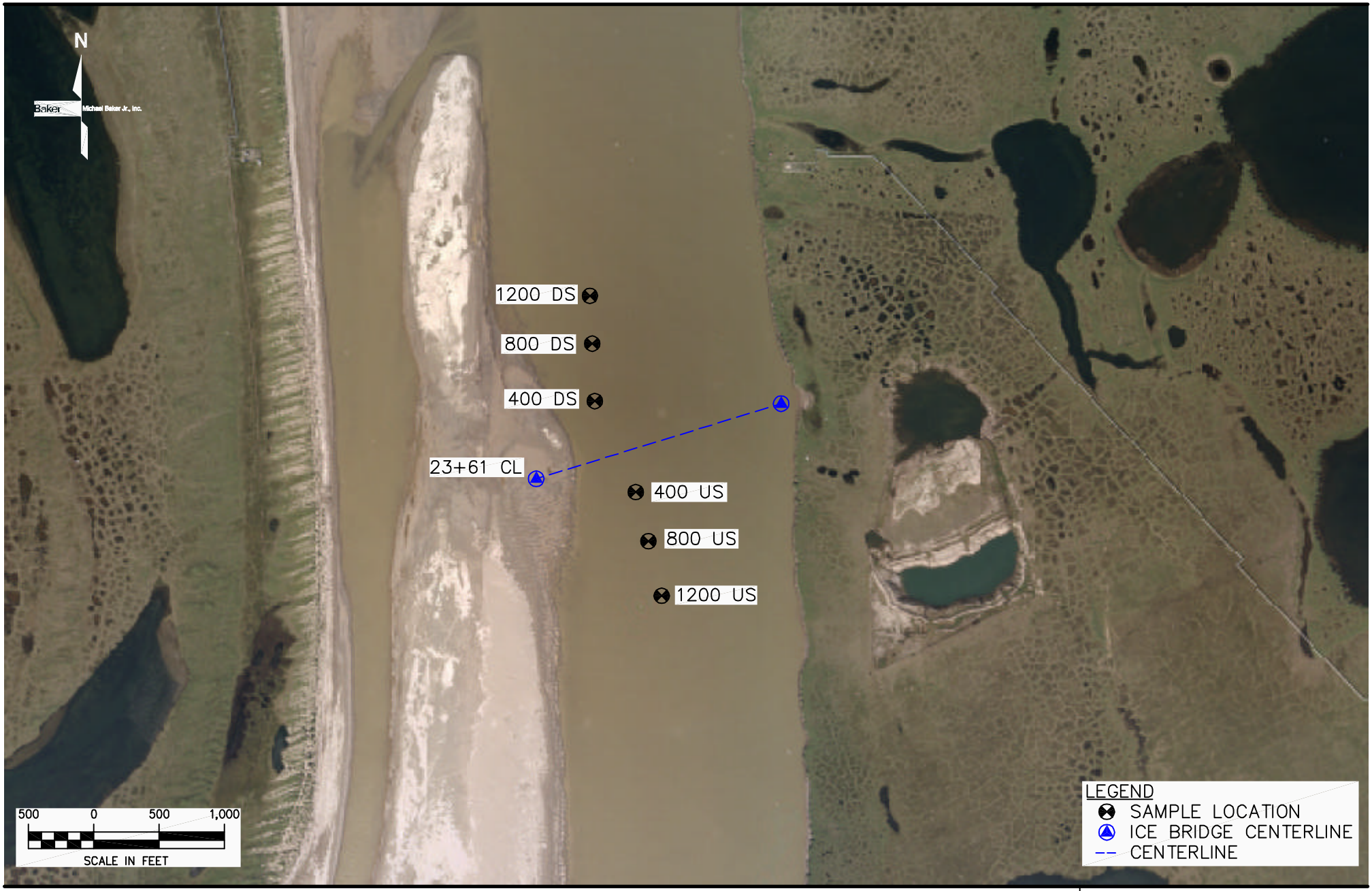
At 6:00 AM on December 19, LCMF conducted their weekly health and safety meeting which was attended by Mr. McBroom. At 7:30, equipment was assembled, calibrated and loaded into the Haggulund. Mr. Chris Zeimet of LCMF drove Mr. McBroom to the ice bridge monitoring site leaving Alpine at 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature). Dissolved oxygen was only measured at two locations (1200 and 800 feet downstream) due to equipment failure of the primary DO meter (Hach HQ10). Water velocities were measured at one location (400 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of November 19 by Mr. McBroom.

A representative water sample was collected at 400 feet downstream, at a depth of 0 feet below water surface, to determine the correction coefficient necessary for specific conductance calculations. The resulting correction coefficient for a reference temperature of 25° C was determined to be 0.0196 (Standard Methods suggests a value of 0.0191 for most environmental water samples). The resulting specific conductance values were calculated and are presented in the attached spreadsheets.

Mr. McBroom and Mr. Zeimet returned to Alpine at 5:30 PM. At 10:30 AM on Tuesday, December 20, Mr. McBroom departed Alpine for Anchorage, arriving at 1:30 PM.

Concentrations of conductivity were recorded above 500 µs/cm in each of the six monitoring locations at or below seven feet of depth, with values above this limit ranging from 640 to 18,160 µs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.



ConocoPhillips Alaska, Inc.

DATE:	12/19/05	PROJECT:	107341
DRAWN:	WAP	FILE:	12/19/05 ICE BRIDGE MONITORING
CHECKED:	MDM	SCALE:	1" = 1000'

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DECEMBER 19, 2005

ICE BRIDGE MONITORING LOCATIONS

1-1

(SHEET 1 OF 1)

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 4, 2006
Project Code: 107341	**Submitted by:** Mark McBroom, EIT

Weather: Temperature -16° F, 10-15 mph wind

Mr. McBroom arrived at Alpine on Tuesday, January 3, 2005 at 6:25 PM. Upon arrival, he met up with Don Bruce and Mike Rourick of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 6:00 AM on January 4, LCMF conducted their weekly health and safety meeting which was attended by Mr. McBroom. At 7:30, equipment was assembled, calibrated and loaded into the Hagglund. Mr. Rourick of LCMF drove Mr. McBroom to the ice bridge monitoring site leaving Alpine at 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and Hach HQ10 meter (dissolved oxygen). Water velocities were measured at one location (400 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of January 4 by Mr. McBroom.

Mr. McBroom and Mr. Rourick returned to Alpine at 3:30 PM. At 8:00 AM on Thursday, January 5, Mr. McBroom departed Alpine for Anchorage, arriving at 11:30 AM.

Concentrations of conductivity were recorded above 500 μs/cm in each of the six monitoring locations at or below six feet of depth, with values above this limit ranging from 15,720 to 16,880 μs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 17, 2006
Project Code: 107341	**Submitted by:** Mark McBroom, EIT

Weather: Temperature -5° F, 10-15 mph wind

Mr. McBroom arrived at Alpine on Monday, January 16, 2005 at 6:25 PM. Upon arrival, he met up with Gene Diamond and Chris Zeimet of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 6:00 AM on January 17, LCMF conducted their weekly health and safety meeting which was attended by Mr. McBroom. At 7:30, equipment was assembled, calibrated and loaded into the Hagglund. Mr. Zeimet of LCMF drove Mr. McBroom to the ice bridge monitoring site leaving Alpine at 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and Hach HQ10 meter (dissolved oxygen). Water velocities were measured at one location (1200 feet upstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of January 17 by Mr. McBroom.

Mr. McBroom and Mr. Zeimet returned to Alpine at 4:00 PM. At 8:00 AM on Wednesday, January 18, Mr. McBroom departed Alpine for Anchorage, arriving at 11:45 AM.

Concentrations of conductivity were recorded above 500 μs/cm in each of the six monitoring locations at or below three feet of depth, with values above this limit ranging from 640 to 18,160 μs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 31, 2006
Project Code: 107341	**Submitted by:** Mark McBroom, EIT

Weather: Temperature -38^{o} to -46^{o} F, 10-15 mph wind

Mr. Wilden Paulino arrived at Alpine on Tuesday, January 31, 2006 at 10:15 AM. Upon arrival, he met up with Don Bruce and AJ Griffin of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 10:50, equipment was assembled, calibrated and loaded into the Hagglund. Mr. Griffin of LCMF drove Mr. Paulino to the ice bridge monitoring site leaving Alpine at 12:15 PM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature) and Hach HQ10 meter (dissolved oxygen). Water velocities were measured at one location (1200 feet upstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of January 31 by Mr. Paulino.

Mr. Paulino and Mr. Griffin returned to Alpine at 6:00 PM. At 8:00 AM on Wednesday, February 1, Mr. Paulino departed Alpine for Anchorage, arriving at 11:45 AM.

Concentrations of conductivity were recorded above 500 μs/cm in each of the six monitoring locations at or below three feet of depth, with values above this limit ranging from 1476 to 18,200 μs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 14, 2006
Project Code: 107341	**Submitted by:** Mark McBroom, EIT

Weather: Temperature 21° F, 10-15 mph wind

Mr. McBroom arrived at Alpine on Monday, February 13, 2006 at 5:20 PM. Upon arrival, he met up with Gene Diamond and Chris Zeimet of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 6:00 AM on February 14, LCMF conducted their weekly health and safety meeting which was attended by Mr. McBroom. At 8:00, equipment was assembled, calibrated and loaded into the Haggulund. Mr. Chris Zeimet of LCMF drove Mr. McBroom to the ice bridge monitoring site leaving Alpine at 8:15 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature). Dissolved oxygen was not measured due to equipment failure of the primary DO meter (Hach HQ10). Water velocities were measured at one location (1200 feet upstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of February 14 by Mr. McBroom.

Mr. McBroom and Mr. Zeimet returned to Alpine at 4:00 PM. At 8:00 AM on Wednesday, February 15, Mr. McBroom departed Alpine for Anchorage, arriving at 11:25 AM.

Concentrations of conductivity were recorded above 500 μS/cm in each of the six monitoring locations at or below four feet of depth. The values above this limit ranged from 536 to 18,390 μs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 28, 2006
Project Code: 107341	**Submitted by:** Michael T. Alexander, PE

Weather: Temperature -32^{o} F, 10-15 mph wind

Mr. Paulino arrived at Alpine on Monday, February 27, 2006 at 5:55 PM. Upon arrival, he met up with Don Bruce of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 6:00 AM on February 28, LCMF conducted their weekly health and safety meeting which was attended by Mr. Paulino. At 7:30 AM, equipment was assembled, calibrated and loaded into the Haggulund. Mr. Sam Ahtuangaruak of LCMF drove Mr. Paulino to the ice bridge monitoring site leaving Alpine at 8:05 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature). Dissolved oxygen was not measured due to equipment failure of the primary DO meter (Hach HQ10). Water velocities were measured at one location (1200 feet upstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at one-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of February 28 by Mr. Paulino.

Mr. Paulino and Mr. Ahtuangaruak returned to Alpine at 1:30 PM. Mr. Paulino departed Alpine At 8:00 AM on Wednesday, March 1.

Concentrations of conductivity were recorded above 500 μS/cm in each of the six monitoring locations. The values above this limit ranged from 2144 to 19,500 μs/cm. The next monitoring event will be scheduled as outlined in DNR permit FH 04-III-0135.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** April 4, 2006
Project Code: 107341	**Submitted by:** Michael T. Alexander, PE

Weather: Temperature ranged 10 to -10^{o} F, calm wind, clear and sunny

Mr. Alexander arrived at Alpine on Monday, April 3, 2006 at 5:45 PM. Upon arrival, he met up with Gene Diamond of LCMF, and coordinated the procedures that were going to be followed at the ice bridge monitoring site. The purpose of the trip was to conduct scheduled monitoring of the Colville River Ice Bridge.

At 6:00 AM on April 4, LCMF conducted their daily health and safety meeting which was attended by Mr. Alexander. At 7:00 AM, equipment was assembled, calibrated and loaded into the Haggulund. Mr. AJ Griffin of LCMF drove Mr. Alexander to the ice bridge monitoring site leaving Alpine at 8:45 AM. Water depth, ice thickness, freeboard, salinity, conductivity, temperature, dissolved oxygen and water velocities were measured at predetermined sampling locations. Locations included sites 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Results are tabulated in the attached spreadsheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature). Dissolved oxygen was measured using a Hach HQ10 meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at two-foot intervals. Water chemistry meters were calibrated prior to the trip by TTT Environmental. The YSI-30 was again calibrated on the morning of April 4 by Mr. Alexander.

Mr. Alexander and Mr. Griffin returned to Alpine at 6:15 PM. Mr. Alexander departed Alpine at 7:30 AM on Wednesday, April 5.

Conductivity was measured above 500 μS/cm in each of the six monitoring locations. The values above this limit ranged from 6,210 to 19,200 μs/cm.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 06, 2006
Project Code: 110211	**Submitted by:** Mark McBroom, EIT

Weather: Temperature 24^{o} F with 10-15 mph winds, clear.

Mr. McBroom arrived at Alpine on Sunday, November 5, 2006 at 1:45 PM to kickoff the 2006-2007 Colville River Ice Bridge Monitoring project. Mr. McBroom attempted to contact LCMF, who were out checking ice thickness for travel safety. Mr. McBroom met with Shellie Colegrove of CPAI to discuss the project sampling plan. The purpose of the trip was to monitor water chemistry of the Colville River in the vicinity of the proposed ice bridge, and identify the location of a seasonal tidal salt wedge (specific conductance > 500 uS/cm). Sampling of the Alpine drinking water lakes was also conducted during this trip and is discussed in a separate project trip report.

At 6:00 AM on November 6, Mr. McBroom attended the daily LCMF health and safety meeting and coordinated the access and procedures for in situ sampling on the Colville River. At 6:45, equipment was assembled, calibrated and loaded onto snow machines. LCMF (Gene Diamond and Chris Zeimet) accompanied Mr. McBroom to the ice bridge monitoring site, leaving Alpine at approximately 8:15 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity was measured at 1200 feet downstream.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Marsh McBirney Model 2000 (water velocity), and a Hach HQ40d LDO meter (dissolved oxygen). A single velocity measurement was obtained and applied to a typical vertical-velocity curve to estimate average channel velocity. All data are presented in attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 355 uS/cm, with values being relatively consistent with an average of approximately 350 uS/cm. Dissolved oxygen also remained consistent with depth and distance downstream, having values as high as 97%, and averaging 93.5%. Velocity was observed at all locations. Measured and estimated average velocities were 0.29 and 0.25 ft/s, respectively.

Tracking of the tidal salt wedge yielded a noticeable increase in conductivity downstream of the proposed ice bridge. Extrapolation of observed data using linear trends in historic ice bridge monitoring data places the leading edge (500 uS/cm) at approximately 3 to 4 miles downstream of the proposed ice bridge. The range in values is based on limited knowledge of channel bathymetry.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 6, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:55 a.m.	14	0.8	0.1	1	-	-	-	-	-	-	-
				2	0.1	179	350	14.1	95.8	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	180	351	14.1	96.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	180	351	14.1	95.8	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	180	351	14.1	95.8	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	180	351	14.2	96.2	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	180	351	14.2	96.7	0.2	-
				13	-	-	-	-	-	-	-
				14	0.1	180	351	14.3	97.3	0.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:27 a.m.	13.9	0.9	0.0	1	-	-	-	-	-	-	-
				2	0.1	179	349	13.6	92.6	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	179	350	13.7	92.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	179	350	13.6	92.6	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	179	350	13.6	92.6	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	179	350	13.6	92.5	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	179	350	13.6	92.5	0.2	-
				13.5	0.1	180	351	13.7	92.3	0.2	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:05 a.m.	14	0.9	0.1	1	-	-	-	-	-	-	-
				2	0.0	178	349	13.6	92.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	178	349	13.6	93.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	179	350	13.6	93.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.0	179	350	13.5	93.0	0.2	-
				9	-	-	-	-	-	-	-
				10	0.0	179	350	13.5	93.0	0.2	-
				11	-	-	-	-	-	-	-
				12	0.0	179	350	13.4	93.0	0.2	-
				13	-	-	-	-	-	-	-
				14	0.1	178	347	12.6	91.5	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Downstream flow was observed with cloth tape at all sampling locations.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 6, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 11:32 a.m.	13.5	0.8	0.0	1	0.1	180	351	13.7	93.7	0.2	-
				2	-	-	-	-	-	-	-
				3	0.1	181	353	13.7	93.7	0.2	-
				4	-	-	-	-	-	-	-
				5	0.1	181	353	13.6	93.6	0.2	-
				6	-	-	-	-	-	-	-
				7	0.1	181	353	13.5	93.4	0.2	-
				8	-	-	-	-	-	-	-
				9	-	-	-	-	-	-	-
				10	0.1	181	354	13.4	93.2	0.2	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
				13	0.1	181	354	13.2	92.8	0.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:57 a.m.	13.2	0.9	0.0	1	0.1	181	353	13.8	93.2	0.2	-
				2	-	-	-	-	-	-	-
				3	0.1	181	353	13.8	93.2	0.2	-
				4	-	-	-	-	-	-	-
				5	0.1	181	354	13.8	93.1	0.2	-
				6	-	-	-	-	-	-	-
				7	0.1	181	354	13.8	93.2	0.2	-
				8	-	-	-	-	-	-	-
				9	0.1	181	354	13.8	93.3	0.2	-
				10	-	-	-	-	-	-	-
				11	0.1	182	355	13.8	93.7	0.2	-
				12	-	-	-	-	-	-	-
				13	0.1	182	355	14.0	95.0	0.2	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 12:27 p.m.	13.2	0.9	0.0	1	0.2	181	352	13.7	92.8	0.2	-
				2	-	-	-	-	-	-	-
				3	0.2	180	350	13.7	92.8	0.2	-
				4	-	-	-	-	-	-	0.29*
				5	0.2	179	348	13.7	92.7	0.2	-
				6	-	-	-	-	-	-	-
				7	0.2	179	348	13.7	92.6	0.2	-
				8	-	-	-	-	-	-	-
				9	0.2	179	348	13.7	92.5	0.2	-
				10	-	-	-	-	-	-	-
				11	0.2	178	347	13.6	92.4	0.2	-
				12	-	-	-	-	-	-	-
				13	0.2	174	338	13.7	93.2	0.2	-

Notes:

*Sample hole located over past sampling overflow, increasing ice thickness and freeboard

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Velocity was measured using a Marsh-McBirney. Downstream flow was observed with cloth tape at all sampling locations.

* Typical vertical-velocity curve under ice suggests that the measured velocity is approximately 120% of average, yielding an average velocity of 0.25 ft/s

Baker

Colville River Ice Bridge Monitoring Program
Salt Wedge Tracking

Sample Date: November 6, 2006

Location Time	Water Depth (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)
2.7 Miles Downstream of Proposed Ice Bridge N70°16'24" W150°48'03"	10.3	10.3	0.1	182	355
7.4 Miles Downstream of Proposed Ice Bridge N70°20'00" W150°43'10"	10.3	8.0	0.1	425	830
		10.3	0.2	1547	3010
7.6 Miles Downstream of Proposed Ice Bridge N70°20'11" W150°42'49"	8.2	8.2	0.1	612	1195
12.4 Miles Downstream of Proposed Ice Bridge N70°22'44" W150°33'39"	5.3	5.3	0.1	2550	4981

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Sample depth is measured from the water surface.

