

KS00055

**REINSTALLATION OF HISTORIC WATER SURVEY OF
CANADA STAFF GAUGES, UPPER BULKLEY RIVER
BRITISH COLUMBIA**

Submitted to:

Community Futures Development Corporation of Nadina

Houston, British Columbia

Submitted by:

AGRA Earth & Environmental Limited

Smithers, British Columbia

April 2000

April 17, 2000
KS00055

Community Futures Development Corporation of Nadina
Box 236,
3232 Highway 16,
Houston, BC
V0J 1Z0

Attention: Mr. Angus Glass, Director

**RE: REINSTALLATION OF HISTORIC WATER SURVEY
OF CANADA STAFF GAUGES**

1.0 INTRODUCTION

Nadina Community Futures (NCF) of Houston, BC has implemented a program of water level monitoring in the Upper Bulkley River watershed, to determine effects of resource development on the hydrologic regime in the watershed. To facilitate this monitoring, NCF retained AGRA Earth & Environmental Limited (AGRA) to install four staff gauges at historic Water Survey of Canada (WSC) stations on selected tributaries of the Bulkley River, listed below, and generate stage/discharge rating curves for these streams.

Ms. Brenda Donas, Community Habitat Advisor for the Smithers area Department of Federal Fisheries and Oceans, directed the locations of the staff gauges. Four staff gauges were installed at the following sites:

- WSC Station 08EE009 on Richfield Creek
- WSC Station 08EE-018 on Maxan Creek above Bulkley Lake
- WSC Station 08EE013 on Buck Creek at the mouth of Buck Creek
- New station located on the abutments of the Buck Creek bridge #1 on Buck Creek

Ms. Donas implemented regular staff gauge readings (twice per week) in order to obtain the water level data necessary to generate discharge hydrographs of the study creeks. One year of water level data has been collected and this report contains discharge hydrographs for the study streams.

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2.0 FIELD METHODOLOGY

Station record sheets were obtained from Water Survey of Canada for three stations (Appendix 1). Locations for staff gauge installations were chosen based on the guidance from the Manual of Standard Operating Procedures for Hydrometric Surveys in British Columbia (RIC 1998).

The staff gauges were Water Survey of Canada standard. Discharge measurements were obtained with a Price AA flow meter (Serial # X87-03).

3.0 RESULTS

3.1 RICHFIELD CREEK

The Richfield Creek Water Survey of Canada station was discontinued in 1974. The original station description sheets are provided in Appendix 1.0. The original staff gauge was located on the abutments of a footbridge across the creek. The footbridge and original benchmarks for the station no longer exist. The new staff gauge is located approximately 100 m upstream of the multi-plate culvert that crosses under Highway 16, 2.0 km WNW of Topley, BC. Two new benchmarks were located upstream of the staff gauge.

Four velocity cross sections of Richfield Creek were completed (Table 1). Figure 1 shows the Richfield Creek water level data recorded by DFO in 1998 and 1999. The water level records are included in Appendix 2.0. Figure 2 shows the discharge rating curve for Richfield Creek. Photos of Richfield Creek during different seasons are provided in Appendix 3.0

Table 1. Discharge at Richfield Creek 1998 and 1999. The cross sections were completed 5 m upstream of the location of the staff gauge. Field notes are provided in Appendix 2.

Date	Staff Gauge (m)	Discharge (Q in m ³ /sec)
September 22, 1998	0.055	0.115
November 4, 1998	0.216	0.799
May 18, 1999	0.75	9.693
September 15, 1999	0.19	0.489

Figure 1. Ritchfield Creek Water Levels for 1998 and 1999

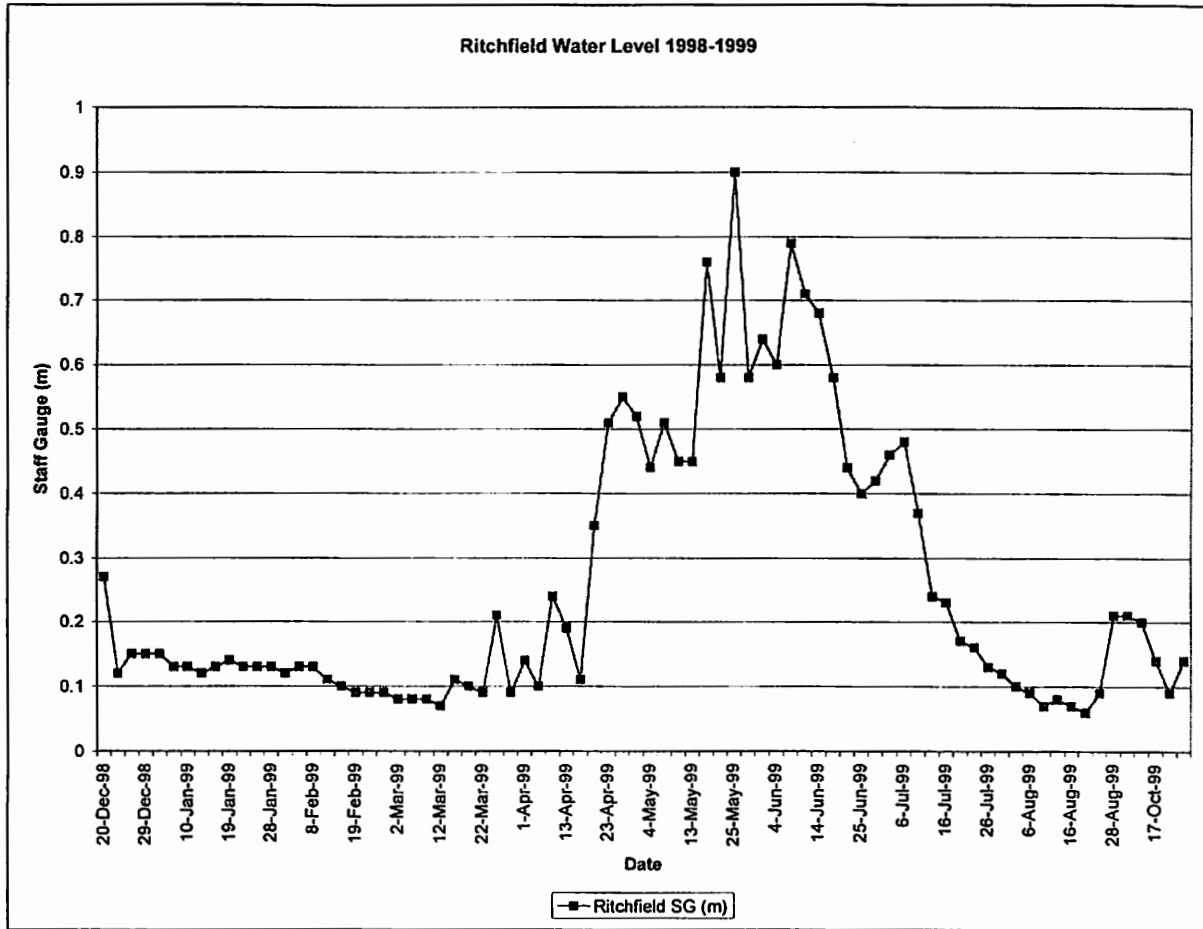
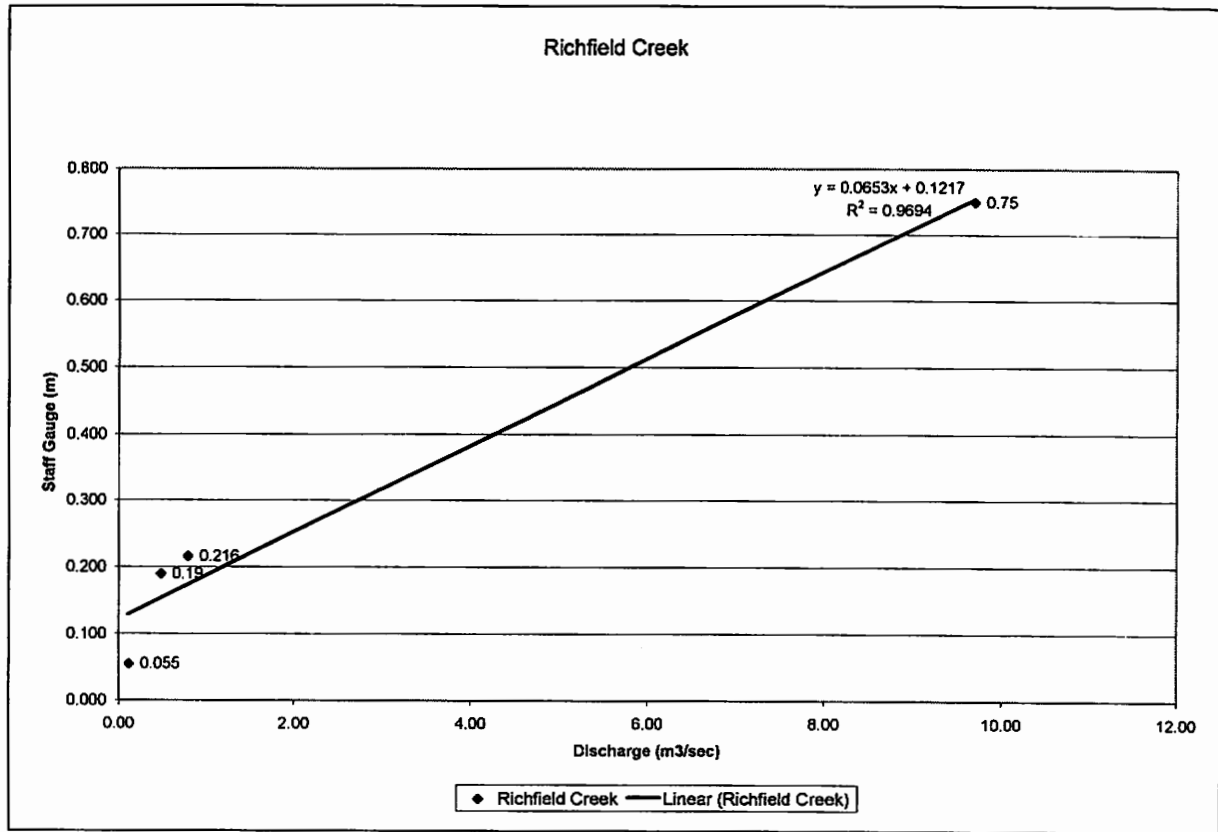


Figure 2.0 Ritchfield Creek Discharge Rating Curve Based on 1999 and 1998 Data.



3.2 MAXAN CREEK

The Maxan Creek Water Survey of Canada station was discontinued in the late 1970s. The Maxan Creek station originally included a cableway across the creek. The cableway is still present. The station equipment consisted of an A71 recording gauge activated by a 35' range servo manometer. A new staff gauge has been located on the left bank of Maxan Creek. Three bench marks were located. Bench Mark #2 uses the original benchmark left from the WSC Station.

A copy of a recent air photo is provided for directions to the site. The Forestdale Canyon Road leaves Highway 16 at Broman Lake. At the junction of the Forestdale Canyon Road and the Maxan FSR, the turnoff is 6.0 km from the bridge across the Bulkley River. The access road crosses the BC Gas line at 200 m after which an old logging road turns right (upstream). At the second old landing, a flagged trail leads approximately 200 m to an old road/livestock trail that leads down to the station.

Four velocity cross sections were completed on Maxan Creek (Table 2). Water level data was collected in 1998 and 1999 and is shown in Figure 3 (Appendix 2). A discharge rating curve based on the four velocity cross sections is provided in Figure 4. Photos of Maxan Creek are provided in Appendix 3.0.

Table 2. Discharge at Maxan Creek for 1998 and 1999. The velocity cross section was completed 25 m downstream of the location of the staff gauge. Field notes are provided in Appendix 2.

Date	Staff Gauge (m)	Discharge (Q) in m ³ /sec
September 22, 1998	0.048	0.080
November 4, 1998	0.168	0.575
May 18, 1999	0.80	22.5
September 15, 1999	0.172	0.604

Figure 3. Maxan Creek Water Levels for 1998 and 1999.

