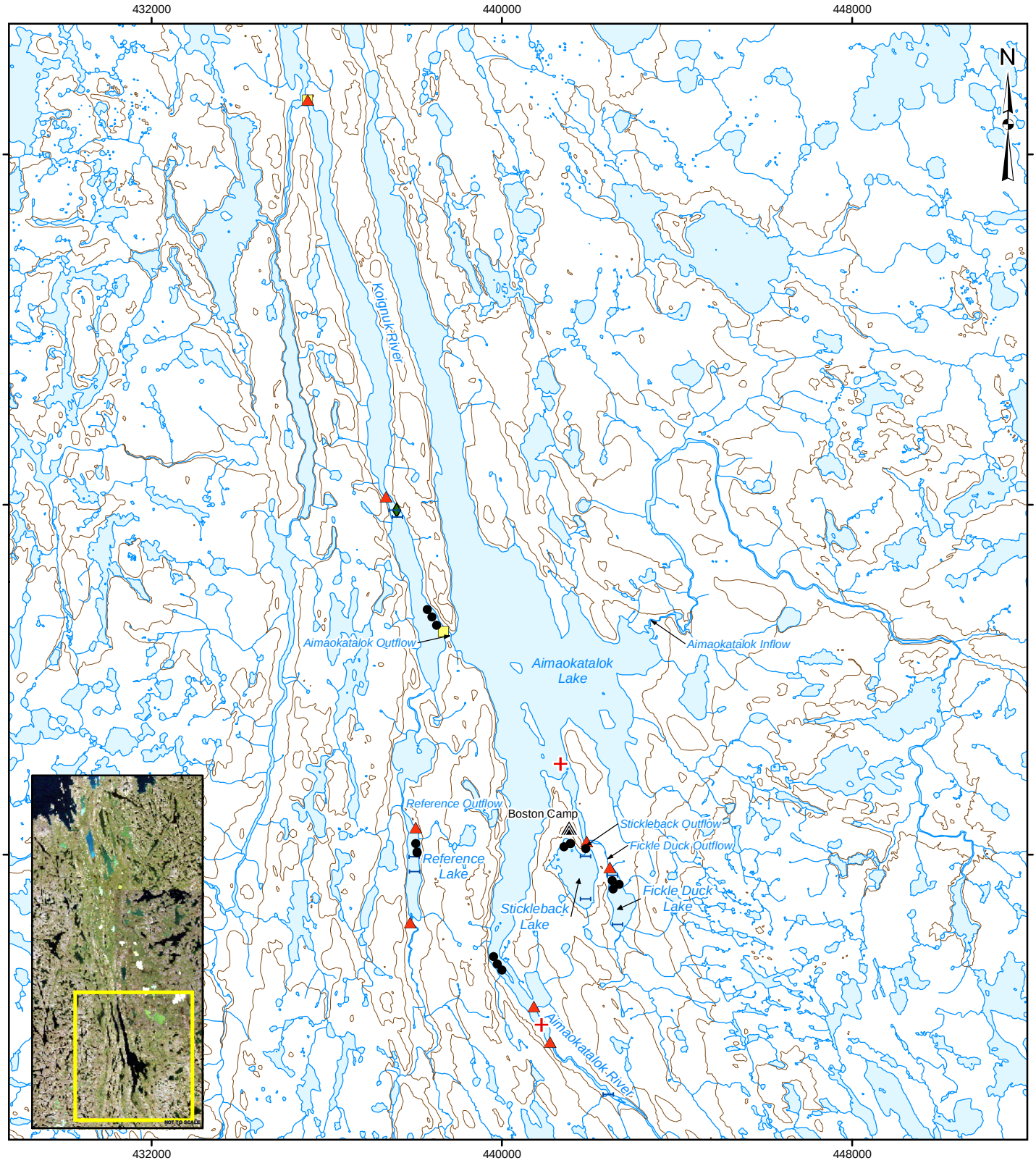

LEGEND

- CAMP
- ANGLING
- BACKPACK ELECTROFISHING
- BEACH SEINING
- FYKE NETTING
- GILL NETTING
- MINNOW TRAPPING
- CONTOUR (20 m INTERVAL)
- WATERCOURSE
- WATERBODY

3500 0 3500

SCALE 1:125000 METRES

REFERENCE

Base data obtained from Government of Canada, Natural Resources Canada, Centre for Topographic Information (1:50 000). Landsat 7 imagery captured in 2007, obtained from CanImage. Field data collected by Golder Associates Ltd., 2008.
Projection: UTM Zone 13 Datum: NAD 83

PROJECT

NEWMONT. The Gold Company

HOPE BAY MINING LTD.

TITLE

2006 FISH SAMPLING LOCATIONS
BOSTON PROJECT AREA

Golder Associates
Edmonton, Alberta

PROJECT NO. 07-1373-0019			SCALE AS SHOWN	REV. 0
DESIGN	AH	23 Oct. 2008		
GIS	RC	11 Mar. 2009		
CHECK	AH	16 Mar. 2009		
REVIEW	GA	16 Mar. 2009		

FIGURE: 6.1

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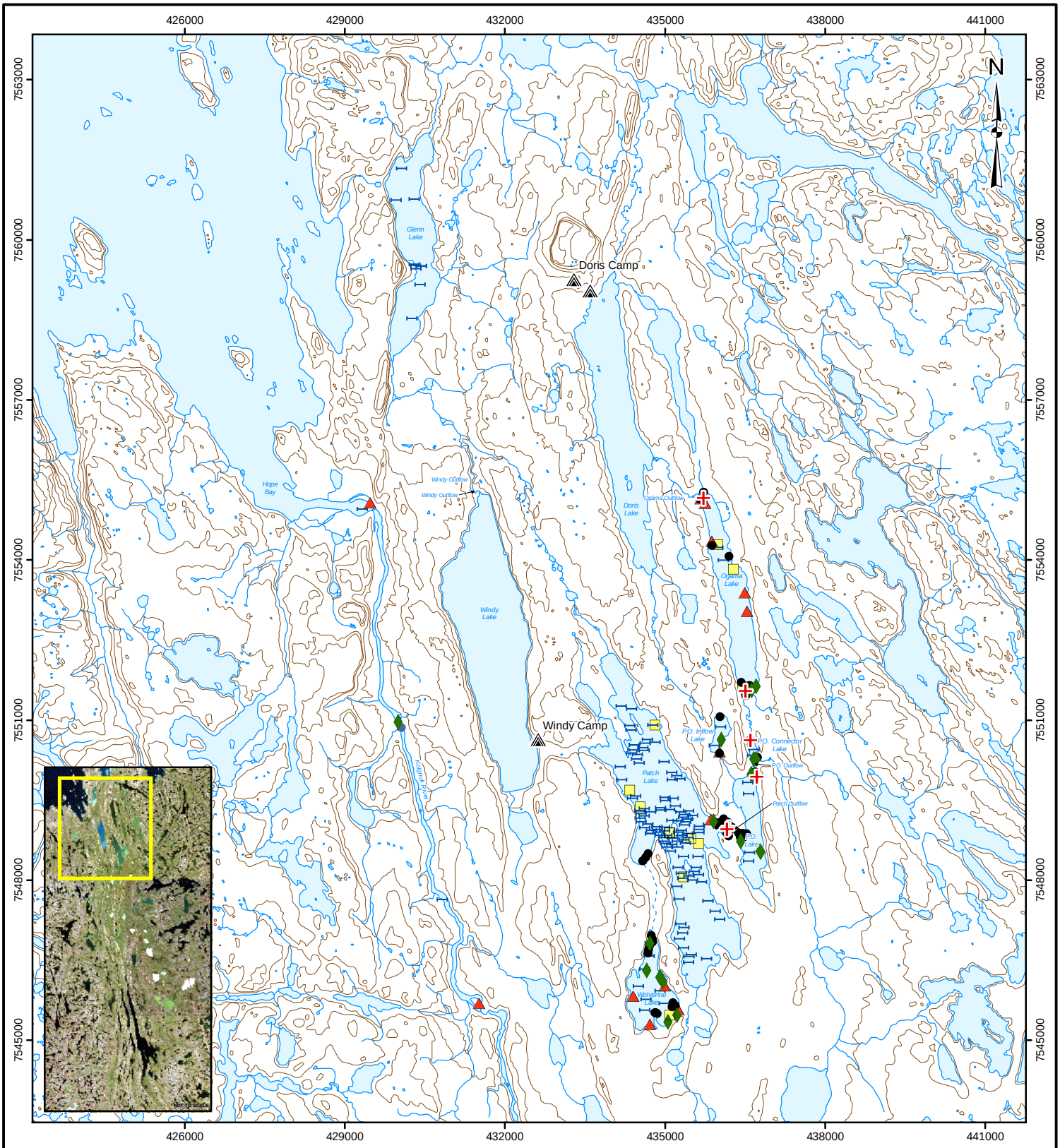

LEGEND

- CAMP
- ANGLING
- BACKPACK ELECTROFISHING
- BEACH SEINING
- FYKE NETTING
- GILL NETTING
- KICK NETTING
- MINNOW TRAPPING
- CONTOUR (20 m INTERVAL)
- INTERMITTENT STREAM
- WATERCOURSE
- WATERBODY

2500 0 2500

SCALE 1:100000 METRES

REFERENCE

Base data obtained from Government of Canada, Natural Resources Canada, Centre for Topographic Information (1:50 000). Landsat 7 imagery captured in 2007, obtained from CanImage. Field data collected by Golder Associates Ltd., 2008.
Projection: UTM Zone 13 Datum: NAD 83

PROJECT

NEWMONT The Gold Company

HOPE BAY MINING LTD.

TITLE

2006 - 2007 FISH SAMPLING LOCATIONS
MADRID PROJECT AREA

Golder Associates
Edmonton, Alberta

PROJECT NO. 07-1373-0019			SCALE AS SHOWN	REV. 0
DESIGN	AH	23 Oct. 2008	FIGURE: 6.2	
GIS	RC	11 Mar. 2009		
CHECK	AH	16 Mar. 2009		
REVIEW	GA	16 Mar. 2009		

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6.2.3 Fish Collection Methods

Fish sampling was conducted in selected lakes and streams using angling, backpack electrofishing, beach seining, fyke netting, gill netting, kick netting, and minnow trapping.

6.2.3.1 Angling

Angling was conducted by either casting from shore or boat, or by trolling behind a boat. Barbless lures were used, and captured fish were processed for life history information before being tagged and released. Other recorded data included date and time of capture, location, hours fished, and number of rods used.

6.2.3.2 Backpack Electrofishing

A Smith-Root Model 12B backpack electrofisher was used to collect fish in lakes and streams in the Boston and Madrid Project areas. The operator waded upstream and sampled in the vicinity of suspected fish holding areas (e.g., under boulders, undercut banks); the netter collected stunned fish and placed them in a holding bucket. Recorded information at each station included UTM coordinates, date and time of sampling, distance sampled, sampling effort (seconds), and electrofisher settings. Captured fish were allowed to recover, then were processed for life history information, and subsequently released into the area of capture.

6.2.3.3 Beach Seining

Beach seining for small fish was conducted in shallow areas of lakes and streams in the Boston and Madrid Project areas. Suitable habitat for beach seining was selected along lake shorelines and in areas of fine substrate. The beach seine was 9 m long, with a mesh size of 6 mm, and was equipped with a collection bag with a mesh size of 3 mm. The length and effective width of each haul was recorded to determine catch-per-unit-effort (CPUE). Similar to the other sampling methods, life history information, UTM coordinates, date, time, water temperature, and substrate type were recorded.

6.2.3.4 Fyke Netting

Modified Arctic fyke nets were used to sample fish in Aimaokatalok, Patch, P.O., P.O. Connector, and Ogama lakes. Fyke nets were generally set near the lake outflows or inflows to catch fish moving into or out of the lakes. This net consisted of a single trap net, two 7.6 m wings, and a 7.6 m lead to shore. The trap was 0.9 m wide and contained two throats (7.5 x 7.5 cm each). The trap, wings and lead were

constructed of 1.0 cm dark grey knotless nylon mesh. The wings and lead were 0.9 m deep. Wing net panels were attached to either side of the trap entrance and were stretched out parallel to shore. Fyke net sets were held in place by T-bar posts driven into the substrate.

Fyke nets were checked daily. Information recorded during each net check included date, check time, water temperature, and life history data from captured fish.

6.2.3.5 Gill Netting

Variable mesh experimental gill nets were employed to sample in the Koignuk River, and in Aimaokatalok, Fickle Duck, Ogama, P.O., P.O. Connector, P.O. Inflow, Patch, Reference, Stickleback, Wolverine, and Glenn lakes. In 2006, the experimental gill nets were composed of either one or two panels measuring 15.2 x 2.4 m each (mesh size 1.9 or 2.5 cm), or two panels measuring 15.2 x 1.8 m each (mesh size 3.8 or 6.4 cm). In 2007, each experimental gill net was composed of two or three panels measuring 15.2 x 1.8 m each. Mesh sizes in 2007 ranged from 2.5 to 6.4 cm. Set times were kept short to minimize capture related mortalities. Information recorded at each gill-net station included UTM coordinates, date and time of set and lift, water depth, and the number and species of fish captured.

6.2.3.6 Kick Netting

Kick sampling was conducted in an attempt to collect eggs of spring spawners (e.g., Arctic grayling) in selected high quality habitats in the Koignuk River. Kick sampling was performed by positioning a small canvas kick net directly downstream of an area of suitable spawning substrate. An area of about 1 m^2 was disturbed by kicking the bed material, causing looses material (e.g., eggs) to mobilize and drift downstream into the net.

6.2.3.7 Minnow Trapping

Gee™ minnow traps were used to sample small fish in small lakes and streams in the Boston and Madrid Project areas. The traps (40 cm long, 23 cm diameter in the middle, 19 cm diameter at each end) were two-piece wire enclosures with inverted funnel openings. They were baited with pet food or sardines, and were set in near-shore habitats. Date, time, UTM coordinates, depth, water temperature, and substrate type were recorded for all minnow trap sets, and life history information was recorded for captured fish.

6.2.4 Habitat Surveys in the Lower Koignuk River

Instream habitats were assessed to identify potential Arctic grayling spawning habitat and other high quality fish habitats, such as rearing and feeding stations. Substrate types were visually assessed and recorded. The quality of habitat was assessed based on depth and availability of cover.

6.2.5 Life History Data Collection

Life history information was collected from most captured fish. Fish were identified to species, measured (fork or total length to the nearest millimetre), and weighed (grams). Additional life history data were collected from fish that died during sampling; data collected included sex and maturity, reproductive status, and stomach contents.

To facilitate data recording and presentation of results, all captured fish were assigned a four-letter species code. The common and scientific names of fish species captured in 2006 and 2007, as well as their coded abbreviations, are presented in Table 6.1.

Table 6.1 Common and Scientific Names of Fish Species Captured in the Boston and Madrid Project Areas, 2006 – 2007

Family	Common Name[a]	Scientific Name[a]	Code
Clupeidae	Pacific herring	*Clupea pallasii* Valenciennes	PCHR
Cottidae	Fourhorn sculpin	*Myoxocephalus quadricornis* (Linnaeus)	FRSC
	Slimy sculpin	*Cottus cognatus* Richardson	SLSC
Gasterosteidae	Ninespine stickleback	*Pungitius pungitius* (Linnaeus)	NNST
Gadidae	Saffron cod	*Eleginus gracilis* (Tilesius)	SFCD
Lotidae	Burbot	*Lota lota (*Linnaeus)	BURB
Pleuronectidae	Arctic flounder	*Pleuronectes glacialis* (Pallas)	ARFL
Salmonidae	Arctic char	*Salvelinus alpinus* (Linnaeus)	ARCH
	Arctic Grayling	*Thymallus arcticus* (Pallas)	ARGR
	Lake trout	*Salvelinus namaycush* (Walbaum)	LKTR
	Lake whitefish	*Coregonus clupeaformis* (Mitchill)	LKWH
	Broad whitefish	*Coregonus nasus* (Pallas)	BRWH
	Cisco	*Coregonus artedi* Lesueur	CISC
	Least cisco	*Coregonus sardinella* Valenciennes	LSCS

[a] From Nelson et al. (2004).

6.2.6 Fish Tagging

Fish captured in Patch, P.O., P.O. Connector, and Ogama lakes that were greater than 300 mm in fork length (FL) were tagged with a uniquely numbered PIT (passive integrated transponder) tag to aid in assessing population numbers and movements through subsequent recaptures. PIT tags and injectors were sterilized with diluted isopropyl alcohol prior to use with each fish. PIT tags were inserted into the body cavity of fish between the pelvic and pectoral girdles and scanned with a microchip reader to ensure proper function prior to the release of each fish (Columbia Basin Fish and Wildlife Authority PIT Tag Screening Committee 1999). In addition, fish greater than 500 mm in length were also given a uniquely numbered Hallprint™ T-bar anchor tag. Tags were placed just below the dorsal fin of suitably sized fish for quick visual identification.