(3) Conductivity and temperature were measured using a YSI-30 meter

(4) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 15, 2006
Project Code: 110211	**Submitted by:** Mark McBroom & Ozzy Orwick

Weather: Temperature -2^{o} F with 5 mph winds, clear.

Mark McBroom and Ozzy Orwick of Baker arrived at Alpine on Tuesday, November 14, 2006 at 6:30 PM. At 6:00 AM on November 15, Mr. McBroom and Mr. Orwick attended the daily LCMF health and safety meeting and coordinated the access and procedures for in situ sampling on the Colville River. At 6:45 AM, equipment was assembled, calibrated and loaded onto snow machines. LCMF (Chris Zeimet) accompanied Mr. McBroom and Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. A velocity measurement was attempted at the 1200 feet downstream sampling location but due to a malfunction with the velocity meter no data was obtained.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Marsh McBirney Model 2000 (water velocity), and a Hach HQ40d LDO meter (dissolved oxygen). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 356 uS/cm, with values being relatively consistent, having an average of approximately 343 uS/cm. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 93.6%, and averaging 86.4%. Downstream flow was not visually observed at any sampling locations.

Tracking of the tidal salt wedge yielded a noticeable increase in conductivity both temporally and spatially. A comparison of observed conductivity at a position 7.4 miles downstream of the ice bridge revealed a significant increase in conductivity at depth over the one week sampling interval; from approximately 1800 uS/cm (11/06/06) to more than 9000 uS/cm (11/15/06). Refer to the attached tables for calculated values of specific conductance. A new location was sampled approximately 5.4 miles downstream of the ice bridge in an attempt to identify the leading edge. At this location, at a depth of 10 feet, specific conductance was calculated to be 665 uS/cm. A lack of observed channel flow and temporal increase in specific conductance downstream of the ice bridge suggests an active upstream migration of the tidal salt wedge.

Please note the attached revision to last week's table of salt wedge sample data.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 15, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:30 a.m.	12.7	0.9	0.0	1	-	-	-	-	-	-	-
				2	0.2	179	348	13.0	85.8	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	178	347	12.9	85.5	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	179	348	12.9	85.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	179	349	12.9	85.3	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	178	347	12.9	85.6	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	177	345	13.1	86.5	0.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:00 a.m.	12.7	1.1	0.1	1	-	-	-	-	-	-	-
				2	0.1	173	338	12.6	83.2	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	173	338	12.6	83.4	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	173	338	12.5	83.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	176	344	12.5	83.1	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	176	344	12.5	83.2	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	176	345	12.6	83.9	0.2	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:32 a.m.	13	1.0	0.1	1	-	-	-	-	-	-	-
				2	0.0	173	339	13.0	86.7	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	173	339	12.9	86.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	174	340	12.9	86.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	176	343	12.8	85.8	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	176	344	12.8	85.8	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	177	346	12.8	86.0	0.2	-
				13	0.1	177	346	12.7	86.3	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Velocity measurements were attempted but failed due to Marsh-McBirney malfunction. No downstream flow was visually observed at any sampling location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 15, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 11:30 a.m.	12.5	1.2	0.1	1	-	-	-	-	-	-	-
				2	0.1	175	342	12.9	87.5	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	175	342	12.8	87.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	176	343	12.6	86.5	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	177	345	12.6	86.5	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	178	346	11.8	84.4	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	183	356	11.2	82.9	0.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:50 a.m.	12.7	1.1	0.1	1	-	-	-	-	-	-	-
				2	0.2	175	340	13.1	86.7	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	175	341	13.1	86.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	175	341	13.1	87.1	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	176	342	13.1	87.5	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	177	343	13.2	83.0	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	178	346	13.5	89.5	0.2	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 12:20 p.m.	11.6	1.1	0.1	1	-	-	-	-	-	-	-
				2	0.2	175	340	13.3	88.0	0.2	-
				3	-	-	-		-	-	-
				4	0.2	175	341	13.4	88.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	175	341	13.5	89.7	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	175	341	13.7	90.6	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	176	342	13.9	92.3	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	176	342	14.1	93.6	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Velocity measurements were attempted but failed due to Marsh-McBirney malfunction. No downstream flow was visually observed at any sampling location.

Baker

Colville River Ice Bridge Monitoring Program
Salt Wedge Tracking

Sample Date: November 15, 2006

Location Time	Water Depth (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)
5.4 Miles Downstream of Proposed Ice Bridge Approximate Location: N70°18'26" W150°45'13" 15:05	10.0	10.0	0.6	347	665
7.4 Miles Downstream of Proposed Ice Bridge N70°20'00" W150°43'10" 14:30	11.7	8.0	0.3	336	651
		10.0	0.3	>7300	>14000
		11.7	0.4	>9000	>17000

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Sample depth is measured from the water surface.

(3) Conductivity and temperature were measured using a YSI-30 meter

(4) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

REVISION

Colville River Ice Bridge Monitoring Program
Salt Wedge Tracking

Sample Date: November 6, 2006

Location Time	Water Depth (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)
2.7 Miles Downstream of Proposed Ice Bridge N70°16'24" W150°48'03"	10.3	10.3	0.1	182	355
7.4 Miles Downstream of Proposed Ice Bridge N70°20'00" W150°43'10"	13.2	8.0	0.1	425	830
		13.2	0.2	1818	3538
7.6 Miles Downstream of Proposed Ice Bridge N70°20'11" W150°42'49"	8.2	8.2	0.1	612	1195
12.4 Miles Downstream of Proposed Ice Bridge N70°22'44" W150°33'39"	5.3	5.3	0.1	2550	4981

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Sample depth is measured from the water surface.
(3) Conductivity and temperature were measured using a YSI-30 meter
(4) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

Project Trip Report

Project Name:	Date of Trip:
Colville River Ice Bridge Monitoring	November 30, 2006
Project Code:	**Submitted by:**
110211	Mark McBroom

Weather: Temperature 8^{o} F with 20 mph winds, clear.

Mark McBroom of Baker arrived at Alpine on Wednesday, November 29, 2006 at 6:00 PM. At 6:00 AM on November 30, Mr. McBroom attended the daily LCMF health and safety meeting and coordinated the access and procedures for in situ sampling on the Colville River. At 6:30 AM, equipment was assembled, calibrated and loaded onto snow machines. LCMF (Mike Rourick) accompanied Mr. McBroom to the ice bridge monitoring sites, leaving Alpine at approximately 7:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Marsh McBirney Model 2000 (water velocity), and a Hach HQ40d LDO meter (dissolved oxygen). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 368 uS/cm, with values being relatively consistent, having an average of approximately 349 uS/cm. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 91.1%, and averaging 78.8%. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location.

Additional sampling downstream of the ice bridge, in an attempt to track the salt wedge, was not performed this trip. Comparing data from the last sampling event (11/15/06) only a slight increase in specific conductance has occurred over the two week period, increasing by an average of only six microsiemens.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 30, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:30 a.m.	13.3	1.5	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	179	348	11.1	73.1	0.2	-
				4	-	-	-	-	-	-	-
				5	0.2	179	348	11.1	73.2	0.2	-
				6	-	-	-	-	-	-	-
				7	0.2	181	353	11.1	78.5	0.2	-
				8	-	-	-	-	-	-	-
				9	0.2	183	356	11.2	78.6	0.2	-
				10	-	-	-	-	-	-	-
				11	0.3	184	357	11.2	78.7	0.2	-
				12	-	-	-	-	-	-	-
				13	0.2	185	359	11.2	78.7	0.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:10 a.m.	13.2	1.7	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	179	348	11.1	78.2	0.2	-
				4	-	-	-	-	-	-	-
				5	0.2	179	348	11.1	78.3	0.2	-
				6	-	-	-	-	-	-	-
				7	0.2	179	348	11.2	78.8	0.2	-
				8	-	-	-	-	-	-	-
				9	0.2	186	361	11.2	79.0	0.2	-
				10	-	-	-	-	-	-	-
				11	0.2	188	365	11.2	79.1	0.2	-
				12	-	-	-	-	-	-	-
				13	0.2	189	368	11.5	91.1	0.2	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:40 a.m.	14.0	1.8	0.1	1	-	-	-	-	-	-	-
				2	0.1	179	350	11.1	78.6	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	179	350	11.1	78.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	179	350	11.1	79.2	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	185	361	11.3	80.3	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	186	363	11.3	80.4	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	187	365	11.2	80.6	0.2	-
				13	-	-	-	-	-	-	-
				14	0.2	187	364	11.1	81.1	0.2	-

Notes: 349 78.8

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 30, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:50 a.m.	13.2	1.9	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	162	315	11.1	78.3	0.1	-
				4	-	-	-	-	-	-	-
				5	0.2	163	316	11.1	78.3	0.1	-
				6	-	-	-	-	-	-	-
				7	0.3	169	328	11.1	78.3	0.1	-
				8	-	-	-	-	-	-	-
				9	0.3	171	332	11.1	78.3	0.2	-
				10	-	-	-	-	-	-	-
				11	0.3	172	333	11.2	78.5	0.2	-
				12	-	-	-	-	-	-	-
				13	0.2	173	336	11.2	78.8	0.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:20 a.m.	13.5	1.8	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.2	173	337	11.1	78.5	0.2	-
				4	-	-	-	-	-	-	-
				5	0.2	174	338	11.1	78.5	0.2	-
				6	-	-	-	-	-	-	-
				7	0.3	179	346	11.1	78.5	0.2	-
				8	-	-	-	-	-	-	-
				9	0.3	181	351	11.1	78.5	0.2	-
				10	-	-	-	-	-	-	-
				11	0.3	182	353	11.1	78.6	0.2	-
				12	-	-	-	-	-	-	-
				13	0.3	183	355	11.2	79.1	0.2	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:36 p.m.	12.7	1.8	0.1	1	-	-	-	-	-	-	-
				2	0.3	180	349	11.1	78.1	0.2	-
				3	-	-	-		-	-	-
				4	0.3	179	348	11.1	78.1	0.2	-0.01
				5	-	-	-	-	-	-	-
				6	0.3	184	356	11.1	78.1	0.2	0.00
				7	-	-	-	-	-	-	-
				8	0.3	184	357	11.1	78.2	0.2	0.00
				9	-	-	-	-	-	-	-
				10	0.3	185	359	11.1	78.2	0.2	0.02
				11	-	-	-	-	-	-	-
				12	0.3	186	361	11.2	78.9	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 18, 2006
Project Code: 110211	**Submitted by:** Ozzy Orwick

Weather: Temperature -5° F with 0 - 5 mph winds, light snow.

Ozzy Orwick of Baker arrived at Alpine on Monday, December 18, 2006 at 8:30 AM. At 9:00 AM, Mr. Orwick contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 9:30 AM, equipment was assembled, calibrated and loaded into a Hauggland. LCMF (A.J. Griffin) accompanied Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 10:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location. Dissolved oxygen saturation measurements were not made due to the meters not arriving with cargo at Alpine.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 17341 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 6626 uS/cm, and increased with depth. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 18, 2006

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 1:16 p.m.	13.9	1.9	0.1	1	-	-	-	-	-	-	-
				2	0.0	199	390	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	207	406	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	262	514	-	-	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	1170	2277	-	-	1.1	-
				9	-	-	-	-	-	-	-
				10	0.4	4060	7840	-	-	4.1	-
				11	-	-	-	-	-	-	-
				12	0.4	8140	15719	-	-	8.7	-
				13	0.4	8320	16067	-	-	8.9	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 12:56 a.m.	13.6	2.0	0.0	1	-	-	-	-	-	-	-
				2	0.0	200	392	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	206	405	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	246	483	-	-	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	1070	2082	-	-	1.0	-
				9	-	-	-	-	-	-	-
				10	0.4	4390	8478	-	-	4.5	-
				11	-	-	-	-	-	-	-
				12	0.4	8040	15526	-	-	8.5	-
				13	0.4	8100	15642	-	-	8.6	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:44 a.m.	14.0	2.2	0.1	1	-	-	-	-	-	-	-
				2	0.1	202	394	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	236	461	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	318	621	-	-	0.3	-
				7	-	-	-	-	-	-	-
				8	0.3	1470	2849	-	-	1.4	-
				9	-	-	-	-	-	-	-
				10	0.5	4500	8657	-	-	4.4	-
				11	-	-	-	-	-	-	-
				12	0.5	7440	14313	-	-	7.9	-
				13	0.5	7650	14717	-	-	8.1	-
				14	0.5	7660	14736	-	-	8.1	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were not obtained due to cargo not arriving at Alpine.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 18, 2006

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:30 p.m.	13.7	2.3	0.1	1	-	-	-	-	-	-	-
				2	0.0	232	455	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	235	462	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	303	594	-	-	0.3	-
				7	-	-	-	-	-	-	-
				8	0.2	1280	2491	-	-	1.2	-
				9	-	-	-	-	-	-	-
				10	0.4	5050	9752	-	-	5.2	-
				11	-	-	-	-	-	-	-
				12	0.4	8590	16588	-	-	9.2	-
				13	0.4	8650	16704	-	-	9.3	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:50 p.m.	14.0	2.3	0.1	1	-	-	-	-	-	-	-
				2	0.0	225	442	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	237	465	-	-	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	228	447	-	-	0.3	-
				7	-	-	-	-	-	-	-
				8	0.2	1040	2024	-	-	1.0	-
				9	-	-	-	-	-	-	-
				10	0.3	4190	8122	-	-	4.2	-
				11	-	-	-	-	-	-	-
				12	0.4	8770	16936	-	-	9.4	-
				13	0.4	8790	16974	-	-	9.5	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:03 p.m.	12.5	2.4	0.1	1	-	-	-	-	-	-	-
				2	0.0	216	423	-	-	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	232	455	-	-	0.2	0.00
				5	-	-	-	-	-	-	-
				6	0.0	332	651	-	-	0.3	-0.01
				7	-	-	-	-	-	-	-
				8	0.2	1350	2627	-	-	1.3	0.00
				9	-	-	-	-	-	-	-
				10	0.3	4620	8956	-	-	4.7	0.00
				11	-	-	-	-	-	-	-
				12	0.4	8980	17341	-	-	9.7	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were not obtained due to cargo not arriving at Alpine.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 3, 2007
Project Code: 110221	**Submitted by:** Ozzy Orwick

Weather: Temperature -38^{o} F with 0-5 mph winds, clear.

Ozzy Orwick of Baker arrived at Alpine on Tuesday, January 2, 2007 at 10:30 AM. At 11:00 AM, Mr. Orwick contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. Water quality data was then collected at lakes L9310, L9312 and L9313. At 6:00 AM on January 3, Mr. Orwick attended the daily LCMF health and safety meeting. At 6:45 AM, equipment was assembled and calibrated. At 8:00 AM Mr. Orwick attended an Alpine staff meeting with LCMF. At 8:45 AM equipment was loaded into a Hauggland. LCMF (Chris Zeimet) accompanied Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 9:15 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. A velocity measurement was attempted at the 1200 feet downstream sampling location, however due to equipment failure a reading was not obtained. No flow was visually present.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and a Hach HQ40d LDO meter (dissolved oxygen). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 19,654 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 7,428 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 66.9%, and averaging 64.5%. Velocity measurements were not conducted due to equipment failure, however downstream flow was not visually observed at any sampling location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 3, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 1:16 p.m.	13.1	2.6	0.1	1	-	-	-	-	-	-	-
				2	0.0	210	412	8.9	64.3	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	220	431	8.8	63.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	330	647	8.9	64.3	0.3	-
				7	-	-	-	-	-	-	-
				8	0.3	2550	4943	9.1	66.6	2.5	-
				9	-	-	-	-	-	-	-
				10	0.6	8000	15333	8.5	63.3	8.5	-
				11	-	-	-	-	-	-	-
				12	0.7	9320	17796	8.2	64.5	9.9	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 12:56 a.m.	12.9	2.6	0.0	1	-	-	-	-	-	-	-
				2	0.0	210	412	8.8	63.4	0.2	-
				3	-		-	-	-	-	-
				4	0.0	200	392	8.8	63.2	0.2	-
				5	-		-	-	-	-	-
				6	0.1	240	469	8.7	63.8	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	2730	5272	8.9	66.4	2.7	-
				9	-	-	-	-	-	-	-
				10	0.8	8590	16341	8.4	63.9	9.1	-
				11	-	-	-	-	-	-	-
				12	1.7	10010	18424	8.3	65.9	10.4	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:44 a.m.	13.5	3.0	0.05	1	-	-	-	-	-	-	-
				2	0.0	200	392	8.9	64.1	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	200	392	8.8	63.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	310	606	8.9	64.2	0.3	-
				7	-	-	-	-	-	-	-
				8	0.3	2940	5699	8.9	64.7	2.9	-
				9	-	-	-	-	-	-	-
				10	0.6	8140	15601	8.8	64.3	8.6	-
				11	-	-	-	-	-	-	-
				12	0.8	9230	17558	8.8	64.7	9.9	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Flow velocity measurements were not obtained due to equipment failure

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 3, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:30 p.m.	13	3.0	0.1	1	-	-	-	-	-	-	-
				2	0.0	240	471	9.0	64.8	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	230	451	8.9	64.4	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	270	529	8.9	65.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	3670	7114	8.7	65.3	3.7	-
				9	-	-	-	-	-	-	-
				10	0.7	8450	16135	8.6	64.3	9.0	-
				11	-	-	-	-	-	-	-
				12	0.9	10370	19654	7.5	62.8	11.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:50 p.m.	13.1	2.8	0.1	1	-	-	-	-	-	-	-
				2	0.0	230	451	9.0	64.5	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	230	451	9.0	64.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	380	745	9.2	66.2	0.3	-
				7	-	-	-	-	-	-	-
				8	0.4	3330	6431	9.0	65.7	3.3	-
				9	-	-	-	-	-	-	-
				10	0.8	8860	16854	8.8	65.7	8.9	-
				11	-	-	-	-	-	-	-
				12	1.2	9820	18406	8.8	66.9	10.4	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:03 p.m.	12.1	3.1	0.1	1	-	-	-	-	-	-	-
				2	0.0	230	451	9.0	64.4	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	240	471	8.9	63.4	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	530	1035	8.9	64.0	0.5	-
				7	-	-	-	-	-	-	-
				8	0.4	3380	6527	9.2	66.6	3.3	-
				9	-	-	-	-	-	-	-
				10	0.6	8530	16349	8.5	62.6	9.0	-
				11	-	-	-	-	-	-	-
				12	1.0	10130	19128	7.9	61.1	10.7	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Flow velocity measurements were not obtained due to equipment failure

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 17, 2007
Project Code: 110221	**Submitted by:** Mark McBroom

Weather: Temperature -28^{o} F with 0-5 mph winds, clear.

Mark McBroom of Baker arrived at Alpine on Tuesday, January 16, 2007 at 11:15 AM. At 11:30 AM, Mr. McBroom contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 6:00 AM on January 17, Mr. McBroom attended the daily LCMF health and safety meeting. At 6:45 AM, equipment was assembled and calibrated. At 7:45 AM equipment was loaded into a Hauggland and Mr. McBroom, accompanied by LCMF (Lance Bennett), departed for to the ice bridge monitoring sites on the Colville River. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. A velocity measurement was obtained at the 1200 feet downstream sampling location. Mr. McBroom and Mr. Bennett returned to Alpine at approximately 4:30 P.M.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Hach HQ40d LDO meter (dissolved oxygen), and a Marsh McBirney Model 2000 flow meter (water velocity). All data are presented in the attached tables.