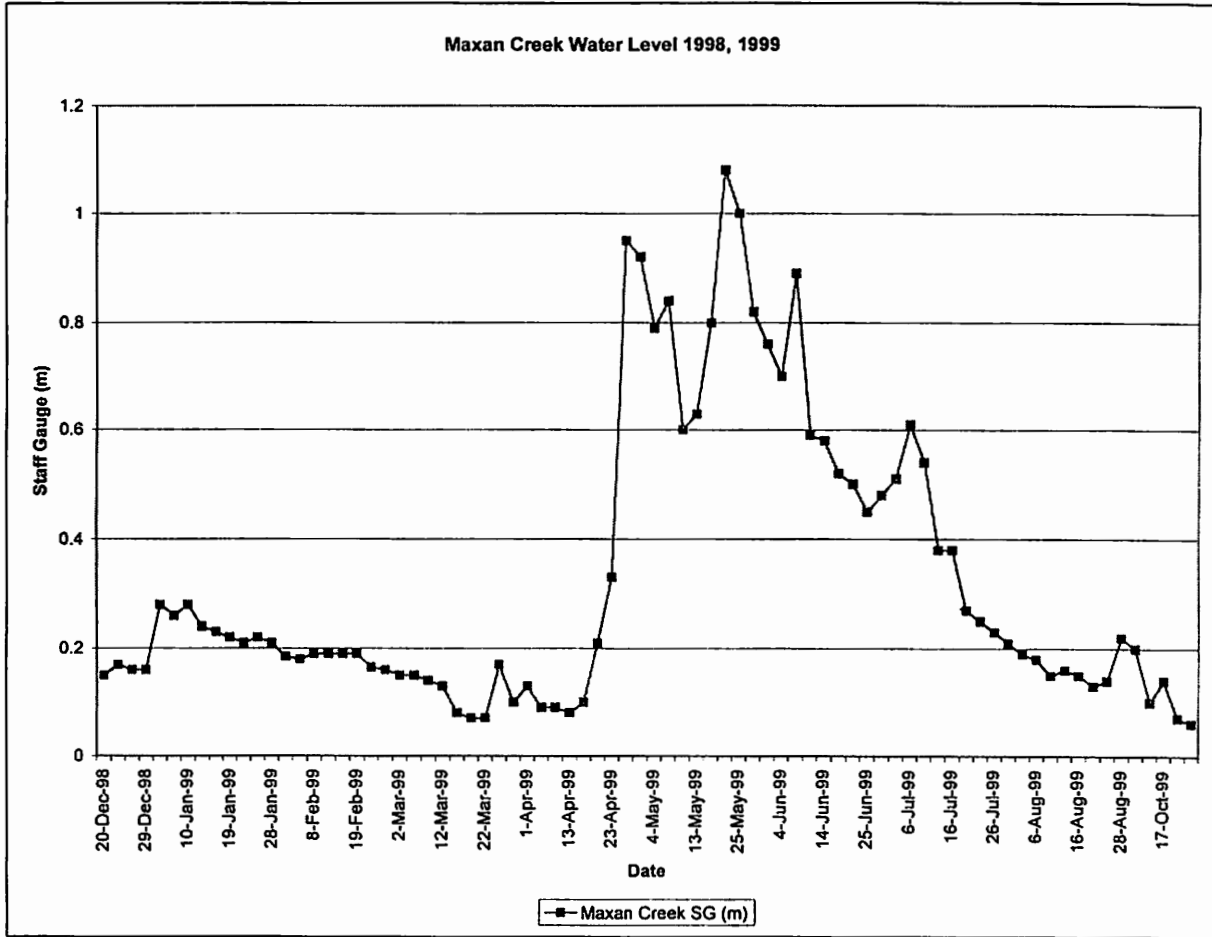
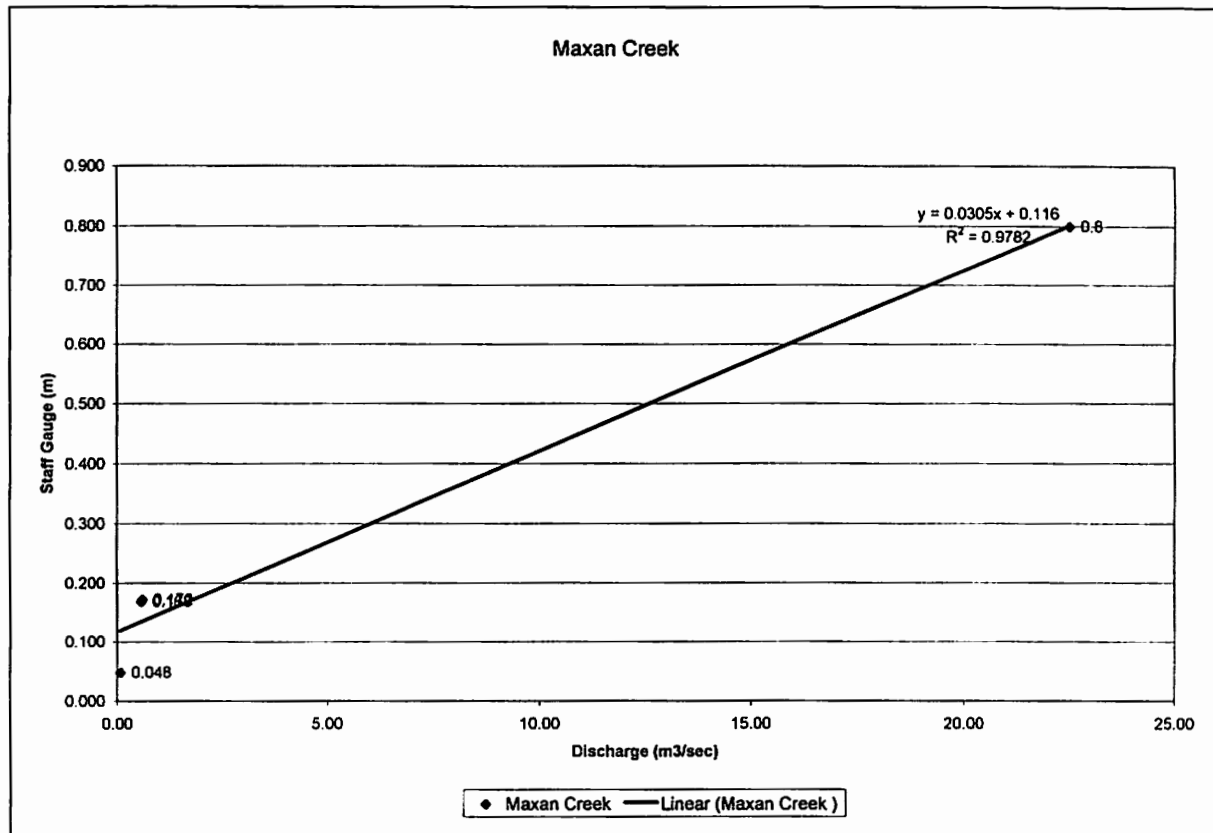


Figure 4.0 Maxan Creek Discharge Rating Curve for 1998 and 1999



3.3 BUCK CREEK AT THE MOUTH

Station 08EE013, Buck Creek at the mouth of Buck Creek is located 25 m upstream of the footbridge in the town of Houston, BC, 122 m upstream of the bridge across Highway 16.

During moderate to low flows, the discharge is obtained by wading. Two velocity cross sections were conducted by wading (Table 3). At higher velocities, a bridge mount is suspended from the Buck Creek footbridge. A bridge mount was not available on May 18, 1999 so average velocity was calculated using a neutrally buoyant object, and for confirmation, Water Survey of Canada was contacted and the discharge for May 18, 1999 was obtained.

Water level was recorded twice weekly until June of 1999, when the staff gauge was either vandalised or washed out. A graph of water level in 1998 and 1999 is presented in Figure 6. Water level data is included in Appendix 2. Figure 7 shows the discharge rating curve for 1998 and 1999. Photos of Buck Creek at the footbridge are provided in Appendix 3.0.

Table 3. Discharge at Buck Creek at the mouth for three periods in 1998 and 1999. The cross sections were completed 35 m downstream of the location of the staff gauge. The staff gauge was lost in June of 1999. Field notes are provided in Appendix 2.

Date	Staff Gauge (m)	Discharge (Q in m ³ /sec)
October 2, 1998	0.140	0.316
November 5, 1998	0.30	2.587
May 18, 1999	0.93	22.16
Staff gauge lost June, 1999	N/a	N/a

Figure 5 Buck Creek at the Footbridge Water Levels for 1998 and 1999 (to June 1999).

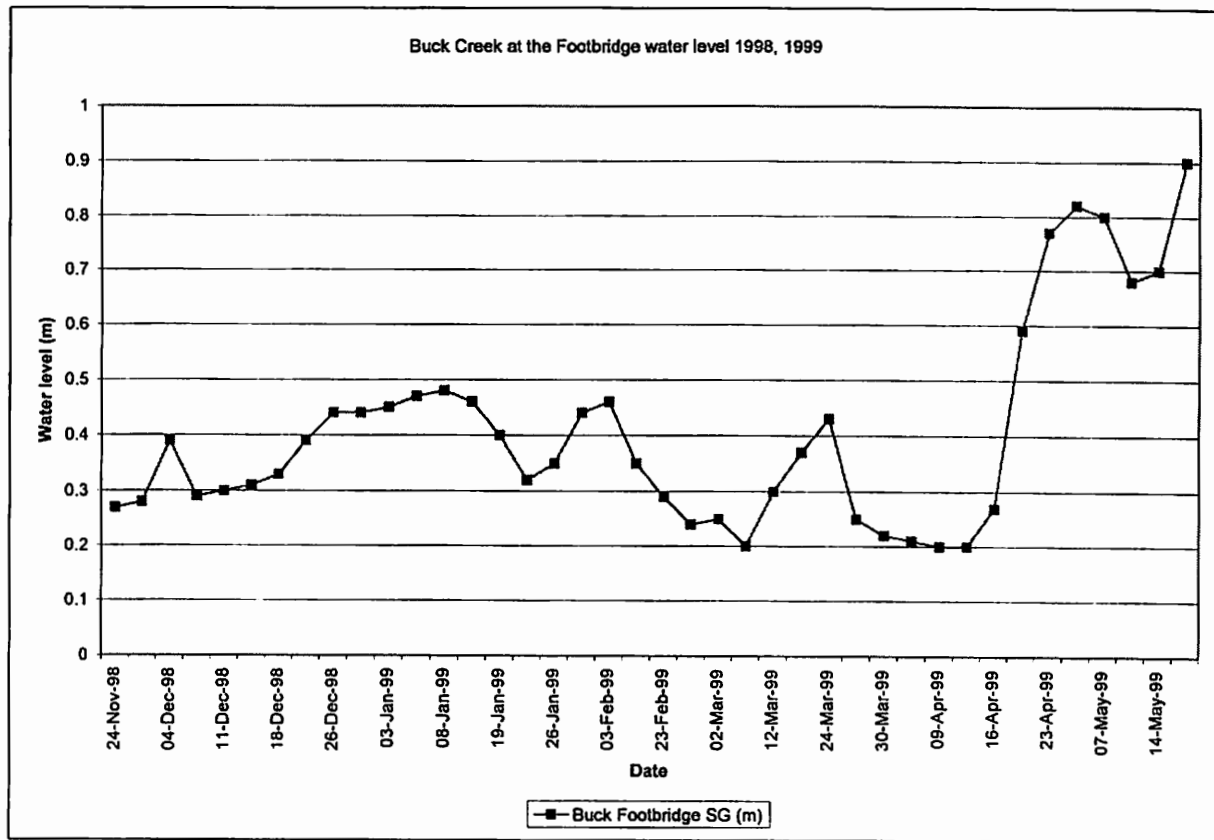
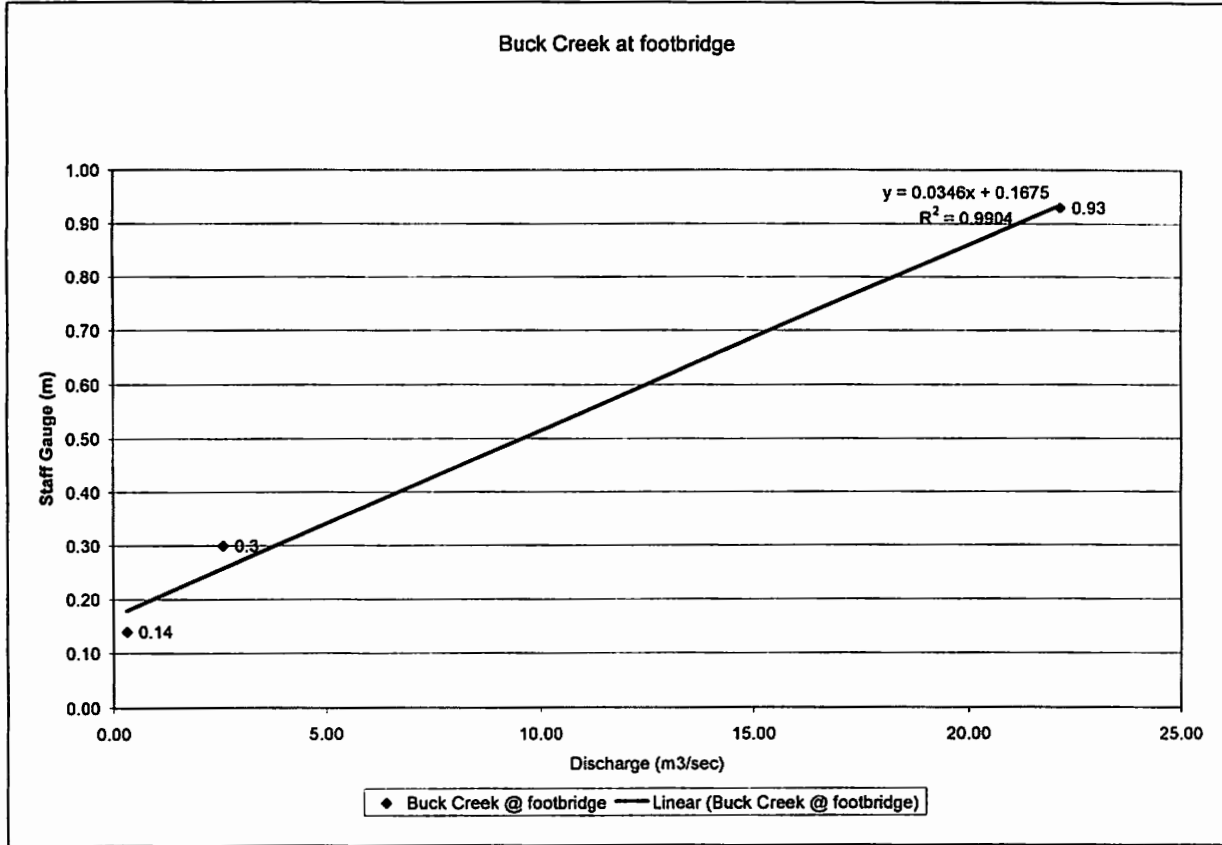


Figure 6 Buck Creek at the Footbridge Discharge Rating Curve



3.4 BUCK CREEK AT BUCK BRIDGE #1

Ms. Donas requested that a fourth staff gauge be installed in Buck Creek, at Buck Bridge #1. The information to be collected was required for a fish habitat restoration/rehabilitation/enhancement project, proposed by the Department of Federal Fisheries and Oceans.