6.2.7 Data Analysis

All life history data from individual fish were consolidated into tables (Appendix E1) and submitted to a thorough QA/QC procedure. The data were then used to calculate the following life history statistics:

- length-frequency distributions;
- length-weight relationships; and
- mean, standard deviation, and range of length, weight, and condition factor data.

As an index of relative abundance, CPUE values were calculated for each sampling method. CPUE values for fyke net and minnow trap catches are reported as number of fish captured per 24 hours of trap operation. CPUE values for gill net sets are reported as number of fish captured per 100 m^2 of each mesh panel set per 24 hours. CPUE values for angling are reported as number of fish captured per hour of angling with one rod. Backpack electrofishing CPUE values are reported as number of fish per 100 seconds, and beach seining CPUE units are reported as number of fish per 100 m^2 of area seined.

6.3 RESULTS

6.3.1 Boston Project Area Lake Communities

The catch and size statistics for fish sampled during the sampling program are summarized in Appendices E2 to E9; data from individual fish are presented in Appendix E1.

6.3.1.1 Aimaokatalok Lake

Fish sampling was conducted in Aimaokatalok Lake on 16 and 18 July 2006. Fish capture methods used to document species composition and abundance included backpack electrofishing, fyke netting, gill netting, and minnow trapping.

Species Composition and Relative Abundance

In total, 127 fish representing three species (lake trout, cisco, and ninespine stickleback) were captured in Aimaokatalok Lake (Table 6.2). Previous studies conducted by Rescan Environmental between 1993 and 1997 indicated the presence of lake trout, lake whitefish, cisco, and Arctic grayling in Aimaokatalok Lake (Golder 2008a). Lake whitefish and Arctic grayling were not captured during the 2006 sampling program. In 2006, ninespine stickleback was the predominant species in the overall catch (85.0%), followed by lake trout (13.4%) and cisco (1.6%). Most of the fish captured in Aimaokatalok Lake were small in size with the exception of one large lake trout (422 mm in fork length), which was captured during gill netting efforts. The fyke net in Aimaokatalok had the highest CPUE of all the fyke nets set in lakes during the 2006 and 2007 sampling programs (Appendix E5).

Table 6.2 Fish Species and Number Captured in Aimaokatalok Lake, 2006

Capture Method	Ninespine stickleback	Lake trout	Cisco	Total
Backpack electrofishing	6	14		**20**
Fyke nets	100	2	2	**104**
Gill nets		1		**1**
Minnow traps	2			**2**
Total	**108 (85.0%)**	**17 (13.4%)**	**2 (1.6%)**	**127 (100%)**

Life History Data

Lake Trout

Of the 17 lake trout captured in Aimaokatalok Lake, only three were measured. One fish was an adult; the fork length of the adult fish was 422 mm (Appendix E9). The remaining lake trout captured were juveniles and young-of-the-year (YOY), ranging in fork length from 25 to 85 mm. The adult lake trout had a weight of 852 g and condition factor of 1.13, which was slightly higher than the mean reported condition factor (1.08) from previous studies conducted by Rescan Environmental in Aimaokatalok Lake (Golder 2008a).

Ninespine Stickleback

In total, 108 ninespine stickleback were captured in Aimaokatalok Lake. Lengths were measured for 102 of the captured fish (Figure 6.3); fork lengths ranged from 30 to 55 mm (Appendix E9). The length-frequency distribution was unimodal, with 62% of captured fish measuring 35 to 40 mm (Figure 6.3).

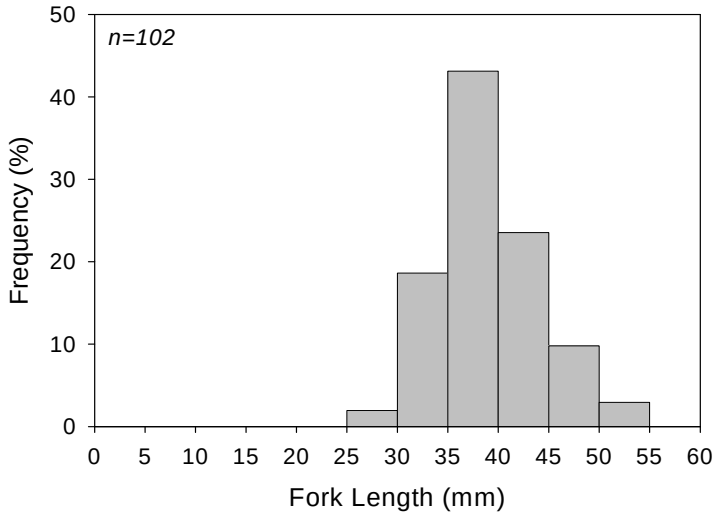


Figure 6.3 Length-Frequency Distribution for Ninespine Stickleback Captured in Aimaokatalok Lake, 2006

Cisco

Two juvenile cisco were captured in the fyke net near the inflow from Fickle Duck Lake. The fork lengths of these fish were 85 mm and 75 mm (Appendix E9).

6.3.1.2 Fickle Duck Lake

Fish sampling took place in Fickle Duck Lake on 18 July 2006. Both large and small fish were targeted during sampling, with capture methods including beach seining, gill netting, and minnow trapping.

Species Composition and Relative Abundance

Fish sampling in Fickle Duck Lake yielded a total of only nine fish of two species (lake trout and ninespine stickleback) (Table 6.3). Previous studies by Rescan Environmental reported the presence of only Arctic grayling in 1995 and 1996; however, this result is suspect since lake trout tissue samples were also reported as being collected during those studies, but were not reported as part of the catch (Golder 2008a). Arctic grayling were not captured in Fickle Duck Lake by Golder Associates Ltd. in 2006.

Table 6.3 Fish Species and Number Captured in Fickle Duck Lake, 2006

Capture Method	Ninespine Stickleback	Lake Trout	Total
Beach seine	1	1	2
Gill nets		2	2
Minnow traps	5		5
Total	**6 (66.7%)**	**3 (33.3%)**	**9 (100.0%)**

Ninespine stickleback were present in the largest numbers in the overall catch (66.7%), and lake trout contributed the remainder (33.3%). Adult lake trout were captured by gill netting, whereas the juvenile lake trout was collected by beach seining. Ninespine stickleback were captured by beach seining and minnow trapping (Table 6.3).

Life History Data

Lake Trout

Three lake trout were captured in Fickle Duck Lake. These included one juvenile (78 mm FL) and two adults (490 and 555 mm FL). The weights of the two adults were 1390 g and 2620 g, and the condition factors were 1.18 and 1.53 (Appendix E9).

Ninespine Stickleback

Six ninespine stickleback were captured in Fickle Duck Lake. Fork length ranged from 46 to 51 mm (Appendix E9).

6.3.1.3 Reference Lake

Fish sampling was conducted in Reference Lake on 19 July 2006. Both large and small bodied fish were targeted during sampling in Reference Lake. Fish capture methods included backpack electrofishing, gill netting, and minnow trapping. Reference Lake was not sampled during previous sampling programs.

Species Composition and Relative Abundance

Fish sampling in Reference Lake yielded a total of 14 fish representing three species (Table 6.4). Ninespine stickleback were present in the largest numbers in the overall catch (85.7%); lake trout (7.1%) and cisco (7.1%) contributed the remainder of the catch. One adult lake trout was captured in a gill net. Small sized fish (ninespine stickleback and cisco) were captured using a backpack electrofisher and minnow traps.

Table 6.4 Fish Species and Number Captured in Reference Lake, 2006

Capture Method	Ninespine stickleback	Lake trout	Cisco	Total
Backpack electrofisher	10		1	**11**
Gill nets		1		**1**
Minnow traps	2			**2**
Total	**12 (85.7%)**	**1 (7.1%)**	**1 (7.1%)**	**14 (100.0%)**

Life History Data

Lake Trout

Only one lake trout was captured during gill netting efforts in Reference Lake. This fish had a fork length of 195 mm, weighed 80 g and had a condition factor of 1.13 (Appendix E9). The condition of this fish was similar to the lake trout captured in Aimaokatalok Lake in 2006 (1.13) and was slightly lower than the reported condition factors for Fickle Duck Lake in 2006 (1.18 and 1.53) (Appendix E9).

Cisco

One YOY cisco (28 mm FL) was captured during backpack electrofishing conducted along the north end of the lake near the lake outflow.

Ninespine Stickleback

Ninespine stickleback captured in Reference Lake (n = 12) ranged in length from 30 to 50 mm (Appendix E9).

6.3.1.4 Stickleback Lake

Gill netting and minnow trapping were used to sample fish communities in Stickleback Lake on 17 July 2006. Similar to previous studies conducted by Rescan Environmental (Golder 2008a), ninespine stickleback was the only species captured during fish sampling efforts in Stickleback Lake (Appendix E1). Twenty-seven ninespine stickleback were captured in minnow traps; the fork lengths of these fish ranged from 40 to 82 mm (Appendix E9). Fish were not captured by gill netting in Stickleback Lake in this study or in previous studies (Golder 2008a). It is likely that ninespine stickleback is the only fish species inhabiting Stickleback Lake.

6.3.2 Boston Project Area Stream Communities

6.3.2.1 Aimaokatalok River

Backpack electrofishing was conducted on 16 July 2006 within the lowest reach of the Aimaokatalok River as it entered Aimaokatalok Lake (Figure 6.1). Fish data have not been collected for Aimaokatalok River previously. In total, 15 ninespine stickleback and nine YOY lake trout were captured (Appendix E1). The YOY lake trout were between 25 and 53 mm in fork length (Appendix E9). The mean length for the captured ninespine stickleback was 42 mm, and lengths for individual fish ranged from 31 to 64 mm (Appendix E9).

6.3.2.2 Fickle Duck Inflow

Fickle Duck Inflow was sampled using a backpack electrofisher on 18 July 2006. Eight ninespine stickleback were captured (Appendix E1). Lengths for the individual fish ranged from 35 to 50 mm (Appendix E9). Similarly, ninespine stickleback was the only fish species captured in this stream when it was sampled in 1997 (Golder 2008a). Total CPUE for backpack electrofishing was 1.7 fish/100 s of shocking (Appendix E3).

6.3.2.3 Fickle Duck Outflow

Fish sampling took place in Fickle Duck Outflow on 18 July 2006. Sampling in Fickle Duck Outflow consisted solely of backpack electrofishing.

Species Composition and Relative Abundance

Fish sampling in Fickle Duck Outflow yielded a total of nine fish representing three fish species (Table 6.5). Ninespine stickleback made up 78.0% of the catch; lake trout and burbot each contributed 11.0% to the total. Ninespine stickleback

and lake trout were also documented in this stream during previous studies (Golder 2008a).

Table 6.5 Fish Species and Number Captured in Fickle Duck Outflow, 2006

Capture Method	Ninespine stickleback	Lake trout	Burbot	Total
Backpack electrofishing	7	1	1	**9**
Total	**7 (78.0%)**	**1 (11.0%)**	**1 (11.0%)**	**9 (100.0%)**

Life History Data

Lake Trout

One lake trout was caught in Fickle Duck Outflow. The fish was a juvenile with a fork length of 85 mm (Appendix E9). One lake trout fry was captured in the outflow in 1994 (Golder 2008a). This stream does not appear to have suitable holding or spawning habitat for adult lake trout.

Burbot

One burbot was caught in Fickle Duck Outflow. Total length was measured to be 415 mm. The fish had a weight of 490 g and a condition factor of 0.69 (Appendix E9). Juvenile burbot were also captured in the Koignuk River in 2006, but were not reported in previous studies for the Hope Bay Belt waterbodies.

Ninespine Stickleback

Seven ninespine stickleback were captured in Fickle Duck Outflow. Fork lengths ranged from 35 to 51 mm, and the mean length was 42 mm (Appendix E9).

6.3.2.4 Koignuk River

Fish sampling took place within the Koignuk River downstream of the outflow from Aimaokatalok Lake on 19 and 20 July 2006, and in the lower reaches from the confluence at Hope Bay to the second set of rapids upstream of the bay on 8 July 2007. Both large and small fish were targeted during sampling in the Koignuk River. Fish capture methods included angling, backpack electrofishing, beach seining, gill netting, minnow trapping, and dip netting.

The 2007 sampling program was conducted in conjunction with a habitat assessment to identify potential Arctic grayling spawning areas and other high quality fish habitats in the lower Koignuk River. The following section of this report presents the fish capture information from all fish sampling conducted in

2006 and 2007. Results specific to the 2007 fisheries habitat assessment in the lower Koignuk River are presented in Section 6.5.

Species Composition and Relative Abundance

Fish sampling in the Koignuk River yielded a total of 201 fish representing 10 species in 2006 (n = 169) and 2007 (n = 32). Lake whitefish contributed the largest proportion of the overall catch (65.2%), followed by ninespine stickleback (14.4%), Arctic grayling (9.0%), lake trout (4.5%), Arctic flounder (3.0%), slimy sculpin (1.5%), burbot (1.0%), fourhorn sculpin (1.0%), and Arctic char (0.5%) (Table 6.6). In previous sampling programs, lake trout, Arctic grayling, lake whitefish, and Greenland cod were captured in the Koignuk River (Golder 2008a).

Table 6.6 Fish Species and Number of Fish Captured in Koignuk River, 2006 – 2007

Capture Method	Arctic char	Arctic flounder	Arctic grayling	Burbot	Fourhorn sculpin	Lake trout	Lake whitefish	Ninespine stickleback	Slimy sculpin	Total
Angling			5			8				**13**
Gill nets	1						5			**6**
Beach seine							120			**120**
Minnow traps										**0**
Backpack electrofishing		6	13	2	1	1	6	29	3	**61**
Dip net					1					**1**
Total	1	6	18	2	2	9	131	29	3	**201**
	(0.5%)	(3.0%)	(9.0%)	(1.0%)	(1.0%)	(4.5%)	(65.2%)	(14.4%)	(1.5%)	**(100.0%)**

Large numbers of YOY corregonids were captured and observed during beach seine efforts along the shoreline and shallow shoals in 2006, and several juveniles were captured or observed during backpack electrofishing efforts in 2007. Arctic grayling and lake trout were captured by angling in the tail-out areas of riffle/run habitats in 2006 and 2007. The CPUE for backpack electrofishing in the Koignuk River was 3.0 fish/100 s and beach seining was 11.1 fish/100 m^2. These were the highest CPUE for these fishing methods in the Boston and Madrid Project area streams (Appendices E3 and E4).

Young-of-the-year and juvenile corregonids (whitefish and cisco) are often difficult to identify to species level in the field; however, these fish are most likely lake whitefish as only adult lake whitefish have been documented in the Koignuk River (Appendix E1; Golder 2008a). For this report, these juvenile and YOY corregonids have been identified as lake whitefish.

Life History Data

Arctic Char

One adult Arctic char was captured in a gill net in the lower reach of the Koignuk River in 2007. This fish measured 605 mm in fork length, weighed 2538 g, and had a condition factor of 1.15 (Appendix E9). The condition of this fish was within the range of condition factors reported for other Hope Bay waterbodies (range from 0.50 to 1.62) (RL&L/Golder 2002; Golder 2007, 2008a, 2008b).

Arctic Grayling

Eighteen Arctic grayling were captured in the Koignuk River in 2006 and 2007. The Arctic grayling represented two distinct size-classes of fish. Of these, 12 were juveniles and YOY that ranged in fork length from 23 to 109 mm (mean 49 mm; Appendix E9). The condition factor for the one weighed juvenile fish was 1.00 (Appendix E9).

The mean fork length for the six adult Arctic grayling caught in the Koignuk River was 384 mm, and the lengths ranged from 350 to 400 mm (Appendix E9). The weights for two of these fish were 603 and 650 g and the condition factors were 0.96 and 1.14, respectively (Appendix E9). The mean condition factor for Arctic grayling was 1.03 in previous studies in the Koignuk River (Golder 2008a), which is similar to the mean condition factor of these two fish (1.05).

Lake Trout

There were nine lake trout captured in the Koignuk River in 2006. One juvenile lake trout (78 mm) was captured during backpack electrofishing efforts. The remaining eight fish ranged in fork length from 440 to 665 mm and had a mean fork length of 497 mm (Appendix E9). The mean weight for the adult lake trout was 1519 g (range from 1135 to 2750 g). The mean condition factor was 1.25, which is higher than the mean condition factor (1.09) reported by Rescan Environmental between 1995 and 1998 (Golder 2008a).