Specific conductance values increased significantly with depth and have noticeably increased since the previous monitoring event (January 3, 2007). The greatest concentration of specific conductance was measured downstream of the ice bridge, with a gradient of specific conductivity increasing from upstream to downstream. The range in observed specific conductance went from 366 to 20015 uS. Dissolved oxygen concentrations also remained relatively consistent with depth and distance downstream, having values as high as 60.1%, as low as 51.9%, and averaging 57.2%. No significant relationship is evident between specific conductance and dissolved oxygen. Oxygen values did decrease with depth as would be expected. No measurable flow velocity was observed at 1200-feet downstream.

The next Colville River ice bridge monitoring event is scheduled to take place on January 31, 2007.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 17, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 11:30 a.m.	13.4	3.0	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.3	189	366	8.5	58.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.4	208	402	8.4	57.8	0.2	-
				7	-	-	-	-	-	-	-
				8	0.5	372	716	8.2	56.9	0.3	-
				9	-	-	-	-	-	-	-
				10	0.9	8520	16147	8.0	56.3	9.0	-
				11	-	-	-	-	-	-	-
				12	1.1	9620	18098	7.6	53.1	10.1	
				13	1.1	10460	19678	7.8	54.7	11.1	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 11:00 a.m.	13.9	2.8	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-		-	-	-	-	-
				4	0.3	189	367	8.6	58.1	0.2	-
				5	-		-	-	-	-	-
				6	0.3	198	383	8.5	57.9	0.2	-
				7	-	-	-	-	-	-	-
				8	0.5	287	552	8.5	58.2	0.3	-
				9	-	-	-	-	-	-	-
				10	0.9	8210	15560	8.2	56.8	8.6	-
				11	-	-	-	-	-	-	-
				12	1.0	9550.0	18032	8.3	57.6	10.1	
				14	1.1	10580	19904	7.8	54.5	11.3	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:30 a.m.	14.0	3.1	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	189	367	8.7	53.8	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	201	391	8.8	59.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	400	772	8.8	60.4	0.4	-
				9	-	-	-	-	-	-	-
				10	0.8	8280	15751	8.2	56.6	8.6	-
				11	-	-	-	-	-	-	-
				12	0.9	9660	18308	8.2	56.8	10.3	
				14	1.0	10570	19958	7.6	53.3	11.3	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 17, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 12:35 p.m.	12.7	3.3	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	503	979	8.7	59.4	0.5	-
				5	-	-	-	-	-	-	-
				6	0.4	2850	5504	8.7	60.4	2.8	-
				7	-	-	-	-	-	-	-
				8	0.4	4970	9598	8.7	60.8	5.1	-
				9	-	-	-	-	-	-	-
				10	0.8	8670	16493	8.2	57.7	9.2	-
				11	-	-	-	-	-	-	-
				12	0.9	9660	18308	8.2	58.4	10.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:10 p.m.	13.4	3.0	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.3	592	1148	8.7	59.8	0.5	-
				5	-	-	-	-	-	-	-
				6	0.5	2904	5587	8.8	60.7	2.9	-
				7	-	-	-	-	-	-	-
				8	0.6	5500	10541	8.2	56.8	5.6	-
				9	-	-	-	-	-	-	-
				10	0.8	8680	16512	7.9	55.5	9.1	-
				11	-	-	-	-	-	-	-
				12	1.0	9900	18693	7.3	51.9	10.5	-
				13	1.0	10600	20015	7.5	53.8	11.3	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:10 p.m.	12.4	3.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.3	498	965	8.7	60.2	0.5	-
				5	-	-	-	-	-	-	-
				6	0.5	2945	5666	8.7	60.3	2.9	-0.01
				7	-	-	-	-	-	-	-
				8	0.6	5090	9755	8.1	56.7	5.2	-0.01
				9	-	-	-	-	-	-	-
				10	0.9	8790	16659	8.1	56.5	9.3	-0.01
				11	-	-	-	-	-	-	-
				12	0.8	10040	19099	8.0	55.3	10.8	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Flow velocity was measured using a Marsh McBirney Model 2000 flow meter

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 1, 2007
Project Code: 110211	**Submitted by:** Ozzy Orwick

Weather: Temperature 5^{o} F with 0-5 mph winds, clear.

Ozzy Orwick of Baker arrived at Alpine on Tuesday, January 30, 2007 at 11:30 AM. At 12:30 PM, Mr. Orwick contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 6:00 AM on January 31, Mr. Orwick attended the daily LCMF health and safety meeting. At 6:45 AM, equipment was assembled and calibrated. LCMF (Chris Zeimet) accompanied Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 7:45 AM. Due to Phase II weather conditions a LCMF convoy Hauggland and crew was assigned to escort Mr. Orwick and Mr. Zeimet to the ice bridge monitoring sites. While in route, Phase II weather conditions progressed into Phase III and at 8:30 AM the convoy party determined that weather conditions were too severe to continue and both vehicles returned to Alpine.

At 6:00 AM on February 1, Mr. Orwick attended the daily LCMF health and safety meeting and coordinated the access and procedures for in situ sampling on the Colville River. At 6:45 AM, equipment was assembled. LCMF (Chris Zeimet) accompanied Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 7:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Hach HQ40d LDO meter (dissolved oxygen), and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 23158 uS/cm. Specific conductance values were relatively consistent at each sampling location, having average minimum values of approximately 427 uS/cm upstream and 1400 uS/cm downstream, near the surface. Values increased with depth to a near constant value averaging 21756 uS/cm. Dissolved oxygen saturation remained consistent with depth and distance downstream, having values as high as 64.8%, as low as 49.9%, and averaging 55.3%. Direct velocity measurements revealed no significant flow at the 1200-foot downstream location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 1, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 8:50 a.m.	12.7	3.6	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	219	430	8.0	58.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	227	445	8.0	57.9	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	318	621	7.9	57.6	0.3	-
				9	-	-	-	-	-	-	-
				10	0.7	9690	18502	7.3	53.4	10.3	-
				11	-	-	-	-	-	-	-
				12	0.8	10330	19651	7.1	52.6	11.1	
800-ft Upstream N70°14'10.7" W150°50'06.5" 8:35 a.m.	13.6	3.6	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-		-	-	-	-	-
				4	0.0	218	427	8.0	58.1	0.2	-
				5	-		-	-	-	-	-
				6	0.0	227	445	8.0	58.1	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	328	638	7.8	56.9	0.3	-
				9	-	-	-	-	-	-	-
				10	0.7	9360	17872	7.2	53.4	10.0	-
				11	-	-	-	-	-	-	-
				12	0.9	10590	20071	7.1	52.7	11.4	
				13	1.0	12010	22677	6.7	49.9	12.9	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:15 a.m.	13.2	3.5	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	216	424	7.9	57.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.0	221	433	7.9	57.4	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	375	730	7.8	57.0	0.3	-
				9	-	-	-	-	-	-	-
				10	0.8	9850	18738	7.3	54.4	10.5	-
				11	-	-	-	-	-	-	-
				12	0.9	10700	20279	7.3	54.0	11.4	
				13	1.0	11690	22073	6.8	50.9	12.6	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 1, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:35 a.m.	13.1	3.7	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	619	1214	8.9	64.8	0.6	-
				5	-	-	-	-	-	-	-
				6	0.3	650	1260	7.6	55.8	2.5	-
				7	-	-	-	-	-	-	-
				8	0.4	2510	4847	7.6	55.7	3.9	-
				9	-	-	-	-	-	-	-
				10	0.7	3870	7389	7.1	52.6	10.3	-
				11	-	-	-	-	-	-	-
				12	1.0	11630	21960	6.4	48.8	12.5	-
				13	1.1	12310	23158	6.8	52.6	13.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:50 a.m.	12.5	3.9	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	723	1418	8.4	60.4	0.7	-
				5	-	-	-	-	-	-	-
				6	0.3	2480	4807	7.7	56.1	2.5	-
				7	-	-	-	-	-	-	-
				8	0.5	4010	7715	7.8	56.9	4.0	-
				9	-	-	-	-	-	-	-
				10	0.8	9470	18015	7.2	52.9	10.1	-
				11	-	-	-	-	-	-	-
				12	0.9	10640	20165	6.9	50.2	11.4	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:05 p.m.	12.5	4.0	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	802	1573	8.2	59.7	0.8	-
				5	-	-	-	-	-	-	-0.01
				6	0.3	2560	4962	7.7	56.5	2.5	-0.01
				7	-	-	-	-	-	-	-0.01
				8	0.5	4300	8272	7.6	56.2	4.3	-0.01
				9	-	-	-	-	-	-	-0.01
				10	0.8	9670	18395	7.1	52.8	10.3	-0.02
				11	-	-	-	-	-	-	-0.02
				12	1.0	12080	22810	7.1	53.4	13.0	0.00

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25 ^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Flow velocity was measured using a Marsh McBirney Model 2000 flow meter

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 17, 2007
Project Code: 110211	**Submitted by:** Ozzy Orwick

Weather: Temperature -20^{o} F with 0-5 mph winds, clear.

Ozzy Orwick of Baker arrived at Alpine on Friday, February 16, 2007 at 2:30 PM. At 3:30 PM, Mr. Orwick contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 6:00 AM on February 17, Mr. Orwick attended the daily LCMF health and safety meeting and coordinated the access and procedures for in situ sampling on the Colville River. At 6:45 AM, equipment was assembled and calibrated. At 8:00 AM equipment was loaded into a Hauggland. LCMF (Jack Tiepelman) accompanied Mr. Orwick to the ice bridge monitoring sites, leaving Alpine at approximately 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature) and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 23073 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 11818 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 56.1%, and averaging 52.0%. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 17, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 1:16 p.m.	12.7	4.1	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	242	473	7.8	53.2	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	321	619	7.4	51.6	0.3	-
				9	-	-	-	-	-	-	-
				10	0.8	10210	19422	7.5	52.8	10.9	-
				11	-	-	-	-	-	-	-
				12	1.2	11170	20936	8.0	56.1	11.8	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 12:56 a.m.	13.1	4.1	0.2	1	-	-	-	-	-	-	-
				2	-		-	-	-	-	-
				3	-		-	-	-	-	-
				4	-		-	-	-	-	-
				5	-		-	-	-	-	-
				6	0.1	346	676	8.0	54.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	341	661	7.5	51.5	0.3	-
				9	-	-	-	-	-	-	-
				10	0.7	9800	18712	7.3	50.9	0.7	-
				11	-	-	-	-	-	-	-
				12	0.9	11090	21018	7.4	51.4	0.9	-
				13	1.0	11900	22470	7.5	52.7	1.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:44 a.m.	13.5	4.0	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	235	459	7.9	53.6	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	333	645	7.5	51.4	0.3	-
				9	-	-	-	-	-	-	-
				10	0.8	10120	19251	7.5	52.0	10.8	-
				11	-	-	-	-	-	-	-
				12	1.0	11130	21016	7.5	52.6	11.9	-
				13	1.0	11600	21903	7.7	54.5	12.5	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 17, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:30 p.m.	13	3.9	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	766.0	1502	7.9	53.9	0.7	-
				5	-	-	-	-	-	-	-
				6	0.4	2210	4268	7.3	50.2	2.2	-
				7	-	-	-	-	-	-	-
				8	0.5	3627	6978	7.2	49.5	3.6	-
				9	-	-	-	-	-	-	-
				10	0.8	10080	19175	7.2	50.3	10.8	-
				11	-	-	-	-	-	-	-
				12	1.0	11320	21375	7.4	51.7	12.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:50 p.m.	12.4	4.3	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.4	2308	4457	7.4	50.8	2.3	-
				7	-	-	-	-	-	-	-
				8	0.5	3897	7497	7.2	50.5	3.9	-
				9	-	-	-	-	-	-	-
				10	0.9	10360	19635	7.3	52.1	11.1	-
				11	-	-	-	-	-	-	-
				12	1.1	11780	22161	7.2	53.7	12.4	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:03 p.m.	12.6	4.3	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	2179	4224	7.4	50.9	2.1	0.00
				7	-	-	-	-	-	-	-
				8	0.5	3815	7339	7.2	50.0	3.8	0.00
				9	-	-	-	-	-	-	-
				10	0.9	10150	19237	7.4	51.4	10.8	0.00
				11	-	-	-	-	-	-	-
				12	1.2	12310	23073	7.4	52.2	13.2	-0.02

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Project Trip Report

Project Name:	Date of Trip:
Colville River Ice Bridge Monitoring	February 28, 2007
Project Code:	**Submitted by:**
110211	Mark McBroom

Weather: Temperature -30^{o} F with 5-10 mph winds, slightly overcast.

Mark McBroom of Baker arrived at Alpine on Tuesday, February 27, 2007 at 1:30 PM. At 2:30 PM, Mr. McBroom contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 6:00 AM on February 28, Mr. McBroom attended the daily LCMF health and safety meeting. At 7:00 AM, equipment was assembled and calibrated. At 7:15 AM equipment was loaded into a Hagglund. LCMF (Chris Zeimet) accompanied Mr. McBroom to the ice bridge monitoring sites, leaving Alpine at approximately 8:00 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Hach HQ40d LDO meter (dissolved oxygen), and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 22514 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 12244 uS/cm, and increased with depth. Dissolved oxygen concentration also remained consistent, increasing with depth and distance downstream, having values as high as 8.7 mg/L, as low as 6.4 mg/L, and averaging 7.53 mg/L. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location.

Historically Baker has presented both dissolved oxygen concentration and saturation. While concentration (recorded in mg/L) is a direct measurement, saturation (recorded in %) is a calculated value. The Hach HQ unit measures dissolved oxygen concentration, from which dissolved oxygen saturation is calculated given a measured temperature and a user defined salinity. The default salinity setting of 0.0 ppt for saturation correction has been chosen due to the obvious variability in saline concentration relative to depth and sample location. Though this assumed salinity concentration does effect resulting saturation values, the presented values are no more than 10% less than the actual saturation level in areas of high salinity. Reported dissolved oxygen concentration measurements are not dependent on salinity concentration.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 28, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:40 a.m.	13.0	4.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.2	275.8	537	8.25	55.7	0.2	-
				6	-	-	-	-	-	-	-
				7	0.3	353.8	686	7.46	50.6	0.3	-
				8	-	-	-	-	-	-	-
				9	0.7	6030	11514	7.31	50.4	6.2	-
				10	-	-	-	-	-	-	-
				11	1.1	10830	20374	7.37	51.2	11.5	-
				12	-	-	-	-	-	-	-
				13	1.2	11540	21630	7.26	51.0	12.3	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:20 a.m.	13.8	4.6	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.1	267.0	522	8.7	58.5	0.2	-
				6	-	-	-	-	-	-	-
				7	0.3	328.0	636	7.5	50.6	0.3	-
				8	-	-	-	-	-	-	-
				9	0.7	6430	12278	7.4	50.7	6.6	-
				10	-	-	-	-	-	-	-
				11	1.0	10950	20676	7.5	51.5	11.7	-
				12	-	-	-	-	-	-	-
				13	1.3	11780	21999	7.4	52.1	12.6	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:50 a.m.	14.3	4.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	262	512	8.3	55.8	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	459	886	7.2	48.9	0.4	-
				9	-	-	-	-	-	-	-
				10	0.8	9960	18947	7.2	49.5	10.7	-
				11	-	-	-	-	-	-	-
				12	1.0	11200	21148	7.5	51.9	12.0	-
				13	-	-	-	-	-	-	-
				14	1.3	11830	22092	7.7	53.3	12.6	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25 ^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not account for by meter.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 28, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:08 a.m.	13	4.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.2	792	1541	8.6	57.4	0.7	-
				6	-	-	-	-	-	-	-
				7	0.6	2509	4809	7.6	51.4	2.5	-
				8	-	-	-	-	-	-	-
				9	0.9	6050	11466	7.3	49.5	6.2	-
				10	-	-	-	-	-	-	-
				11	1.1	10650	20035	7.6	52.0	11.4	-
				12	-	-	-	-	-	-	-
				13	1.2	11560	21667	7.4	50.6	12.3	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:50 a.m.	13.4	4.6	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.5	1800	3463	7.5	50.6	1.7	-
				7	-	-	-	-	-	-	-
				8	0.7	3338	6374	7.5	51.0	3.3	-
				9	-	-	-	-	-	-	-
				10	0.9	10040	19028	7.6	51.8	10.7	-
				11	-	-	-	-	-	-	-
				12	1.1	11380	21409	7.5	51.8	12.2	
				13	1.4	12100	22514	6.4	44.6	12.8	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 11:12 a.m.	12.2	4.9	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.5	1750	3367	7.4	50.2	2.1	0.00
				7	-	-	-	-	-	-	-
				8	0.8	3320	6316	7.5	51.6	3.8	0.01
				9	-	-	-	-	-	-	-
				10	0.9	9380	17777	7.5	52.2	10.8	-0.01
				11	-	-	-	-	-	-	-
				12	1.0	11050	20865	7.2	51.9	13.2	0.01

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not account for by meter.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** March 14, 2007
Project Code: 110211	**Submitted by:** Michael Alexander, PE

Weather: Temperature -20^{o} F with 15-20 mph winds, overcast and clear in afternoon.