The staff gauge was installed on the second to last bridge piling on the left bank of Buck Creek. Two benchmarks were located on other bridge pilings. Four velocity cross sections were completed at the site (Table 4). Staff gauge (water level) readings were recorded twice weekly for 1998 and 1999 (Figure 7, Appendix 2). A discharge rating curve for 1998 and 1999 is shown in Figure 8. Photos of Buck Creek at Bridge #1 are provided in Appendix 3.0.

Table 4. Discharge at Buck Creek at Buck Bridge #1 for 1998 and 1999. The cross sections were completed 15 m downstream of the staff gauge. Field notes are provided in Appendix 2.

Date	Staff Gauge (m)	Discharge (Q in m ³ /sec)
November 5, 1998	0.23	2.016
December 3, 1998	0.065	0.667
May 18, 1999	0.78	13.83
August 9, 1999	0.03	0.798

Figure 7.0 Buck Creek at Buck Bridge #1, Water Level 1998 and 1999

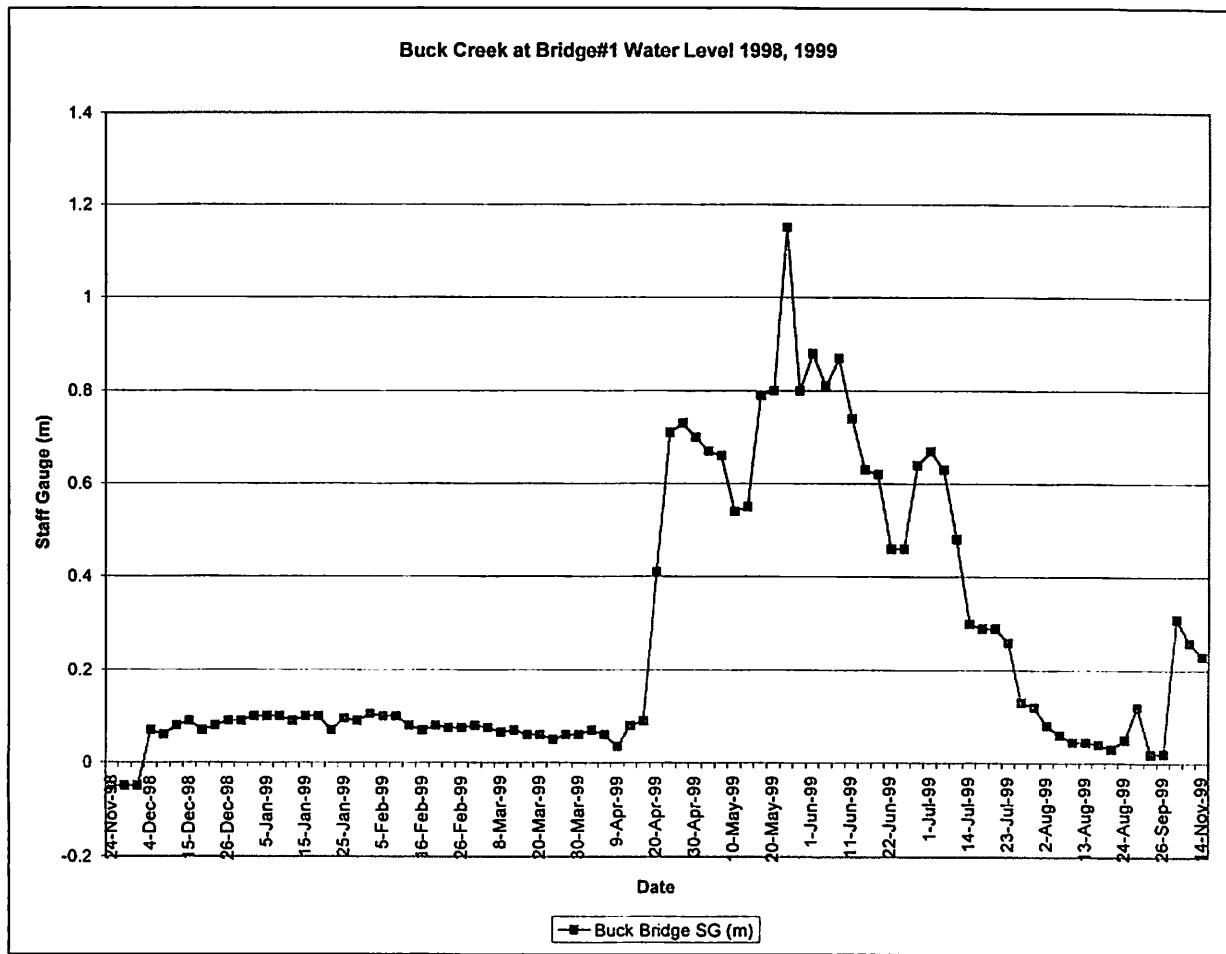
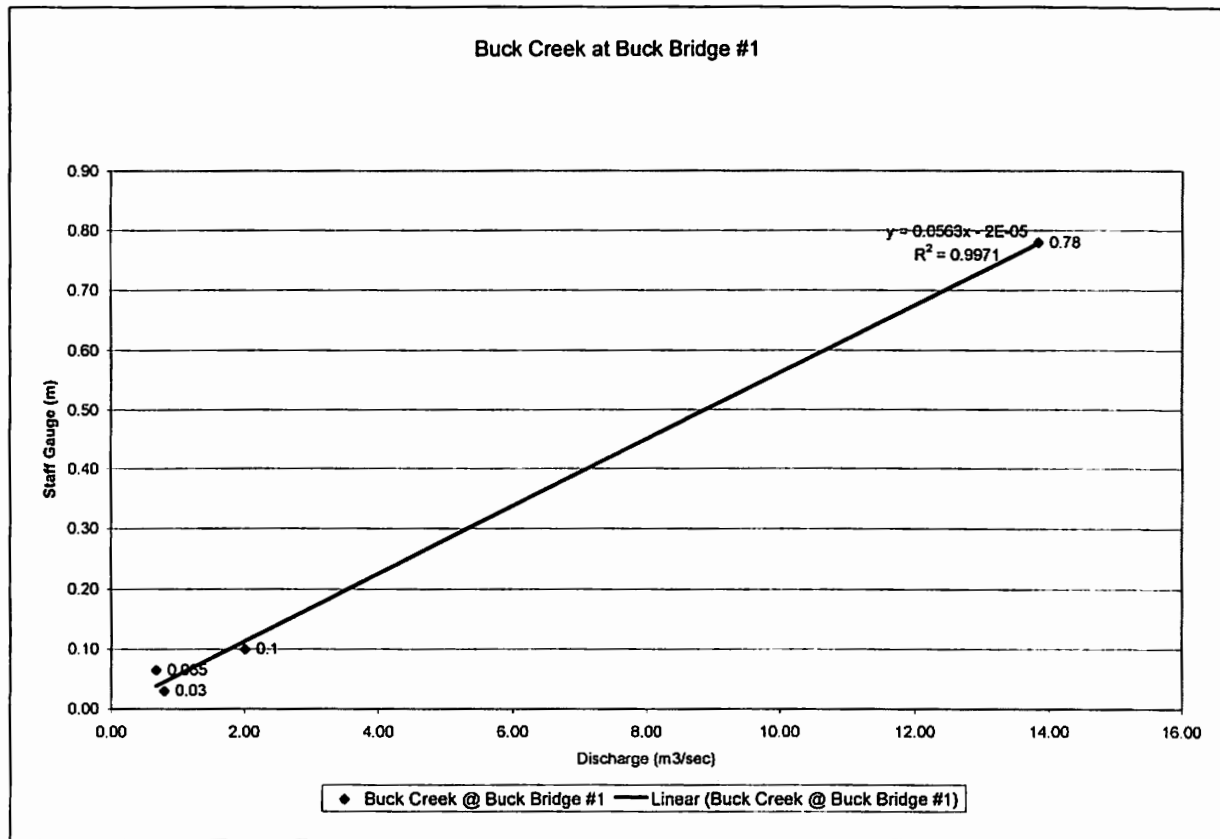


Figure 8.0 Buck Creek at Buck Bridge #1, Discharge Rating Curve for 1998 and 1999



4.0 CLOSURE

This report was prepared for Community Futures Development Corporation of Nadina for use in the ongoing investigations into impacts on fish, fish habitat and riparian habitat conditions on the Upper Bulkley River and tributaries to the Upper Bulkley. AGRA is pleased to be able to assist on this and other habitat restoration projects in the Skeena Region.

If you have any questions about this report, please call Jessica Chaplin in Smithers, at 250-847-8783, fax 250-847-9049 or email at agraee@bulkley.net

Sincerely,

AGRA Earth & Environmental Limited

Jessica Chaplin, B.Sc., RPBio
Aquatic Biologist

JH/rmm3
KS00055.ltr

5.0 REFERENCES

G. McG. Clark and Associates. 1997. Manual of Standard Operating Procedures for Hydrometric Surveys in British Columbia (RIC) Draft, October 1997. Water Inventory Section, Resources Inventory Branch, Ministry of Environment, Lands and Parks.

Water Survey of Canada Station Descriptions 08EE013 Buck Creek at the Mouth.

Water Survey of Canada Station Descriptions 08EE018 Maxan Creek above Bulkley Lake

Water Survey of Canada Station Descriptions 08EE009 Richfield Creek

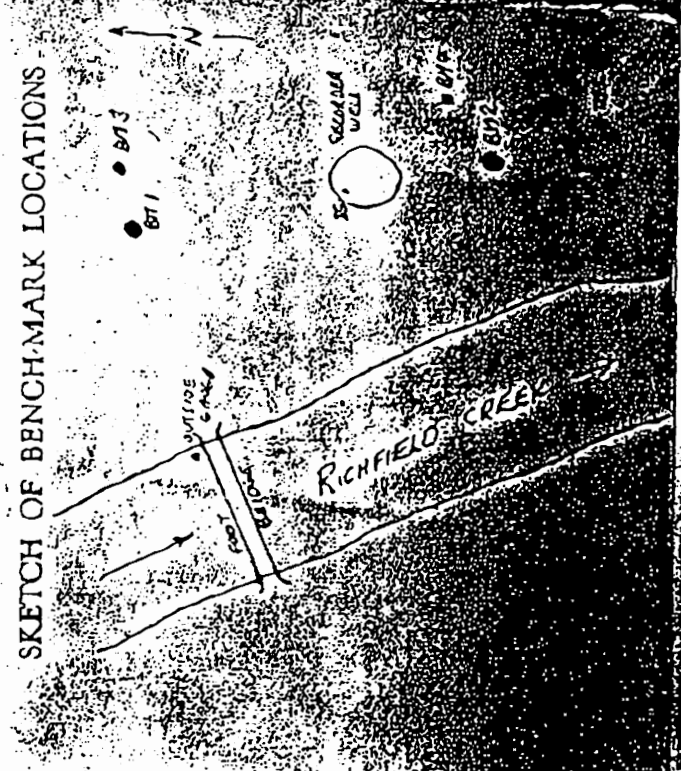
Appendix 1
Water Survey of Canada station descriptions