Lake Whitefish

In total, 126 lake whitefish were captured in the Koignuk River in 2006. Mean fork length for adult fish was calculated to be 498 mm. Most of lake whitefish (96%) were young-of-the-year, and they ranged in length from 30 to 40 mm. To reduce mortality of these YOY fish, the fork lengths were estimated as they were counted and released. In 2007, one juvenile lake whitefish (78 mm FL) was captured and five others were observed (Appendix E9). The five adult lake whitefish ranged in length from 480 to 520 mm. The weights for two of these fish were 1350 and 1375 g, and the condition factors were 1.10 and 1.22 (Appendix E9). During previous studies conducted by Rescan Environmental on the Koignuk

River, only one lake whitefish was captured and it had a condition factor of 0.98 (Golder 2008a).

Burbot

Two juvenile burbot were caught in the Koignuk River in 2006. These fish were 83 and 70 mm in total length. Burbot was also captured in Fickle Duck Outflow in 2006, but have not been captured during previous sampling programs in the Hope Bay Belt.

Arctic Flounder

Three Arctic flounder were captured, and three were observed, in the lower reach of the Koignuk River in 2007. The mean total length of captured fish was 103 mm (n = 3), and the lengths ranged from 76 to 139 mm. The weights for these three fish ranged from 6 to 42 g, and the condition factors ranged from 0.99 to 1.56 (Appendix E9). These condition factors are within the range reported for Arctic flounder from Roberts Bay, which had condition factors ranging from 0.84 to 2.41 in 2006 and 2007 (Golder 2007, 2008b).

Fourhorn Sculpin

Two fourhorn sculpin were captured in the lower Koignuk River in 2007. The total lengths of these fish were 16 mm and 83 mm. The weight of the larger fourhorn sculpin was 5 g, which resulted in a condition factor of 0.87 for the fish (Appendix E9). This condition factor is similar to those reported for fourhorn sculpin captured in Roberts Bay, which range from 0.81 to 1.34 (Golder 2007, 2008b).

Slimy Sculpin

Three slimy sculpin were captured in the Koignuk River in 2006. The total lengths for individual fish ranged from 46 to 57 mm (Appendix E9). Slimy sculpin were not captured previously in the Koignuk River (Golder 2008a).

Ninespine Stickleback

Twenty-nine ninespine stickleback were caught in the Koignuk River in 2006 and 2007. These fish ranged in fork length from 31 to 67 mm (Appendix E9).

6.3.2.5 Stickleback Outflow

Stickleback Outflow was sampled using backpack electrofishing on 17 July 2006. In total, 24 ninespine stickleback and one slimy sculpin were captured (Appendix E1). The mean fork length for the ninespine stickleback was 46 mm, ranging from 35 to 57 mm, and the slimy sculpin was 115 mm in total length

(Appendix E9). Ninespine stickleback was the only species captured in Stickleback Outflow during a previous sampling program in 1997 (Golder 2008a).

6.3.3 Madrid Project Area Lake Communities

6.3.3.1 Glenn Lake

Backpack electrofishing and gill netting were used to capture fish in Glenn Lake from 6 to 7 August 2007 and 22 to 23 August 2007. Fishing in Glenn Lake was conducted as part of Ms. Heidi Swanson's PhD thesis data collection. Lake trout and Arctic char were the target species for this research, and as such, length and weight were only recorded for the fish that were sacrificed and retained for further analysis by Ms. Swanson.

Species Composition and Relative Abundance

Fish sampling in Glenn Lake yielded a total of 425 fish consisting of four species (Table 6.7). Cisco made up the majority of the catch (89.2%), followed by lake trout (9.4%), Arctic char (0.9%), and ninespine stickleback (0.9%). Glenn Lake was not sampled during previous programs in the Hope Bay Belt.

Table 6.7 Fish Species and Number of Fish Captured in Glenn Lake, 2007

Capture Method	Arctic char	Cisco	Lake trout	Lake whitefish	Total
Backpack electrofishing	3		8		**11**
Gill nets	1	379	32	2	**414**
Total	**4 (0.9%)**	**379 (89.2%)**	**40 (9.4%)**	**2 (0.5%)**	**425 (100.0%)**

Life History Data

Arctic Char

Four juvenile Arctic char were captured in Glenn Lake. The fork lengths ranged from 193 to 241 mm (n = 3), and the weights ranged from 80 to 160 (mean of 1.32 g) (Appendix E9). The condition factor for these fish ranged from 1.11 to 1.19 (mean of 1.15) (Appendix E9), which was higher than the condition factors previously reported for Arctic char captured in the Doris Project area in 2006 and 2007 (Golder 2007, 2008b).

Lake Trout

Forty lake trout were captured in Glenn Lake. In general, the fork lengths were distributed evenly across size-classes, ranging from 152 to 750 mm (n = 34;

Figure 6.4). The 300 to 350 mm and 650 to 700 mm size-classes had higher length frequencies than the other size-classes. The weights for 32 of the lake trout ranged between 36 and 4753 g.

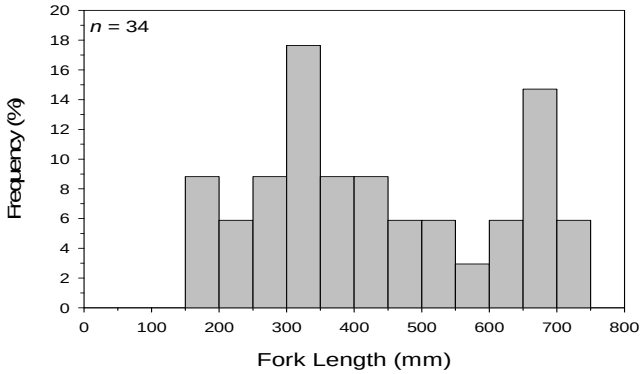


Figure 6.4 Length-Frequency Distribution for Lake Trout Captured in Glenn Lake, 2007

The length-weight relationship for lake trout captured in Glenn Lake (Figure 6.5) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$W = 7.26 \times 10^{-6} * L^{3.056}$ (n = 32, r^2 = 0.97)

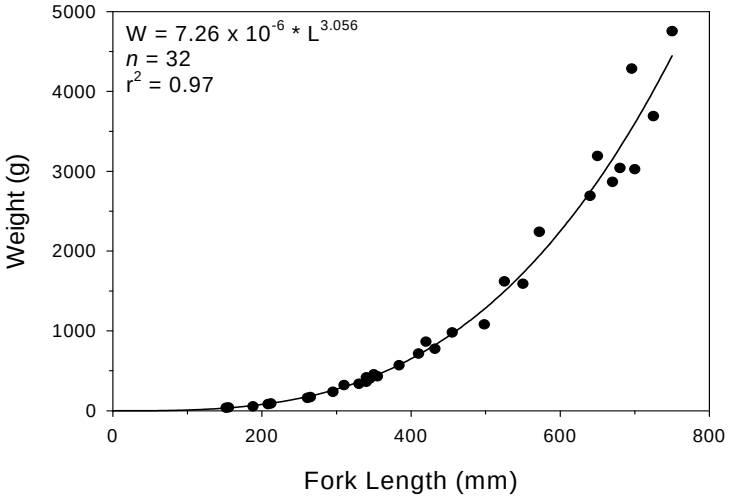


Figure 6.5 Length-Weight Relationship for Lake Trout in Glenn Lake, 2007

Condition factor for individual lake trout ranged from 0.83 to 1.27 (Appendix E9). The mean condition factor (1.01) is lower than the mean reported for lake trout

captured in Roberts Lake (1.12 in 2006 and 1.10 in 2007), which also contains both resident and anadromous lake trout (Golder 2007, 2008b).

Lake Whitefish

Two lake whitefish were captured in Glenn Lake. Fork lengths of the whitefish were 435 and 449 mm and weights were 1165 and 1345 g, respectively. The condition factors for these fish were 1.41 and 1.49 (Appendix E9), which are similar to those reported in other waterbodies sampled in 2006 and 2007 (Golder 2007, 2008b).

Cisco

In total, 379 cisco were captured in Glenn Lake. Life history measurements were recorded for only the six fish that were retained for tissue analysis as part of Ms. Swanson's PhD thesis research. These fish ranged in fork length from 213 to 250 mm and ranged in weight from 100 to 175 g (Appendix E9). The mean condition factor was 1.12 (range 1.03 to 1.19) (Appendix E9).

6.3.3.2 Ogama Lake

Angling, backpack electrofishing, beach seining, gill netting, and minnow trapping were used to capture fish in Ogama Lake from 2 to 6 August 2006.

Species Composition and Relative Abundance

Fish sampling in Ogama Lake yielded a total of 383 fish of four species (Table 6.8). Cisco made up the largest proportion of the catch (78.3%), followed by ninespine stickleback (11.2%), lake whitefish (9.7%), and lake trout (0.8%). Lake trout, lake whitefish, and cisco were captured during a study conducted by Rescan Environmental in 1996 (RL&L/Golder 2002).

Table 6.8 Fish Species and Number of Fish Captured in Ogama Lake, 2006

Capture Method	Cisco	Ninespine stickleback	Lake whitefish	Lake trout	Total
Angling				1	**1**
Backpack electrofishing		1	1		**2**
Beach seine	275		26		**301**
Gill nets	25		10	2	**37**
Minnow traps		42			**42**
Total	**300 (78.3%)**	**43 (11.2%)**	**37 (9.7%)**	**3 (0.8%)**	**383 (100.0%)**

Life History Data

Lake Trout

Three lake trout were captured in Ogama Lake. Fork lengths ranged from 550 to 665 mm. Lake trout weights ranged from 1455 to 3150 g, and the condition factors were between 0.84 and 1.07 (Appendix E9). The mean condition factor was 0.93, which was at the low end of the mean condition factors reported for lake trout captured in other waterbodies in 2006 and 2007 (means ranging from 0.94 to 1.36) (Appendix E9). Additional lake trout were also captured moving into and out of Ogama Lake through the streams at the north and south ends of the lake (see Sections 6.3.4.1 and 6.3.4.2).

Lake Whitefish

Of the 37 lake whitefish captured in Ogama Lake, 27 were YOY that ranged in fork length from 35 to 55 mm. To reduce mortality from handling stress, only two fish were measured (both 46 mm fork length) and the lengths of the remaing fish were estimated as they were counted and released. The 10 larger fish ranged in fork length from 294 to 346 mm and had a mean of 319 mm (Appendix E9). The weight range of these fish was 245 to 635 g (mean of 409 g), and the range of condition factors was 0.90 to 1.53 (mean 1.24) (Appendix E9). The mean condition factor of these fish was slightly lower than the mean condition factor of the lake whitefish captured Patch Lake (1.33) and P.O. Lake (1.36) in 2006 and 2007 (Appendix E9).

Cisco

Three hundred cisco from two distinct size-classes were captured in Ogama Lake. Most of the fish caught (92%) were YOY with estimated lengths between 35 and 60 mm (Appendix E1). The YOY cisco were counted and released with only estimating their lengths to reduce mortality caused by handling stress. Length measurements were taken for 25 larger fish; fork lengths for these larger fish ranged from 203 to 255 mm (Figure 6.6). The 25 larger cisco ranged in weight from 95 g to 195 g, and their condition factors ranged from 0.87 to 1.31 (Appendix E9). The mean condition factor for cisco captured in Ogama Lake was 1.13, which is only slightly higher than the mean condition factor reported for Patch Lake (1.11) and P.O. Lake (0.97) (Appendix E9).

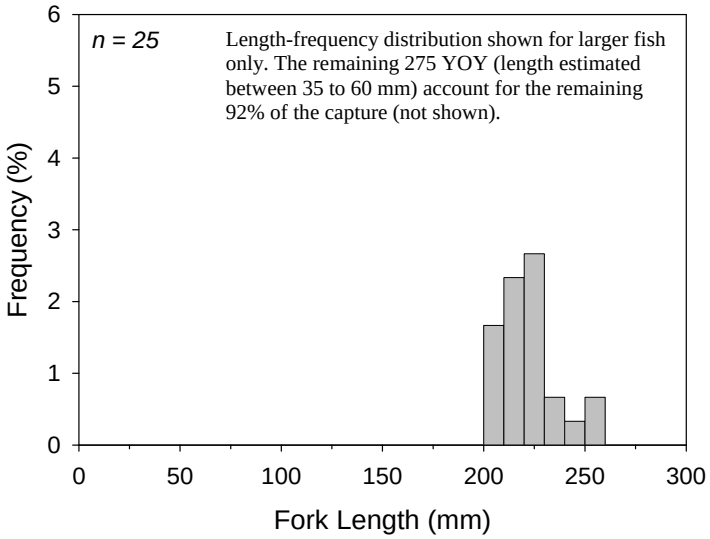


Figure 6.6 Length-Frequency Distribution for Larger Cisco Captured in Ogama Lake, 2006

Ninespine Stickleback

In total, 43 ninespine stickleback were captured in Ogama Lake. The fish ranged in length from 45 to 74 mm (Figure 6.7; Appendix E9). The majority (65%) of the fish were in the 50 to 60 mm length range (Figure 6.7).

6.3.3.3 Patch Lake

Angling, backpack electrofishing, fyke netting, gill netting, and minnow trapping were used to capture fish in Patch Lake on 25 to 28 July 2006, 9 to 18 July 2007, 12 to 19 and 28 August 2007 (Figures 6.2 and 6.8). The 2007 sampling was conducted to estimate the lake trout population size within the lake.

Species Composition and Relative Abundance

In total, 782 fish were captured during sampling efforts in Patch Lake in 2006 and 2007 (Table 6.9). Five fish species were identified in this study, wheras only lake trout, lake whitefish, and cisco were reported in previous studies by Rescan Environmental (RL&L/Golder 2002). Lake trout was the most common species in the catch (40.4%), followed by lake whitefish (29.8%), cisco (27.7%), a small number of least cisco (1.5%), and ninespine stickleback (0.5%). Gill nets were a very successful method for capturing fish in Patch Lake (Appendix E6).

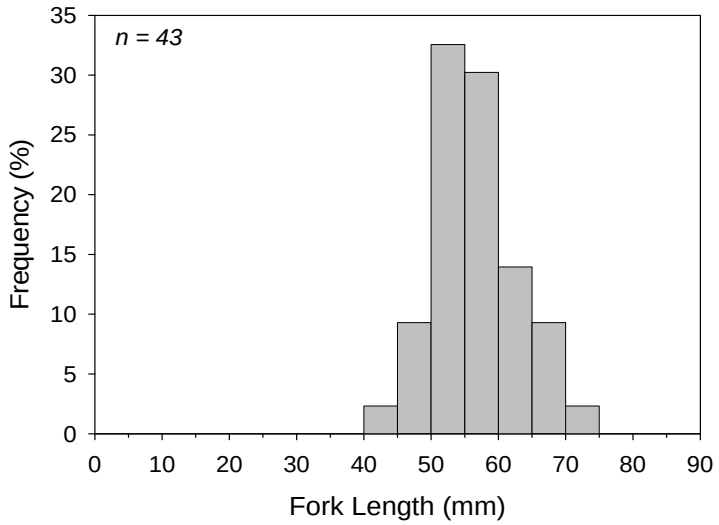
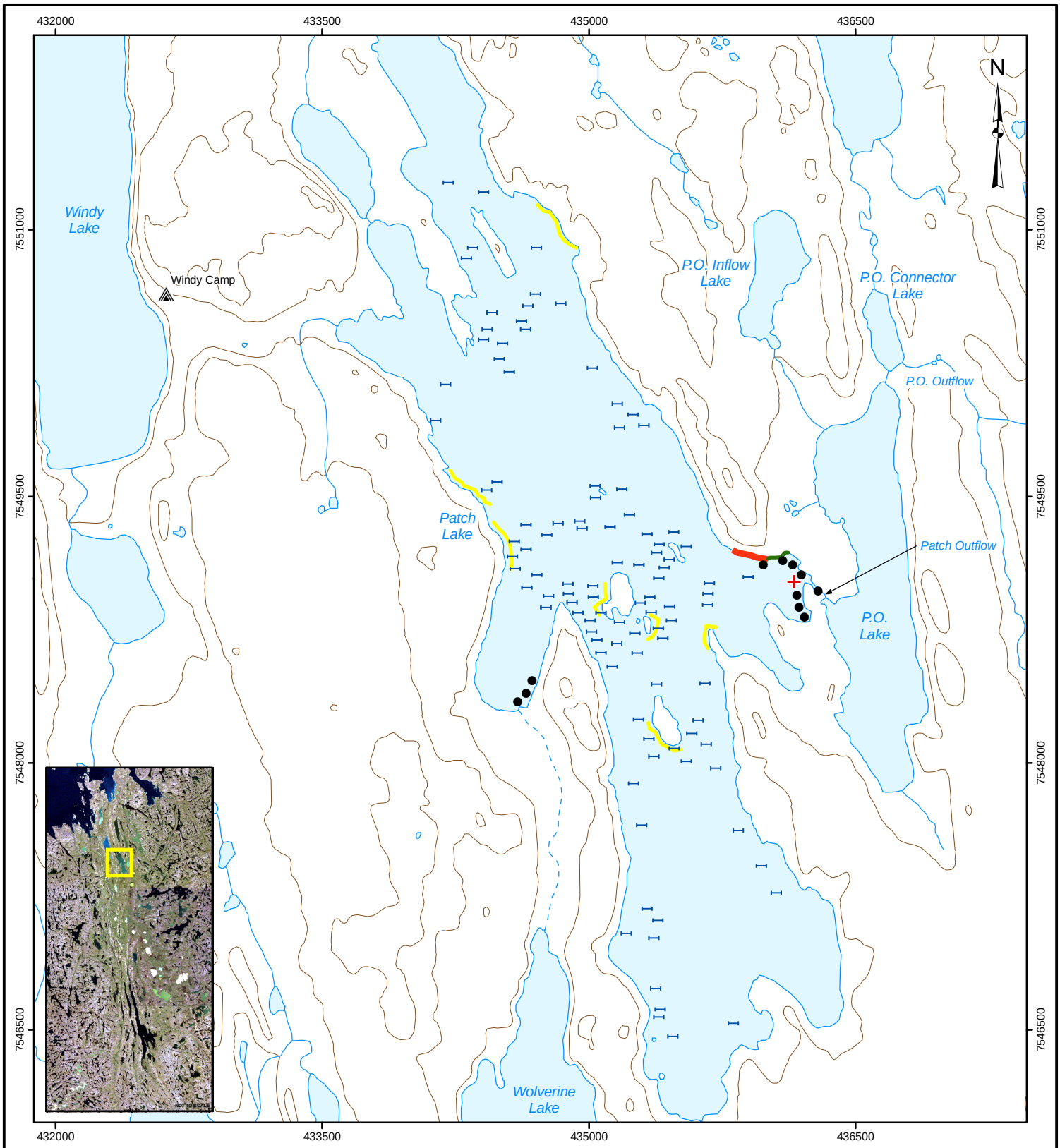