Michael Alexander of Baker arrived at Alpine on Tuesday, March 13, 2007 at 6:00 PM. At 7:00 AM on March 14, Mr. Alexander met with LCMF and coordinated the monitoring activities. At 8:00 AM, equipment was assembled, calibrated and loaded into a Hagglund. LCMF (Darron Saxowsky) accompanied Mr. Alexander to the ice bridge monitoring sites, leaving Alpine at approximately 9:00 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot upstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Hach HQ40d LDO meter (dissolved oxygen), and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 21,233 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 11,092 uS/cm, and increased with depth. Dissolved oxygen concentration also remained consistent, increasing with depth and having values as high as 8.8 mg/L, as low as 7.3 mg/L, and averaging 8.0 mg/L. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed flow less than 0.1 ft/s at the 1200-foot upstream location.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: March 14, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:50 a.m.	13.5	4.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.2	353.5	688	7.7	59.6	0.3	-
				6	0.2	348.1	677	8.2	61.8	0.3	-
				7	0.3	507	983	8.0	60.3	0.4	-
				8	0.5	2915	5608	7.9	59.1	3.1	-
				9	0.5	6900	13274	8.3	61.5	7.5	-
				10	0.6	9860	18898	8.4	62.0	10.4	-
				11	1.0	10720	20242	8.4	62.5	11.4	-
				12	1.1	11040	20769	8.5	62.9	11.7	-
				13	1.2	11140	20880	8.4	62.3	12.0	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 11:40 a.m.	13.4	4.6	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.0	296.1	581	8.2	63.1	0.3	-
				6	0.1	295.6	577	8.8	65.9	0.3	-
				7	0.2	379.3	738	7.7	56.2	0.3	-
				8	0.6	1419	2720	7.4	53.8	1.5	-
				9	0.7	5760	10998	7.9	57.4	5.5	-
				10	0.9	9460	17929	8.0	58.0	10.1	-
				11	1.0	10440	19713	8.0	58.6	11.2	-
				12	1.2	11040	20693	8.0	58.3	11.8	-
				13	1.3	11370	21233	7.9	57.8	12.1	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:30 p.m.	13.8	4.8	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.0	330.0	647	8.4	65.0	0.3	-
				6	0.0	337.9	663	8.6	64.8	0.3	0.02
				7	0.1	571	1115	7.5	55.3	0.5	0.00
				8	0.4	3341	6452	7.5	55.2	3.0	-0.02
				9	0.7	7630	14569	7.9	58.3	8.4	-0.06
				10	1.0	10050	18977	8.4	61.7	10.7	-0.06
				11	1.1	10710	20148	8.2	60.5	11.4	-0.06
				12	1.2	11040	20693	8.1	59.6	11.7	-0.06
				13	1.3	11270	21047	8.5	63.1	12.0	-0.06
				14	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25 ^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not accounted for by meter.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: March 14, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:30 a.m.	12.8	4.9	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.5	2154	4144	7.4	55.6	2.0	-
				7	0.5	3178	6114	7.4	54.8	2.9	-
				8	0.7	4691	8957	7.4	55.0	4.8	-
				9	0.9	6820	12925	8.0	58.7	7.1	-
				10	0.9	9540	18081	7.9	58.1	10.3	-
				11	1.0	1077	2034	8.2	60.5	11.5	-
				12	1.2	11150	20899	8.2	60.7	11.8	-
				13	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:00 a.m.	12.7	4.9	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.1	1479	2911	8.6	62.0	1.5	-
				7	0.1	2300	4493	7.6	54.7	2.3	-
				8	0.2	3500	6810	7.6	54.9	3.3	-
				9	0.7	5000	9547	7.6	55.1	5.1	-
				10	1.0	7700	14539	7.8	56.6	8.2	-
				11	1.1	9800	18436	8.2	60.0	9.9	-
				12	1.2	10900	20430	8.2	60.3	11.7	
				13	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 9:15 a.m.	12.0	5.1	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.4	1883	3636	7.4	55.0	1.9	-
				7	0.5	2922	5621	7.3	53.8	2.9	-
				8	0.8	4756	9047	7.5	55.6	5.0	-
				9	0.8	7030	13373	8.0	58.6	6.6	-
				10	0.9	9380	17777	7.9	58.1	10.3	-
				11	1.1	10650	20035	7.9	57.8	11.3	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not accounted for by meter.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** March 24, 2007
Project Code: 110211	**Submitted by:** Mark McBroom, EIT

Weather: Temperature -37^{o} F with 5-10 mph winds, clear.

Mark McBroom of Baker arrived at Alpine on Friday, March 23, 2007 at 11:00 AM. At 6:00 AM on March 24, Mr. McBroom attended the LCMF safety meeting, after which he coordinated the ice bridge monitoring activities. At 6:45 AM, equipment was assembled, calibrated and loaded into a Hagglund. LCMF (John Max) accompanied Mr. McBroom to the ice bridge monitoring sites, leaving Alpine at approximately 7:15 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline. Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were not obtained during this monitoring event do to time constraints and equipment limitations.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), and a Hach HQ40d LDO meter (dissolved oxygen). All data are presented in the attached tables.

The maximum specific conductance calculated near the proposed ice bridge was 21,074 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 13,209 uS/cm, and increased with depth. Dissolved oxygen concentration also remained consistent, increasing with depth and having values as high as 9.3 mg/L, as low as 7.3 mg/L, and averaging 8.3 mg/L. Though no velocity measurements were taken, flow was not visually observed at any of the six sampling locations.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: March 24, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:02 a.m.	13.6	5.0	0.35	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	493	956	8.2	59.0	0.4	-
				7	-	-	-	-	-	-	-
				8	0.8	3327	6329	8.3	60.1	3.2	-
				9	-	-	-	-	-	-	-
				10	1.1	9690	18229	8.2	60.2	10.2	-
				11	-	-	-	-	-	-	-
				12	1.5	11050	20486	8.8	64.6	11.6	-
				13	1.6	11250	20781	8.5	62.7	11.8	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 8:30 a.m.	13.1	5.5	0.45	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	464	903	9.0	64.2	0.4	-
				7	-	-	-	-	-	-	-
				8	0.7	2745	5241	7.9	57.2	2.8	-
				9	-	-	-	-	-	-	-
				10	1.1	9200	17308	8.5	61.5	9.7	-
				11	-	-	-	-	-	-	-
				12	1.5	11160	20690	9.0	65.5	11.8	-
				13	1.7	11420	21019	8.9	65.1	12.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:00 p.m.	13.5	5.3	0.25	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	453	881	7.8	56.3	0.4	-
				7	-	-	-	-	-	-	-
				8	0.7	3773	7204	8.1	59.0	3.7	-
				9	-	-	-	-	-	-	-
				10	1.1	9790	18417	8.3	61.0	10.4	-
				11	-	-	-	-	-	-	-
				12	1.4	11110	20672	8.3	61.0	11.8	-
				13	1.5	11340	21023	9.3	69.0	12.0	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not accounted for by meter.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: March 24, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:32 a.m.	12.5	5.1	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	1818	3524	7.7	56.3	1.8	-
				7	-	-	-	-	-	-	-
				8	0.9	5120	9704	7.8	57.8	5.2	-
				9	-	-	-	-	-	-	-
				10	1.3	9580	17890	8.3	61.7	10.1	-
				11	-	-	-	-	-	-	-
				12	1.5	11010	20412	8.4	62.8	11.6	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:05 a.m.	12.5	5.4	0.35	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.4	2036	3932	7.3	54.9	2.0	-
				7	-	-	-	-	-	-	-
				8	1.0	5290	9989	8.2	62.9	5.4	-
				9	-		-	-	-	-	-
				10	1.2	9850	18462	7.7	60.2	10.4	-
				11	-	-	-	-	-	-	-
				12	1.7	11450	21074	7.3	62.6	12.0	
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:26 a.m.	12.6	5.5	0.35	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.4	1920	3708	7.8	57.7	1.9	-
				7	-	-	-	-	-	-	-
				8	1.0	5060	9554	8.4	63.3	5.1	-
				9	-	-	-	-	-	-	-
				10	1.1	9300	17496	8.7	65.5	9.8	-
				11	-	-	-	-	-	-	-
				12	1.6	11240	20763	8.6	71.0	11.8	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Dissolved oxygen saturation (%) values scewed due to presence of salinity not accounted for by meter.

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** April 11, 2007
Project Code: 110211	**Submitted by:** Ozzy Orwick

Weather: Temperature 0^{o} F, 0-5 mph winds, slightly overcast.

Ozzy Orwick of Baker arrived at Alpine on Tuesday, April 10, 2007 at 10:30 AM. At 1:00 PM, Mr. Orwick contacted LCMF and coordinated the access and procedures for in situ sampling on the Colville River. At 6:00 AM on April 11, Mr. Orwick attended the daily LCMF health and safety meeting. At 7:00 AM, equipment was assembled and calibrated. At 7:30 AM equipment was loaded into a Hagglund. LCMF (Darren Saxowsky) accompanied Mr. Orwick to the ice bridge monitoring sites and the Nuiqsut burbot hole, leaving Alpine at approximately 8:30 AM. Water depth, ice thickness, freeboard, salinity, conductivity, dissolved oxygen, and temperature were measured at sampling locations positioned at 400, 800 and 1200 feet upstream and downstream of the ice bridge centerline and at three locations at the Nuiqsut burbot hole (Figure 1). Specific conductance was calculated from conductivity by Baker using standard methods and empirical data. Velocity measurements were obtained at the 1200-foot downstream sampling location.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity and temperature), a Hach HQ40d LDO meter (dissolved oxygen), and a Marsh McBirney Model 2000 (water velocity). All data are presented in the attached tables.

The maximum specific conductance calculated near the ice bridge was 20962 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 12464 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent, increasing with depth and distance downstream, having values as high as 97.7%, and averaging 76.0%. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location.

The maximum specific conductance calculated near the Nuiqsut burbot hole was 4487 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 2075 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent across the three sampling locations, having values decreasing with depth. Observed values were as high as 55.0% while averaging 47.0%. Downstream flow was not visually observed at any sampling locations. No direct velocity measurement was conducted.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: April 11, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 1:30 p.m.	13.0	5.7	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	670	1309	10.46	77.6	0.6	-
				7	-	-	-	-	-	-	-
				8	0.8	4730	8998	9.59	64.6	4.8	-
				9	-	-	-	-	-	-	-
				10	1.2	9250	17338	9.88	75.2	9.7	-
				11	-	-	-	-	-	-	-
				12	1.6	10960	20245	10.35	80.0	11.5	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 1:15 p.m.	14.2	5.6	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	703.0	1368	9.5	71.4	0.7	-
				7	-	-	-	-	-	-	-
				8	0.7	4050.0	7733	8.7	65.5	4.1	-
				9	-	-	-	-	-	-	-
				10	1.2	8860.0	16607	10.1	77.0	9.4	-
				11	-	-	-	-	-	-	-
				12	1.6	11060.0	20430	11.0	84.6	11.7	-
				13	-	-	-	-	-	-	-
				14	1.8	11430	20962	11.1	86.1	12.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 1:00 p.m.	1413.7.3	5.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	652	1269	9.2	69.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.9	5250	9950	8.9	68.1	0.9	-
				9	-	-	-	-	-	-	-
				10	1.3	9590	17909	10.2	79.3	1.3	-
				11	-	-	-	-	-	-	-
				12	1.8	11360	20833	9.7	79.5	1.8	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: April 11, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:45 p.m.	13.6	5.8	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	1731	3381	9.6	70.4	1.7	-
				7	-	-	-	-	-	-	-
				8	1.0	4990	9422	8.7	64.9	5.0	-
				9	-	-	-	-	-	-	-
				10	1.3	8900	16621	10.9	82.4	9.2	-
				11	-	-	-	-	-	-	-
				12	1.6	10820	19987	11.3	86.2	11.4	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 2:00 p.m.	13.4	4.6	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	1760	3451	9.8	72.2	1.7	-
				7	-	-	-	-	-	-	-
				8	1.0	5080	9592	8.1	61.4	5.1	-
				9	-	-	-	-	-	-	-
				10	1.5	9040	16759	9.9	77.6	9.4	-
				11	-	-	-	-	-	-	-
				12	1.8	11080	20320	10.7	85.4	11.6	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 2:30 p.m.	13.0	5.7	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	1720	3373	8.0	59.6	1.7	0.00
				7	-	-	-	-	-	-	-
				8	0.9	4600	8718	9.0	67.8	4.6	-0.06
				9	-	-	-	-	-	-	-
				10	1.2	8020	15032	11.0	84.0	8.3	-0.06
				11	-	-	-	-	-	-	-
				12	1.7	10860	19988	12.7	97.7	11.4	-0.04

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

(7) Velocity was measured using a Marsh-McBirney.

ConocoPhillips
Alaska, Inc.

DATE:	4/12/2007	PROJECT:	
DRAWN:	MDM	FILE:	Burbot_Hole _Sampling.dwg
CHECKED:	MTA	SCALE:	AS SHOWN

Baker

Michael Baker Jr., Inc.
A Unit of Michael Baker Corporation
1400 West Benson Blvd., Suite 200
Anchorage, Alaska 99503
Phone: (907) 273–1600
Fax: (907) 273–1699

BURBOT FISHING HOLE

2007

WATER QUALITY MONITORING

FIGURE 1

(SHEET 1 OF 1)

Baker

Nuiqsut Burbot Fishing Hole
Water Quality

Sample Date: April 11, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
500-ft Upstream N70°10'29.1" W150°54'05.3" 11:30 a.m.	10.4	5.5	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	246	478	7.5	55.0	0.2	-
				7	0.5	416	801	6.9	51.2	0.4	-
				8	0.6	1216	2331	5.9	38.3	1.2	-
				9	0.8	2246	4273	4.6	34.4	2.2	-
				10	1.1	2385	4487	4.8	36.8	2.3	-
N70°10'33.1" W150°53'52.0" 9:45 a.m.	9.9	5.2	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	259	504	7.3	53.4	0.2	-
				7	0.4	392	757	7.5	55.1	0.4	-
				8	0.6	1025	1968	7.2	52.9	1.0	-
				9	0.8	2148	4086	5.7	42.8	2.1	-
500-ft Downstream N70°10'37.0" W150°53'42.7" 10:30 a.m.	8.1	5.3	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	260	505	7.2	53.2	0.2	-
				7	0.4	361	697	7.1	53.0	0.3	-
				8	0.8	2110	4014	4.9	38.2	2.0	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data specific to the Colville River.

(6) Dissolved oxygen measurements were obtained using a Hach HQ40d meter

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 12, 2007
Project Code: 112810	**Submitted By:** Mark McBroom

Weather: 10˚ F, 0-5 mph wind, minor snow fall mid-day

Mark McBroom and Ozzy Orwick arrived at Alpine on Sunday November 11, 2007 at 5:30 PM. Upon their arrival they met with Gene Diamond of LCMF and coordinated the following day's procedures for the first ice bridge monitoring event of the 2007/2008 winter season.

At 6:00 AM on November 12, Mr. McBroom and Mr. Orwick attended LCMF's weekly health and safety meeting. At 7:30 AM equipment was assembled, calibrated and prepared for transport. Roy Baldwin of LCMF accompanied the Baker crew to the Colville River Ice Bridge site via snow machines, departing Alpine at 9:30 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Several measurements were also obtained downstream of the ice bridge to identify high salinity waters. Results are tabulated in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 DO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on the morning of November 12 by Baker.

Concentrations of specific conductance were recorded between 455 and 512 µs/cm. Velocities were measured at approximately 0.10 ft/s. High saline waters, having a concentration of 2800 µs/cm at depth, were observed approximately 1.5 miles downstream of the ice bridge centerline. Concentrations at 1.2 miles downstream were observed at a maximum of 500 µs/cm. The next monitoring event is scheduled for November 28.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 12, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 11:40 a.m.	12.8	1.0	0	1	-	-	-	-	-	-	-
				2	0.2	249	485	11.8	82.1	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	249	485	11.8	82.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	249	485	11.1	82.1	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	249	485	11.8	82.1	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	249	485	11.8	82.3	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	249	485	11.8	82.8	0.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 11:55 a.m.	11.8	1.1	0.05	1	-	-	-	-	-	-	-
				2	0.2	255	497	11.8	82.1	0.2	
				3	-	-	-	-	-	-	-
				4	0.2	257	499	11.8	82.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	258	502	11.7	82.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	259	503	11.8	82.1	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	257	500	11.8	82.1	0.2	-
				11	0.2	251	489	11.8	82.3	0.2	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:10 p.m.	13.2	0.9	0.05	1	-	-	-	-	-	-	-
				2	0.1	248	483	11.7	82.0	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	248	482	11.7	82.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	248	483	11.7	81.9	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	255	497	11.7	82.0	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	256	497	11.7	82.0	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	255	497	11.7	82.1	0.2	-
				12	0.2	255	497	11.7	82.6	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured usinng a Hach HQ40

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 12, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 11:20 a.m.	12.6	1.0	0	1	-	-	-	-	-	-	-
				2	0.1	256	500	11.8	82.3	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	258	504	11.8	82.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	260	508	11.8	82.3	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	262	511	11.8	82.3	0.2	-
				9	-	-	-	-	-	-	-
				10	0.1	263	514	11.8	82.3	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	263	512	11.9	83.2	0.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:05 a.m.	12.5	1.1	0	1	-	-	-	-	-	-	-
				2	0.1	250	487	11.8	82.5	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	250	487	11.8	82.5	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	250	487	11.8	82.5	0.2	-
				7	-	-	-	-	-	-	-
				8	0.2	250	486	11.8	82.6	0.2	-
				9	-	-	-	-	-	-	-
				10	0.2	250	486	11.9	82.8	0.2	-
				11	-	-	-	-	-	-	-
				12	0.2	252	491	11.9	83.4	0.2	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:28 a.m.	12.1	0.9	0	1	-	-	-	-	-	-	-
				2	0.1	249	485	11.8	82.7	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	247	482	11.8	82.7	0.2	0.11
				5	-	-	-	-	-	-	-
				6	0.1	244	476	11.7	82.6	0.2	-
				7	-	-	-	-	-	-	-
				8	0.1	233	455	11.6	82.5	0.2	0.09
				9	-	-	-	-	-	-	-
				10	0.1	251	491	11.6	82.4	0.2	-
				11	-	-	-	-	-	-	-
				12	0.1	251	491	11.3	82.4	0.2	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured usinng a Hach HQ40

(7) Velocity was measured using a Marsh-McBirney

Baker

Colville River Ice Bridge Monitoring Program
Tracking Salt Wedge

Sample Date: November 12, 2007

Distance Location	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)
1.63 Miles N70°16'32.24" W150°47'58.3"	9.5	1.2	0.1	1	-	-	-	-
				2	0.1	310	606	0.3
				3	-	-	-	-
				4	0.1	312	610	0.3
				5	-	-	-	-
				6	0.2	355	692	0.3
				7	0.3	996	1931	1.0
				8	0.5	5300	10196	5.5
				9	0.5	6150	11831	6.4
1.5 Miles N70°15'31.6" W150°49'34.6"	9.1	1.1	0	1	-	-	-	-
				2	-	-	-	-
				3	-	-	-	-
				4	-	-	-	-
				5	-	-	-	-
				6	-	-	-	-
				7	0.1	324	633	0.3
				8	0.2	350	681	0.3
				9	0.2	2800	5448	2.8
1.2 Miles N70°15'18.0" W150°49'48.8"	6.8	-	-	1	-	-	-	-
				2	-	-	-	-
				3	-	-	-	-
				4	-	-	-	-
				5	-	-	-	-
				6	0.2	255	496	0.2

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 20, 2007
Project Code: 112810	**Submitted by:** Ozzy Orwick

Weather: 0˚ F, 0-5 mph wind, foggy

The objective of this monitoring event was to identify hydraulically isolated water source to aid construction of the Colville River Ice Bridge. The area of interest was the Putu Slough, defined as the lower reach of the Putu Channel located in the western floodplain of the Colville River's East Channel upstream of HDD West. Physical parameters of ice and in situ under-ice water quality data were collected to identify potential isolation of the water body from the Nigliq and East Channels.

The attached sheets, listed below, present the resulting data of this monitoring event:

1. Tabulated field data for the Putu Slough
2. Figure 1 Putu Slough Sampling locations and transects (2006 imagery)
3. Photo 1 Putu Slough sampling location near HDD West (July 28, 2007)

At 6:00 AM on November 20, Mr. Orwick attended LCMF's daily health and safety meeting. At 7:00 AM equipment was assembled, calibrated and prepared for transport. Darren Saxowsky of LCMF accompanied Mr. Orwick to the Colville River via snow machines, departing Alpine at 8:00 AM.

Ice thickness, total depth, freeboard, temperature, salinity and conductivity were collected at multiple sampling locations, see Figure 1. In situ water quality parameters were recorded using a YSI-30 meter. The YSI-30 was calibrated on the morning of November 20 by Mr. Orwick. Specific conductance was calculated from conductivity, temperature, and historic empirical data. Concentrations of specific conductance were recorded between 879 and > 977 µs/cm.