STATION LOCATION

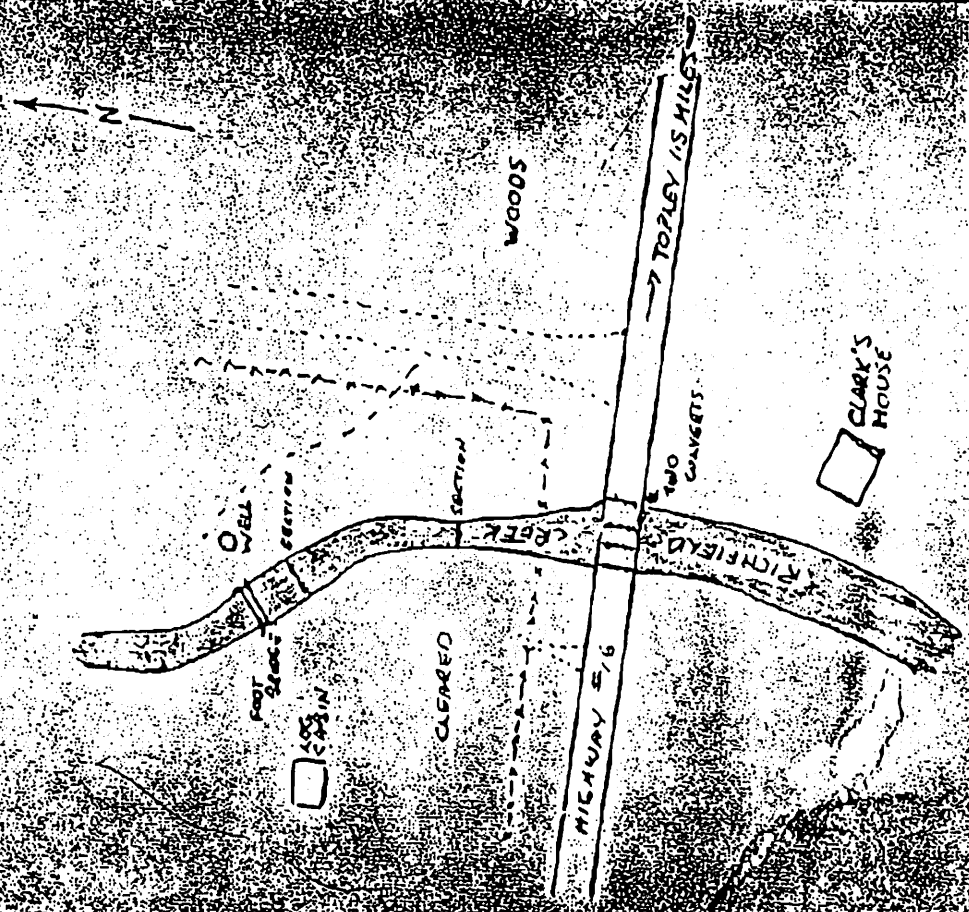
DEPARTMENT OF CHEMISTRY AND METALLOGY
 WATER RESOURCES DIVISION
 RICHFIELD, OHIO
 DISTRICT NO. 2638
 LOCATION: 54° 39' 57" N
 ESTABLISHED: SEPTEMBER 3, 1964
 NAME OF OBSERVER: J. L. SANDERSON
 DISTANCE: 1.5 MILES W.N.W. OF RICHFIELD, OHIO
 CHARACTER: UNDER HIGHWAY
 DESCRIPTION OF STATION: STAKE GAUGE 1-7 ON FOOT BRIDGE, 10' FROM RB.
 DESCRIPTION OF THE EQUIPMENT FROM WHICH MEASUREMENTS ARE MADE: WADING ALL STAGES
 LOCATION AND DESCRIPTION OF INITIAL POINT FOR ESTABLISHING STATION: 2-6" GRAV. SPINES ON RB.
 CHANNEL ABOVE THE STATION: straight or curved for about 100 feet, water swift, abundant, etc.
 CHANNEL BELOW THE STATION: straight or curved for about 100 feet, water swift, abundant, etc.
 RIGHT BANK: high, sandy, or low, liable to overflow, etc.
 LEFT BANK: high, sandy, or low, liable to overflow, etc.
 TYPE OF CHANNEL: GRAVE
 TYPE OF GRAVE: SPINE GRAVE

BRANCH STATION
 CIVIL ENGINEER: J. L. SANDERSON
 TOPOGRAPHY: 126° 29' 04" W
 BY: J. L. SANDERSON
 P.O. ADDRESS: RICHFIELD, OHIO
 CHARACTER OF OBSERVATION: TOPOGRAPHY, PACING, FROM MEASUREMENTS
 TYPE OF BRIDGE: U.S. SIDE
 MEASUREMENTS MADE: 100 feet, water swift, abundant, etc.
 100 feet, water swift, abundant, etc.
 TYPE OF CHANNEL: GRAVE
 TYPE OF GRAVE: SPINE GRAVE

NAME OF CHANNEL: OLE CHANNEL
 NUMBER OF CHANNELS AT LOW AND HIGH WATER: APPROXIMATE DEPTH AT HIGH WATER: NONE
 NOTE ANY CONDITIONS WHICH MAY AFFECT THE MEASUREMENT, ETC.: NONE
 BENCH-MARK: Describe fully, give elevation above base of the gauge and above sea-level or other datum, if possible; make sketch bringing out the principal features.
 BM 1 - WIRE WADDER ON NEAR APPROX. SET 2' ABOVE GROUND IN 12" SPACE 24" W. OF WELL ELEV. - 9.14
 BM 2 - WIRE WADDER ON NEAR APPROX. SET 7' ABOVE GROUND IN 18" SPACE 12" W. OF WELL ELEV. - 9.06
 BM 3 - ELEV. 7.24 (69) PILE BM SET 6' IN SHOULDER OF BM 1
 BM 4 - ELEV. 8.05 (69) PILE BM SET 8' W. OF FACE OF ESCAPE OBSTACLE
 DATE: APRIL 17, 1977
 TAKE SUFFICIENT MEASUREMENTS TO DEVELOP A CROSS-SECTION OF STREAM BED AND, BY USE OF LEVEL, DEVELOP BANKS TO SHOW HIGH-WATER MARK. REPAIR ALL ELEVATIONS TO PUMP LAMB.



SKETCH OF STATION LOCATION
Richfield Creek



PREPARED BY	DATE
REVIEWED BY	

Make a sketch showing the relative location of the station, gauge, bench-marks, tributaries, roads, etc.

PROJECT OF THE ENVIRONMENT
3 BRANCH - WATER SURVEY OF CANADA
DESCRIPTION OF STATION

NAME OF STATION: KLAT RIVER
PROV. B.C.

Latitude 116° 57' 55W
Scale: 1:250,000
BY G. R. CORNISH 17 1990
By 19
By 19
ics) (upstream, downstream) from

rich respect to towns, bridges, highways,
islands, falls, dams, etc.
RIDGE AVE. DRINKET RIVER @ BRIM
T OF MATTERS.

ion of the gauge. If chain gauge or wire
rom end of weight to the first marker:
ET GAUGE 2/5 RAIL @ BRIDGE

ipment from which measurements are made:
IE FLOW GAUGE
© LAW IN MEDIUM STAGE
© HIGH STAGE
ion of inlet point for soundings:
AT IN AGREEMENT
US ENERGY COM
S AT 100M - WHICH IS THE RIGHT BANK
S AT 100M

R 40A
(A-69)

DEPARTMENT OF ENERGY, MINES AND RESOURCES
INLAND WATERS BRANCH-WATER SURVEY OF CANADA

DESCRIPTION OF STATION

Station Number BEE-18

Station Name MAXAN CREEK

Above BULKLEY LAKE

Prov. B.C.
Latitude $54^{\circ} 25'$
Longitude $126^{\circ} 10' 12''$

Map Number 93/B E. HALF

Scale 1:50,000

Established September 27 1974

By BA LANGFORD

Relocated

By 19

Former location

(miles, yards) (upstream, downstream) from

Location of station with respect to towns, bridges, highways,
railroads, tributaries, islands, falls, dams, etc.

2.8 MILES WEST OF BURNS LAKE

8.1 MILES SOUTH OF HIGHWAY 16 AT BURNIN LAKE

TAKE FORESTDALE CANYON ROAD

3 MILES ABOVE BULKLEY LAKE

Description and location of the gauge. If chain gauge or wire
weight, give length from end of weight to the first marker:

AZI BRADKING GAUGE ACTIVATED BY 36 RANGE

SEVO MANOMETER

Description of the equipment from which measurements are made:

CABLEWAY 12' UPSTREAM OF GAUGE

WADING AT LOW STAGE

Location and description of initial point for soundings:

RIGHT BANK A FRAME

Description of channel or other conditions affecting control
and discharge and discharge measurement:

Number of channels at low and high water, approximate depth of
water, etc.:
ONE ALL STAGES

Coefficient for 7/10 method:

Note any conditions affecting the natural flow such as storage
and/or diversions:

Crest-stage gauge description:

Zero flow at G.H.:

Bench-marks: Describe fully, give year established, elevation
above zero of the gauge and above sea level or other datum,
if possible: 4.743 m (75)

BM 1 ELEV. 1536 (74) PIPE WITH BRONZE CAP 2' ABOVE
GROUND LEVEL 17' WEST OF GAUGE

4.743 m (75) SHELTER
BM 2 ELEV. 1409 (74) PIPE WITH BRONZE CAP 18" ABOVE
GROUND LEVEL 10' N.E. OF GAUGE

2.955 m (75) SHELTER EL: 1242 (77)

BM 3 ELEV. 1200 (74) PIPE WITH BRONZE CAP 12" ABOVE
GROUND LEVEL 35' NW. OF GAUGE
SHELTER. ELEV. 844 (77)

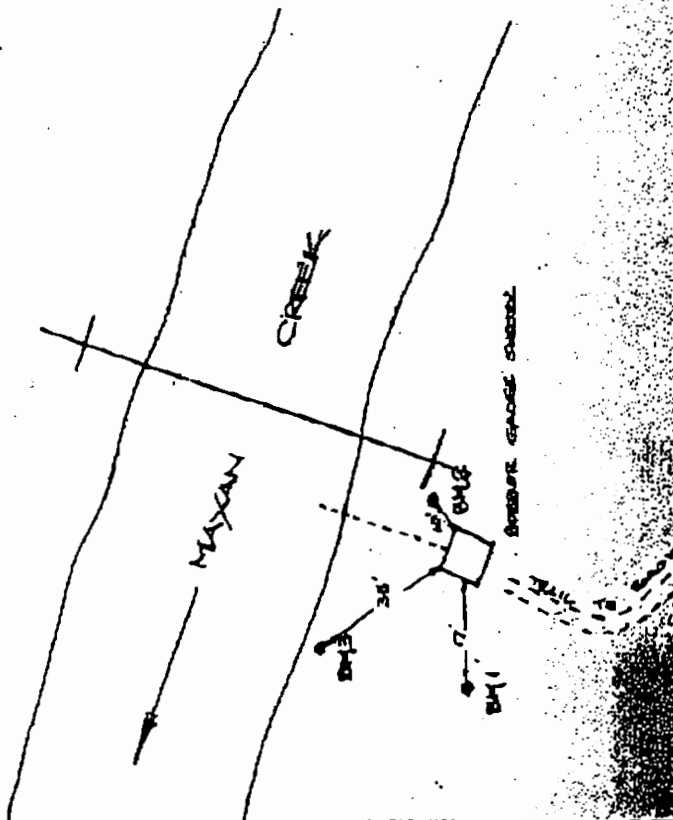
08EE018 MANN CREEK

ABOVE BULKLEY LAKE

Elevation of gauge zero:

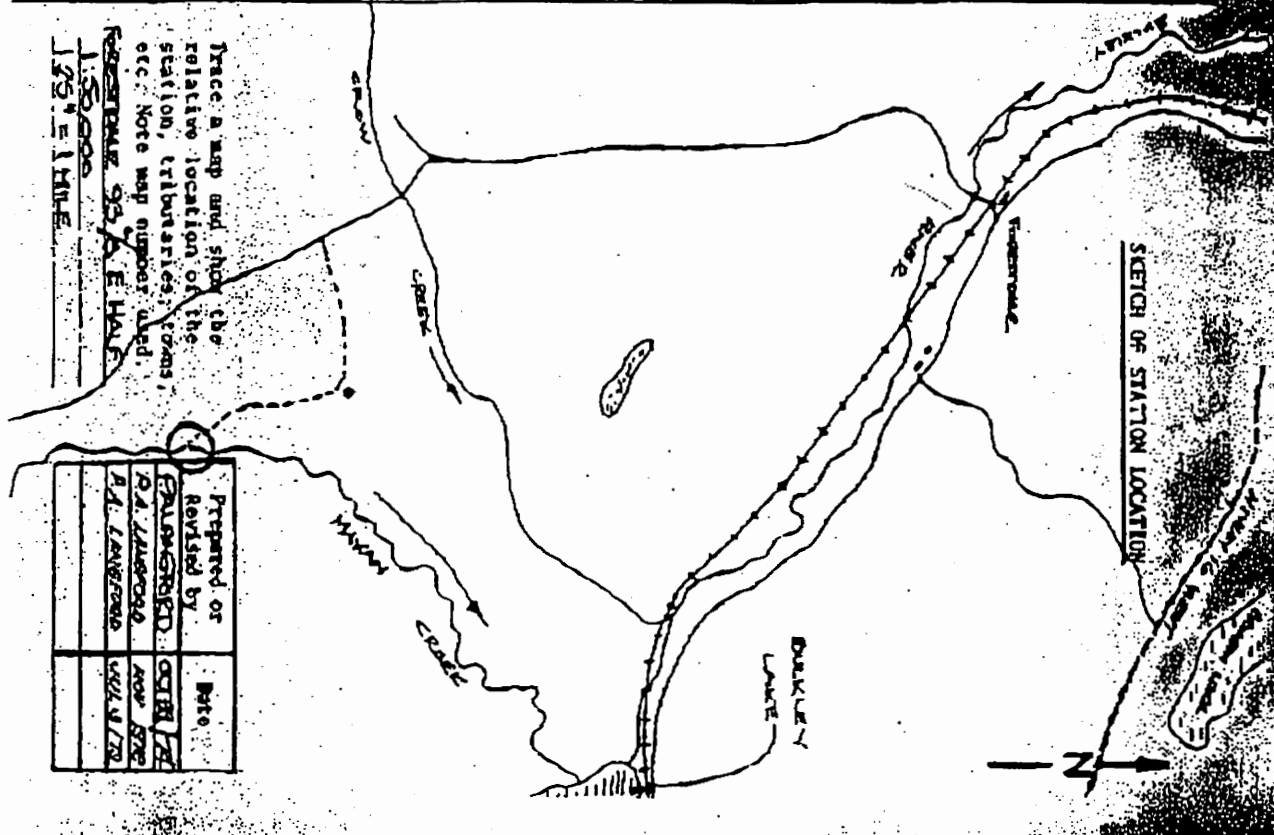
SKETCH OF STATION

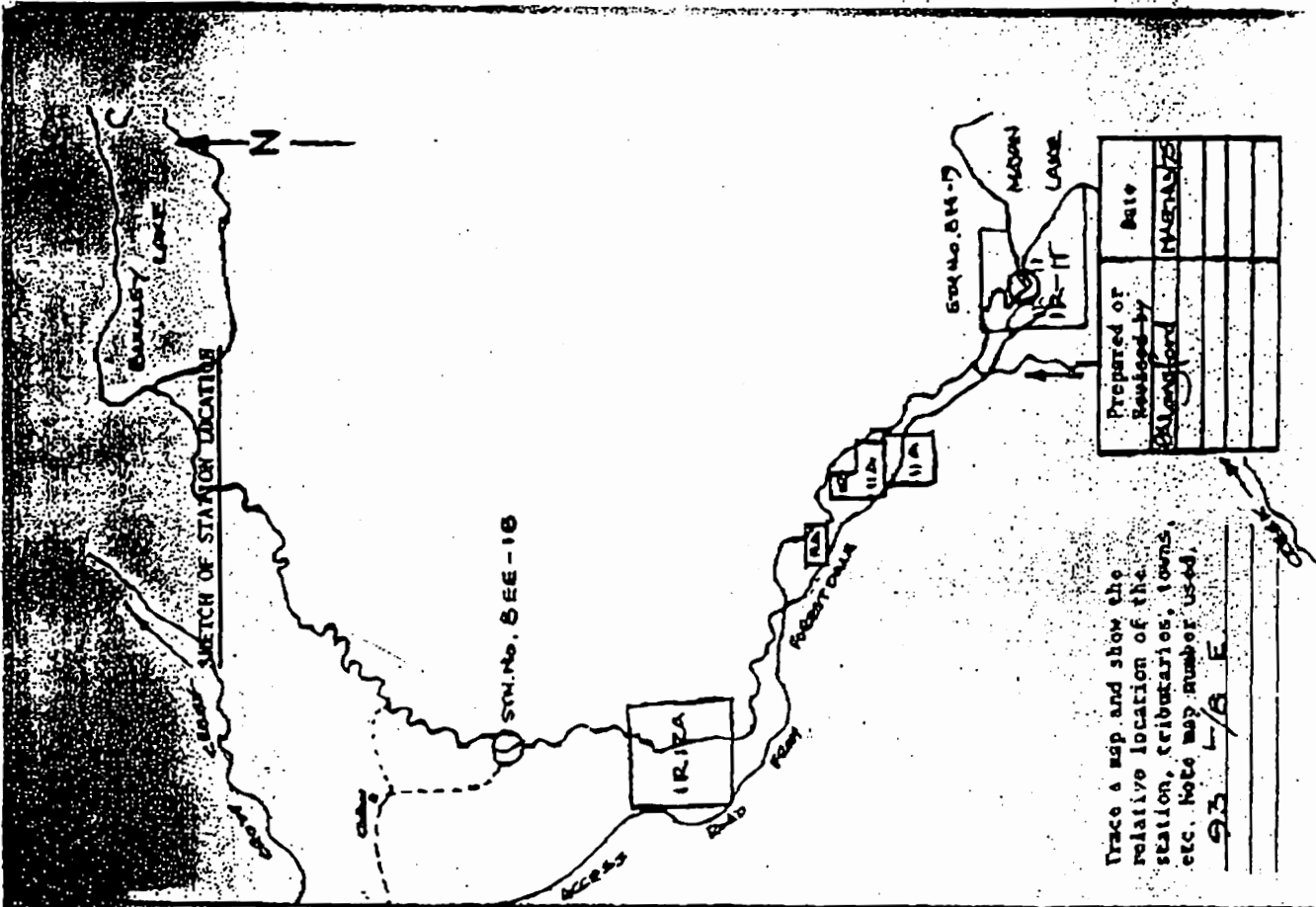
showing location of bench-marks, cableway, recorder, crest-stage gauge, caches, etc.



Trace a map and show the relative location of the station, tributaries, rivers, etc. Note map number and 1:50,000 1:25' = 1 INCH

Prepared or Revised by	Date
PAUL GRIED	02/11/78
D. A. LAMBERT	NOV 87
R. J. LAMBERT	08/11/78

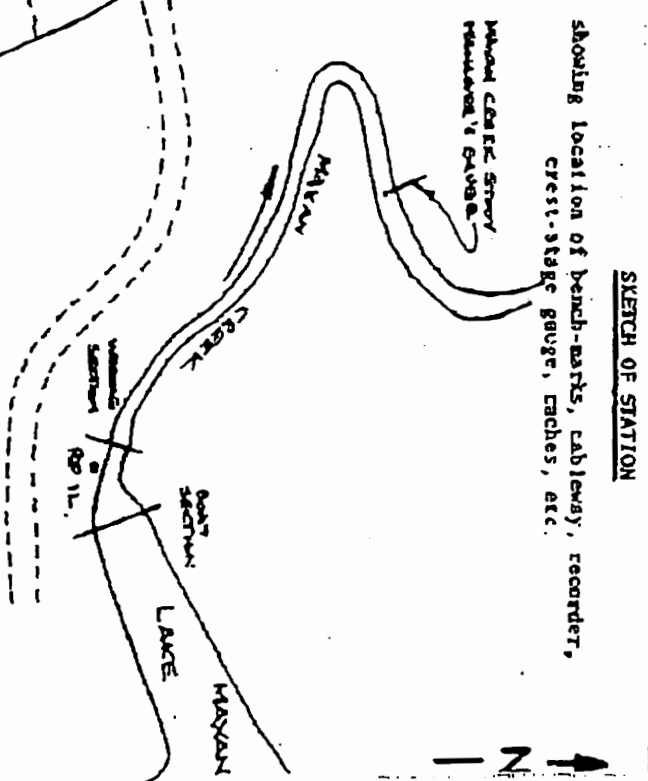




Trace a map and show the relative location of the station, tributaries, towns, etc. Note map number used.

93 L/A E

DBEED19 MARM CREEK
AT OUTLET OF MARM LAKE



Elevation of gauge zero: _____

DEPARTMENT OF ENVIRONMENT
WATER RESOURCES BRANCH - WATER SURVEY OF CANADA

DESCRIPTION OF STATION

Station Number OBBEO13

Station Name BUCK CAERH @ THE MOUTH

Prov. B.C.

Latitude 54° 23' 52" N Longitude 126° 39' 04" W

Map Number 95 1/2 X Scale 1:50,000

Established APRIL 12 1973 By S. B. GAINS

Reestablished 19 By

Relocated 19 By

(miles, yards) (upstream, downstream) from former location

Location of station with respect to towns, bridges, highways, railroads, trambuses, islands, falls, dams, etc.

1.2 MILES UPSTREAM OF HWY 16 BRIDGE CROSSING

BUCK CAERH @ MOUTH

Crest-stage gauge description:

Note any conditions affecting the natural flow such as storage and/or diversions:

Coefficient for 2/10 method:

Number of channels at low and high water, approximate depth of water, etc.: ONE AT ALL STAGES

Description of channel or other conditions affecting control and discharge and discharge measurement:

CREEK CONTINUED BY 2 FEET ON BOTH BANKS UP TO DOWN STREAM OF SOURCE

Location and description of initial point for soundings:

None

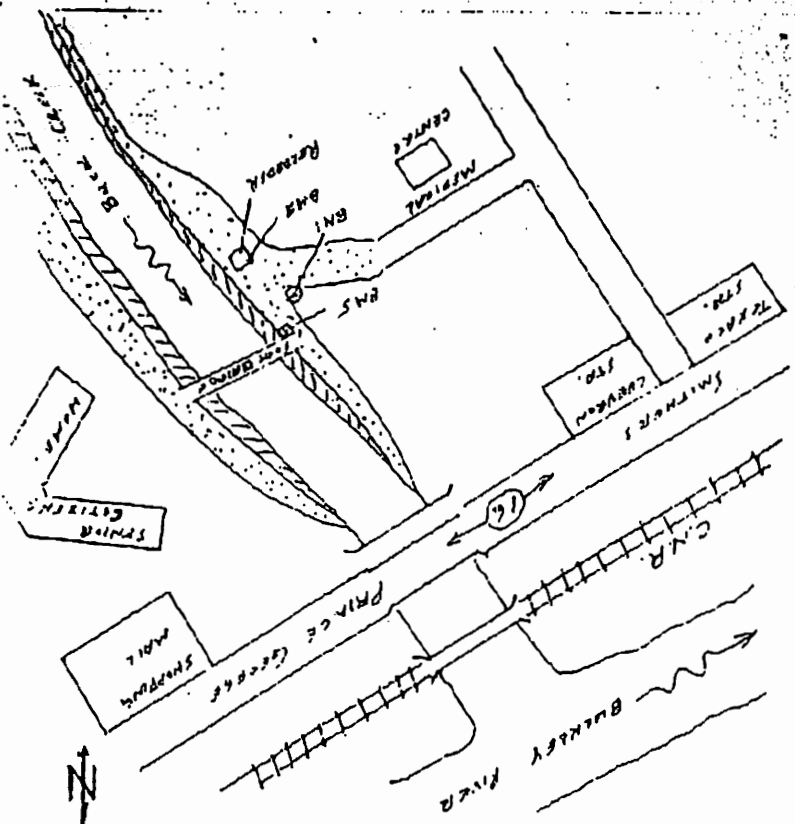
Description of the equipment from which measurements are made:

LEVEL TO WATER WITH SURVEYORS LEVEL EACH OPEN WATER VEGETATION

WARNING: LOAD TO HEAVY STAGE

BARIS: CANAL FROM FORTBIAK DAM @ DOWNSTREAM

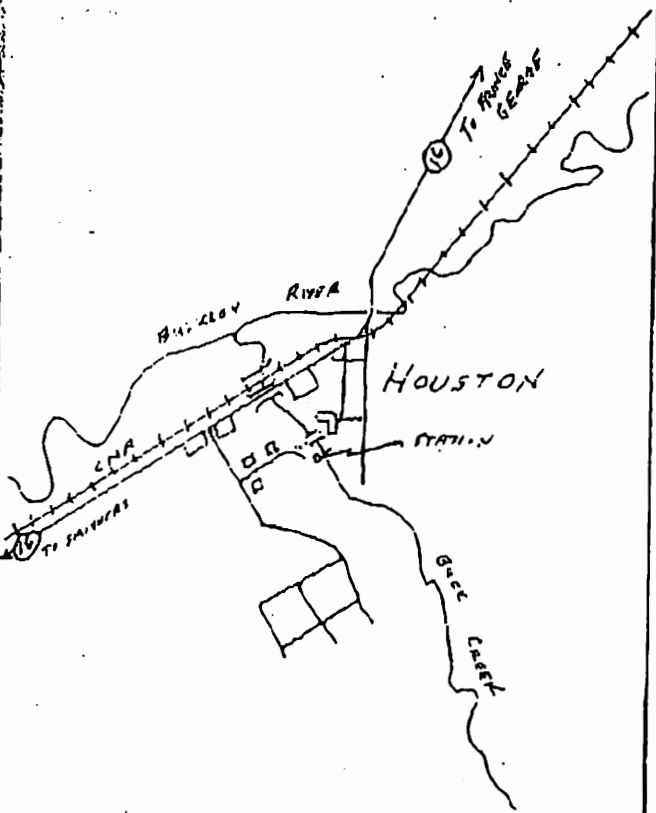
8. MILES TO HIGH STAGES



showing location of bench-marks, culvert, recorder, crest-stage gauge, cachers, etc.

SKETCH OF STATION

SKETCH OF STATION LOCATION



Trace a map and show the relative location of the station, tributaries, towns, etc. Note map number used.

5 1/2 93

Prepared or Revised by
LUTJAK

B.M. 6 - Brass cap on 2" pipe, 22 METRES WEST OF RECORDER. ELEV. 2.960 M. ABOVE G.D.