Figure 6.7 Length-Frequency Distribution for Ninespine Stickleback Captured in Ogama Lake, 2006

Table 6.9 Fish Species and Number of Fish Captured in Patch Lake, 2006 – 2007

Capture Method	Cisco	Lake trout	Lake whitefish	Least cisco	Ninespine stickleback	Total
Angling		9				**9**
Backpack electrofishing		1			1	**2**
Fyke nets	2	27	11			**40**
Gill nets	215	279	222	12		**728**
Minnow traps					3	**3**
Total	**217 (27.7%)**	**316 (40.4%)**	**233 (29.8%)**	**12 (1.5%)**	**4 (0.5%)**	**782 (100.0%)**



LEGEND

- CAMP
- ANGLING
- BACKPACK ELECTROFISHING
- BEACH SEINING
- FYKE NETTING
- GILL NETTING
- MINNOW TRAPPING
- CONTOUR (20 m INTERVAL)
- INTERMITTENT STREAM
- WATERCOURSE
- WATERBODY

REFERENCE

Base data obtained from Government of Canada, Natural Resources Canada, Centre for Topographic Information (1:50 000). Landsat 7 imagery captured in 2007, obtained from CanImage. Field data collected by Golder Associates Ltd., 2008.
Projection: UTM Zone 13 Datum: NAD 83

PROJECT

NEWMONT The Gold Company

HOPE BAY MINING LTD.

TITLE

2007 FISH SAMPLING LOCATIONS IN PATCH LAKE
MADRID PROJECT AREA

Golder Associates
Edmonton, Alberta

PROJECT NO. 07-1373-0019			SCALE AS SHOWN	REV. 0
DESIGN	AH	28 Oct. 2008	FIGURE: 6.8	
GIS	RC	11 Mar. 2009		
CHECK	AH	16 Mar. 2009		
REVIEW	GA	16 Mar. 2009		

M:\Projects\2008\1373\0026_HBML_Doris_North_Environmental_Programs\MapDocs\2007_Revised\Fig1_1_AQ_RF_ProjectLocation_09Jan2009.mxd

Life History Data

Lake Trout

In total, 316 lake trout were captured in Patch Lake. Fork lengths for 300 measured fish ranged from 277 to 980 mm, with a unimodal size distribution (Figure 6.9). The most frequently captured size-class was 700 to 710 mm (6.7% of the captured fish), and 56% of the captured fish were between 610 and 720 mm (Figure 6.9). Lake trout (n = 203) ranged in weight from 195 to 8695 g (Appendix E9).

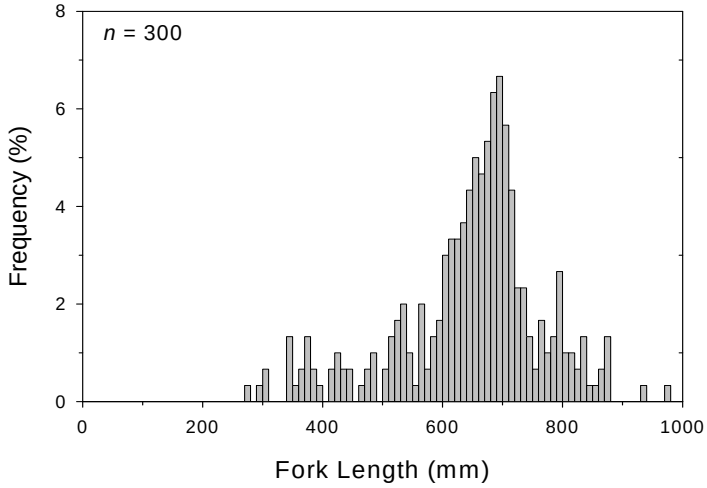


Figure 6.9 Length-Frequency Distribution for Lake Trout Captured in Patch Lake, 2006 – 2007

The length-weight relationship for lake trout captured in Patch Lake (Figure 6.10) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$$W = 2.84 \times 10^{-5} * L^{2.842} \qquad (n = 203, r^2 = 0.95)$$

Condition factors for individual lake trout ranged from 0.74 to 1.49 (Appendix E9), which was similar to the fish captured during previous studies in Patch Lake (ranging from 0.56 to 1.35) conducted by Rescan Environmental (RL&L/Golder 2002). The mean condition factor during the present study (1.03) was higher than the mean reported for P.O. Lake (0.84) (Appendix E9).

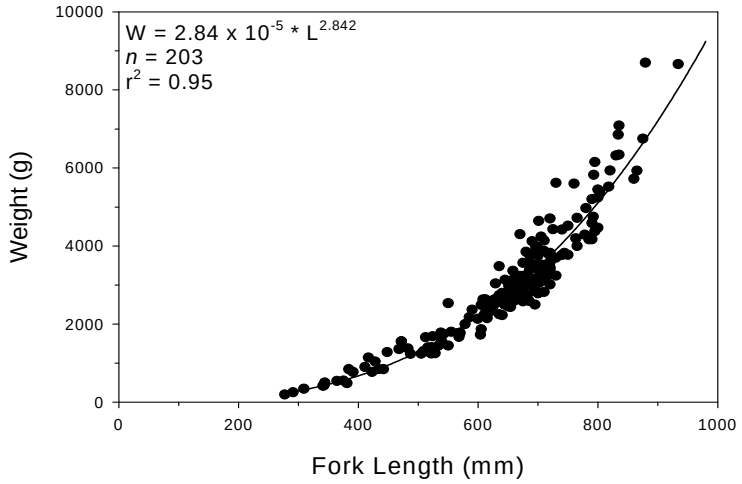


Figure 6.10 Length-Weight Relationship for Lake Trout in Patch Lake, 2006 – 2007

Lake Whitefish

In total, 233 lake whitefish were captured during fyke net and gill net sampling efforts in Patch Lake. Fork lengths for 225 of these fish ranged from 214 to 615 mm (Figure 6.11). The length-frequency distribution was unimodal, with the greatest number of fish captured in the 360 to 370 mm fork length size-class (9.8%). The majority of the captured fish were between 340 and 350 mm in fork length (Figure 6.11). Weights for the lake whitefish (n = 131) ranged from 158 to 1825 g (Appendix E9).

The length-weight relationship for lake whitefish captured in Patch Lake (Figure 6.12) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$W = 1.35 \times 10^{-6} * L^{2.996}$ (n = 131, $r^2 = 0.92$)

Condition factors for lake whitefish in Patch Lake ranged from 0.82 to 1.75, with a mean of 1.34 (Appendix E9), which was similar to the range previously reported for Patch Lake (0.84 to 1.73) (RL&L/Golder 2002). The mean condition factor was also similar to the mean condition factor reported for the connected P.O. Lake (1.36) in 2006 (Appendix E9).

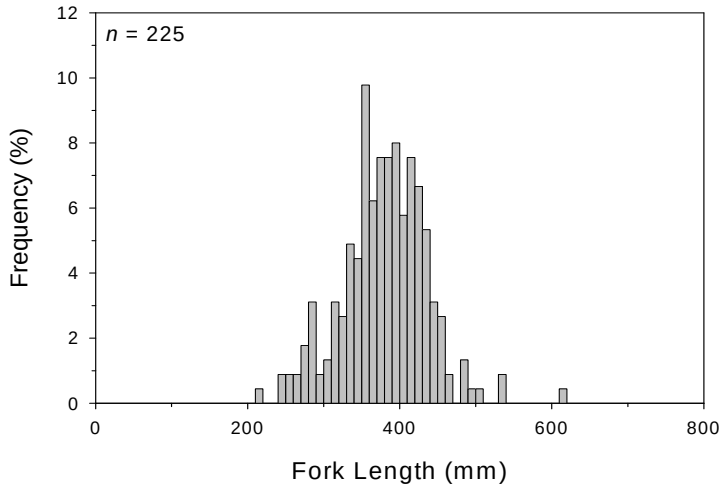


Figure 6.11 Length-Frequency Distribution for Lake Whitefish Captured in Patch Lake, 2006 – 2007

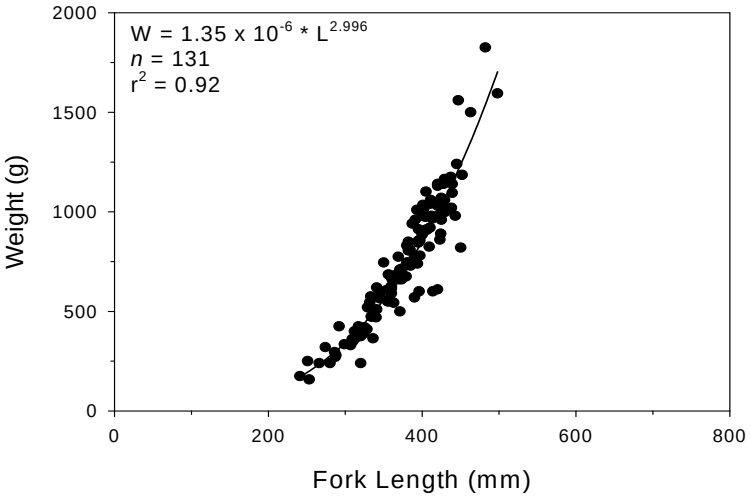


Figure 6.12 Length-Weight Relationship for Lake Whitefish in Patch Lake, 2006 – 2007

Cisco

In total, 217 cisco were captured in Patch Lake. Fork lengths of the cisco (n = 195) ranged from 85 to 450 mm, and the weights (n = 90) ranged from 13 to 378 g (Appendix E9). Most (95%) of cisco captured were less than 300 mm, and the most frequently captured size-class was 220 to 230 mm (13.3%) (Figure 6.13).

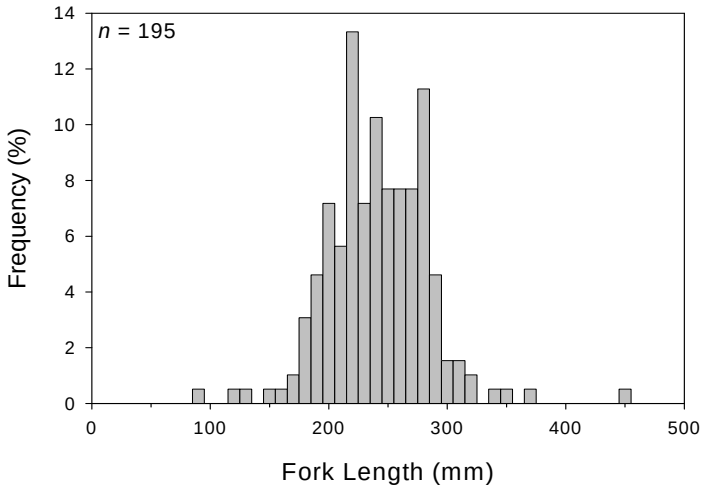


Figure 6.13 Length-Frequency Distribution for Cisco Captured in Patch Lake, 2006 – 2007

The length-weight relationship for cisco captured in Patch Lake (Figure 6.14) was described by the following equation, where W is weight in grams and L is fork length in millimetres:

$W = 2.71 \times 10^{-6} * L^{3.252}$ (n = 90, r^2 = 0.94)

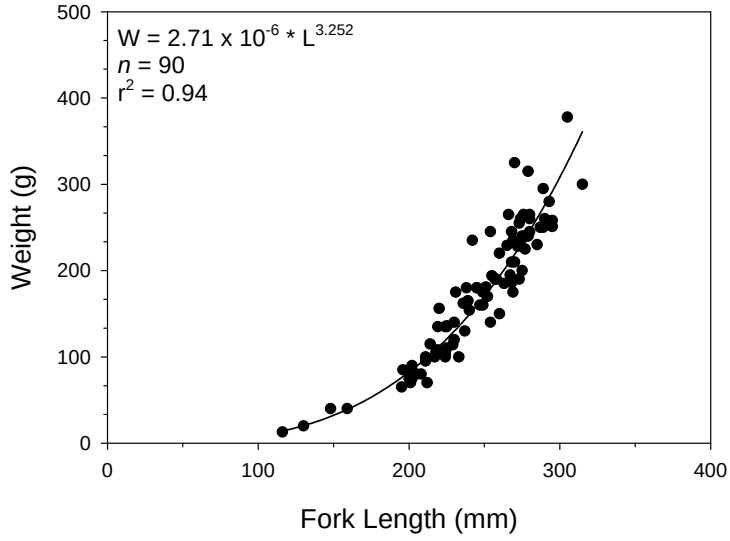


Figure 6.14 Length-Weight Relationship for Cisco in Patch Lake, 2006 – 2007

Condition factors for cisco caught in Patch Lake ranged from 0.73 to 1.50 (Appendix E9). The mean condition factor (1.09) for cisco in this study was higher than the mean condition factor reported in previous studies on Patch Lake (0.98) (RL&L/Golder 2002).

Least Cisco

Twelve least cisco were captured in Patch Lake. Fork lengths ranged between 204 and 253 mm (Appendix E9). Least cisco have not previously been reported in Patch Lake. Differentiating between cisco species is difficult due to the high degree of similarily between species and morphological variation within each species (Scott and Crossman 1973). It is possible that some of the cisco reported in previous years were, in fact, least cisco.

Ninespine Stickleback

Four ninespine stickleback, ranging in length between 45 and 73 mm, were captured in Patch Lake (Appendix E9).

6.3.3.4 Patch Lake Population Estimation

Methods

The lake trout population in Patch Lake was estimated from mark-recapture data collected from multiple sets of gill nets in summer 2007 (18 days in total from July to August with set locations throughout the area of the lake, though there was greater effort in the central deep areas of the lake; Figure 6.8). It was assumed that fish had not left or entered the lake, and had not given birth or died during the sampling period. Closed population models in program MARK (Cooch and White 2006) were used to evaluate the data. The program MARK and related guide to mark-recapture analyses are available online at no cost at http://www.phidot.org/software/ (visited 24 January 2008).

These models allow animals to have unique capture probabilities (i.e., heterogeneity) and, therefore, are the most realistic models to fit fisheries applications (Pine et al. 2003). Although the Schnabel model (Ricker 1975) can be easily applied in Microsoft Excel™ spreadsheet calculators, the Schnabel model assumes that capture probabilities among animals are equal (i.e., no heterogeneity). Further, MARK encompasses almost all currently used methods for analysis of marked individuals, and offers more flexibility and power in statistical modeling and hypothesis testing than other available programs. MARK can fit and evaluate several models, in addition to the Schnabel model, using Akaike's Information Criterion (Burnham and Anderson 2002). It is also important to note that if the monitoring program at Patch Lake was extended to a multi-year program, MARK has the option of robust population models for calculation of population sizes during short-term studies, as well as survival and recruitment to be estimated with a Jolly-Serber model for the intervals between the closed periods (Pollock 1982).