Grounded ice was located across the Putu Channel reach between the Nigliq and East Channels (points 18 and 19, Figure 1) disconnecting the downstream Putu Slough from the Nigliq Channel. Photo 1, taken on July 18, 2007, shows the connecting channel of the Putu Slough and east Channel location near HDD West. During this sampling event, two transects were surveyed (points 1 through 4, Figure 1 and Photo1) at this location. Neither grounded ice nor ice covered water was located.

The Putu Slough is considered to be hydraulically isolated given the resulting water quality values relative to the East Channel, and lack of possible hydraulic connections with either the Nigliq or East Channels.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Putu Channel and Slough

Sample Date: November 20, 2007

Location	Figure 1 Point Number	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)
N70°14'41.5" W150°51'23.9"	1	Ground	-	-	-	-	-	-	-
N70°14'42.7" W150°51'12.5"	2	Ground	-	-	-	-	-	-	-
N70°14'39.7" W150°51'22.7"	3	Ground	-	-	-	-	-	-	-
N70°14'40.1" W150°51'10.8"	4	Ground	-	-	-	-	-	-	-
N70°14'32.8" W150°51'09.5"	5	1.5	1	0	1.25	0.1	> 500	> 977	> 0.5
N70°14'22.0" W150°51'10.6"	6	Ground	-	-	-	-	-	-	-
N70°14'22.0" W150°51'09.5"	7	2	1.1	0	-	-	-	-	-
N70°14'21.9" W150°51'08.4"	8	3.7	1.5	0.1	3	0.1	> 500	> 977	> 0.5
N70°14'22.0" W150°50'06.7"	9	4.5	1.4	0	-	-	-	-	-
N70°14'22.0" W150°51'05.1"	10	3	1.5	0	-	-	-	-	-
N70°14'21.8" W151°51'02.3"	11	Ground	-	-	-	-	-	-	-
N70°14'13.9" W150°51'16.4"	12	Ground	-	-	-	-	-	-	-
N70°14'14.0" W150°51'13.5"	13	4.8	1.3	-	4	0.1	450	879	0.4
N70°14'14.0" W150°51'10.1"	14	5.8	1.2	-	5	0.2	471	916	0.4
N70o14'14.1" W150o51'07.5"	15	3	1.5	-	-	-	-	-	-
N70°13'41.3" W150°51'14.9"	16	1.5	1.3	-	-	-	-	-	-
N70°13'41.3" W150°51'12.8"	17	Ground	-	-	-	-	-	-	-
N70°13'26.8" W152°52'27.0"	18	Ground	-	-	-	-	-	-	-
N70°13'25.3" W150°52'26.0"	19	Ground	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

ConocoPhillips Alaska, Inc.

DATE:	11/21/2007	PROJECT:	112810
DRAWN:	MDM	FILE:	PUTU_SLOUGH.DWG
CHECKED:	OOO	SCALE:	AS SHOWN

Baker
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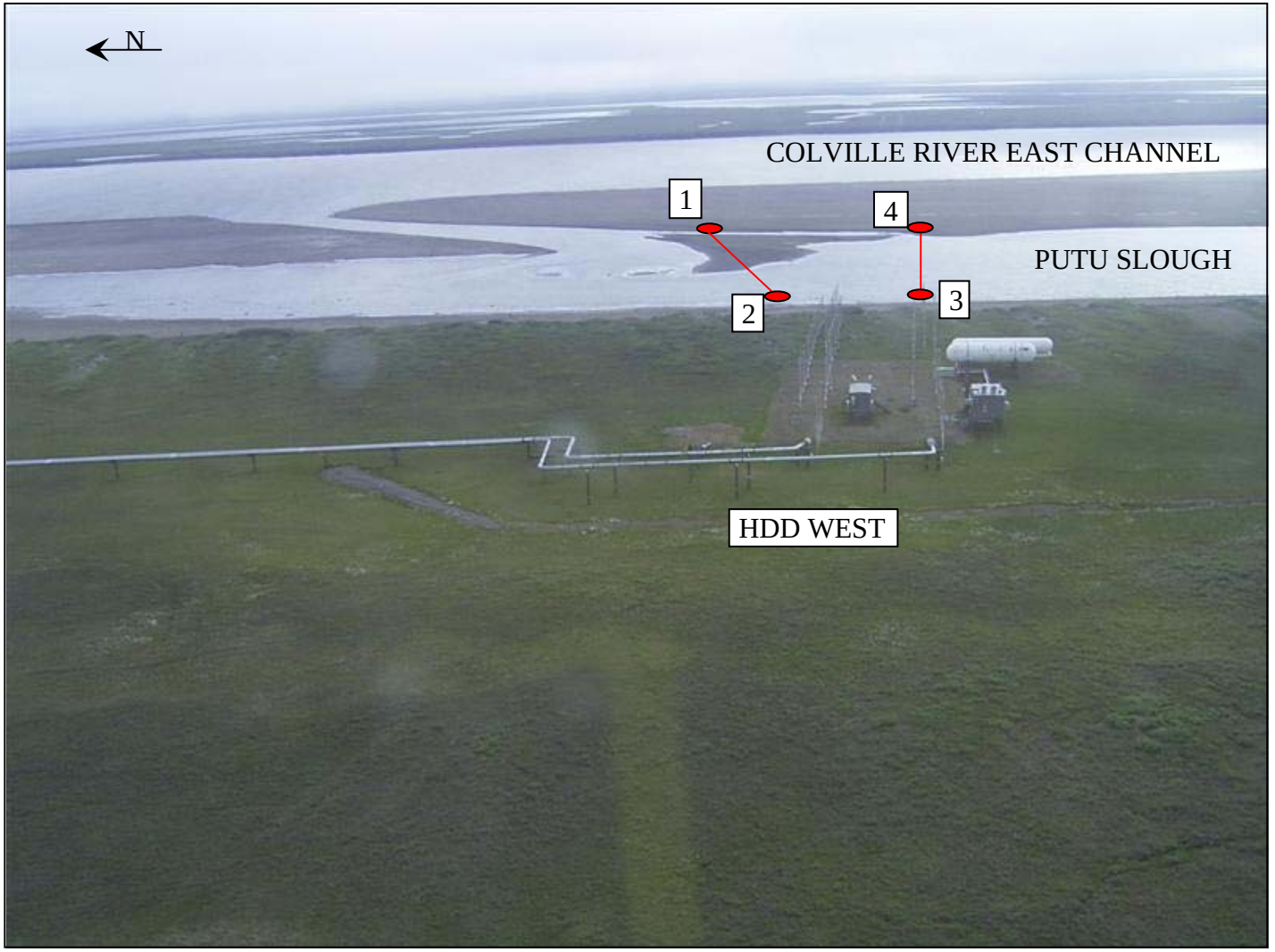
PUTU CHANNEL SAMPLING
2007/2008 COLVILLE RIVER ICE BRIDGE MONITORING

FIGURE 1
(SHEET 1 OF 1)

Photo 1 Putu Slough sampling locations near HDD West, November 20, 2007 (Image: July 18, 2007)



Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 27, 2007
Project Code: 112810	**Submitted by:** Mark McBroom

Weather: -15˚ F, 5-10 mph wind

Mark McBroom arrived at Alpine on Tuesday November 27, 2007 at 11:00 AM. Upon arrival he met with LCMF to coordinate transportation to the Colville River that afternoon. At 12:00 PM equipment was assembled, calibrated and prepared for transport. Jack Tiepelman of LCMF accompanied Mr. McBroom to the Colville River Ice Bridge site via snow machines, departing Alpine at approximately 12:45 PM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as three locations near the northern outlet channel of the Putu Slough (attached figure). Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ-40d LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated prior to departure on November 27 by Mr. McBroom.

Concentrations of specific conductance were recorded between 459 and 1310 µS/cm. No significant velocities (<0.1 ft/s) were observed at 1200 feet downstream. A transition zone of high specific conductance was identified between 10 and 11 feet of depth. Maximum observed values of specific conductance have dropped over 2000 µS/cm since the November 16 monitoring event. Based on a comparison of observed water depths with those collected on November 12, ice and water surface elevations have dropped over 1 foot.

Specific conductance concentrations measured at the northern outlet of the Putu Slough ranged from 465 to 563 µS/cm. Values of specific conductance exceeded 500 µS/cm at a depth of 7 feet.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 27, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 2:41 p.m.	11.9	1.3	0	1	-	-	-	-	-	-	-
				2	0.3	238	461	9.9	67.2	0.2	-
				3	-	-	-	-	-	-	-
				4	0.3	237	460	9.8	66.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.4	238	460	9.8	66.5	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	241	465	9.8	66.2	0.2	-
				9	-	-	-	-	-	-	-
				10	0.5	295	567	9.7	68.8	0.2	-
				11	0.7	600	1146	9.4	66.5	0.6	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 2:55 p.m.	11.1	1.3	0	1	-	-	-	-	-	-	-
				2	0.3	237	459	9.9	67.2	0.2	
				3	-	-	-	-	-	-	-
				4	0.3	237	459	9.9	67.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	237	460	9.8	66.8	0.2	-
				7	-	-	-	-	-	-	-
				8	0.5	239	460	9.9	67.2	0.2	-
				9	-	-	-	-	-	-	-
				10	0.5	244	470	10.0	67.9	0.2	-
				11	0.6	286	549	10.0	68.3	0.2	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 3:15 p.m.	11.6	1.2	0	1	-	-	-	-	-	-	-
				2	0.3	237	459	9.9	67.4	0.2	-
				3	-	-	-	-	-	-	-
				4	0.3	237	459	9.9	67.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.4	238	460	9.8	67.0	0.2	-
				7	-	-	-	-	-	-	-
				8	0.5	239	460	9.9	67.3	0.2	-
				9	-	-	-	-	-	-	-
				10	0.5	245	471	9.9	67.8	0.2	-
				11	0.6	270	518	10.0	69.0	0.2	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 27, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 2:23 p.m.	11.0	1.3	0	1	-	-	-	-	-	-	-
				2	0.2	237	462	9.9	67.2	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	238	462	9.8	66.8	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	242	470	9.8	66.5	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	260	502	9.7	66.2	0.2	-
				9	-	-	-	-	-	-	-
				10	0.6	273	522	10.0	68.8	0.2	-
				11	0.9	691	1310	9.7	66.5	0.6	-
				12	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 2:00 p.m.	10.8	1.4	0.1	1	-	-	-	-	-	-	-
				2	0.2	238	463	10.0	68.2	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	238	463	9.7	68.5	0.2	-
				5	-	-	-	-	-	-	-
				6	0.3	239	464	9.9	67.2	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	243	470	9.8	67.0	0.2	-
				9	-	-	-	-	-	-	-
				10	0.4	263	508	10.0	68.6	0.2	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 1:14 p.m.	10.6	1.0	0	1	-	-	-	-	-	-	-
				2	0.1	239	466	9.9	67.7	0.2	-0.01
				3	-	-	-	-	-	-	-
				4	0.1	239	467	9.8	67.4	0.2	-0.02
				5	-	-	-	-	-	-	-
				6	0.2	240	466	9.7	67.1	0.2	0.00
				7	-	-	-	-	-	-	-
				8	0.3	240	466	9.7	67.3	0.2	0.01
				9	-	-	-	-	-	-	-
				10	0.4	265	512	9.8	69.6	0.2	-0.06
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel @ Putu Slough Outlet

Sample Date: November 27, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)
Putu Fingerling Outlet N70°14'51" W150°50'45" 4:05 p.m.	7.3	1.5	0.1	1	-	-	-	-
				2	0.1	239	467	0.2
				3	0.1	239	467	0.2
				4	0.1	239	467	0.2
				5	0.2	240	466	0.2
				6	0.2	242	470	0.2
				7	0.3	254	493	0.2
175-Feet Upstream N70°14'50" W150°50'41" 4:14 p.m.	7.8	1.2	0.1	1	-	-	-	-
				2	0.1	238	465	0.2
				3	0.1	238	465	0.2
				4	0.1	238	465	0.2
				5	0.1	239	466	0.2
				6	0.2	241	469	0.2
				7	0.4	262	506	0.2
200-Feet Downstream N70°14'54" W150°50'44" 4:19 p.m.	8.2	1.2	0.0	1	-	-	-	-
				2	0.1	239	466	0.2
				3	0.1	238	466	0.2
				4	0.1	239	466	0.2
				5	0.1	239	467	0.2
				6	0.2	244	475	0.2
				7	0.4	261	503	0.2
				8	0.4	292	563	0.2

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 3, 2007
Project Code: 112810	**Submitted by:** Ozzy Orwick

Weather: 10˚ F, 25-30 mph wind

Ozzy Orwick arrived at Alpine on Sunday December 2, 2007 at 6:30 PM. Upon his arrival he met with Gene Diamond of LCMF and coordinated transportation to the Colville River for the following day's Ice Bridge Monitoring event. At 6:00 AM on December 3, Mr. Orwick attended LCMF's weekly health and safety meeting. At 7:30 AM equipment was assembled, calibrated and prepared for transport. Chris Zeimet of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 11:30 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ-40d LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated prior to departure on November 27 by Mr. McBroom.

Concentrations of specific conductance were recorded between 462 and 7647 µS/cm. No significant velocities (<0.1 ft/s) were observed at 1200 feet downstream. A transition zone of high specific conductance was identified around 8 feet of depth. Maximum observed values of specific conductance have significantly increased since the November 27 monitoring event.

Specific conductance concentrations measured 1 mile downstream of the Colville River Ice Bridge ranged from 472 to 1399 µS/cm. Specific conductance concentrations measured1 mile upstream of the Colville River Ice Bridge ranged from 462 to 16131 µS/cm while specific conductance values measured 2 miles upstream ranged from 459 to 478 µS/cm

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 3, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 12:50 p.m.	11.7	1.5	0	1	-	-	-	-	-	-	-
				2	0.1	240	468	9.6	64.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	240	469	9.6	65.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	246	481	9.5	64.9	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	323	626	9.4	64.9	0.3	-
				9	-	-	-	-	-	-	-
				10	0.8	2200	4185	9.3	95.3	2.1	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 12:40 p.m.	11.1	1.5	0	1	-	-	-	-	-	-	-
				2	0.1	239	467	9.6	65.0	0.2	
				3	-	-	-	-	-	-	-
				4	0.1	240	468	9.6	65.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	241	471	9.6	65.2	0.2	-
				7	-	-	-	-	-	-	-
				8	0.3	292	565	9.3	64.4	0.3	-
				9	-	-	-	-	-	-	-
				10	0.7	2200	4201	9.2	64.5	2.1	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 12:30 p.m.	12.0	1.4	0	1	-	-	-	-	-	-	-
				2	0.1	237	462	9.5	65.1	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	237	463	9.5	65.2	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	244	475	9.4	64.9	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	485	936	9.2	64.0	0.4	-
				9	-	-	-	-	-	-	-
				10	0.7	2300	4392	8.9	63.0	2.2	-
				11	2.0	4200	7647	8.5	60.0	4.0	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 3, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 1:05 p.m.	11.1	1.5	0	1	-	-	-	-	-	-	-
				2	0.1	241	471	9.5	64.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.2	241	469	9.5	65.1	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	246	479	9.4	65.1	0.2	-
				7	-	-	-	-	-	-	-
				8	0.7	836	1596	9.1	54.5	0.8	-
				9	-	-	-	-	-	-	-
				10	1.0	2300	4343	8.8	64.2	2.2	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 1:15 p.m.	11.0	1.4	0	1	-	-	-	-	-	-	-
				2	0.1	241	470	10.0	65.2	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	242	472	9.7	65.3	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	252	492	9.9	65.6	0.2	-
				7	-	-	-	-	-	-	-
				8	0.4	622	1201	9.8	65.6	0.6	-
				9	-	-	-	-	-	-	-
				10	1.4	2100	3907	10.0	63.6	2.0	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 1:25 p.m.	10.7	1.4	0	1	-	-	-	-	-	-	-
				2	0.1	241	471	9.6	65.3	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	242	473	9.7	65.5	0.2	0.00
				5	-	-	-	-	-	-	-
				6	0.3	247	479	9.6	65.3	0.2	-0.01
				7	-	-	-	-	-	-	-
				8	0.5	1050	2020	9.6	66.0	1.0	-0.02
				9	-	-	-	-	-	-	-
				10	1.0	2100	3965	9.4	64.9	2.0	0.01
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel @ Putu Slough Outlet

Sample Date: December 3, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'12" W150°49'52" 1:50 p.m.	8.8	1.3	0	1	-	-	-	-
				2	0.2	243	472	0.2
				3	-	-	-	-
				4	0.2	245	476	0.2
				5	-	-	-	-
				6	0.5	316	608	0.3
				7	-	-	-	-
				8	1.4	752	1399	0.7
1 Mile Upstream of Colville River Ice Bridge N70o13'26" W150o49'40" 12:15 p.m.	18.0	1.5	0	1	-	-	-	-
				2	0.1	237	462	0.2
				3	-	-	-	-
				4	0.1	237	463	0.2
				5	-	-	-	-
				6	0.2	241	469	0.2
				7	-	-	-	-
				8	0.2	307	597	0.3
				9	-	-	-	-
				10	0.5	2790	5367	2.8
				11	-	-	-	-
				12	0.5	5510	10600	5.6
				13	-	-	-	-
				14	0.6	7960	15256	8.4
				15	-	-	-	-
				16	0.8	8370	15922	8.9
				17	0.8	8480	16131	9.0
2 Mile Upstream of Colville River Ice Bridge N70o12'35" W150o49'41" 12:00 p.m.	11.1	1.5	0	1	-	-	-	-
				2	0.1	235	459	0.2
				3	-	-	-	-
				4	0.1	235	459	0.2
				5	-	-	-	-
				6	0.1	235	459	0.2
				7	-	-	-	-
				8	0.2	240	467	0.2
				9	-	-	-	-
				10	0.2	242	471	0.2
				11	0.3	248	481	0.2

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 12, 2007
Project Code: 112810	**Submitted by:** Mark McBroom

Weather: 0˚ F, 0-10 mph SW wind

Mark McBroom arrived at Alpine on Tuesday December 11, 2007 at 7:30 PM. Upon his arrival he met with Gene Diamond of LCMF and coordinated transportation to the Colville River for the following day's Ice Bridge Monitoring event. At 6:00 AM on December 12, Mr. McBroom attended LCMF's weekly health and safety meeting. At 6:45 AM equipment was assembled, calibrated and prepared for transport. Roy Baldwin of LCMF accompanied Mr. McBroom to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:45 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ-40d LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated prior to departure on December 12 by Mr. McBroom.

Concentrations of specific conductance were recorded between 523 and 28,400 µS/cm. No significant velocities were observed at 1200 feet downstream. A transition zone of high specific conductance was identified around 6 feet of depth. Maximum observed values of specific conductance have increased nearly three-fold since the December 3 monitoring event.