Back Creek

PARTMENT OF CHEMICAL MINES
WATER RESOURCES
STATION NO. 05EE005
DESCRIPTION OF STATION
REMPFIELD
(see TABLE)
Loc. No. DL 2638
Loc. 52° 30' 52" N Lon.
Established SEPTEMBER 13, 1964
Name of observer LUTJAK
Day 8 Distance from
Location of station with respect to towns, bridges, hills, dams, etc.: 1.5 MILES W.N.W. OF HIGHWAY #16 APPROX. 300' N.S. CONVEY UNDER HIGHWAY.
Description and location of the gauge. If chain gauge, height to the first marker: STAFF GAUGE 1-7 ON FOOT 10" FROM N.B.
Description of the equipment from which measured: WADING ALL STAGES
Location and description of initial point for sounding: 2 64 GAL. SPIRES ON R.B.
Channel above the station: straight or curved for above
Channel below the station: straight or curved for above
Right bank: high, mostly low, liable to overflow.
SILT GRAVEL
SILT GRAVEL

Appendix 2.
Water Level Data for 1998 and 1999

**STAFF GAUGE READING
RICHFIELD CREEK**

DATE	Weather	Time	AIR TEMP (C)	WATER TEMP (C)	STAFF GAUGE (cm)	SNOW PACK (cm)	ICE THICK (cm)	Richfield Page 1
Dec 20/98	H/O	11:15	-17	1	27	10	9	
22	H/O	10:30	-16	1	12	15	9	
26	H/O	11:15	-10	1	15	27	9	
29	H/O	10:45	-6	1	15	31	9	
Jan 3/99	H/O	11:00	-1	1	15	36	9	
5	H/O	9:50	2	1	13	31	8	
10	H/O/S	11:26	-6	1	13	36	7	
12	H/O/S	8:45	0	1	12	38	8	
15	H/O/S	8:43	-3	1	13	36	8	
19	H/O/S	10:41	-7	1	14	40	8	
22	Snowing	11:00	-10	1	13	38	12	
25	H/O	10:45	-9	1	13	36	13	
28	H/O	8:40	-16	1	13	38	15	
Feb 2/99	Snowing	11:40	-6	0.5	12	55	18	
5	H/O	9:45	0	0.5	13	51	18	
8	Sunny	11:15	-11	0.5	13	54	16.5	
12	Sunny	9:55	3	1	11	45	16	
16	Sunny	8:45	-8	0.5	10	45	16	
19	Sunny	8:46	-8	0.5	9	43	14.5	
23	Sunny	8:50	-7	1	9	44	15	
26	Sunny	8:55	-3	1	9	44	12	
Mar 2/99	Sunny	8:30	-4	1	8	44	11	
5	Sunny	8:30	-7	1	8	44	10	
8	Sunny	8:29	-2	1	8	43	9	
12	H/O	9:22	1	1	7	41	8	
17	Snowing	8:45	-4	0.5	11	45	5	
20	Sunny	8:50	3	1	10	43	3	
22	H/O	9:16	5	1	9	32	0	
26	Sunny	11:30	5	1	21	26	0	
30	Snowing	9:30	2	1	9	25	0	
Apr 1/99	Sunny	11:00	3	1	14	21	0	
6	Sunny	9:37	5	1	10	12	0	
9	Sunny	9:29	-2	1	24	5	0	
13	Sunny	9:18	1	1	19	0	0	
16	Sunny	8:30	4	1	11	0	0	
20	H/O	8:55	5	1	35	0	0	
23	H/O	8:55	6	1	51	0	0	
27	Sunny	8:45	-1	0.5	55	0	0	
30	H/O	9:00	8	1.5	52	0	0	
May 4/99	Sunny	9:14	3	1	44	0	0	
7	H/O	10:00	3	2	51	0	0	
10	Sunny	8:45	5	1	45	0	0	
13	Snowing	8:40	3	3	45	0	0	
18	H/O	8:35	5	4	76	0	0	
21	H/O	8:33	5	4	58	0	0	
25	Sunny	9:06	7	3	90	0	0	
28	Sunny	9:11	9	3.5	58	0	0	

DATE	Weather	Time	AIR TEMP (C)	WATER TEMP (C)	STAFF GAUGE (cm)	SNOW PACK (cm)	ICE THICK (cm)	Richfield Page 1
June 1/99	H/O	12:56	10	6	64	0	0	
4	Rain	2:00	12	6	60	0	0	
8	H/O	11:45	13	6	79	0	0	
11	Sunny	10:15	18	8.5	71	0	0	
14	Sunny	9:30	23	9	68	0	0	
18	Rain	11:30	16	11	58	0	0	
22	Rain	10:30	13	8	44	0	0	
25	H/O	12:00	17	11	40	0	0	
29	H/O	10:15	12	9	42	0	0	
JUL-1/99	Rain	12:10	10	10	46	0	0	
6	Sunny	10:45	18	10	48	0	0	
9	Sunny	8:00	17	10	37	0	0	
14	Sunny	8:44	18	10	24	0	0	
16	Sunny	8:00	5	8	23	0	0	
21	Sunny	8:10	17	12	17	0	0	
23	Sunny	9:30	14	10.5	16	0	0	
26	H/O	9:36	17	10	13	0	0	
28	Rain	4:45	13	10	12	0	0	
AUG-2/99	Sunny	3:39	26	13	10	0	0	
6	Sunny	9:40	18	13	9	0	0	
10	Sunny	10:00	14	11	7	0	0	
13	Sunny	8:35	10	10	8	0	0	
16	H/O	7:45	9	12	7	0	0	
20	Sunny	1:58	18	15	6	0	0	
24	Rain	11:30	11	12	9	0	0	
28	H/O	8:50	13	9.5	21	0	0	
SEP12/99	Sunny	1:00	14	7	21	0	0	
26	H/O	11:00	8	6	20	0	0	
OCT17/99	H/O	2:00	10	3	14	0	0	
31	Sunny	2:50	1	0	9	0	0	
NOV14/99	H/O	9:10	1	0	14	0	0	



**STAFF GAUGE READING
MAXAN CREEK**

DATE	Weather	Time	AIR TEMP (C)	WATER TEMP (C)	STAFF GAUGE (cm)	SNOW PACK (cm)	ICE THICK (cm)	Maxan Page 1
Dec 20/98	H/O	9:00	-18	1	15	20	19	
22	H/O	9:00	-10	1	17	21	23	
26	H/O	10:00	-10	1	16	47	25	
29	H/O	8:00	-8	1	16	49	26	
Jan 3/99	H/O	9:12	-1	1	28	51	28	
5	H/O	12:00	2	1	26	46	26	
10	H/O/S	12:25	-4	1	28	45	29	
12	Sunny	10:00	-1	1	24	50	28	
15	Sunny	9:58	-5	1	23	51	29	
19	H/O/S	9:29	-10	1	22	56	30	
22	Snowing	9:47	-12	1	21	56	30	
26	H/O	2:10	-5	1	22	57	30	
28	Sunny	10:30	-16	0.5	21	59	33	
Feb 2/99	Snowing	10:35	-8	0.5	18.5	70	33	
5	Snowing	11:30	0	0.5	18	69	33	
8	Sunny	10:20	-12	0.5	19	72	33	
12	Sunny	9:15	4	0.5	19	67	32	
16	Sunny	10:16	-8	0.5	19	67	33	
19	Sunny	9:59	-8	0.5	19	65	32	
23	Sunny	10:30	-7	1	16.5	64	35	
26	Sunny	10:20	-1	1	16	63	34	
Mar 2/99	Sunny	10:25	-2	1	15	75	34	
5	Sunny	11:15	0	1	15	77	33	
8	Sunny	10:00	-2	1	14	72	32	
12	H/O	10:30	2	1	13	70	31	
17	Snowing	10:35	-4	0.5	8	69	32	
20	Sunny	10:30	3	1	7	65	29	
22	H/O	10:29	5	1	7	56	21	
26	Sunny	8:45	0	1	17	52	19	
30	Snowing	11:00	4	1	10	54	17	
Apr 1/99	Sunny	9:00	3	1	13	53	15	
6	Sunny	10:55	5	1	9	52	0	
9	Sunny	10:45	-2	1	9	43	0	
13	Sunny	10:45	2	1	8	42	0	
16	Sunny	9:30	3	1	10	36	0	
20	H/O	10:15	5	1	21	20	0	
23	H/O	10:20	6	1	33	16	0	
27	Sunny	10:15	4	0.5	95	3	0	
30	H/O	10:20	6	1	92	0	0	
May 4/99	Sunny	10:55	4	3	79	0	0	
7	Sunny	11:20	5	3	84	0	0	
10	Sunny	10:15	5	3	60	0	0	
13	Snowing	10:20	3	3	63	0	0	
18	H/O	10:15	5	3.5	80	0	0	
23	Sunny	11:00	9	4	108	0	0	
25	Sunny	10:54	10	5	100	0	0	
28	Sunny	11:03	9	5	82	0	0	

DATE	Weather	Time	AIR TEMP (C)	WATER TEMP (C)	STAFF GAUGE (cm)	SNOW PACK (cm)	ICE THICK (cm)
June 1/99	H/O	1:55	10	7	76	0	0
4	H/O	3:40	9	7	70	0	0
8	H/O	1:30	13	7	89	0	0
11	Sunny	11:45	20	8	59	0	0
14	Sunny	11:10	23	9	58	0	0
18	Rain	12:45	15	12	52	0	0
22	Rain	11:45	13	9.5	50	0	0
25	H/O	1:05	16	12	45	0	0
29	H/O	11:30	12	10	48	0	0
July 1/99	Rain	2:00	10	10	51	0	0
6	Sunny	12:00	18	12	61	0	0
9	Sunny	9:45	18	12	54	0	0
14	Sunny	10:00	18	12	38	0	0
16	Sunny	9:30	8	10	38	0	0
21	Sunny	9:30	18	13	27	0	0
23	Sunny	10:45	16	12	25	0	0
26	H/O	11:10	17	12	23	0	0
28	Rain	6:00	13	12	21	0	0
AUG 2/99	Sunny	2:00	26	13	19	0	0
6	Sunny	10:45	17	15	18	0	0
10	Sunny	11:30	14	13	15	0	0
13	Sunny	10:25	9	12	16	0	0
16	H/O	9:20	10	13	15	0	0
20	Sunny	3:40	19	14	13	0	0
24	Rain	1:15	11	13	14	0	0
28	Sunny	10:05	15	10	22	0	0
SEP12/99	Sunny	2:00	15	8	20	0	0
26	H/O	12:45	6	5	10	0	0
OCT17/99	Sunny	3:00	10	3	14	0	0
31	H/O	2:02	2	1	7	0	0
NOV14/99	H/O	10:05	1.5	1	6	0	0



Staff Gauge Readings Winter 1998/1999: Reach 1 Lower Buck Creek

Date	Depth _w (m)	Comment
11/24/98	0.27	
11/27/98	0.28	
12/04/98	0.39	
12/08/98	0.29	
12/11/98	0.3	
12/15/98	0.31	
12/18/98	0.33	
12/22/98	0.39	jim/tracy
12/26/98	0.44	
12/29/98	0.44	
01/03/99	0.45	
01/05/99	0.47	
01/08/99	0.48	
01/12/99	0.46	
01/19/99	0.4	
01/22/99	0.32	
01/26/99	0.35	
01/29/99	0.44	
02/03/99	0.46	scott/tenley
02/09/99	0.35	
02/23/99	0.29	
02/26/99	0.24	
03/02/99	0.25	
03/05/99	0.2	
03/12/99	0.3	
03/19/99	0.37	Very warm, sunny last few days
03/24/99	0.43	Open areas visible near gauge
03/26/99	0.25	Open except for some ice upstream, warm temperatures (John)
03/30/99	0.22	Completely open, slightly cooler temperatures over last few days
04/06/99	0.21	
04/09/99	0.2	
04/13/99	0.2	
04/16/99	0.27	
04/20/99	0.59	Increasing snowmelt plus moderately heavy rains
04/23/99	0.77	
05/04/99	0.82	
05/07/99	0.8	
05/11/99	0.68	
05/14/99	0.7	
05/18/99	0.9	



STAFF GAUGE READING (Three Sheets)
BUCK CREEK BRIDGE 1 STAFF GAUGE

DATE	STAFF GAUGE (cm)	WATER TEMP (C)	SNOW PACK (cm)	AIR TEMP (C)	ICE THICK (cm)
Nov 24/98	-5	1	7	-1	2.6
27	-5	1	7	-5	4
Dec1/98	-5	1	9	-5	5.1
4	7	1	9	1	6.5
8	6	1	9	-10	6.5
11	8	1	7	2	8.5
15	9	1	6	2	8.5
18	7	1	23	-5	14
22	8	1	27	-22	16
26	9	1	37	-10	22
29	9	1	41	-5	23
Jan 3/99	10	1.5	47	0	24
5	10	1.5	45	3	21
8	10	1	45	-7	20
12	9	1	46	0	17
15	10	1	47	-2	18
19	10	1	48	-4	18
22	7	1	48	-10	18
25	9.5	0.5	47	-9	18
28	9	0.5	46	-7	19
Feb 2/99	10.5	0.5	80	-1	19
5	10	0.5	77	1	19
8	10	0.5	84	-12	20
12	8	0.5	80	3	19
16	7	0.5	72	2	20
19	8	0.5	71	3	24
23	7.5	1	75	2	24
26	7.5	1	73	4	20
Mar 2/99	8	1	74	3	18
5	7.5	1	78	0	17
8	6.5	1	76	0	16
12	7	1	79	4	14
17	6	0.5	77	-4	14
20	6	1	75	8	12
22	5	1	74	4	8
26	6	1	63	5	0
30	6	1	66	1	0
Apr 1/99	7	1	64	4	0
6	6	1	58	2	0
9	3.5	0	58	-5	0
13	8	1	51	8	0
16	9	1	41	8	0
20	41	1	20	9	0
23	71	1	16	11	0
27	73	1	0	8	0
30	70	1	0	8	0