The model types used in analyses are described in detail in Otis et al. (1978). Specifically, six types of models were examined: M0, Mb, Mt, as well as M0,

Mb and Mt with heterogeneity (two mixtures). M0 is the simplest model for closed populations and does not allow for changes in capture probability due to heterogeneity, behavior, or time. Mh (heterogeneity model) allows each animal to have a unique capture probability (for example, due to size or sex), but this capture probability must remain constant among all sampling periods. The trap response/behaviour model Mb estimates an initial capture probability (pi) and recapture probability (ci) that may differ from each other. The model Mt allows capture probability to vary among sampling periods, but it must remain constant among individuals for each period. This model is also called the Schnabel model.

Information Theory, specifically Akaike's Information Criterion corrected for small sample sizes (AICc), (Burnham and Andersen 2002) was used to select models for estimating the population size of lake trout. The best model had the smallest AICc value ($AICc_{min}$; Appendix C10). Primary inference was drawn from this model and others within two units of $AICc_{min}$ (Burnham and Andersen 2002).

Results

In brief, AICc identified Mt as the top model. There were no models within two AICc units of the top model (i.e., Mt). Probability of capture varied among sampling occasions. The lowest capture probability was 0.0009 (sampling day 1), whereas the highest was 0.026 (sampling day 12). The overall mean probability of capture was low (0.012). The population size of lake trout greater than 300 mm in Patch Lake was estimated to be 1159 individuals (95% CI = 825 to 1680 individuals; Appendix E10).

6.3.3.5 P.O. Lake

Beach seines, fyke nets, gill nets, dip nets, and minnow traps were used to sample fish communities in P.O. Lake on 30 and 31 July 2006.

Species Composition and Relative Abundance

Fish sampling in P.O. Lake resulted in the capture of 102 fish consisting of four species (Table 6.10). Ninespine stickleback were captured the most frequently (76.5%), followed by lake trout (13.7%), lake whitefish (6.8%), and cisco (3.0%). P.O. Lake was not fished in previous studies. The majority (65%) of the ninespine stickleback sampled were collected by dip netting in a disconnected pool beside P.O. Lake. These fish were not included in the CPUE calculations or life history statistics.

Table 6.10 Fish Species and Number of Fish Captured in P.O. Lake, 2006

Capture Method	Ninespine stickleback	Lake trout	Lake whitefish	Cisco	Total
Beach seine	6				**6**
Dip Net	51				**51**
Fyke nets		9		1	**10**
Gill nets		5	7	2	**14**
Minnow traps	21				**21**
Total	**78 (76.5%)**	**14 (13.7%)**	**7 (6.8%)**	**3 (3.0%)**	**102 (100.0%)**

Lake trout and cisco were also captured in a fyke net set near the lake outflow. Ninespine stickleback were captured in beach seines and minnow traps set along the shoreline of the lake (Table 6.10). Abundant aquatic vegetation in these areas provided good habitat for forage fish species, such as ninespine stickleback.

Life History Data

Lake Trout

Fourteen lake trout were caught in P.O. Lake. Individual fish ranged in fork length from 304 to 725 mm, but the majority of fish (71%) were greater than 600 mm in length. Weights fell between 265 and 3000 g (mean of 1808 g) and condition factors ranged from 0.77 to 1.11 (mean of 0.92) (Appendix E9). The mean condition factor was lower than the mean condition factor reported for Patch Lake (1.03) and Ogama Lake (0.93) (Appendix E9).

Lake Whitefish

Seven lake whitefish were captured in P.O. Lake. The mean fork length for lake whitefish was 365 mm and the range was 300 to 434 mm. Fish weights ranged from 330 to 1365 g (n = 6), and the condition factors ranged from 1.22 to 1.67 (Appendix E9). The mean condition factor was 1.36, which was similar to the mean condition factor reported for lake whitefish in Patch Lake (1.33) and was slightly higher than the condition factor reported for Ogama Lake (1.24) (Appendix E9).

Ninespine Stickleback

Twenty-seven ninespine stickleback were captured in P.O. Lake, ranging in length from 21 to 65 mm (Appendix E9). Seventy percent of the ninespine stickleback were between 40 and 60 mm in length (Figure 6.15). Fifty-one additional ninespine stickleback were collected from a disconnected pool on the shore of P.O. Lake. The length of these fish was estimated to be 20 to 25 mm (Appendix E1).

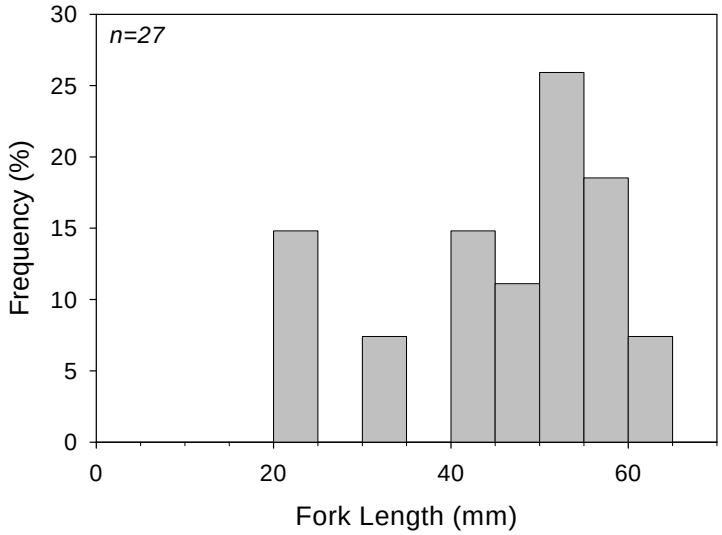


Figure 6.15 Length-Frequency Distribution for Ninespine Stickleback Captured in P.O. Lake, 2006

Cisco

Three cisco were captured in P.O. Lake. Fork lengths for individual fish ranged from 204 to 215 mm. Weights of these fish were between 80 and 95 g. The condition factors of these fish ranged between 0.88 and 1.12, with a mean of 0.97 (Appendix E9), which was slightly lower than the mean condition factor reported for Patch Lake (1.09) and Ogama Lake (1.13) (Appendix E9).

6.3.3.6 P.O. Connector Lake

P.O. Connector Lake is the small waterbody located between P.O. Lake and Ogama Lake (Figure 6.2). Beach seining, fyke netting, gill netting, minnow trapping, and dip netting were used to sample for fish species present in P.O. Connector Lake on 31 July and 1 to 2 August 2006.

Species Composition and Relative Abundance

Fish sampling in P.O. Connector Lake yielded a total of 114 fish representing three species (Table 6.11). Ninespine stickleback was the most frequently captured species (91.2%), followed by lake trout (6.1%), and lake whitefish (2.6%). P.O. Connector Lake had not been sampled during previous fish sampling programs. In 2006, ninespine stickleback were observed throughout aquatic vegetation along the north shore of the lake and appeared to be quite abundant. Several fish were captured opportunistically by dip netting in vegetated littoral areas.

Table 6.11 Fish Species and Number of Fish Captured in P.O. Connector Lake, 2006

Capture Method	Ninespine stickleback	Lake trout	Lake whitefish	Total
Beach seine		1		**1**
Dip nets	5	1		**6**
Fyke nets	27		1	**28**
Gill nets		5	2	**7**
Minnow traps	72			**72**
Total	**104 (91.2%)**	**7 (6.1%)**	**3 (2.6%)**	**114 (100.0%)**

Life History Data

Lake Trout

The seven lake trout caught in P.O. Connector Lake ranged in fork length from 349 to 710 mm. Only five of the captured lake trout were weighed; their weights ranged between 415 and 2985 g, and their condition factors ranged from 0.83 to 1.08 (Appendix E9). The mean condition factor was 0.94, which was similar to the mean reported condition factors for P.O. Lake (0.84) and Ogama Lake (0.93) (Appendix E9).

Lake Whitefish

The three lake whitefish caught in P.O. Connector Lake ranged in fork length from 74 to 367 mm. Two fish were weighed (465 and 590 g). These two fish were in good condition as indicated by their condition factors of 1.19 and 1.41 (Appendix E9). The condition factors for these fish were similar to the mean condition factor reported for P.O. Lake (1.36) and Ogama Lake (1.24) (Appendix E9).

Ninespine Stickleback

Ninespine stickleback (n = 104) from P.O. Connector Lake ranged in fork length from 35 to 70 mm (Appendix E9). The majority of captured fish (60.5%) were between 45 and 54 mm (Figure 6.16).

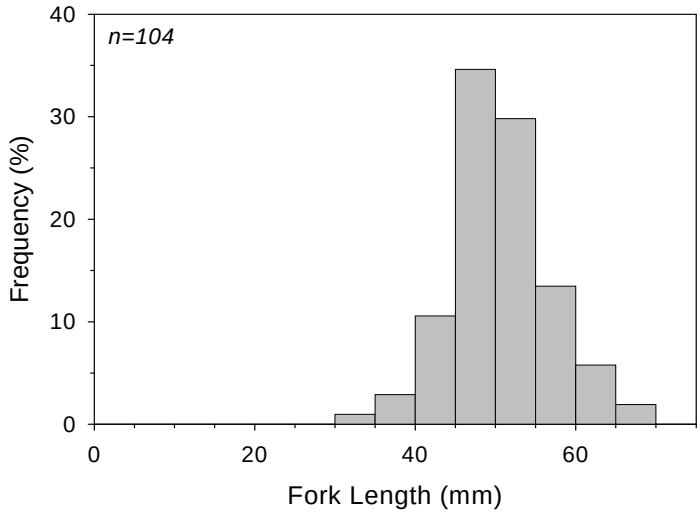


Figure 6.16 Length-Frequency Distribution for Ninespine Stickleback Captured in P.O. Connector Lake, 2006

6.3.3.7 P.O. Inflow Lake

P.O. Inflow Lake is the small waterbody located to the north-west of P.O. Lake and P.O. Connector Lake (Figure 6.2). This lake drains south-east into P.O. Lake. Backpack electrofishing, beach seining, gill netting, and minnow trapping were used to capture fish in P.O. Inflow Lake on 6 and 7 August 2006.

Species Composition and Relative Abundance

In total, 671 fish were captured in P.O. Inflow Lake (Table 6.12). Fish catch was comprised of two species. Ninespine stickleback was the most abundant species (68.4%) in the catch and cisco made up the remainder of the catch (31.6%). Of all the sampled lakes in the Boston and Madrid Project areas, P.O. Inflow Lake had the highest CPUE values for backpack electrofishing (11.9 fish/100 s) and beach seining (625.0 fish/100 m^2) (Appendices E3 and E4).

Table 6.12 Fish Species and Number of Fish Captured in P.O. Inflow Lake, 2006

Capture Method	Ninespine stickleback	Cisco	Total
Backpack electrofishing	121	12	**133**
Beach seine	300	200	**500**
Gill nets			
Minnow traps	38		**38**
Total	**459 (68.4%)**	**212 (31.6%)**	**671 (100.0%)**

Life History Data

Cisco

In total, 212 cisco were captured in P.O. Inflow Lake. Lengths were measured from a subset of cisco captured in the lake; mean fork length (n = 21) was 53 mm. Fork lengths for measured fish ranged from 35 to 79 mm (Appendix E9). The majority of cisco (62%) were between 40 and 60 mm in fork length (Figure 6.17).

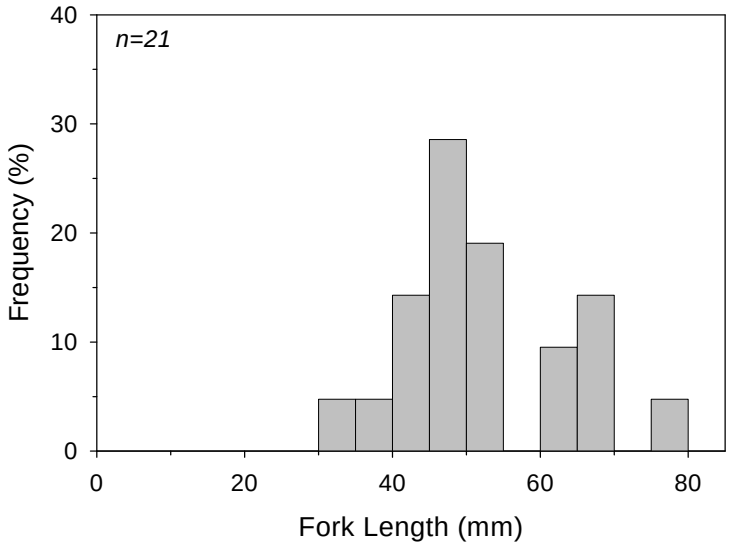


Figure 6.17 Length-Frequency Distribution for Cisco Captured in P.O. Inflow Lake, 2006

Ninespine Stickleback

In total, 459 ninespine stickleback were captured in P.O. Inflow Lake. Lengths were measured from a subset of the total catch. Fork length for measured fish (n = 169) ranged from 20 to 78 mm (Appendix E9). Most of the fish captured (81%) were between 40 and 60 mm in fork length (Figure 6.18).

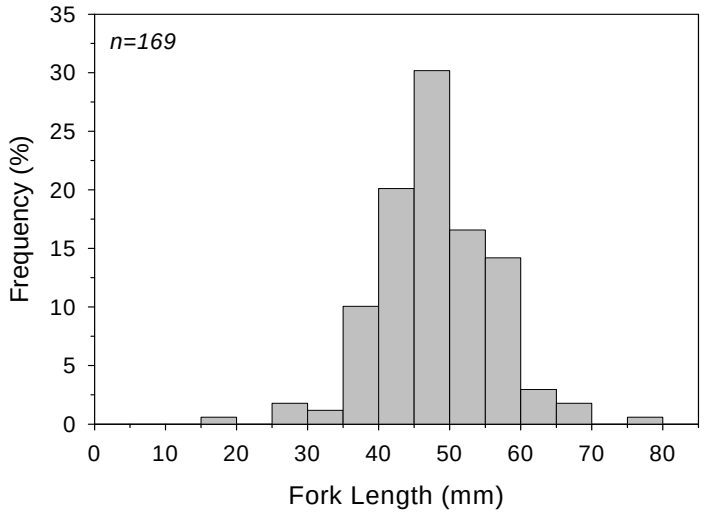


Figure 6.18 Length-Frequency Distribution for Ninespine Stickleback Captured in P.O. Inflow Lake, 2006

6.3.3.8 Wolverine Lake

Angling, backpack electrofishing, beach seining, gill netting, and minnow trapping were used to capture fish in Wolverine Lake on 23 and 24 July 2006, 7 August 2006, and 31 August 2007.

Species Composition and Relative Abundance

Fish sampling in Wolverine Lake yielded a total of 4389 individual fish consisting of two species (Table 6.13). Least cisco made up most of the catch (91.1%) and were captured primarily in two beach seine hauls in 2006. Ninespine stickleback (8.9%) made up the remainder of the catch. Beach seining was very successful for capturing fish (Table 6.13).

Table 6.13 Fish Species and Number of Fish Captured in Wolverine Lake, 2006 – 2007

Capture Method	Least cisco	Ninespine stickleback	Total
Backpack electrofishing		74	**74**
Beach seine	3997	214	**4211**
Gill nets		1	**1**
Minnow traps	3	100	**103**
Total	**4000 (91.1%)**	**389 (8.9%)**	**4389 (100.0%)**

Life History Data

Least Cisco

Large numbers (*n* = ~4000) of small least cisco were captured during beach seining efforts along the north-west shoreline of Wolverine Lake. Least cisco that were measured (*n* = 114) ranged from 35 to 85 mm in fork length (Figure 6.19; Appendix E9). The length-frequency distribution was bimodal with 46% of the cisco measuring between 40 and 54 mm and 32% measuring between 65 and 74 mm (Figure 6.19). The unmeasured fish were estimated to have fork lengths between 45 and 70 mm (Appendix E1).