Specific conductance concentrations measured 1 mile downstream of the Colville River Ice Bridge ranged from 631 to 24,400 µS/cm. Specific conductance concentrations measured1 mile upstream of the Colville River Ice Bridge ranged from 518 to 28,900 µS/cm while specific conductance values measured 2 miles upstream ranged from 500 to 25,300 µS/cm. Maximum values increased significantly at 2 miles upstream supporting an advancement of the downstream salt wedge. Specific conductance varied little over the three mile distance with respect to depth, having an average value of 15,700 µS/cm at a depth of 8 feet.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 12, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:00 a.m.	11.3	1.8	0	1	-	-	-	-	-	-	-
				2	0.0	269	527	10.2	74.0	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	269	527	10.1	73.8	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	305	596	10.0	73.5	0.3	-
				7	-	-	-	-	-	-	-
				8	0.6	8270	15850	8.7	67.9	8.8	-
				9	-	-	-	-	-	-	-
				10	1.0	14450	27285	8.3	66.7	15.8	-
				11	1.3	15200	28386	7.8	66.0	16.5	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:15 a.m.	11.5	1.8	0	1	-	-	-	-	-	-	-
				2	0.0	268	525	10.2	74.1	0.2	
				3	-	-	-	-	-	-	-
				4	0.1	268	524	10.2	73.9	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	276	539	10.0	73.1	0.2	-
				7	-	-	-	-	-	-	-
				8	0.6	8550	16387	9.1	68.7	9.1	-
				9	-	-	-	-	-	-	-
				10	0.9	14330	27159	8.8	67.3	15.7	-
				11	1.4	14810	27557	8.6	67.8	16.1	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:35 a.m.	12.0	1.6	0	1	-	-	-	-	-	-	-
				2	0.0	269	527	10.2	73.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.1	270	527	10.1	73.7	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	273	534	9.9	72.6	0.2	-
				7	-	-	-	-	-	-	-
				8	0.6	8100	15524	9.3	69.1	8.6	-
				9	-	-	-	-	-	-	-
				10	0.8	14100	26822	9.1	68.6	15.5	-
				11.5	1.2	14870	27871	8.9	68.5	16.2	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 12, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:35 p.m.	12.3	1.8	0	1	-	-	-	-	-	-	-
				2	0.0	269	528	10.2	74.5	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	271	532	10.2	74.0	0.2	-
				5	-	-	-	-	-	-	-
				6	0.1	350	683	10.0	73.5	0.3	-
				7	-	-	-	-	-	-	-
				8	0.6	8530	16349	9.4	69.8	9.1	-
				9	-	-	-	-	-	-	-
				10	0.8	14070	26765	9.3	70.1	15.4	-
				11	-	-	-	-	-	-	-
				12	1.5	15280	28328	8.8	68.1	16.5	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:25 a.m.	12.0	1.8	0	1	-	-	-	-	-	-	-
				2	0.0	269	527	10.1	73.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.0	268	526	10.1	73.8	0.2	-
				5	-	-	-	-	-	-	-
				6	0.2	322	627	10.0	73.2	0.3	-
				7	-	-	-	-	-	-	-
				8	0.5	7150	13755	9.1	68.8	7.5	-
				9	-	-	-	-	-	-	-
				10	0.9	13910	26363	9.1	68.7	15.2	-
				11.5	1.1	15060	28332	8.0	66.4	16.5	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 8:35 a.m.	11.9	1.7	0	1	-	-	-	-	-	-	-
				2	0.0	268	526	10.3	75.0	0.2	-0.01
				3	-	-	-	-	-	-	-
				4	0.0	273	535	10.1	73.4	0.2	-0.05
				5	-	-	-	-	-	-	-
				6	0.1	400	781	9.8	71.6	0.4	-0.13
				7	-	-	-	-	-	-	-
				8	0.3	8920	17291	8.9	66.2	9.2	-0.04
				9	-	-	-	-	-	-	-
				10	0.5	13730	26414	8.5	64.8	15.2	0.08
				11	0.4	14610	28213	8.5	64.8	16.3	
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Colville River East Channel

Sample Date: December 12, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'14.7" W150°50'22.6" 12:32 p.m.	9.8	1.6	0	1	-	-	-	-	-	-
				2	0.0	322	631	10.4	75.2	0.3
				3	-	-	-	-	-	-
				4	0.1	333	650	10.3	74.9	0.3
				5	-	-	-	-	-	-
				6	0.2	494	960	10.2	74.4	0.5
				7	-	-	-	-	-	-
				8	0.7	8130	15524	8.4	62.7	8.6
				9.5	1.2	13020	24404	7.5	59.3	14.0
1 Mile Upstream of Colville River Ice Bridge N70o13'26" W150o49'40" 10:50 a.m.	18.7	1.9	0.1	1	-	-	-	-	-	-
				2	0.0	264	518	10.1	72.9	0.2
				3	-	-	-	-	-	-
				4	0.0	268	525	10.1	72.8	0.2
				5	-	-	-	-	-	-
				6	0.1	350	683	9.9	72.1	0.3
				7	-	-	-	-	-	-
				8	0.5	8320	16006	9.1	68.1	8.8
				9	-	-	-	-	-	-
				10	0.8	13620	25909	9.0	67.5	15.0
				11	-	-	-	-	-	-
				12	0.9	14450	27386	9.0	68.4	15.9
				13	-	-	-	-	-	-
				14	0.9	14800	28049	9.0	68.9	16.3
				15	-	-	-	-	-	-
				16	1.0	15140	28588	8.8	68.6	16.6
				17	-	-	-	-	-	-
				18	1.4	15530	28896	8.3	68.2	16.9
2 Mile Upstream of Colville River Ice Bridge N70o12'35" W150o49'41" 11:26 a.m.	11.9	1.6	0.1	1	-	-	-	-	-	-
				2	0.1	256	501	10.0	72.4	0.2
				3	-	-	-	-	-	-
				4	0.1	256	500	9.9	72.2	0.2
				5	-	-	-	-	-	-
				6	0.1	260	508	9.9	71.9	0.2
				7	-	-	-	-	-	-
				8	0.5	7940	15275	8.9	66.3	8.3
				9	-	-	-	-	-	-
				10	0.9	13240	25093	8.4	65.5	14.4
				11	1.1	13460	25322	8.1	67.7	14.6

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** December 26, 2007
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: 0˚ F, 0-5 mph wind

Ozzy Orwick arrived at Alpine on Wednesday, December 26, 2007 at 1:00 PM. Upon arrival Mr. Orwick met with Don Bruce of LCMF and coordinated procedures for that day's ice bridge monitoring event.

At 2:00 PM equipment was assembled, calibrated and prepared for transport. Lance Bennett of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via a Hagguland, departing Alpine at 2:45 PM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Several measurements were also obtained downstream of the ice bridge to identify high salinity waters. Results are tabulated in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 DO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on December 26 by Mr. Orwick prior to sampling.

The maximum specific conductance calculated near the proposed ice bridge location was 31,980 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 16,498 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 74.3%, and averaging 67.0%. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location. The next monitoring event is scheduled for January 5, 2008.

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: December 26, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 4:45 p.m.	11.5	2.3	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.1	349	681	10.3	73.6	0.3	-
				4	0.2	441	858	9.9	71.6	0.4	-
				5	-	-	-	-	-	-	-
				6	0.6	9500	18208	8.4	61.1	10.2	-
				7	-	-	-	-	-	-	-
				8	1.1	13640	25660	8.8	65.1	14.8	-
				9	-	-	-	-	-	-	-
				10	1.2	15930	29858	8.9	67.2	17.5	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 5:00 p.m.	11.5	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.1	346	676	10.3	73.9	0.3	-
				4	0.1	422	824	10.0	71.8	0.4	-
				5	-	-	-	-	-	-	-
				6	0.6	9360	17939	10.0	62.0	10.0	-
				7	-	-	-	-	-	-	-
				8	0.9	13540	25661	14.8	62.8	14.8	-
				9	-	-	-	-	-	-	-
				10	1.1	15700	29536	17.3	63.0	17.3	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 5:15 p.m.	12.9	2.3	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.1	361	705	10.3	74.3	0.3	-
				4	0.1	419	818	9.9	71.9	0.4	-
				5	-	-	-	-	-	-	-
				6	0.6	9430	18073	8.3	61.1	10.2	-
				7	-	-	-	-	-	-	-
				8	0.9	13460	25510	8.4	62.7	14.7	-
				9	-	-	-	-	-	-	-
				10	1.0	15700	29645	8.2	62.0	17.3	-
				11	-	-	-	-	-	-	-
				12	1.5	17250	31980	8.1	61.7	18.9	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured usinng a Hach HQ40

Baker

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: December 26, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 4:30 p.m.	11.9	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	352	690	10.2	73.5	0.3	-
				4	0.1	442	863	9.9	71.4	0.4	-
				5	-	-	-	-	-	-	-
				6	0.6	9410	18035	8.7	63.9	10.2	-
				7	-	-	-	-	-	-	-
				8	0.8	13620	25909	8.7	64.3	14.9	-
				9	-	-	-	-	-	-	-
				10	1.0	15710	29664	9.0	66.2	17.3	-
				11	1.2	16300	30552	9.4	69.8	17.9	-
				12	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 4:10 p.m.	12.2	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	343	673	10.3	73.9	0.3	-
				4	0.1	498	973	10.0	71.8	0.5	-
				5	-	-	-	-	-	-	-
				6	0.5	9370	18026	8.5	62.0	10.0	-
				7	-	-	-	-	-	-	-
				8	0.8	13550	25776	8.6	62.8	14.8	-
				9	-	-	-	-	-	-	-
				10	0.9	15710	29774	8.6	63.0	17.3	-
				11	-	-	-	-	-	-	-
				12	1.1	16970	31925	8.5	62.2	18.7	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 3:45 p.m.	10.7	2.6	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	349	684	10.2	73.9	0.3	-
				4	0.1	477	932	10.0	72.7	0.5	-0.06
				5	-	-	-	-	-	-	-
				6	0.5	9490	18257	8.5	62.6	10.2	-0.06
				7	-	-	-	-	-	-	-
				8	0.9	13670	25908	8.7	65.3	14.9	-0.06
				9	-	-	-	-	-	-	-
				10	1.0	15450	29173	8.8	66.8	17.0	-0.05
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured usinng a Hach HQ40

(7) Velocity was measured using a Marsh-McBirney Flow Meter

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 5, 2007
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: -30˚ F, 0-5 mph wind

Ozzy Orwick arrived at Alpine on Friday, January 5, 2007 at 6:00 PM. Upon arrival Mr. Orwick met with Gene Diamond of LCMF and coordinated procedures for following day's ice bridge monitoring event. Upon his arrival he met with Gene Diamond of LCMF and coordinated transportation to the Colville River for the following day's Ice Bridge Monitoring event. At 6:00 AM on January 5, Mr. Orwick attended LCMF's weekly health and safety meeting. At 6:45 AM equipment was assembled, calibrated and prepared for transport. Lance Bennett of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:45 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 DO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on January 5 by Mr. Orwick prior to sampling.

The maximum specific conductance calculated near the ice bridge location was 31,579 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 17,577 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with depth and distance downstream, having values as high as 76.1%, and averaging 63.0%. Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location. The next monitoring event is scheduled for January 23, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 5, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 8:40 a.m.	11.6	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	444	870	10.1	72.5	0.4	-
				4	-	-	-	-	-	-	-
				5	0.2	1434	2790	9.3	67.0	1.4	-
				6	-	-	-	-	-	-	-
				7	0.7	11720	22378	7.9	58.3	12.7	-
				8	-	-	-	-	-	-	-
				9	0.9	14950	28334	8.1	59.7	16.5	-
				10	-	.	-	-	-	-	-
				11	1.0	16530	31212	7.9	59.2	18.3	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:00 a.m.	11.5	2.8	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.1	408	797	9.8	70.0	0.4	-
				4	-	-	-	-	-	-	-
				5	0.2	1585	3084	8.9	64.0	1.5	-
				6	-	-	-	-	-	-	-
				7	0.7	11640	22226	7.9	57.7	12.6	-
				8	-	-	-	-	-	-	-
				9	0.9	14980	28391	8.2	59.7	16.5	-
				10	-	-	-	-	-	-	-
				11	1.1	16270	30608	7.9	59.1	17.9	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:20 a.m.	12.5	2.4	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.0	348	683	10.1	72.3	0.3	-
				4	-	-	-	-	-	-	-
				5	0.2	1605	3123	9.2	66.2	1.6	-
				6	-	-	-	-	-	-	-
				7	0.7	11610	22168	7.7	56.6	12.6	-
				8	-	-	-	-	-	-	-
				9	0.9	14910	28258	8.0	58.8	16.4	-
				10	-	-	-	-	-	-	-
				11	1.0	16140	30476	7.8	57.6	17.8	-
				12	1.3	16910	31579	7.9	58.4	18.6	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 5, 2007

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 11:10 p.m.	11.8	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.3	432	838	10.5	76.1	0.4	-
				4	-	-	-	-	-	-	-
				5	0.5	1519	2922	9.4	68.4	1.5	-
				6	-	-	-	-	-	-	-
				7	0.9	12170	23065	7.7	57.1	13.2	-
				8	-	-	-	-	-	-	-
				9	1.2	15100	28303	7.8	58.8	16.5	-
				10	-	-	-	-	-	-	-
				11	1.1	16700	31417	8.1	61.2	18.4	-
				12	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 11:25 a.m.	12.1	2.4	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.4	437	844	10.5	75.6	0.4	-
				4	-	-	-	-	-	-	-
				5	0.7	1365	2606	8.7	62.9	1.3	-
				6	-	-	-	-	-	-	-
				7	1.0	11760	22205	7.8	57.2	12.7	-
				8	-	-	-	-	-	-	-
				9	1.2	14990	28096	8.0	58.8	16.3	-
				10	-	-	-	-	-	-	-
				11	1.4	16750	31166	8.4	61.0	18.4	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 11:35 a.m.	11.9	2.5	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	0.4	450	870	10.6	75.5	0.4	0.00
				4	-	-	-	-	-	-	-
				5	0.7	1366	2608	9.3	66.9	1.3	-0.03
				6	-	-	-	-	-	-	-
				7	1.1	12340	23215	7.9	57.6	13.3	-0.04
				8	-	-	-	-	-	-	-
				9	1.3	15210	28404	8.1	58.7	16.6	-0.06
				10	-	-	-	-	-	-	-
				11	1.4	16850	31352	8.5	61.6	18.5	-0.05
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Colville River East Channel

Sample Date: January 5, 2007

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'14.7" W150°50'22.6" 12:00 p.m.	9.5	2.5	0	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.5	903	1737	10.3	75.2	0.9
				5	-	-	-	-	-	-
				6	1.0	9610	18146	7.9	58.7	10.1
				7	-	-	-	-	-	-
				8	1.2	14370	26934	9.5	71.5	15.8
1 Mile Upstream of Colville River Ice Bridge N70°13'26" W150°49'40" 10:40 a.m.	19.1	2.2	0.1	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.0	347	681	10.1	72.4	0.3
				4	-	-	-	-	-	-
				5	0.3	2337	4530	8.0	57.8	2.3
				6	-	-	-	-	-	-
				7	0.7	11450	21863	8.2	59.9	12.4
				8	-	-	-	-	-	-
				9	0.9	14470	27424	8.1	59.7	15.9
				10	-	-	-	-	-	-
				11	1.0	15500	29267	8.7	63.8	17.0
				12	-	-	-	-	-	-
				13	1.1	15980	30062	8.3	61.0	17.6
				14	-	-	-	-	-	-
				15	1.1	16270	30608	8.1	60.1	17.9
				16	-	-	-	-	-	-
				17	1.2	16440	30814	7.7	57.3	18.1
				18	-	-	-	-	-	-
				19	1.2	16510	30945	7.6	57.5	18.1
2 Mile Upstream of Colville River Ice Bridge N70°12'35" W150°49'41" 10:15 a.m.	11	2.7	0.1	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	0.0	450	883	9.4	68.1	0.4
				4	-	-	-	-	-	-
				5	0.3	4294	8324	7.8	57.3	4.3
				6	-	-	-	-	-	-
				7	0.8	12130	23075	7.7	57.8	13.2
				8	-	-	-	-	-	-
				9	1.1	13850	26055	7.5	57.8	15.1
				10	-	-	-	-	-	-
				11	1.5	15660	29032	7.7	60.4	16.9

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** January 22, 2008
Project Code: 112810	**Submitted By:** Mark McBroom

Weather: 10˚ F, 20-25 mph wind

Mark McBroom arrived at Alpine on Sunday, January 20, 2008 at 6:00 PM. Upon arrival Mr. McBroom met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on January 22, Mr. McBroom attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. Darron Saxowsky of LCMF accompanied Mr. McBroom to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:00 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on January 22 by Mr. McBroom prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 32,900 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 20,500 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 73.8%, and averaging 59.0%. Overall, specific conductance increased, while dissolved oxygen decreased, since the last monitoring event (January 5). Measured velocities suggested slight upstream flow; likely due to a tidal surge. The next monitoring event is scheduled for February 6, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: January 22, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (˚C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:45 a.m.	11.8	3.4	0.25	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.1	586	1145	9.5	66.5	0.5	-
				5	-	-	-	-	-	-	-
				6	0.4	10070	19446	7.6	54.0	9.2	-
				7	-	-	-	-	-	-	-
				8	0.6	14760	28289	8.1	57.4	15.9	-
				9	-	-	-	-	-	-	-
				10	0.8	15960	30361	8.3	59.3	18.0	-
				11	0.9	16420	31120	8.7	62.0	18.3	-
				12	-	-	-	-	-	-	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:11 a.m.	12.3	3.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	563	1096	8.8	62.2	0.5	-
				5	-	-	-	-	-	-	-
				6	0.4	8680	16762	8.0	57.1	9.2	-
				7	-	-	-	-	-	-	-
				8	0.8	14460	27507	8.4	61.2	15.9	-
				9	-	-	-	-	-	-	-
				10	0.9	16190	30684	8.9	65.9	18.0	-
				11	-	-	-	-	-	-	-
				12	0.9	16980	32181	9.3	70.5	18.8	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:28 a.m.	11.7	2.9	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	594	1156	10.5	73.8	0.5	-
				5	-	-	-	-	-	-	-
				6	0.5	9710	18680	7.2	50.8	10.5	-
				7	-	-	-	-	-	-	-
				8	0.7	14770	28202	7.2	51.3	16.3	-
				9	-	-	-	-	-	-	-
				10	0.8	1570	2987	7.2	52.2	17.4	-
				11	1.0	16110	30419	7.7	55.4	17.8	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: January 22, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (˚C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:24 p.m.	12.6	3.1	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	2653	5162	9.9	70.2	2.6	-
				5	-	-	-	-	-	-	-
				6	0.4	7000	13518	8.1	57.5	7.3	-
				7	-	-	-	-	-	-	-
				8	0.7	11920	22760	6.5	47.0	13.0	-
				9	-	-	-	-	-	-	-
				10	0.8	15720	29904	7.4	53.7	17.5	-
				11	-	-	-	-	-	-	-
				12	0.9	17140	32484	7.8	58.0	19.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:00 a.m.	12.1	3.1	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	2531	4925	9.1	64.6	2.5	-
				5	-	-	-	-	-	-	-
				6	0.4	6820	13170	8.0	57.2	7.2	-
				7	-	-	-	-	-	-	-
				8	0.7	11890	22703	7.3	52.5	12.9	-
				9	-	-	-	-	-	-	-
				10	0.7	15780	30131	7.8	56.8	17.5	-
				11	-	-	-	-	-	-	-
				12	0.9	17070	32352	7.9	60.2	19.0	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 9:30 a.m.	12.0	3.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.2	2769	5388	9.5	67.8	2.8	-0.05
				5	-	-	-	-	-	-	-
				6	0.4	7180	13865	7.9	56.8	7.6	-0.05
				7	-	-	-	-	-	-	-
				8	0.6	11860	22731	7.3	53.5	12.9	-0.09
				9	-	-	-	-	-	-	-
				10	0.8	16720	31806	7.6	56.3	18.6	-0.37
				11	-	-	-	-	-	-	-
				12	1.1	17510	32941	7.4	58.6	19.5	-0.08