DATE	STAFF GAUGE (cm)	WATER TEMP (C)	SNOW PACK (cm)	AIR TEMP (C)	ICE THICK (cm)
May 4/99	67	1.5	0	1	0
7	66	3	0	3	0
10	54	3	0	10	0
13	55	4	0	6	0
18	79	4	0	6	0
20	80	4	0	7	0
25	115	6	0	9	0
28	80	6	0	8	0
June 1/99	88	6	0	10	0
4	81	8	0	13	0
8	87	8	0	13	0
11	74	10	0	15	0
14	63	14	0	24	0
18	62	12	0	16	0
22	46	10	0	13	0
25	46	12	0	15	0
29	64	10	0	12	0
JUL-1/99	67	11	0	8	0
6	63	13	0	21	0
9	48	12	0	20	0
14	30	12	0	18	0
16	29	10	0	13	0
21	29	13	0	17	0
23	26	13	0	17	0
26	13	13	0	16	0
28	12	13	0	14	0
AUG-2/99	8	14	0	26	0
6	6	15	0	17	0
10	4.5	12	0	9	0
13	4.5	12	0	8	0
16	4	12	0	12	0
21	3	13	0	10	0
24	5	12	0	10	0
28	12	11	0	13	0
SEP12/99	1.9	10	0	17	0
26	2	6	0	6	0
OCT17/99	31	4.5	0	7	0
31	26	2	3	-4	1
NOV14/99	23	1	1	10	0



Appendix 3.0 Photographs of Water Survey of Canada Stations Richfield, Maxan, Buck
Creek at the Footbridge and Buck Bridge #1.

Richfield Creek looking downstream. Sept. 21/98.



Richfield Creek staff gauge. Sept. 21/98.



Maxan Creek, WSC Station
08EE018 on right bank. Sept.
22/98



Maxan Creek, WSC Station
08EE018 looking downstream.
Sept. 22/98



Buck Creek at confluence with Bulkley River. Staff gauge on right bank.



Buck Creek at confluence with Bulkley River. Looking upstream. Oct. 2/98.



Buck Creek at confluence with Bulkley River. Staff gauge on right bank.



Buck Creek at confluence with Bulkley River. Looking upstream. Oct. 2/98.



Appendix 4.0 Field Notes for Establishment of New Stations

Project: KS00055
 Client: Department of Federal Fisheries and Oceans, Nadina Community Futures
 Title: Re-installation of 4 Water Survey of Canada staff gauges

Site: Ritchfield Creek
 Location: 15 miles WNW of Topley, on Highway #16, approximately 100 m upstream of the multi plate culvert under the highway
 Date: September 22, 1998
 Installed staff gauge, installed bench marks, completed velocity cross section

BM#1 tree on left bank upstream of staff gauge, 7 degrees E of N, 15 m upstream
 BM#2 tree on left bank upstream of staff gauge, 6 degrees E of N, 17.35 m upstream
 SG top of metal plate of the 1.0 m staff gauge

	BS	FS	Elev	HI
BM#1	-0.05	0	1000	1.224
BM#2	0	0.098		
SG	0	1.664		

Velocity: velocity cross section located 5 m upstream of the staff gauge

Date: September 22, 1998 SG: 0.055 $0.6689 \text{ revs/sec} + 0.0101$

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0	0	0	0	0	0	0	0	0 RB
0.5	76	0	0	0	0	0	0	
1	92	0	0	0	0	0	0	
1.5	100	0	0	0	0	0	0	
2	104	0	0	0	0	0	0	
2.5	104	0.5	0	0	0	0	0	0 wetted width
3	106	1	0	0	0	0	0	0 no current
3.5	110	10	23	41.96	0.377	0.019	0.019	
4	116	17	6	46.4	0.097	0.008	0.027	
4.5	110	11	9	41.1	0.157	0.009	0.036	
5	111	14	15	43.9	0.239	0.017	0.052	
5.5	113	18	11	42.5	0.183	0.016	0.069	
6	115	20	21	43.2	0.335	0.034	0.102	
6.5	106	12	11	45.2	0.173	0.010	0.113	
7	104	10	0	0	0.000	0.000	0.113	behind rock
7.5	98	8	3	41.2	0.059	0.002	0.115	
7.7	98	0	0	0	0.000	0.000	0.115	wetted width
8	86	0	0	0	0	0	0	
8.5	78	0	0	0	0	0	0	
9	76	0	0	0	0	0	0	
9.5	70	0	0	0	0	0	0	
10	56	0	0	0	0	0	0	
10.5	6	0	0	0	0	0	0	
10.6	0	0	0	0	0	0	0	0 LB

Site: Ritchfield Creek

Velocity: velocity cross section located 5 m upstream of the staff gauge

Date: November 4 0:40 SG= 0.216 $0.6729 \text{ revs/sec} + 0.0036$

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
1	0	0	0	0	0	0	0	0 RB
1.5		7	0	0	0.000	0.000	0.000	too shallow
2		14	40	48.9	0.554	0.039	0.039	
2.5		19	30	41.4	0.491	0.047	0.085	

3	23	40	47.7	0.568	0.065	0.151
3.5	31	30	43.6	0.467	0.072	0.223
4	34	10	46.2	0.149	0.025	0.248
4.5	30	25	41.6	0.408	0.061	0.310
5	29	35	46.2	0.513	0.074	0.384
5.5	34	35	53.5	0.444	0.075	0.460
6	37	25	41.5	0.409	0.076	0.535
6.5	32	40	50.3	0.539	0.086	0.621
7	31	35	51.7	0.459	0.071	0.693
7.5	19	45	41	0.742	0.071	0.763
8	12	35	40	0.592	0.036	0.799
8.5	4	0	0	0.000	0.000	0.799
9	0	0	0	0.000	0.000	0.799 LB

finished at 13:01, staff gauge 0.215

MAXAN CREEK

Site: Maxan Creek

Location: 28 miles west of Burns Lake. 8.1 miles south of Highway 16 at Broman Lake, take Forestdale Canyon Road, 3 miles above Bulkley Lake.

Date: September 22, 1998

Installed staff gauge, installed bench marks, completed velocity cross section

- BM#1 tree 7.5 m upstream of the LB tower 1.0 m high, 4 inch lag bolt
- BM#2 pipe, 1.5 m from LB tower 20 cm high, no cap (same as BM#2 on the WSC records)
- BM#3 tree 6.0 m upstream of LB tower on bank. Lag bolt installed 1.0 m from ground
- SG top of metal plate of the 1.0 m staff gauge

	BS	FS	Elev	HI
BM#1	0.032	0	1000	0
BM#2	0	0.902		
BM#3	0	0.878		
SG	0	2.056		

Velocity: velocity cross section located 25 m downstream of the staff gauge

Date: September 22, 1998 SG=0.048 0.6689*revs/sec+0.0101

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0	0	0	0	0	0	0	0	0 RB
0.25	62	9	0	0	0	0	0	0 wetted width
0.5	66	12	1	47.3	0.024	0.001	0.001	
1	72	17	7	45.5	0.113	0.010	0.011	
1.5	76	19	9	44.7	0.145	0.014	0.025	
2	80	21	8	41.2	0.140	0.015	0.040	
2.5	80	20	7	41	0.124	0.012	0.052	
3	77	16	7	42.2	0.121	0.010	0.062	
3.5	79	16	5	47.4	0.081	0.006	0.068	
4	75	10	8	42.3	0.137	0.007	0.075	
4.5	79	12	6	49.3	0.092	0.005	0.080	
5	77	8	0	0	0	0	0	0 no current
5.5	76	6	0	0	0	0	0	0 no current
6	72	0.5	0	0	0	0	0	0 too shallow
6.5	76	0	0	0	0	0	0	0 wetted width
7	72	0	0	0	0	0	0	
7.5	72	0	0	0	0	0	0	
8	71	0	0	0	0	0	0	
8.5	75	0	0	0	0	0	0	

9	77	0	0	0	0	0	0
9.5	77	0	0	0	0	0	0
10	77	0	0	0	0	0	0
10.5	80	0	0	0	0	0	0
11	86	0	0	0	0	0	0
11.5	89	0	0	0	0	0	0
12	102	2	0	0	0	0	0 small pond
12.5	101	0	0	0	0	0	0 11.8 to 12.6 m
13	97	0	0	0	0	0	0
13.5	90	0	0	0	0	0	0
14	80	0	0	0	0	0	0
14.5	0	0	0	0	0	0	0 LB

Site: Maxan Creek

Velocity: velocity cross section located 25 m downstream of the staff gauge

Date: November 4 10:30 SG=0.168 0.6729*revs/sec+0.0036

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0	0	0	0	0	0	0	0	0 LB
0.5		0		0	0	0	0	0
1		0	0	0	0	0	0	0 wetted width
1.5		3	0	0	0	0	0	0 too shallow
2		6	0	0	0	0	0	0 too shallow
2.5		7	0	0	0	0	0	0 no current
3		4	0	0	0	0	0	0 small gravel bar
3.5		2	0	0	0	0	0	0
4		2	0	0	0	0	0	0
4.5		2	0	0	0	0	0	0
5		5	0	0	0	0	0	0
5.5		5	0	0	0	0	0	0
6		7	12	41.9	0.196	0.007	0.007	
6.5		9	11	40.3	0.187	0.008	0.015	
7		12	21	41.7	0.342	0.021	0.036	
7.5		16	20	38.6	0.352	0.028	0.064	
8		17	30	48.5	0.420	0.036	0.100	
8.5		20	30	46.3	0.440	0.044	0.144	
9		20	35	45.8	0.518	0.052	0.195	
9.5		21	30	41.5	0.490	0.051	0.247	
10		24	40	42.2	0.641	0.077	0.324	
10.5		24	35	41.3	0.574	0.069	0.393	
11		24	40	45.2	0.599	0.072	0.465	
11.5		21	30	46.8	0.435	0.046	0.510	
12		21	20	43	0.317	0.033	0.544	
12.5		18	25	48.1	0.353	0.032	0.575	
13		0	0	0		0	0.575	RB

finished at 11:03 SG=0.170

BUCK CREEK

Site: Buck Creek

Location: 25 metres upstream of the footbridge in Houston, BC. Staff gauge is on the right bank

Date: October 2, 1998

Installed staff gauge, installed bench marks, completed velocity cross section

BM#1

BM#2

BM#3

SG



AGRA

ENGINEERING GLOBAL SOLUTIONS

	UP	MID	LOW
BM5	0.676	0.446	0.218
Top SG	3.59	3.45	3.29
HI	1.583		

Velocity: velocity cross section 15 m upstream of the footbridge and 35 m downstream of the staff gauge

Date: October 2, 1 12:52 SG= 0.14 0.6689*revs/sec+0.0101

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0	0	0	0	0	0	0	0	
1.8	0	0	0	0	0	0	0	0 RB
2	0	4	0	0	0	0	0	0 too shallow
2.5	0	12	0	0	0	0	0	0 too shallow
3	0	14	6	49.11	0.092	0.006	0.006	
3.5	0	15	7	40	0.127	0.010	0.016	est flow 0.175 m/sec
4	0	10	6	40.29	0.110	0.005	0.021	
4.5	0	14	7	40	0.127	0.009	0.030	est flow 0.175 m/sec
5	0	11	7	40	0.127	0.007	0.037	est flow 0.175 m/sec
5.5	0	14	7	40	0.127	0.009	0.046	est flow 0.175 m/sec
6	0	8	7	40	0.127	0.005	0.051	est flow 0.175 m/sec
6.5	0	11	7	40	0.127	0.007	0.058	est flow 0.175 m/sec
7	0	15	7	40	0.127	0.010	0.068	est flow 0.175 m/sec
7.5	0	16	7	40	0.127	0.010173	0.078	est flow 0.175 m/sec
8	0	16	7	41.21	0.124	0.010	0.088	
8.5	0	17	7	40.43	0.126	0.011	0.099	
9	0	14	7	40	0.127	0.009	0.108	est flow 0.175 m/sec
9.5	0	17	5	45.4	0.084	0.007	0.115	
10	0	21	12	43.63	0.194	0.020	0.135	
10.5	0	16	5	46.09	0.083	0.007	0.142	
10.75	0	21	9	44.41	0.146	0.015	0.157	
11	0	20	8	40.28	0.143	0.014	0.171	
11.6	0	18	7	44.01	0.116	0.010	0.182	
12.1	0	22	9	40.62	0.158	0.017	0.199	
12.6	0	22	8	43.03	0.134	0.015	0.214	
13	0	17	12	41.84	0.202	0.017	0.231	
13.5	0	24	10	42.74	0.167	0.020	0.251	
14	0	24	7	41.62	0.123	0.015	0.266	
14.5	0	30	11	42.67	0.183	0.027	0.293	
15	0	26	6	41.1	0.108	0.014	0.307	
15.5	0	18	6	46.04	0.097	0.009	0.316	
15.95	0	0	0	0	0	0	0	0 RB