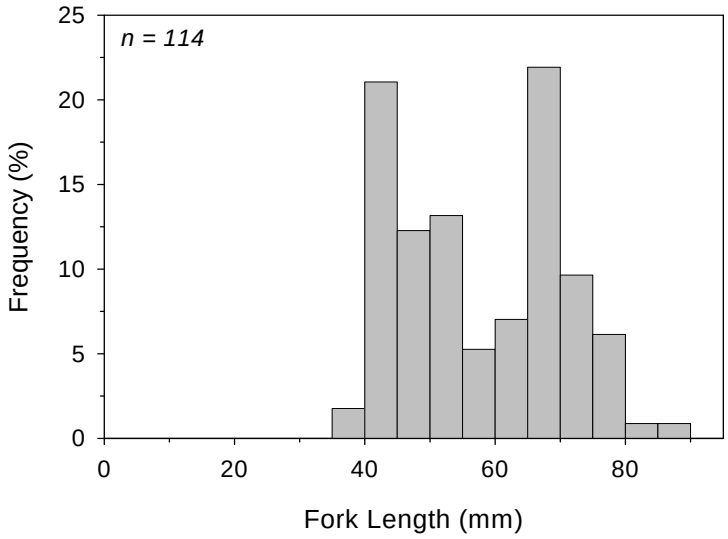


Figure 6.19 Length-Frequency Distribution for Least Cisco Captured in Wolverine Lake, 2006 – 2007

Differentiating between the various species of cisco is difficult for small fish. To accurately identify the cisco species present in Wolverine Lake, several of the least cisco were retained for dissection. During the dissections, Golder Associates Ltd. discovered that many of these small least cisco were actually mature adults. Wolverine Lake is a small, shallow lake that appears to have only intermittent stream flows connecting it to Patch Lake. These least cisco may have stunted growth as a result of the lake isolation, small size, and lack of predator fish species in the lake.

Ninespine Stickleback

In total, 389 ninespine stickleback were captured in Wolverine Lake. Lengths of 221 ninespine stickleback that were measured ranged from 10 to 65 mm (Figure 6.20; Appendix E9). The remaining unmeasured fish were estimated to

be between 30 and 70 mm (Appendix E1). The majority (87%) of the ninespine stickleback captured were between 40 and 65 mm (Figure 6.20).

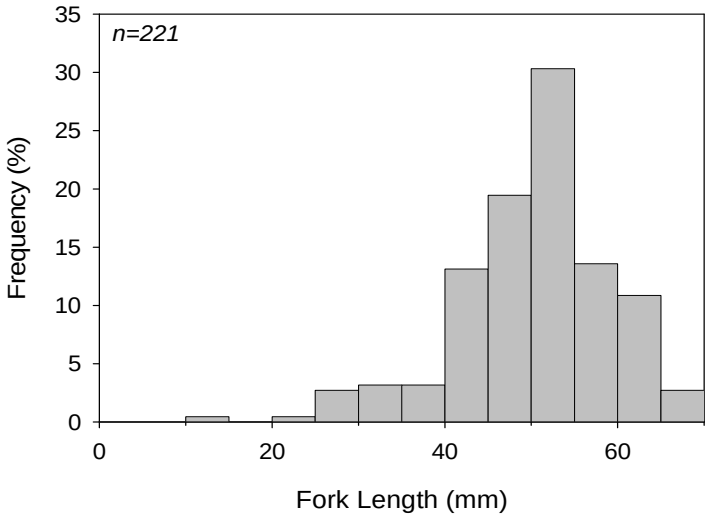


Figure 6.20 Length-Frequency Distribution for Ninespine Stickleback Captured in Wolverine Lake, 2006 – 2007

6.3.4 Madrid Project Area Stream Communities

6.3.4.1 Ogama Inflow

Fish sampling took place in Ogama Inflow, upstream of the confluence with Ogama Lake, on 2 to 4 August 2006. Fish capture methods included backpack electrofishing and minnow trapping. In addition, a fyke net was installed in the inflow to capture fish moving out of Ogama Lake.

Species Composition and Relative Abundance

Fish sampling in Ogama Inflow yielded a total of 60 fish representing three species. Ninespine stickleback contributed the largest proportion of the overall catch (68.3%), followed by lake trout (23.3%), and lake whitefish (8.3%) (Table 6.14). Earlier studies conducted by Rescan Environmental reported the presence of lake trout, lake whitefish, cisco, and ninespine stickleback in two Ogama inflows, including the main inflow from P.O. Lake (RL&L/Golder 2002). Fyke netting efforts in the present study resulted in the capture of all three species including fish of all sizes ranging from 21 to 790 mm in length (Appendix E1). Minnow trapping had a higher CPUE (10.3 fish/h) in Ogama Inflow than in the Koignuk River, which was the only other stream with minnow trapping effort in 2006 and 2007 (Appendix E7).

Table 6.14 Fish Species and Number of Fish Captured in Ogama Inflow, 2006

Capture Method	Ninespine stickleback	Lake whitefish	Lake trout	Total
Backpack electrofishing	2		2	**4**
Fyke nets	3	5	12	**20**
Minnow traps	36			**36**
Total	**41 (68.3%)**	**5 (8.3%)**	**14 (23.3%)**	**60 (100.0%)**

Life History Data

Lake Trout

Fourteen lake trout were caught in Ogama Inflow. The lake trout were primarily large in size and were captured during fyke netting efforts near the mouth at Ogama Lake. The fyke net was set across the entire channel to capture all fish moving upstream out of Ogama Lake. The lake trout captured ranged in fork length from 420 to 790 mm (Appendix E9). The weights of 12 of the captured fish ranged between 660 and 1440 g, and the condition factors ranged from 0.84 to 1.14. The mean condition factor was 0.96, which was similar to the mean condition of lake trout captured in Ogama Lake (0.93) in 2006 (Appendix E9) and during previous studies in Ogama Inflow (mean of 0.96) (RL&L/Golder 2002).

Lake Whitefish

There were five lake whitefish captured in Ogama Inflow. One larger lake whitefish was 342 mm in fork length (Appendix E9). The remaining four fish were YOY and ranged in length from 35 to 50 mm (Appendix E9).

Ninespine Stickleback

Forty-one ninespine stickleback were captured in Ogama Inflow. The mean fork length of the measured fish was 55 mm. The range in lengths for individual fish was 40 to 71 mm (Appendix E9), and the majority (78%) of the fish were between 50 and 69 mm (Figure 6.21).

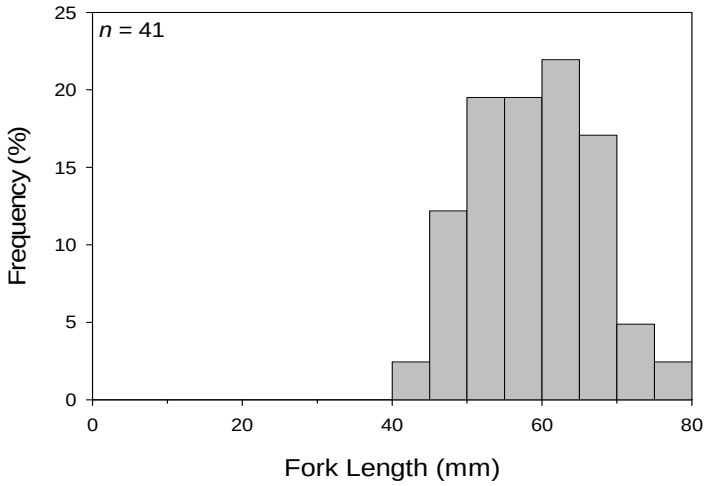


Figure 6.21 Length-Frequency Distribution for Ninespine Stickleback Captured in Ogama Inflow, 2006 – 2007

6.3.4.2 Ogama Outflow

Fish sampling took place within Ogama Outflow on 5 and 6 August 2006 using a backpack electrofisher and fyke net. The fyke net was set across the outflow to capture fish moving downstream out of Ogama Lake.

Species Composition and Relative Abundance

Fish sampling in Ogama Outflow yielded a total of 222 fish representing four species. Ninespine stickleback contributed the largest proportion of the overall catch (94.6%), followed by lake trout (3.2%), lake whitefish (1.8%), and cisco (0.5%) (Table 6.15). Previous sampling programs also reported the presence of these four species in Ogama Outflow (RL&L/Golder 2002).

Table 6.15 Fish Species and Number of Fish Captured in Ogama Outflow, 2006

Capture Method	Cisco	Ninespine stickleback	Lake whitefish	Lake trout	Total
Backpack electrofishing		27		2	**29**
Fyke nets	1	183	4	5	**193**
Total	**1 (0.5%)**	**210 (94.6%)**	**4 (1.8%)**	**7 (3.2%)**	**222 (100.0%)**

Life History Data

Lake Trout

Seven lake trout were captured in Ogama Outflow during electrofishing and fyke netting efforts near the outlet at Ogama Lake. Individual fish ranged in fork length from 283 to 539 mm (Appendix E9). Weights of the lake trout were between 280 and 1400 g, and the mean condition factor was 1.08 (ranging from 0.89 to 1.26) (Appendix E9). The mean condition factor for these fish was slightly higher than the condition of lake trout that were captured in Ogama Lake (0.93) and Ogama Inflow (0.96) (Appendix E9).

Lake Whitefish

Four lake whitefish ranging in lengths from 292 to 322 mm (Appendix E9) were caught in Ogama Outflow. The weights of the lake whitefish ranged from 400 to 500 g, and the condition factors ranged from 1.45 to 1.68, with a mean of 1.56 indicating the fish were robust (Appendix E9). The mean condition factor was higher in Ogama Outflow in this study than in previous studies by Rescan Environmental (mean of 1.16) (RL&L/Golder 2002). The mean condition factor was also higher than the mean condition factor reported for Ogama Lake (1.24) (Appendix E9). All lake whitefish were captured in the fyke net set across the outflow channel and were caught moving from Ogama Lake into the outflow.

Cisco

One cisco was caught in Ogama Outflow. This fish had a length of 231 mm and a weight of 145 g (Appendix E9). The condition factor was 1.18, which was similar to the reported mean condition factor for cisco captured in Ogama Lake (1.13) (Appendix E9).

Ninespine stickleback

In total, 210 ninespine stickleback were captured in the Ogama Outflow. Lengths of the fish (n = 150) ranged from 21 to 83 mm (Figure 6.22; Appendix E9). The majority (64%) of captured fish were between 30 and 45 mm (Figure 6.22).

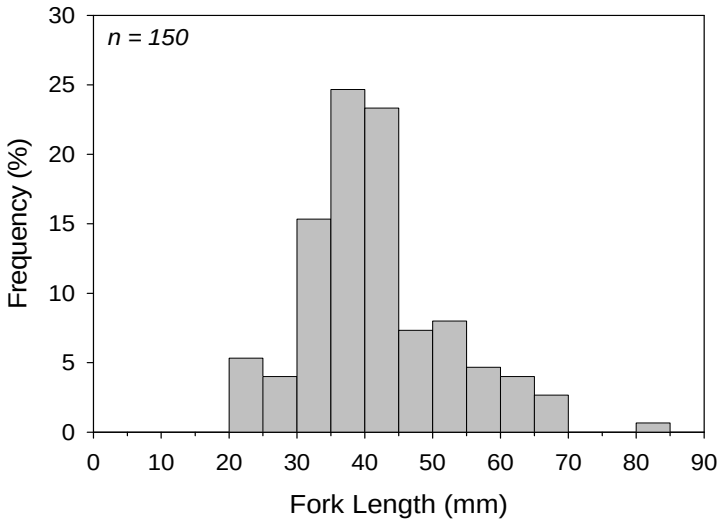


Figure 6.22 Length-Frequency Distribution for Ninespine Stickleback Captured in Ogama Outflow, 2006

6.3.4.3 Patch Outflow

Beach seining was conducted along the length of Patch Outflow on 27 July 2006 (Appendix E8). This was the first time Patch Outflow was sampled. Fish were not captured using this method; however, fish moving from Patch Outflow into Patch Lake were captured in a fyke net set in Patch Lake near the mouth of the outflow (See Section 6.4.3). One lake trout was observed but not captured during sampling efforts in Patch Outflow (Appendix E1).

6.3.4.4 P.O. Outflow

Fish sampling was conducted in P.O. Outflow (the stream connecting P.O. Lake to a small unnamed pond, P.O. Connector Lake, to the north between P.O. and Ogama lakes) on 30 July 2006. Fish sampling was conducted using beach seines and resulted in the capture of six ninespine stickleback (Appendix E4). Individual fork lengths ranged from 24 to 75 mm (Appendix E9). P.O. Outflow had not been sampled during previous studies.

6.4 SUMMARY

6.4.1 Boston Project Area

In total, 444 fish representing 10 species were encountered in the Boston Project area during fisheries surveys conducted in 2006 and 2007 (Tables 6.16 and 6.17). Fish sampling was conducted in five lakes as follows: Aimaokatalok Lake, Fickle Duck Lake, Reference Lake, and Stickleback Lake. Sampling was also conducted on the Koignuk and Aimaokatalok rivers and in three small streams including: Fickle Duck Outflow, Fickle Duck Inflow, and Stickleback Outflow. Overall, the most common fish species captured was ninespine stickleback (53.2%), followed by lake whitefish (29.5%), lake trout (9.0%), Arctic grayling (4.1%), Arctic flounder (1.4%), slimy sculpin (0.9%), burbot (0.7%), cisco (0.7%), fourhorn sculpin (0.5%), and Arctic char (0.2%) (Tables 6.16 and 6.17).

Table 6.16 Fish Species and Number of Fish Encountered in Lakes Sampled in the Boston Project Area, 2006

Species	Aimaokatalok Lake	Fickle Duck Lake	Reference Lake	Stickleback Lake	Total
Cisco	2		1		**3**
Lake trout	17	3	1		**21**
Ninespine stickleback	108	6	12	27	**153**
Total	**127**	**9**	**14**	**27**	**177**

Table 6.17 Fish Species and Number of Fish Encountered in Streams Sampled in the Boston Project Area, 2006 – 2007

Species	Aimaokatalok River	Fickle Duck Outflow	Fickle Duck Inflow	Koignuk River	Stickleback Outflow	Total
Arctic char				1		**1**
Arctic flounder				6		**6**
Arctic grayling				18		**18**
Burbot		**1**		2		**3**
Fourhorn sculpin				2		**2**
Lake trout	9	**1**		9		**19**
Lake whitefish				131		**131**
Ninespine stickleback	15	**7**	8	29	24	**83**
Slimy sculpin				3	1	**4**
Total	**24**	**9**	**8**	**201**	**25**	**267**

Based on the condition factors calculated for fish in the Boston Project area, the fish appear to be in good condition, and were in similar condition to other fish in the Hope Bay Belt (RL&L/Golder 2002; Golder 2007, 2008a, 2008b).

Lake Communities

In 2006, fish sampling was conducted in Aimaokatalok, Fickle Duck, Reference, and Stickleback lakes. Sampling methods included angling, backpack electrofishing, beach seining, fyke netting, gill netting, and minnow trapping.

During 2006, 177 fish representing three species were captured in the sampled lakes. Ninespine stickleback was the dominant species in the catch (86.4%); other species captured in the sampled lakes included lake trout (11.9%) and cisco (1.7%) (Table 6.16). In addition to these three species, lake whitefish and Arctic grayling were captured during previous studies in the Boston Project area lakes. (Golder 2008a). In a previous study conducted by Rescan, Arctic grayling were reported to have been captured in Fickle Duck Lake (Golder 2008a); however, this species was not captured in Fickle Duck Lake during the 2006 sampling program.

Stream Communities

In 2006, fish sampling was conducted in five streams/rivers in the Boston Project area. The streams flowing into and out of Fickle Duck Lake and the outflow from Stickleback Lake were sampled. The lowest reach of the Aimaokatalok River was sampled as it entered Aimaokatalok Lake, and the upper reaches of the Koignuk River downstream of Aimaokatalok Lake were sampled. In 2006 and 2007, the lower reaches of the Koignuk River, just upstream of the confluence at Hope Bay, also were sampled. Sampling methods included angling, backpack electrofishing, beach seining, gill netting, and minnow trapping.

In total, 267 fish representing nine species were captured. Lake whitefish was the dominant fish species (49.1%). This consisted primarily of young-of-the-year lake whitefish captured during beach seining efforts in the upper Koignuk River. Ninespine stickleback (31.1%), Arctic grayling (6.7%), lake trout (7.1%), slimy sculpin (1.5%), and burbot (1.1%) were also captured in these streams. The remaining 3.3% of the catch was composed of Arctic char, fourhorn sculpin, and Arctic flounder, which were only caught in the lower reaches of the Koignuk River (Table 6.17).

In 2006, burbot were captured in Fickle Duck Outflow and the Koignuk River, which were the first reported captures of this species in the Boston Project area. Fourhorn sculpin, Arctic flounder, Arctic char, and slimy sculpin were not captured during previous studies on the Koignuk River; however, these species

were captured in the lower reaches of the river in 2006 and 2007, which had not been sampled during the earlier sampling programs.

6.4.2 Madrid Project Area

In total, 7155 fish, representing six species, were encountered in the Madrid Project area during the fisheries surveys conducted in 2006 and 2007 (Tables 6.18 and 6.19). Fish sampling was conducted in seven lakes and four lake outflows/inflows. The lakes sampled included Glenn, Ogama, Patch, P.O., P.O. Connector, P.O. Inflow, and Wolverine lakes. The outflow streams from Ogama, Patch, and P.O. lakes, as well as the inflow stream to Ogama Lake were sampled. The most common fish species captured was least cisco (56.1%). Other species including ninespine stickleback (18.6%), cisco (15.5%), lake whitefish (4.1%), lake trout (5.6%), and Arctic char (0.1%) also were captured in lakes and streams in the area (Tables 6.18 and 6.19).