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Colville River East Channel

Sample Date: January 22, 2008

Sampling Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'14.7" W150°50'22.6" 7:55 a.m.	8.3	3.7	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.0	2480	4863	10.0	70.9	2.5
				5	-	-	-	-	-	-
				6	0.5	6800	13082	8.3	60.4	7.1
				7	-	-	-	-	-	-
				8	0.8	14610	27793	7.5	56.3	16.1
1 Mile Upstream of Colville River Ice Bridge N70°13'26" W150°49'40" 10:51 a.m.	19.1	3.0	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.1	609	1190	10.0	70.8	0.6
				5	-	-	-	-	-	-
				6	0.5	8850	17026	6.7	48.1	9.4
				7	-	-	-	-	-	-
				8	0.8	14900	28344	6.7	48.7	16.4
				9	-	-	-	-	-	-
				10	1.1	15900	29912	6.9	50.7	17.5
				11	-	-	-	-	-	-
				12	1.2	16250	30458	6.9	50.7	17.8
				13	-	-	-	-	-	-
				14	1.3	16480	30776	6.7	50.2	18.1
				15	-	-	-	-	-	-
				16	1.3	16680	31150	6.6	49.7	18.3
				17	-	-	-	-	-	-
				18	1.4	16930	31501	6.2	49.0	18.5
				19	-	-	-	-	-	-
2 Mile Upstream of Colville River Ice Bridge N70°12'35" W150°49'41" 11:22 a.m.	12.1	3.3	0.3	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	0.1	523	1022	9.5	67.8	0.5
				5	-	-	-	-	-	-
				6	0.7	10680	20393	6.5	48.4	11.5
				7	-	-	-	-	-	-
				8	0.9	14280	27064	6.5	48.8	15.7
				9	-	-	-	-	-	-
				10	1.1	15630	29404	6.6	50.4	17.2
				11	1.8	16250	29801	6.2	51.1	17.5

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 4, 2008
Project Code: 112810	**Submitted By:** Mark McBroom

Weather: -29˚ F, 10-15 mph wind

Mark McBroom and Elijah Keib arrived at Alpine on Sunday, February 3, 2008 at 6:00 PM. Upon arrival Mr. McBroom met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on February 4, Mr. McBroom and Mr. Keib attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. Mike Rourick of LCMF accompanied Mr. McBroom and Mr. Keib to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:30 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on February by Mr. McBroom prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 35,556 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 24,023 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 89%, and averaging 55%. Overall, specific conductance increased, while average dissolved oxygen decreased, since the last monitoring event (January 22). Measured velocities do not suggest the presence of flow. The next monitoring event is scheduled for February 20, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 4, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (˚C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:25 a.m.	12.5	4.3	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4.5	0.0	920	1804	13.0	89.1	0.9	-
				5	-	-	-	-	-	-	-
				6	0.5	7250	13948	6.5	45.1	7.5	-
				7	-	-	-	-	-	-	-
				8	0.7	14400	27496	6.6	45.8	15.9	-
				9	-	-	-	-	-	-	-
				10	0.8	16790	31940	6.8	48.0	18.8	-
				11	-	-	-	-	-	-	-
				12	1.2	18650	34957	6.7	48.1	20.8	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 11:10 a.m.	11.6	3.9	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	901	1767	12.4	85.6	0.9	-
				5	-	-	-	-	-	-	-
				6	0.5	6000	11543	6.6	46.5	6.2	-
				7	-	-	-	-	-	-	-
				8	0.8	14190	26994	6.2	44.0	15.6	-
				9	-	-	-	-	-	-	-
				10	0.8	16890	32130	6.4	46.0	18.8	-
				11	-	-	-	-	-	-	-
				12	1.0	17770	33554	6.1	45.6	19.4	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 11:21 a.m.	12.5	3.6	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.0	884	1733	11.5	79.2	0.8	-
				5	-	-	-	-	-	-	-
				6	0.4	5580	10776	6.6	46.2	5.8	-
				7	-	-	-	-	-	-	-
				8	0.8	14240	27089	6.5	45.9	15.7	-
				9	-	-	-	-	-	-	-
				10	0.8	16970	32282	6.8	48.4	19.0	-
				11	-	-	-	-	-	-	-
				12	1.1	17920	33712	6.1	44.9	19.9	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 4, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (˚C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:00 p.m.	12.3	3.7	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.1	4890	9552	8.6	70.2	5.2	-
				5	-	-	-	-	-	-	-
				6	0.6	13020	24954	6.5	57.5	14.3	-
				7	-	-	-	-	-	-	-
				8	0.7	15730	30035	6.8	47.0	17.5	-
				9	-	-	-	-	-	-	-
				10	0.7	16820	32116	6.9	53.7	18.9	-
				11	-	-	-	-	-	-	-
				12	1.1	18700	35179	6.8	58.0	20.8	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:30 a.m.	12.2	3.7	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.1	4700	9180	10.6	72.5	4.9	-
				5	-	-	-	-	-	-	-
				6	0.6	13300	25491	8.1	57.3	14.7	-
				7	-	-	-	-	-	-	-
				8	0.8	15850	30151	8.5	60.7	17.6	-
				9	-	-	-	-	-	-	-
				10	0.9	17000	32219	8.8	63.8	18.9	-
				11	-	-	-	-	-	-	-
				12	1.1	18900	35556	9.0	66.7	21.1	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 8:50 a.m.	11.9	3.7	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.4	9350	18056	6.1	42.7	10.0	-0.01
				6	-	-	-	-	-	-	-
				7	0.7	14340	27381	6.3	44.4	15.8	-0.07
				8	-	-	-	-	-	-	-
				9	0.9	16400	31082	6.6	46.3	18.2	-0.05
				10	-	-	-	-	-	-	-
				11	1.0	18010	34007	5.9	42.0	20.0	-0.04
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** February 21, 2008
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: 20˚ F, 0-5 mph wind

Ozzy Orwick arrived at Alpine on Wednesday, February 20, 2008 at 7:00 PM. Upon arrival Mr. Orwick met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on February 21, Mr. Orwick attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. Lance Bennet of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:00 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on February 21 by Mr. Orwick prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 35,500 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 26,000 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 65.9%, and averaging 48.5%. Overall, specific conductance increased, while dissolved oxygen decreased, since the last monitoring event (February 5). Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location. The next monitoring event is scheduled for March 5, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: February 21, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:45 a.m.	12.5	4.5	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	4710	9130	8.3	61.5	4.8	-
				7	-	-	-	-	-	-	-
				8	0.5	14400	27703	5.8	42.6	16.0	-
				9	-	-	-	-	-	-	-
				10	0.7	17030	32517	5.8	43.3	19.0	-
				11	-	.	-	-	-	-	-
				12	1.2	18120	33963	6.0	45.5	20.0	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:00 a.m.	11.8	4.8	0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	3890	7541	8.9	65.9	3.9	-
				7	-	-	-	-	-	-	-
				8	0.7	14630	27935	5.8	43.5	16.2	-
				9	-	-	-	-	-	-	-
				10	1.0	17700	33421	6.2	46.7	19.8	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:25 a.m.	12.8	4.3	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	4670	9052	8.9	65.8	4.9	-
				7	-	-	-	-	-	-	-
				8	0.6	14390	27580	5.7	42.4	15.9	-
				9	-	-	-	-	-	-	-
				10	0.9	17160	32522	5.7	42.9	19.1	-
				11	-	-	-	-	-	-	-
				12	1.5	18480	34260	5.8	43.9	20.4	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: February 21, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:25 a.m.	12.5	3.5	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.4	8450	16318	8.7	63.0	9.3	-
				5	-	-	-	-	-	-	-
				6	0.3	10990	21303	6.2	45.7	12.0	-
				7	-	-	-	-	-	-	-
				8	0.9	14970	28372	5.6	41.9	16.4	-
				9	-	-	-	-	-	-	-
				10	1.0	17340	32742	5.6	42.9	19.3	-
				11	-	-	-	-	-	-	-
				12	1.4	18810	34999	5.8	45.0	20.8	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:15a.m.	13.0	4.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	10740	20819	6.3	46.8	11.7	-
				7	-	-	-	-	-	-	-
				8	0.8	14890	28325	5.7	43.0	16.4	-
				9	-	-	-	-	-	-	-
				10	1.0	17300	32666	5.8	43.4	19.2	-
				11	-	-	-	-	-	-	-
				12	1.5	19170	35539	5.8	44.4	21.1	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 9:00 a.m.	11.3	3.6	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	0.3	7110	13782	8.8	64.4	7.7	-
				5	-	-	-	-	-	-	-
				6	0.3	10890	21110	6.5	48.1	11.9	-0.01
				7	-	-	-	-	-	-	-
				8	1.0	15090	28493	5.8	44.3	16.6	-0.09
				9	-	-	-	-	-	-	-
				10	1.3	17600	32868	6.0	46.4	19.4	-0.05
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Colville River East Channel

Sample Date: February 21, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'14.7" W150°50'22.6" 8:45 a.m.	9.1	5.2	0.5	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	-	-	-	-	-	-
				6	0.3	10960	21245	7.8	58.5	12.0
				7	-	-	-	-	-	-
				8	0.8	14670	27907	6.9	53.4	16.2
1 Mile Upstream of Colville River Ice Bridge N70°13'26" W150°49'40" 11:00 a.m.	19.2	4.2	0.2	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	-	-	-	-	-	-
				6	0.4	5160	9964	5.5	40.9	5.4
				7	-	-	-	-	-	-
				8	0.8	14590	27755	5.8	43.9	16.0
				9	-	-	-	-	-	-
				10	1.0	17380	32817	5.8	44.2	19.3
				11	-	-	-	-	-	-
				12	1.1	17930	33731	8.8	44.2	19.9
				13	-	-	-	-	-	-
				14	1.2	18250	34207	5.1	39.8	20.2
				15	-	-	-	-	-	-
				16	1.3	18420	34399	5.1	39.9	20.4
				17	-	-	-	-	-	-
				18	1.7	19030	35025	4.9	39.6	20.8
2 Mile Upstream of Colville River Ice Bridge N70°12'35" W150°49'41" 11:30 a.m.	12.5	4.5	0.3	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	-	-	-	-	-	-
				6	0.5	4170	8022	7.5	55.9	4.3
				7	-	-	-	-	-	-
				8	1.0	14730	27813	5.4	41.1	16.2
				9	-	-	-	-	-	-
				10	1.2	17130	32108	5.5	42.5	18.9
				11	-	-	-	-	-	-
				12	1.8	17880	32790	5.6	44.9	19.5

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** March 5, 2008
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: -10˚ F, 0-5 mph wind

Ozzy Orwick arrived at Alpine on Wednesday, March 5, 2008 at 8:00 PM. Upon arrival Mr. Orwick met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on March 5, Mr. Orwick attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. AJ Griffin of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:30 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on March 5 by Mr. Orwick prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 35,000 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 27,000 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 66.0%, and averaging 42.8%. Overall, specific conductance increased, while dissolved oxygen decreased, since the last monitoring event (February 21). Downstream flow was not visually observed at any sampling locations. Direct velocity measurements revealed no flow at the 1200-foot downstream location. The next monitoring event is scheduled for March 19, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: March 5, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:00 a.m.	12.5	4.8	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	4210	8192	9.1	66.0	4.3	-
				7	-	-	-	-	-	-	-
				8	0.4	14360	27731	5.5	39.7	15.9	-
				9	-	-	-	-	-	-	-
				10	1.0	17200	32477	5.5	40.6	19.2	-
				11	-	-	-	-	-	-	-
				12	1.5	18480	34260	6.0	43.9	20.5	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 8:40 a.m.	12.3	4.8	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	4920	9573	6.0	44.3	5.1	-
				7	-	-	-	-	-	-	-
				8	0.4	14280	27576	5.3	39.4	15.8	-
				9	-	-	-	-	-	-	-
				10	0.6	16910	32410	5.3	40.1	19.0	-
				11	-	-	-	-	-	-	-
				12	1.3	18360	34287	5.5	42.9	20.2	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:25 a.m.	13.3	4.4	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.3	5080	9847	8.0	59.1	5.2	-
				7	-	-	-	-	-	-	-
				8	0.4	14070	27171	5.3	39.8	15.6	-
				9	-	-	-	-	-	-	-
				10	0.8	17000	32339	5.2	39.8	19.0	-
				11	-	-	-	-	-	-	-
				12	1.2	17690	33157	5.2	40.4	19.6	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: March 5, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:10 a.m.	12.6	4.3	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	10520	20548	5.5	41.6	11.5	-
				7	-	-	-	-	-	-	-
				8	0.7	14510	27706	5.2	39.6	16.0	-
				9	-	-	-	-	-	-	-
				10	1.1	17070	32113	4.9	39.7	18.9	-
				11	-	-	-	-	-	-	-
				12	1.6	18820	34764	4.5	38.0	20.4	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 9:25 a.m.	12.5	4.4	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	10260	20118	6.0	44.1	11.3	-
				7	-	-	-	-	-	-	-
				8	0.8	14400	27393	5.7	42.6	15.9	-
				9	-	-	-	-	-	-	-
				10	1.1	16870	31737	5.6	41.8	18.7	-
				11	-	-	-	-	-	-	-
				12	1.9	19080	34866	5.7	43.2	20.7	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 9:45 a.m.	12.0	4.4	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	10500	20509	6.2	45.3	11.5	-0.03
				7	-	-	-	-	-	-	-
				8	0.8	14230	27070	5.6	41.1	15.7	-0.07
				9	-	-	-	-	-	-	-
				10	1.1	17150	32264	19.1	42.8	19.1	-0.05
				11	-	-	-	-	-	-	-
				12	1.6	18220	33656	20.1	30.5	20.1	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** March 19, 2008
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: -30˚ F, 5-10 mph wind

Elijah Keib arrived at Alpine on Tuesday, March 18, 2008 at 6:00 PM. Upon arrival Mr. Keib met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on March 19, Mr. Keib attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. Chris Ziemet of LCMF accompanied Mr. Keib to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 7:30 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline, as well as two locations (1 mile and 2 mile) upstream and one location (1 mile) downstream of the ice bridge. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on March 19 by Mr. Keib prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 32,800 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 25,400 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 68.0%, and averaging 42.4%. Overall, specific conductance decreased, while dissolved oxygen remained constant, since the last monitoring event (March 5). Downstream flow was not visually observed at any sampling locations. Measured velocities suggested slight upstream flow; likely due to a tidal surge. The next monitoring event is scheduled for April 2, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: March 19, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 10:15 a.m.	12.0	4.8	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	5040	9845	7.6	52.0	5.6	-
				7	-	-	-	-	-	-	-
				8	0.3	13550	26266	6.2	42.0	15.3	-
				9	-	-	-	-	-	-	-
				10	0.5	16050	30877	6.4	43.6	18.2	-
				11	-	.	-	-	-	-	-
				12	1.0	17280	32628	6.8	47.1	19.2	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:50 a.m.	11.9	4.9	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	0.0	3680	7216	10.1	68.0	3.8	-
				6	-	-	-	-	-	-	-
				7	0.1	8320	16251	6.9	46.3	9.1	-
				8	-	-	-	-	-	-	-
				9	0.4	14700	28387	5.8	39.5	16.4	-
				10	-	-	-	-	-	-	-
				11	0.6	16400	31432	5.4	36.6	18.1	-
				12	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:40 a.m.	12.5	5.0	0.25	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.2	5120	9963	7.0	48.0	5.3	-
				7	-	-	-	-	-	-	-
				8	0.4	13500	26070	5.4	37.6	14.9	-
				9	-	-	-	-	-	-	-
				10	0.7	16410	31334	5.2	36.6	18.4	-
				11	-	-	-	-	-	-	-
				12	1.2	17460	32726	5.0	35.4	19.3	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: March 19, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{o}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:30 a.m.	12.5	4.4	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	9710	19039	7.2	49.2	10.7	-
				7	-	-	-	-	-	-	-
				8	0.6	13800	26449	5.4	37.0	15.3	-
				9	-	-	-	-	-	-	-
				10	0.8	16320	31046	5.8	40.8	18.2	-
				11	-	-	-	-	-	-	-
				12	1.0	17370	32798	4.5	32.2	19.2	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:50a.m.	11.9	5.0	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-	-	-	-	-	-	-
				7	0.3	12300	23843	5.7	38.9	13.4	-
				8	-	-	-	-	-	-	-
				9	0.6	14680	28136	6.6	45.3	16.7	-
				10	-	-	-	-	-	-	-
				11	0.9	16750	31745	5.0	34.8	18.7	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 11:10 a.m.	11.7	4.3	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-	-	-	-	-	-	-
				7	0.3	11860	22990	5.7	39.4	13.2	-0.11
				8	-	-	-	-	-	-	-
				9	0.7	14970	28584	6.2	43.4	16.6	-0.11
				10	-	-	-	-	-	-	-
				11	1.0	17030	32156	5.3	38.1	18.8	-0.07
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Colville River Ice Bridge Monitoring Program
Water Quality - Colville River East Channel

Sample Date: March 19, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)
1 Mile Downstream of ColvilleRiver Ice Bridge N70°15'14.7" W150°50'22.6" 11:50 a.m.	9..8	5.6	0.4	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	-	-	-	-	-	-
				6	-	-	-	-	-	-
				7	0.0	10100	19804	8.0	54.1	11.3
				8	-	-	-	-	-	-
				9	0.0	12230	23980	7.4	50.4	13.7
1 Mile Upstream of Colville River Ice Bridge N70°13'26" W150°49'40" 9:00 a.m.	19.6	4.6	0.3	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	0.0	3962	7769	12.0	80.0	4.1
				6	-	-	-	-	-	-
				7	0.4	9470	18288	5.4	36.8	10.4
				8	-	-	-	-	-	-
				9	0.8	15380	29257	5.1	35.0	17.1
				10	-	-	-	-	-	-
				11	1.0	17100	32289	5.3	36.4	19.0
				12	-	-	-	-	-	-
				13	1.1	17520	32960	4.9	34.1	19.4
				14	-	-	-	-	-	-
				15	1.3	17750	33148	4.0	27.6	19.6
				16	-	-	-	-	-	-
				17	1.4	17870	33250	3.8	26.3	19.7
				18						
				19	1.3	17800	33241	4.1	28.0	19.5
2 Mile Upstream of Colville River Ice Bridge N70°12'35" W150°49'41" 8:30 a.m.	12.7	4.9	0.3	1	-	-	-	-	-	-
				2	-	-	-	-	-	-
				3	-	-	-	-	-	-
				4	-	-	-	-	-	-
				5	-	-	-	-	-	-
				6	0.2	4680	9106	9.3	63.0	4.8
				7	-	-	-	-	-	-
				8	0.8	14080	26784	4.5	31.1	15.5
				9	-	-	-	-	-	-
				10	1.1	16480	31003	4.3	30.3	18.2
				11	-	-	-	-	-	-
				12	1.2	16740	31377	4.1	29.2	18.2