Site: Buck Creek

Velocity: velocity cross section 15 m upstream of the footbridge and 35 m downstream of the staff gauge

Date: November 5 15:30 SG=0.30

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
2.2	0	0	0	0	0	0	0	0 LB
2.5	0	5	0	0	0	0	0	0 too shallow
3	0	11	25	43.7	0.389	0.021	0.021	
3.5	0	23	16	41	0.266	0.031	0.052	
4	0	31	37	41.8	0.599	0.093	0.145	
4.5	0	38	40	40.6	0.667	0.127	0.272	
5	0	32	32	40.9	0.530	0.085	0.356	
5.5	0	35	36	41.3	0.590	0.103	0.460	
6	0	36	30	42.9	0.474	0.085	0.545	
6.5	0	32	40	43	0.630	0.101	0.646	



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7	0	36	55	44.4	0.837	0.151	0.796
7.5	0	30	45	41.7	0.730	0.109	0.906
8	0	36	35	44.9	0.528	0.095	1.001
8.5	0	38	40	43.1	0.628	0.119	1.120
9	0	34	44	50.8	0.586	0.100	1.220
9.5	0	36	55	57	0.653	0.118	1.337
10	0	38	32	41.5	0.522	0.099	1.437
10.5	0	32	50	57.5	0.589	0.094	1.531
11	0	33	45	46.7	0.652	0.108	1.638
11.5	0	32	40	44.4	0.610	0.098	1.736
12	0	41	35	43.5	0.545	0.112	1.848
12.5	0	42	20	42.2	0.323	0.068	1.916
13	0	40	35	42.6	0.556	0.111	2.027
13.5	0	38	35	40	0.592	0.113	2.139
14	0	43	33	42.8	0.522	0.112	2.252
14.5	0	42	40	43.2	0.627	0.132	2.383
15	0	46	40	44.6	0.607	0.140	2.523
15.5	0	47	15	42	0.244	0.057	2.580
16	0	37	2.5	52.9	0.035	0.007	2.587 behind rock
16.5	0	16	0	0	0	0	0 no current
17	0	10	0	0	0	0	0 no current
17.5	0	0	0	0	0	0	0 RB

finished at 16:12, staff gauge 0.30

Site: BUCK CREEK AT BUCK BRIDGE 1

Site: Buck Creek at Buck Bridge 1

Location: 5 km west of Houston, BC, turn left on Buck Flats Rd. At ~km 17, Buck Bridge #1 crosses Buck Creek. Staff gauge located on LB pilings of bridge, 2nd to last piling from the downstream end.

Date: November 5 13:00

Installed staff gauge, installed bench marks, completed velocity cross section

BM#1 Most downstream bridge piling on RB of the stream, 1.0 m from the stream bottom

BM#2 Most downstream bridge piling on LB of the stream, 1.0 m from the stream bottom

SG top of metal plate of the 1.0 m staff gauge

	BS	FS	Elev
BM#1		1.754	1000
BM#2		1.839	
SG		1.908	
HI		1.05	

Velocity: velocity cross section 15 m upstream of the footbridge and 35 m downstream of the staff gauge

Date: November 5 13:45 SG=0.10

tape (m)	bf depth (cm)	water depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0.8	0	0	0	0	0	0	0	0 LB
1	0	22	0	0	0	0	0	0 eddy, no flow
1.5	0	28	1.5	45.17	0.026	0.004	0.004	
2	0	30	1.5	68.7	0.018	0.003	0.006	
2.5	0	37	2.25	60.2	0.029	0.005	0.012	
3	0	42	3	45.3	0.048	0.010	0.022	
3.5	0	48	4	43.7	0.065	0.016	0.037	
4	0	55	5	40.96	0.086	0.024	0.061	
4.5	0	62	7	43.6	0.112	0.035	0.096	
5	0	68	10	43.3	0.159	0.054	0.150	
5.5	0	76	17	42.1	0.275	0.105	0.254	
6	0	77	25	43.9	0.387	0.149	0.403	



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6.5	0	78	25	40.5	0.419	0.163	0.567
7	0	86	30	41.8	0.487	0.209	0.776
7.5	0	96	35	46	0.516	0.247	1.023
8	0	89	30	43.2	0.471	0.210	1.233
8.5	0	92	25	43.7	0.389	0.179	1.412
9	0	88	25	48.4	0.351	0.155	1.566
9.5	0	92	20	40.9	0.333	0.153	1.719
10	0	80	22	45.5	0.329	0.132	1.851
10.5	0	70	17	43.23	0.268	0.094	1.945
11	0	58	12	44.6	0.185	0.054	1.998
11.5	0	34	4	34.5	0.082	0.014	2.012
12	0	13	4	44.7	0.064	0.004	2.016
12.5	0	0	0	0	0	0	2.016 RB

finished at 14:15, staff gauge 0.10 m

Buck Creek at Bridge #1. Dec 3/98
 Moved staff gauge due to out of water. Re-surveyed

BM#1 Most downstream bridge piling on RB of the stream, 1.0 m from the stream bottom
 BM#2 Most downstream bridge piling on LB of the stream, 1.0 m from the stream bottom
 SG top of metal plate of the 1.0 m staff gauge

	BS	FS	Elev
BM #1		2.25	1000
BM #2			2.328
SG			2.53
HI			1.486

**NB: new staff gauge location
 is 0.13 m lower than previous. Add
 0.13 m to SG readings prior to Dec 3/98**

Start XS at 9:37

Velocity: Velocity cross section 25 m downstream of the bridge abutments and the staff gauge

Date: Dec 3/98 9:37 SG=0.065

tape (m)	bf depth (cm)	w depth (m)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0								
0.5		0.14	12	51.17	0.161	0.011	0.011	
1		0.14	12	51.17	0.161	0.011	0.023	
1.5		0.16	13	41.09	0.216	0.017	0.040	
2		0.26	17	39.6	0.292	0.038	0.078	
2.5		0.27	35	40.45	0.586	0.079	0.157	
3		0.25	21	40.24	0.355	0.044	0.201	
3.5		0.24	36	42.16	0.578	0.069	0.271	
4		0.23	29	39.6	0.496	0.057	0.328	
4.5		0.21	35	48.9	0.485	0.051	0.379	
5		0.23	16	38.5	0.283	0.033	0.411	
5.5		0.28	11	40.81	0.185	0.026	0.437	
6		0.24	24	43.63	0.374	0.045	0.482	
6.5		0.21	26	41.75	0.423	0.044	0.526	
7		0.28	11	44.31	0.171	0.024	0.550	
7.5		0.26	11	42.2	0.179	0.023	0.574	
8		0.23	16	39.3	0.278	0.032	0.606	
8.5		0.2	14	40.7	0.235	0.024	0.629	
9		0.16	12	39.92	0.206	0.016	0.646	
9.5		0.16	12	39.92	0.206	0.016	0.662	
10		0.16	12	39.92	0.206	0.016	0.678	
10.5		0			0	0		

finished at 10:30

Starts 9:00 AM
 Date: May 18/99
 Maxan Creek Water Survey of Canada Station
 SG: 0.8 m

Water too deep to wade
 Orange method

Distance	Seconds	Conversior Velocity		
10	5.87	0.3	1.76 m/sec	
10	5.58	0.3	1.674 m/sec	
10	5.79	0.3	1.737 m/sec	

Starts 10:00
 Date: May 18/1999
 Richfield Creek
 SG: 0.75

Water too deep to wade
 Orange method

Distance	Seconds	Conversior Velocity		
10	7.51	0.3	2.253 m/sec	
10	3.36	0.3	1.008 m/sec	
10	3.69	0.3	1.107 m/sec	

running at 40 cm below bankfull width
 1 was in the slower part of the current
 10 3.81 0.3 1.143 m/sec

Starts 10:48
 Date: May 18,1 999
 Buck Creek at footbridge
 SG: 0.93

Water too deep to wade
 Orange method

Distance	Seconds	Conversior Velocity		
10	3.74	0.3	1.122 m/sec	
10	3.97	0.3	1.191 m/sec	
10	4.24	0.3	1.272 m/sec	

Note: staff gauge is bent and needs levelling
 WSC person there, 23.1 m3/sec is the discharge calculation

Starts 12:34
 Date: May 18,1 999
 Buck Creek at Buck Bridge #1 bfw=19.8 m
 SG: 0.78

Water too deep to wade
 Orange method

Distance	Seconds	Conversior Velocity		
10	4.03	0.3	1.209 m/sec	

Starts 4:31

Date: Aug 9/1999

bfw=19.8 m

Buck Creek at Buck Bridge #1

0.6729*revs/sec+0.0036

25 m downstream of the bridge

SG: 0.03

tape (m)	bankfull depth (cm)	w depth (cm)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
0		0	0					
0.5		0	0					
1		0	0					
1.5		0	0					
2		0	0					
2.5		10	12	41.9	0.196	0.010		
3		27	7	41.2	0.118	0.016		
3.5		22	13	40.7	0.219	0.024		
4		23	17	45.4	0.256	0.029		
4.5		22	25	42.5	0.399	0.044		
5		15	11	43.3	0.175	0.013		
5.5		15	23	42.2	0.370	0.028		
6		20	18	43.3	0.283	0.028		
6.5		25	35	41.4	0.572	0.072		
7		26	30	43.6	0.467	0.061		
7.5		28	21	39.7	0.360	0.050		
8		31	19	43.6	0.297	0.046		
8.5		29	30	40.2	0.506	0.073		
9		30	32	40.8	0.531	0.080		
9.5		28	27	42.6	0.430	0.060		
10		29	23	41.6	0.376	0.054		
10.5		22	13	44.8	0.199	0.022		
11		20	12	39.1	0.210	0.021		
11.5		22	8	42.2	0.131	0.014		
12		14	12	40.9	0.201	0.014		
12.5		9	15	42.1	0.243	0.011		
13		9	25	40.6	0.418	0.019		
13.5		7	19	56.4	0.230	0.008		
14		0	0	ww			0.798	
14.5		0	0					
15		4	0					
15.5		0	0					

Starts 12:00

Date: Sept 15/1999

Richfield Creek

0.6729*revs/sec+0.0036

SG: 0.19

tape (m)	bankfull depth (cm)	w depth (m)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q	comment
1.6		0.01	0					
2		0.05	0					
2.4		0.1	13	48	0.186	0.007		
2.8		0.12	16	34	0.320	0.015		



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3.2	0.12	20	40	0.340	0.016	
3.6	0.15	20	49	0.278	0.017	
4	0.25	19	55	0.236	0.024	
4.4	0.2	25	44	0.386	0.031	
4.8	0.2	20	45	0.303	0.024	
5.2	0.28	35	49	0.484	0.054	
5.6	0.27	31	45	0.467	0.050	
6	0.27	26	44	0.401	0.043	
6.4	0.26	40	43	0.630	0.065	
6.8	0.3	31	43	0.489	0.059	
7.2	0.23	20	46	0.296	0.027	
7.6	0.2	25	45	0.377	0.030	
8	0.22	20	48	0.284	0.025	
8.4	0.1	0	0	0	0	0.489
8.8	0.07	0	0	0	0	
9.2	0.02	0	0	0	0	

Starts: 10:00

Date: Sept 15/1999

Maxan Creek

45 m d/s staff gauge

0.6729*revs/sec+0.0036

SG:

0.172

ww=14.1 m

tape (m)	bankfull depth (cm)	w depth (m)	revolution	time (sec)	velocity (m/sec)	Q (m3/sec)	SUM Q
0							
0.5							
1							
1.5							
2							
2.5							
3							
3.5							
4							
4.5							
5		0.02	0	0	0.000	0.000	
5.5		0.06	0	0	0.000	0.000	
6		0.07	0	0	0.000	0.000	
6.5		0.1	6	42	0.100	0.005	
7		0.11	6	36.5	0.114	0.006	
7.5		0.12	6	36	0.116	0.007	
8		0.14	10	46	0.150	0.010	
8.5		0.15	14	47	0.204	0.015	
9		0.2	15	46	0.223	0.022	
9.5		0.23	18	44	0.279	0.032	
10		0.28	26	48	0.368	0.052	
10.5		0.31	34	49	0.471	0.073	
11		0.33	40	48	0.564	0.093	
11.5		0.35	45	49	0.622	0.109	
12		0.34	36	42	0.580	0.099	
12.5		0.28	25	48	0.354	0.050	
13		0.18	26	51	0.347	0.031	
13.5		0.04	0	0	0.000	0.000	
14							0.604



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