Table 6.18 Summary of Fish Species and Number of Fish Encountered in Lakes Sampled in the Madrid Project Area, 2006 – 2007

Species	Glenn Lake	Ogama Lake	Patch Lake	P.O. Lake	P.O. Connector Lake	P.O. Inflow Lake	Wolverine Lake	Total
Arctic char	4							**4**
Cisco	379	300	217	3		212		**1111**
Lake trout	40	3	316	14	7			**380**
Lake whitefish	2	37	233	7	3			**282**
Least cisco			12				4000	**4012**
Ninespine stickleback		43	4	78	104	459	389	**1077**
Total	**425**	**383**	**782**	**102**	**114**	**671**	**4389**	**6866**

Table 6.19 Summary of Fish Species and Number of Fish Encountered in Streams Sampled in the Madrid Project Area, 2006

Species	Ogama Inflow	Ogama Outflow	Patch Outflow	P.O. Lake Outflow	Total
Cisco		1			**1**
Lake trout	14	7	1		**22**
Lake whitefish	5	4			**9**
Ninespine stickleback	41	210		6	**257**
Total	**60**	**222**	**1**	**6**	**289**

In general, the fish captured in the Madrid Project area appeared to be in good condition and were within the reported ranges of condition factors for fish in the Hope Bay Belt (RL&L/Golder 2002; Golder 2007, 2008a, and 2008b).

Lake Communities

Fish sampling was conducted in Glenn, Ogama, Patch, P.O., P.O. Connector, P.O. Inflow, and Wolverine lakes. Glenn, P.O., P.O. Connector, P.O. Inflow, and Wolverine lakes were sampled for the first time during the 2006 – 2007 sampling program. Sampling methods included angling, backpack electrofishing, beach seining, fyke netting, gill netting, minnow trapping, and dip netting.

In total, 6866 fish comprising six species were captured in the sampled lakes. Least cisco was the most frequently captured species (58.4%), followed by cisco (16.2%), ninespine stickleback (15.7%), lake trout (5.5%), lake whitefish (4.1%), and Arctic char (0.1%). The large numbers of least cisco were due primarily to two large beach seine hauls collected in Wolverine Lake. Ninespine stickleback was the predominant species in three of the five lakes sampled: P.O., P.O. Connector, and P.O. Inflow. In Patch Lake, lake trout was the most commonly captured species and in Ogama Lake, cisco was the most common species. Lake trout were also captured in all of the lakes except for P.O. Inflow and Wolverine lakes (Table 6.18). In general, the species captured in the Madrid Project area lakes were typical of the area (RL&L/Golder 2002).

Wolverine Lake was found to have a unique stunted population of adult least cisco. The fork lengths ranged from only 35 to 85 mm yet dissections revealed that these fish were mature.

Stream Communities

Fish sampling was conducted in the streams flowing out of Ogama, Patch, and P.O. lakes, as well as the inflow to Ogama Lake. The inflow and outflow streams of P.O., P.O. Connector, and P.O. Inflow lakes, and Patch Outflow were sampled for the first time during the 2006 – 2007 studies. These streams were sampled using beach seines, backpack electrofishers, and fyke nets.

In total, 289 fish comprising four species were captured in the sampled streams. Ninespine stickleback was the most frequently captured species (88.9%), followed by lake trout (7.6%), lake whitefish (3.1%), and cisco (0.3%). Only ninespine stickleback was captured in P.O. Outflow, and a single lake trout was observed in Patch Lake Outflow (Table 6.19). Cisco was reported in Ogama Inflow during previous studies though this species was not captured in the 2006-2007 studies. The species captured in Ogama Outflow during the present study were the same as the species previously reported in the stream (RL&L/Golder 2002).

6.5 LOWER KOIGNUK RIVER ASSESSMENT

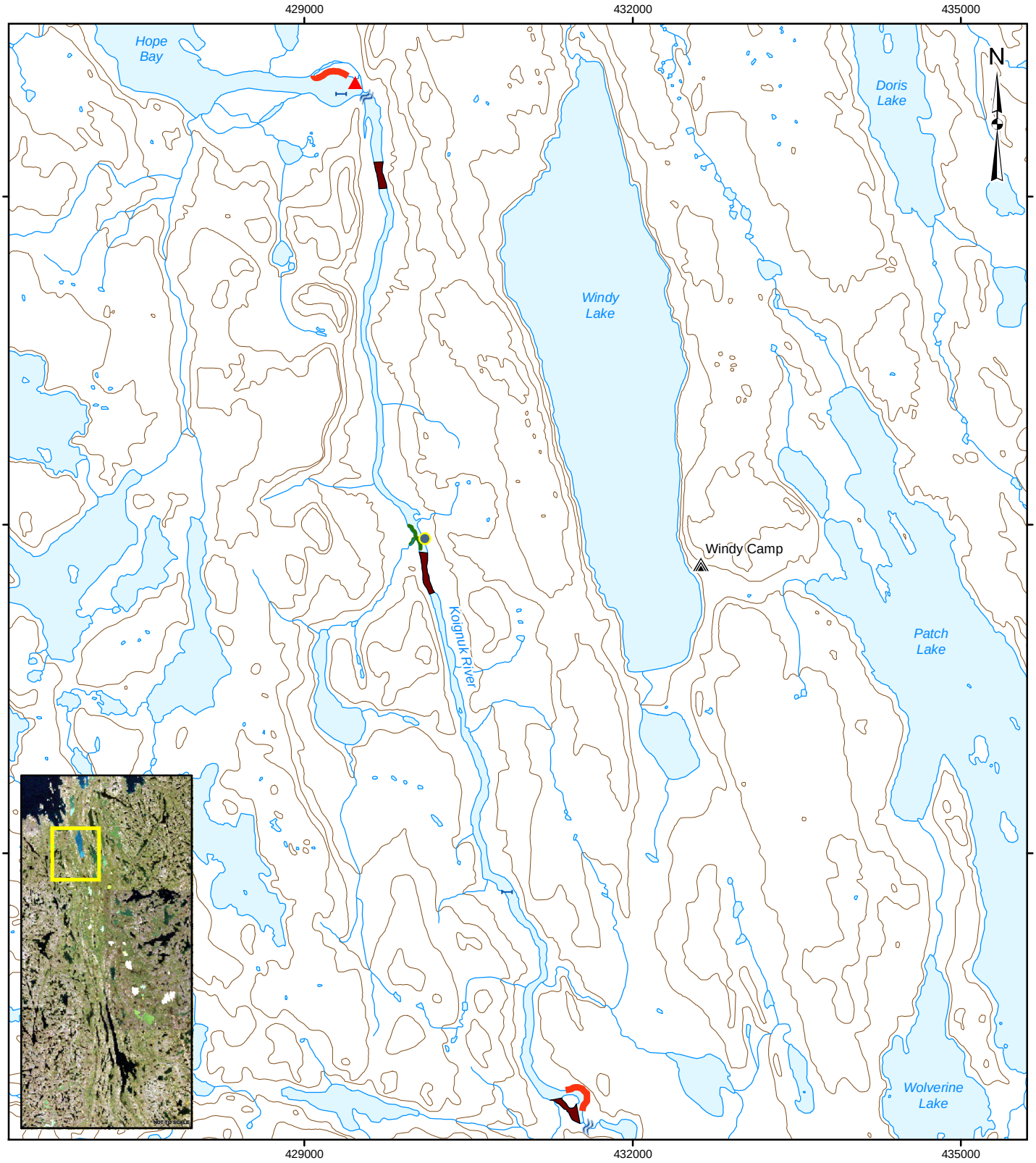
A cursory fish community and fish habitat assessment of the lower Koignuk River was conducted on 8 July 2007. The assessment involved a 10.5 km section of the Koignuk River, upstream from Hope Bay to the second set of substantial rapids (Figure 6.23). During the field visit, areas of potential Arctic grayling spawning habitat were identified, and fish sampling was conducted to determine fish species composition and relative abundance. Sampling methods included the use of a backpack electrofisher, beach seine, gill nets, dip net, and kick nets. Sampling location UTM coordinates are provided in Table 6.20.

Table 6.20 Koignuk River Fish Sampling Locations, 2006 – 2007

Sampling Station	Start Location (Zone 13W)	
	Easting	Northing
KNBP-1	431517	7545695
KNBP-2	429479	7555080
KNDN-1	429479	7555080
KNGN-1	430874	7547645
KNGN-2	429373	7554957
KNSN-1	430053	7550873
KNSN-2	430077	7550902
KNKN-1	430098	7550872

6.5.1 Lower Koignuk River Fisheries Assessment

The Koignuk River flows north into Hope Bay. The lower portion of the Koignuk River assessed by the study team exhibited primarily a straight channel pattern and was generally confined by valley walls on either side of the river. Bank material within this area was composed primarily of lacustrine silt and clay deposits. The average channel width was approximately 65 m. The channel width was notably constricted by bedrock outcrops at two locations. At both locations the constricted channel, in association was a sudden change in gradient, resulted in the formation of large rapids (Figure 6.23). The first set of rapids was located near the mouth of the Koignuk River. This rapid section was short, and the river dropped an estimated 1.5 m over a 20 m distance. At the time of the survey, the wetted channel width was approximately 15 m. The second set of rapids was located at the upstream limit of the survey area (Figure 6.23). The rapid section was 175 m in length and dropped an estimated 3.0 m over that distance. At the time of the survey, the wetted channel width was approximately 20 m.



LEGEND

- CAMP
- DIP NETTING
- GILL NETTING
- KICK NETTING
- BACKPACK ELECTROFISHING
- BEACH SEINING
- POTENTIAL ARCTIC GRAYLING SPAWNING HABITAT
- CONTOUR (20 M INTERVAL)
- WATERCOURSE
- WATERBODY
- RAPID

1500 0 1500

SCALE 1:50000 METRES

REFERENCE

Base data obtained from Government of Canada, Natural Resources Canada, Centre for Topographic Information (1:50 000). Landsat 7 imagery captured in 2007, obtained from CanImage. Field data collected by Golder Associates Ltd., 2008.
Projection: UTM Zone 13 Datum: NAD 83

PROJECT

NEWMONT The Gold Company

HOPE BAY MINING LTD.

TITLE

2006-2007 LOWER KOIGNUK RIVER FISHERIES ASSESSMENT, BOSTON PROJECT AREA

Golder Associates Edmonton, Alberta

PROJECT NO. 07-1373-0019			SCALE AS SHOWN	REV. 0
DESIGN	AH	23 Oct. 2008	FIGURE: 6.23	
GIS	BR	18 Feb. 2009		
CHECK	AH	16 Mar. 2009		
REVIEW	GA	16 Mar. 2009		

M:\Projects\2008\1373\0026_HBML_Doris_North_Environmental_Programs\MapDocs\2007_Revised\Current\Fig6_23_AQ_SL_LowerKoignuk_Boston07_10March09.mxd

Most of the 10.5 km of river assessed consisted of deep slow-moving Flat habitat (maximum depth of 3.5 m). Three locations of potential Arctic grayling spawning habitat were identified within the study area (Figure 6.23). These areas were characterized by fast flowing Run habitat over gravel-cobble substrate. The highest quality Arctic grayling spawning habitat within the reach was situated directly downstream of the upstream set of rapids. In this area, a juvenile Arctic grayling (estimated to be 1 year old) was captured during sampling, inferring spawning within this reach of the river in the previous year. Areas of the river identified as potential Arctic grayling spawning habitat also provide good rearing habitat for juvenile Arctic grayling. Deeper sections of the river provide adequate over-wintering habitat for all species of fish within this reach.

6.5.2 Fish Sampling

Backpack Electrofishing

Backpack electrofishing was conducted at two locations (Figure 6.23). The first sample location (Station KNBP-1) was along the margin of a vegetated mid-channel gravel bar and in shallow run habitat associated with a tail-out area downstream of a large set of rapids. Sampling was conducted for a total of 446 seconds. The substrate at this station was gravel-cobble with some larger boulders. The willows on the gravel bar were partially submerged at the time of the field survey.

At Station KNBP-1, one adult (397 mm in fork length) and one juvenile (109 mm in fork length) Arctic grayling were captured, as well as two ninespine stickleback (31 and 39 mm in fork length) (Appendix E1). Both of the Arctic grayling captured were in good condition. The adult Arctic grayling weighed 603 g and had a condition factor of 1.00 and the juvenile Arctic grayling weighed 13 g and had a condition factor of 0.96 (Appendix E1).

The second backpack electrofishing station (Station KNBP-2) was along the right downstream bank (RDB) of the Koignuk River near the confluence with Hope Bay (Figure 6.23). The habitat at the sample station was shallow Flat habitat. Bed material was comprised of cobble-gravel with the occasional very large boulder. Thick deposition of silt was noted in backwater areas.

During sampling at KNBP-2 (effort 392 s), three Arctic flounder, three ninespine stickleback, one fourhorn sculpin, and one lake whitefish were captured (Appendix E1). In addition to captured fish, 3 Arctic flounder, 10 ninespine stickleback, and 5 lake whitefish were observed. Arctic flounder is primarily a marine species, whereas the lake whitefish and ninespine stickleback are primarily freshwater species.

All of the fish captured at KNBP-2 were small and in good condition. The three Arctic flounder were between 76 and 139 mm in total length, weighing between 6 and 42 g, and had condition factors ranging from 0.99 to 1.56 (Appendix E1). The three ninespine stickleback had total lengths between 43 and 52 mm (Appendix E1). The fourhorn sculpin was 78 mm in total length, weighed 5 g, and had a condition factor of 0.87 (Appendix E1). The lake whitefish had a fork length of 78 mm (Appendix E1).

Gill Net

Variable mesh experimental gill nets were employed to sample fish in the Koignuk River at two locations (Figure 6.23). Each experimental gill net was comprised of two panels measuring 15.2 by 1.8 m. Mesh sizes were 3.8 cm and 5.1 cm. Short duration sets (less than 1.5 h) were used to minimize capture related mortalities.

The first gill net (KNGN-1) was set in a wide, very slow moving section of the river, midpoint within the survey area. The net was set perpendicular to the flow. Maximum set depth was 3.4 m. Fish were not captured during the 1.0 hour set time.

The second gill net (KNGN-2) was set approximately 200 m downstream of the first set of rapids, near the transition area between the Koignuk River and Hope Bay. The net was set perpendicular to the flow from near the left downstream bank (LDB). Maximum set depth was 4.9 m. One Arctic char was captured during the 1.25 hour set. This fish was 605 mm in fork length and weighed 2538 g. This individual had a condition factor of 1.15, indicating that it was in good condition and likely had been feeding in the ocean prior to returning to freshwater.

Beach Seine

Beach seining for small fish was conducted at two stations within the survey area (Figure 6.23). Station KNSN-1 was established along the shore margin in shallow Run habitat (0.45 m deep) over gravel and cobble substrate. A total area of 350 m^2 was seined. The second seining station (KNSN-2) was within a slower moving backwater area with silt substrate. A total area of 280 m^2 was seined at KNSN-2. Fish were not catured during beach seining efforts.

Dip Net

Adjacent to Station KNBP-2, a small isolated shallow pool (1 m by 2 m) was situated onshore approximately 1.5 m back from the edge of the river. The pool contained an estimated 20 YOY fourhorn sculpin. A dip net was used to capture one fish for verification (16 mm in length). The fish were stranded in the pool.

Although not confirmed, it is suspected that the pool was the result of declining water levels after the peak flows of the spring freshet.

Kick Net

Kick sampling was conducted at one location in an attempt to collect eggs of spring spawners (e.g., Arctic grayling). An area of 10 m^2 was sampled within an area of potential Arctic grayling habitat (Figure 6.23). Eggs or recently hatched fish were not found within the sampled area.