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** April 2, 2008
Project Code: 112810	**Submitted By:** Ozzy Orwick

Weather: 20˚ F, 0-5 mph wind

Ozzy Orwick arrived at Alpine on Tuesday, April 1, 2008 at 6:00 PM. Upon arrival Mr. Orwick met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on April 2, Mr. Orwick attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. A.J. Griffin of LCMF accompanied Mr. Orwick to the Colville River Ice Bridge site via Hagglund departing Alpine at approximately 8:00 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on April 2 by Mr. Orwick prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 32,300 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 25,600 uS/cm, and increased with depth. Dissolved oxygen saturation also remained consistent with respect to depth and distance downstream, having values as high as 56.6%, and averaging 43.8%. Overall, specific conductance decreased, while dissolved oxygen remained constant, since the last monitoring event (March 19). Downstream flow was not visually observed at any sampling locations. The next and final monitoring event for the 2007/2008 season is scheduled for April 17, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: April 2, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:45 a.m.	12.4	5.3	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	4210	8255	7.8	55.0	7.4	-
				7	-	-	-	-	-	-	-
				8	0.2	13450	26171	5.8	41.0	15.0	-
				9	-	-	-	-	-	-	-
				10	0.5	16000	30781	5.0	36.0	17.9	-
				11	-	-	-	-	-	-	-
				12	1.5	17340	32147	4.7	35.7	19.1	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:20 a.m.	12.5	5.5	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	6550	12794	8.1	56.6	7.1	-
				7	-	-	-	-	-	-	-
				8	0.4	13480	26031	6.3	44.3	15.0	-
				9	-	-	-	-	-	-	-
				10	0.8	16030	30494	6.0	43.1	17.9	-
				11	-	-	-	-	-	-	-
				12	1.4	17290	32171	6.6	47.9	19.0	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 9:00 a.m.	12.5	5.1	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	6750	13185	7.4	52.0	7.2	-
				7	-	-	-	-	-	-	-
				8	0.3	13380	25936	6.1	43.4	14.8	-
				9	-	-	-	-	-	-	-
				10	0.8	16260	30931	5.3	39.0	18.0	-
				11	-	-	-	-	-	-	-
				12	1.5	17430	32314	5.7	44.2	19.0	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: April 2, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:05 a.m.	12.5	5.0	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	10340	20197	7.0	48.8	11.4	-
				7	-	-	-	-	-	-	-
				8	0.5	13310	25606	5.8	41.4	14.7	-
				9	-	-	-	-	-	-	-
				10	0.9	16110	30532	4.6	33.8	17.9	-
				11	-	-	-	-	-	-	-
				12	1.0	16750	31628	4.9	36.5	18.6	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:30 a.m.	11.9	5.3	0.4	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.1	10310	20138	7.0	51.8	11.4	-
				7	-	-	-	-	-	-	-
				8	0.8	13700	26061	5.2	39.6	15.0	-
				9	-	-	-	-	-	-	-
				10	1.6	17070	31532	4.4	34.3	18.3	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 11:00 a.m.	11.5	4.6	0.1	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	0.0	10400	20392	7.6	55.2	11.4	-
				7	-	-	-	-	-	-	-
				8	0.6	13350	25586	5.7	42.3	14.7	-
				9	-	-	-	-	-	-	-
				10	1.6	16500	30479	5.2	41.6	17.9	-
				11	-	-	-	-	-	-	-
				12	-	-	-	-	-	-	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** April 17, 2008
Project Code: 112810	**Submitted By:** Mark McBroom

Weather: -15˚ F, 0-5 mph wind

Mark McBroom arrived at Alpine on Tuesday, April 16, 2008 at 6:00 PM. Upon arrival Mr. McBroom met with LCMF (Gene Diamond) and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on April 17, Mr. McBroom attended LCMF's daily health and safety meeting. At 6:20 AM equipment was assembled, calibrated and prepared for transport. Chris Ziemet of LCMF accompanied Mr. McBroom to the Colville River Ice Bridge site via Haggalund departing Alpine at approximately 7:00 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Flo-Mate 20000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on April 17 by Mr. McBroom prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 31,710 uS/cm. Specific conductance values were relatively consistent at each sampling location, having an average of approximately 25,790 uS/cm, and increased with depth. Dissolved oxygen saturation decreased with respect to depth and distance downstream, having values as high as 84.8% near ice/water interface, and averaging 51.3%. Overall, specific conductance decreased slightly, while dissolved oxygen increased throughout the water column, since the last monitoring event (April 2). Downstream flow velocities were below the zero accuracy of the meter suggesting little to no flow. This is the last scheduled monitoring event for the 2007/2008 ice bridge season. Additional monitoring events will be performed if requested by CPAI.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: April 17, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:35 a.m.	12.2	5.7	0.5	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.2	7380	14583	12.6	84.8	8.0	-
				7	-	-	-	-	-	-	-
				8	0.5	12490	24028	7.0	48.8	13.7	-
				9	-	-	-	-	-	-	-
				10	1.0	15960	30136	5.1	36.6	17.6	-
				11	-	-	-	-	-	-	-
				12	1.4	17000	31631	5.6	41.9	18.6	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 9:10 a.m.	11.6	5.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.3	7330	14540	12.4	83.4	7.9	-
				7	-	-	-	-	-	-	-
				8	0.3	12830	24870	6.8	47.0	14.2	-
				9	-	-	-	-	-	-	-
				10	0.8	16150	30722	5.4	38.3	18.0	-
				11	-	-	-	-	-	-	-
				12	1.0	16700	31533	5.8	42.0	18.5	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 8:45 a.m.	12.3	5.4	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.3	7310	14501	11.3	76.5	7.9	-
				7	-	-	-	-	-	-	-
				8	0.3	12930	25064	6.7	46.2	14.4	-
				9	-	-	-	-	-	-	-
				10	0.7	15940	30436	5.1	36.0	17.8	-
				11	-	-	-	-	-	-	-
				12	1.2	16730	31358	5.6	40.9	18.4	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: April 17, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 10:00 a.m.	12.5	5.5	0.2	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.2	9730	19226	10.5	70.1	10.7	-
				7	-	-	-	-	-	-	-
				8	0.5	12620	24279	6.7	46.1	13.9	-
				9	-	-	-	-	-	-	-
				10	1.2	16200	30364	5.5	39.4	17.8	-
				11	-	-	-	-	-	-	-
				12	2.1	17410	31588	6.1	45.5	18.1	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 10:20 a.m.	12.2	5.5	0.3	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.1	9760	19211	10.0	67.4	10.8	-
				7	-	-	-	-	-	-	-
				8	0.5	12540	24125	5.9	41.5	13.7	-
				9	-	-	-	-	-	-	-
				10	1.1	15660	29460	5.6	40.3	17.3	-
				11	-	-	-	-	-	-	-
				12	1.3	16890	31542	6.4	48.8	18.5	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:50 a.m.	12.0	5.0	0.0	1	-	-	-	-	-	-	-
				2	-	-	-	-	-	-	-
				3	-	-	-	-	-	-	-
				4	-	-	-	-	-	-	-
				5	-	-	-	-	-	-	-
				6	-0.1	9740	19172	10.4	70.8	10.7	-0.07
				7	-	-	-	-	-	-	-
				8	0.6	12900	24724	6.3	44.2	14.2	-0.07
				9	-	-	-	-	-	-	-
				10	1.0	16010	30230	6.4	46.3	17.7	-0.06
				11	-	-	-	-	-	-	-
				12	1.3	16980	31710	6.6	49.4	18.6	-0.07

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface.

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^0C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000

Project Trip Report

Project Name: Colville River Ice Bridge Monitoring	**Date of Trip:** November 5, 2008
Project Code: 115721	**Submitted By:** Mark McBroom, Elijah Keib

Weather: 0˚ F, 0-5 mph wind

Mark McBroom and Elijah Keib arrived at Alpine on Tuesday, November 4, 2008 at 7:45 PM. Upon arrival Mr. McBroom met with LCMF and coordinated access to the Colville River for the planned ice bridge monitoring event. At 6:00 AM on November 5, Mr. McBroom and Mr. Keib attended LCMF's daily health and safety meeting. At 6:30 AM equipment was assembled, calibrated and prepared for transport. Gene Diamond of LCMF accompanied Mr. McBroom and Mr. Keib to the Colville River Ice Bridge site via snow machine departing Alpine at approximately 8:00 AM. Ice thickness, total depth, freeboard, temperature, salinity, conductivity, dissolved oxygen (DO), and water velocities were collected at predetermined locations. Sampling took place at 400, 800, and 1200 feet upstream and downstream of the proposed ice bridge centerline. Specific conductance was calculated from observed temperatures and conductivity. Results are tabulated and graphed in the attached sheets.

In-situ water quality parameters were recorded using a YSI-30 meter (conductivity, salinity, and temperature). Dissolved oxygen was measured using a Hach HQ40 LDO meter. Water velocities were measured at one location (1200 feet downstream) to determine the presence of flow using a Marsh McBirney Model 2000. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals. The DO meter was calibrated prior to the trip by TTT Environmental. The YSI-30 was calibrated on November 5 by Baker prior to sampling.

The maximum specific conductance calculated near the ice bridge was approximately 22,800 uS/cm. Specific conductance values were relatively consistent at each sampling location with an evident stratification of salt and fresh water. The average specific conductance ranged from approximately 540 uS/cm at 1 foot of depth to 22,000 uS/cm at 12 to 13 feet of depth. Dissolved oxygen saturation remained consistent with respect to depth and distance downstream, having values as high as 94.4%, and averaging 88.8%. Measured velocities suggested slight downstream flow with a maximum measured velocity of 0.2 ft/s. The next monitoring event is scheduled for November 19, 2008.

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Upstream of Bridge

Sample Date: November 5, 2008

Upstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (^{0}C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'14.4" W150°50'09.5" 9:35 a.m.	12.8	0.9	0	1	-	-	-	-	-	-	-
				2	0.4	276	534	13.6	93.9	0.2	-
				3	-	-	-	-	-	-	-
				4	0.4	277	535	13.8	94.2	0.2	-
				5	-	-	-	-	-	-	-
				6	0.4	291	563	13.7	93.3	0.3	-
				7	-	-	-	-	-	-	-
				8	0.6	295	566	12.9	88.4	2.9	-
				9	-	-	-	-	-	-	-
				10	1.0	10920	20619	11.8	81.4	11.7	-
				11	-	-	-	-	-	-	-
				12	1.0	11760	22205	11.8	81.8	12.7	-
800-ft Upstream N70°14'10.7" W150°50'06.5" 10:00 a.m.	13.8	1.0	0	1	0.4	279	539	13.9	94.7	0.2	-
				2	-	-	-	-	-	-	-
				3	0.4	274	528	13.8	94.2	0.2	-
				4	-	-	-	-	-	-	-
				5	0.4	274	529	13.9	94.8	0.2	-
				6	-	-	-	-	-	-	-
				7	0.6	381	731	13.6	92.9	0.3	-
				8	-	-	-	-	-	-	-
				9	0.8	9460	17996	11.9	81.9	10.1	-
				10	-	-	-	-	-	-	-
				11	1.1	11750	22105	12.0	82.4	12.6	-
				12	-	-	-	-	-	-	-
				13	1.0	11940	22545	12.1	83.3	12.8	-
1200-ft Upstream N70°14'06.6" W150°50'03.4" 10:30 a.m.	13.5	1.1	0.1	1	0.4	271	522	13.8	94.2	0.2	-
				2	-	-	-	-	-	-	-
				3	0.4	271	523	13.8	94.0	0.2	-
				4	-	-	-	-	-	-	-
				5	0.4	274	528	13.7	93.2	0.2	-
				6	-	-	-	-	-	-	-
				7	0.5	575	1106	13.5	92.2	0.7	-
				8	-	-	-	-	-	-	-
				9	0.7	9160	17490	12.1	83.4	9.8	-
				10	-	-	-	-	-	-	-
				11	1.0	11770	22224	12.1	83.2	12.7	-
				12	-	-	-	-	-	-	-
				13	0.8	11990	22809	12.4	85.3	13.1	-

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface (negative values represent freeboard above ice surface).

(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25^{0}C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

Colville River Ice Bridge Monitoring Program
Water Quality - Main Channel Downstream of Bridge

Sample Date: November 5, 2008

Downstream Location Time	Water Depth (ft)	Ice Thickness (ft)	Free Board (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (Percent Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.2" W150°50'18.9" 9:05 a.m.	11.1	1.0	0	1	0.3	288	558	13.8	94.3	0.3	-
				2	-	-	-	-	-	-	-
				3	0.4	287	554	13.8	94.0	0.3	-
				4	-	-	-	-	-	-	-
				5	0.3	314	608	13.6	93.1	0.3	-
				6	-	-	-	-	-	-	-
				7	0.4	728	1406	13.2	90.4	0.7	-
				8	-	-	-	-	-	-	-
				9	0.7	9560	18254	11.7	81.0	10.2	-
				10	-	-	-	-	-	-	-
				11	0.8	11190	21287	11.7	81.2	12.1	-
				12	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.5" W150°50'19.6" 8:45 a.m.	13.6	0.8	- 0.1	1	0.2	284	553	13.8	94.4	0.3	-
				2	-	-	-	-	-	-	-
				3	0.2	285	554	13.8	94.3	0.3	-
				4	-	-	-	-	-	-	-
				5	0.1	299	583	13.7	93.6	0.3	-
				6	-	-	-	-	-	-	-
				7	0.2	724	1409	13.4	91.9	0.7	-
				8	-	-	-	-	-	-	-
				9	0.5	9680	18623	11.6	80.7	10.4	-
				10	-	-	-	-	-	-	-
				11	0.6	10990	21063	11.6	80.8	11.9	-
				12	-	-	-	-	-	-	-
				13	0.6	11310	21677	11.5	81.1	12.3	-
1200-ft Downstream N70°14'29.1" W150°50'20.3" 10:45 a.m.	12.5	0.9	0	1	-	-	-	-	-	-	-
				2	0.4	283	546	13.8	94.2	0.3	0.18
				3	-	-	-	-	-	-	-
				4	0.4	283	547	13.9	94.6	0.3	0.19
				5	-	-	-	-	-	-	-
				6	0.4	284	548	13.8	93.8	0.3	0.20
				7	-	-	-	-	-	-	-
				8	0.7	303	578	12.0	82.5	3.1	-0.03
				9	-	-	-	-	-	-	-
				10	0.9	10840	20544	11.9	82.3	11.6	0.07
				11	-	-	-	-	-	-	-
				12	1.0	11200	21148	12.1	83.0	12.0	0.08

Notes:

(1) All sample location coordinates referenced to NAD83 datum.

(2) Freeboard is the distance from the top of ice to the water surface (negative values represent freeboard above ice surface).

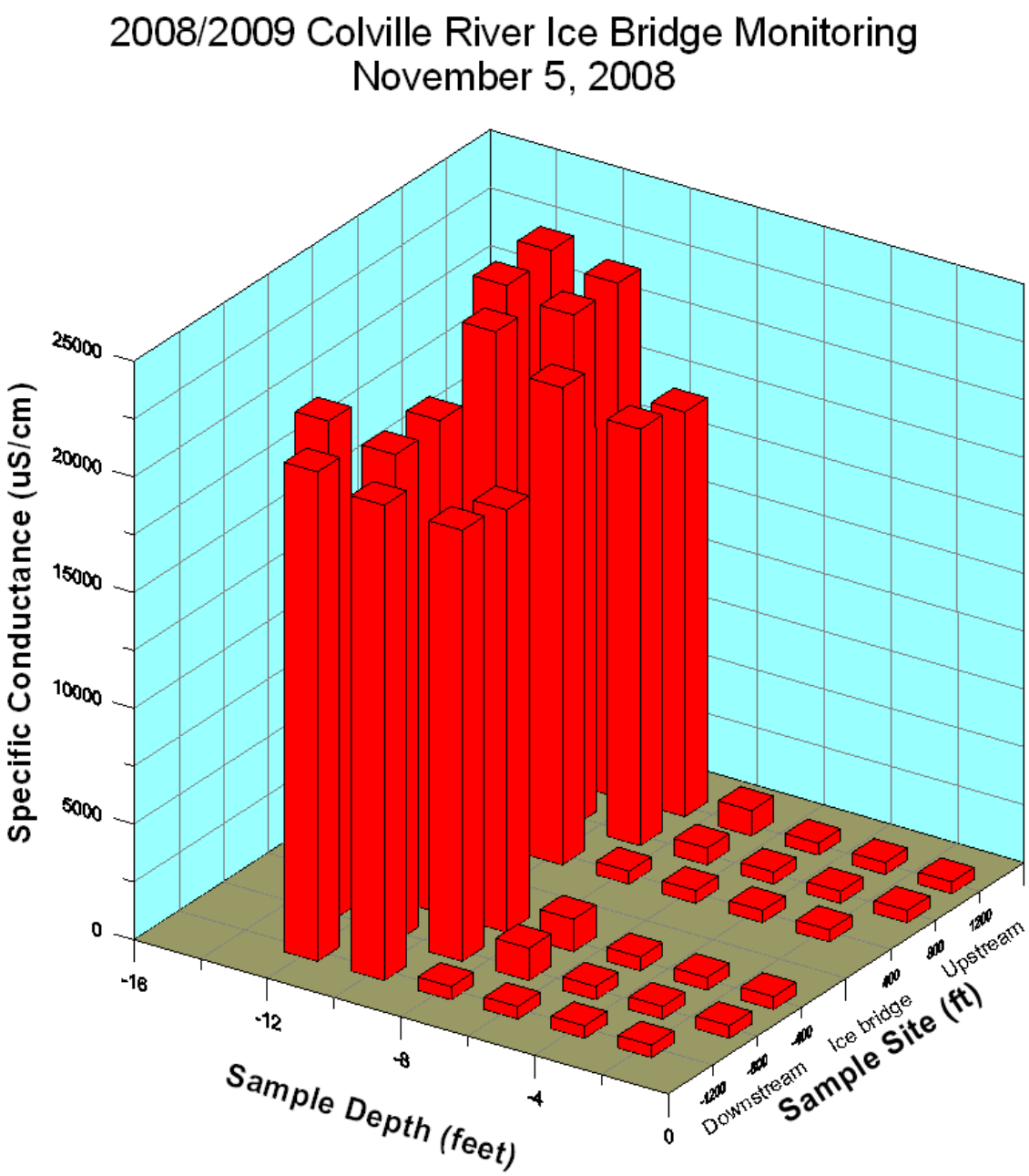
(3) Sample depth is measured from the water surface.

(4) Salinity, conductivity, and temperature were measured using a YSI-30 meter

(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data

(6) Dissolved oxygen was measured using a Hach HQ-40d LDO

(7) Velocity was measured using a Marsh-McBirney Model 2000


2008/2009 Colville River Ice Bridge Monitoring
November 5, 2008
Specific Conductance (uS/cm)
25000
20000
15000
10000
5000
0
-16
-12
-8
-4
0
Sample Depth (feet)
-1200
-800
-400
Ice bridge
400
800
1200
Upstream
Downstream
Sample Site (ft)