7 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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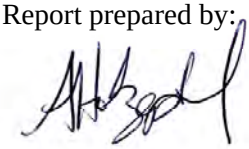

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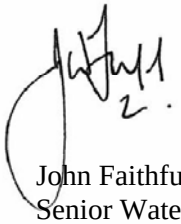

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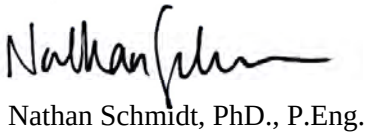

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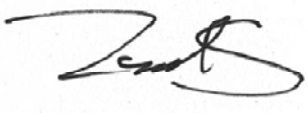

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APPENDIX A

HYDROLOGY DATA

This appendix contains hydrology data referenced in the body of the report. A table of contents for the appendix follows:

PATCH LAKE
HYDROMETRIC STATION

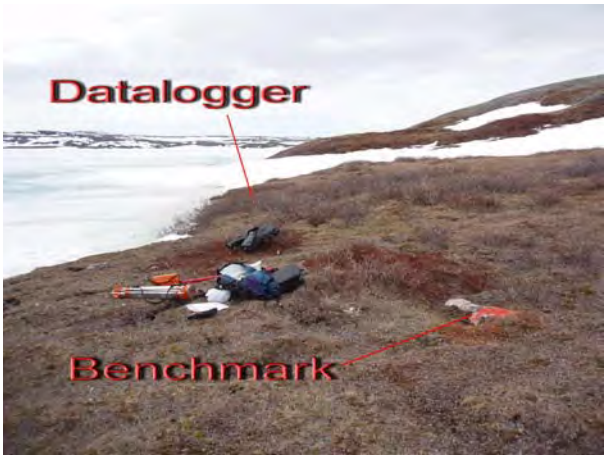
H81

FACTSHEET

LOCATION AND PURPOSE

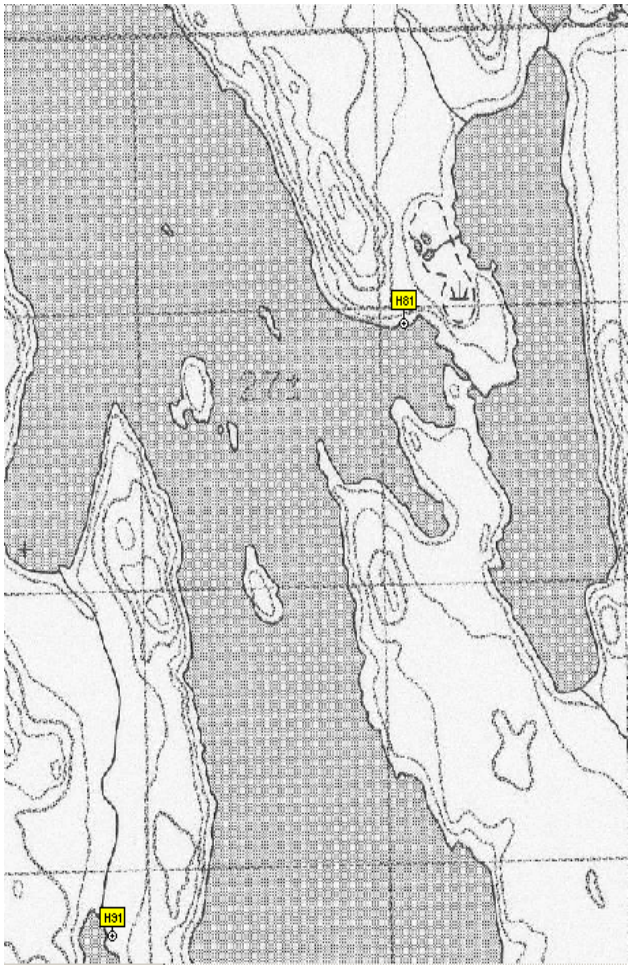
Located on the right upstream bank of Patch Lake outflow, approximately within 100 m downstream of no name tributary of Patch Lake.

Operational:	2006 (1 June – 9 September)	2007 (23 May – 12 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	30.0 km^2
Coordinates:	UTM: 435993 m E, 7549169 m N (NAD83)	Lat/Long:	68°02’57” N, 106°32’04” W
Datalogger:	Optimum Instruments #1410(cold tested)	Transducer:	Keller #00920 (5 psi, 20 m)



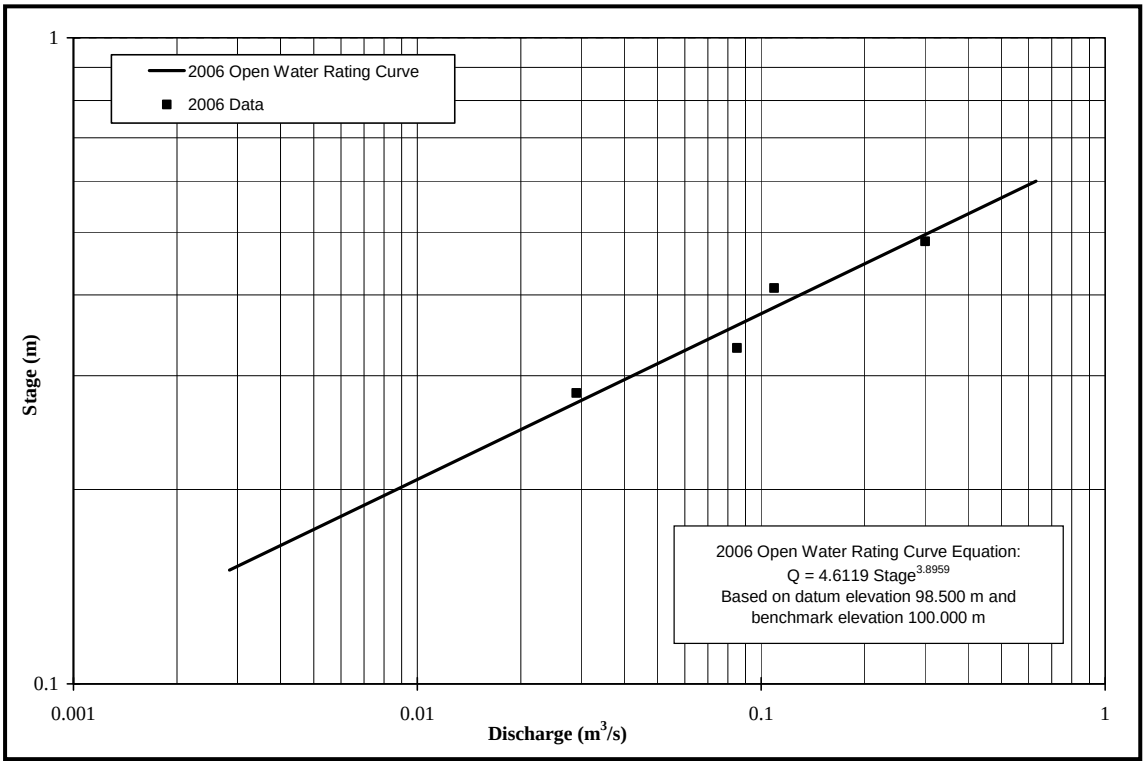
Station H81 looking northwest (downstream) before snow melt.

Station H81 looking southeast (upstream) before snowmelt.

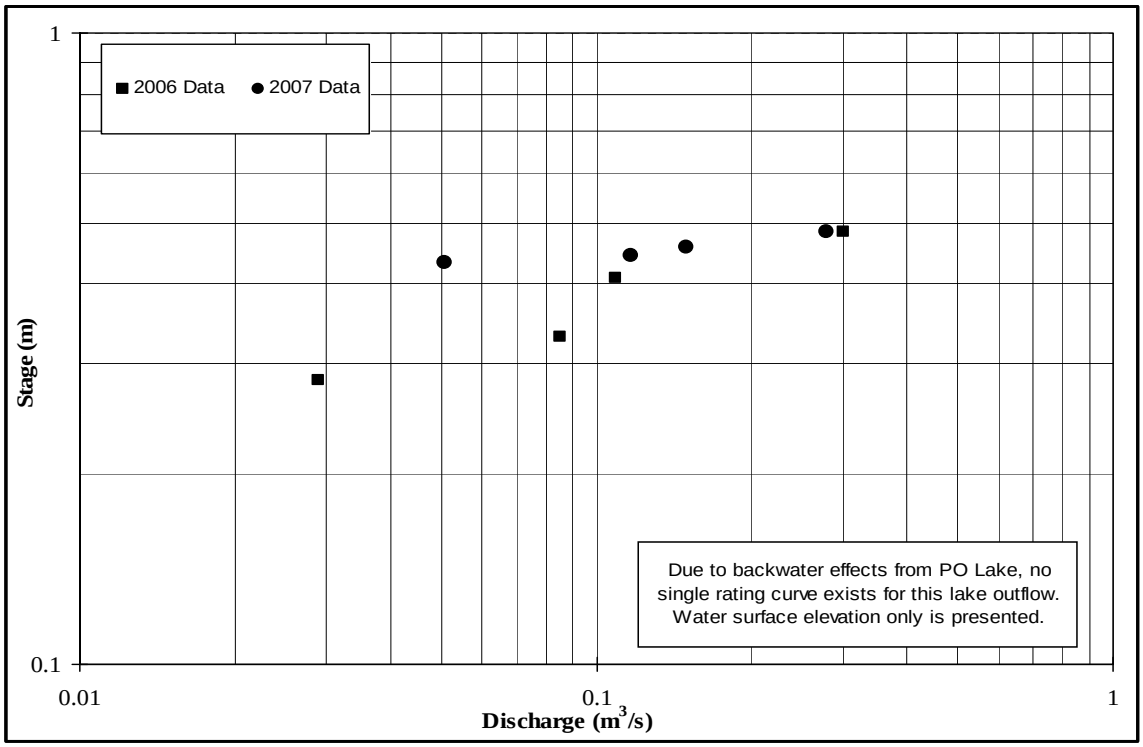


Station H81 location on the NTS Mapping of Patch Lake.

FACT-H81-2007.DOC



Patch Outflow Station H81 - Stage-Discharge Rating Curve (2006)



Patch Outflow Station H81 - Stage-Discharge Rating Curve (2007)

Patch Outflow Station H81 – Stage-Discharge Data (2006-2007)

Stage Datum 98.500 m

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
01/06/2006 13:30	1.0741	-		-	-	-
03/07/2006 9:31	1.0879	97.896		98.984	0.484	0.300
22/07/2006 16:30	1.0317	-		*98.910*	0.410	0.109
12/08/2006 14:30	0.9706	97.860		98.831	0.331	0.085
09/09/2005 9:37	0.9038	-	97.878	*98.782*	0.282	0.029
03/07/2007 15:09	0.7132	98.283		98.996	0.496	n/a
10/07/2007 9:40	0.7123	98.272		98.984	0.484	0.279
19/07/2007 2:00	0.7339	98.224		98.958	0.458	0.149
14/07/2007 9:53	0.6884			*98.945*	0.445	0.117
12/07/2007 9:40	0.6847	98.247	98.256	98.932	0.432	0.051

H81 Patch Outflow - 2006
MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	0.205 P	0.243	0.105	0.035	-	-	-
2	-	-	-	-	-	0.222	0.240	0.104	0.033	-	-	-
3	-	-	-	-	-	0.253	0.242	0.103	0.033	-	-	-
4	-	-	-	-	-	0.276	0.227	0.100	0.033	-	-	-
5	-	-	-	-	-	0.299	0.213	0.097	0.032	-	-	-
6	-	-	-	-	-	0.324	0.203	0.090	0.030	-	-	-
7	-	-	-	-	-	0.342	0.195	0.086	0.031	-	-	-
8	-	-	-	-	-	0.351	0.184	0.084	0.031	-	-	-
9	-	-	-	-	-	0.337	0.180	0.083	0.032 P	-	-	-
10	-	-	-	-	-	0.318	0.175	0.082	-	-	-	-
11	-	-	-	-	-	0.335	0.178	0.078	-	-	-	-
12	-	-	-	-	-	0.335	0.177	0.073	-	-	-	-
13	-	-	-	-	-	0.311	0.172	0.071	-	-	-	-
14	-	-	-	-	-	0.347	0.174	0.067	-	-	-	-
15	-	-	-	-	-	0.336	0.164	0.063	-	-	-	-
16	-	-	-	-	-	0.339	0.153	0.062	-	-	-	-
17	-	-	-	-	-	0.319	0.144	0.060	-	-	-	-
18	-	-	-	-	-	0.315	0.136	0.059	-	-	-	-
19	-	-	-	-	-	0.302	0.142	0.057	-	-	-	-
20	-	-	-	-	-	0.292	0.147	0.055	-	-	-	-
21	-	-	-	-	-	0.287	0.148	0.052	-	-	-	-
22	-	-	-	-	-	0.279	0.142	0.051	-	-	-	-
23	-	-	-	-	-	0.278	0.137	0.047	-	-	-	-
24	-	-	-	-	-	0.269	0.138	0.048	-	-	-	-
25	-	-	-	-	-	0.261	0.132	0.048	-	-	-	-
26	-	-	-	-	-	0.261	0.129	0.046	-	-	-	-
27	-	-	-	-	-	0.259	0.122	0.043	-	-	-	-
28	-	-	-	-	-	0.258	0.113	0.041	-	-	-	-
29	-	-	-	-	-	0.252	0.114	0.040	-	-	-	-
30	-	-	-	-	-	0.241	0.110	0.038	-	-	-	-
31	-	-	-	-	0.000 E	-	0.107	0.036	-	-	-	-
MIN	-	-	-	-	0.000	0.205	0.107	0.036	0.030	-	-	-
MEAN	-	-	-	-	0.000	0.293	0.164	0.067	0.032	-	-	-
MAX	-	-	-	-	0.000	0.351	0.243	0.105	0.035	-	-	-

H81 Patch Outflow - 2006 (Continued)

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	98.950 P	98.970	98.878	98.785	-	-	-
2	-	-	-	-	-	98.959	98.968	98.878	98.782	-	-	-
3	-	-	-	-	-	98.975	98.969	98.877	98.780	-	-	-
4	-	-	-	-	-	98.985	98.962	98.874	98.780	-	-	-
5	-	-	-	-	-	98.995	98.954	98.871	98.779	-	-	-
6	-	-	-	-	-	99.006	98.948	98.864	98.775	-	-	-
7	-	-	-	-	-	99.012	98.944	98.860	98.776	-	-	-
8	-	-	-	-	-	99.015	98.937	98.858	98.778	-	-	-
9	-	-	-	-	-	99.011	98.935	98.856	98.780 P	-	-	-
10	-	-	-	-	-	99.003	98.932	98.855	-	-	-	-
11	-	-	-	-	-	99.009	98.933	98.851	-	-	-	-
12	-	-	-	-	-	99.010	98.933	98.845	-	-	-	-
13	-	-	-	-	-	98.999	98.930	98.843	-	-	-	-
14	-	-	-	-	-	99.015	98.931	98.837	-	-	-	-
15	-	-	-	-	-	99.010	98.925	98.833	-	-	-	-
16	-	-	-	-	-	99.012	98.917	98.830	-	-	-	-
17	-	-	-	-	-	99.004	98.911	98.828	-	-	-	-
18	-	-	-	-	-	99.002	98.904	98.827	-	-	-	-
19	-	-	-	-	-	98.997	98.909	98.823	-	-	-	-
20	-	-	-	-	-	98.993	98.913	98.820	-	-	-	
21	-	-	-	-	-	98.990	98.913	98.816	-	-	-	
22	-	-	-	-	-	98.987	98.909	98.815	-	-	-	
23	-	-	-	-	-	98.986	98.906	98.808	-	-	-	
24	-	-	-	-	-	98.982	98.906	98.810	-	-	-	
25	-	-	-	-	-	98.978	98.902	98.809	-	-	-	
26	-	-	-	-	-	98.978	98.899	98.806	-	-	-	
27	-	-	-	-	-	98.978	98.893	98.802	-	-	-	
28	-	-	-	-	-	98.977	98.886	98.797	-	-	-	
29	-	-	-	-	-	98.974	98.887	98.796	-	-	-	
30	-	-	-	-	-	98.969	98.883	98.791	-	-	-	
31	-	-	-	-	-	-	98.880	98.789	-	-	-	
MIN	-	-	-	-	-	98.950	98.880	98.789	98.775	-	-	
MEAN	-	-	-	-	-	98.992	98.922	98.834	98.779	-	-	
MAX	-	-	-	-	-	99.015	98.970	98.878	98.785	-	-	

E- ESTIMATED P – PARTIAL DAILY

H81 Patch Lake - 2007

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	98.970	98.948	98.986	-	-	-
2	-	-	-	-	-	-	98.971	98.941	98.981	-	-	-
3	-	-	-	-	-	-	98.968	98.938	98.981	-	-	-
4	-	-	-	-	-	-	98.966	98.933	98.973	-	-	-
5	-	-	-	-	-	-	98.966	98.926	98.969	-	-	-
6	-	-	-	-	-	-	98.970	98.921	98.967	-	-	-
7	-	-	-	-	-	-	98.969	98.917	98.966	-	-	-
8	-	-	-	-	-	-	98.971	98.918	98.962	-	-	-
9	-	-	-	-	-	-	98.969	98.920	98.954	-	-	-
10	-	-	-	-	-	-	98.970	98.922	98.947	-	-	-
11	-	-	-	-	-	-	98.969	98.927	98.942	-	-	-
12	-	-	-	-	-	-	98.970	98.933	98.942 P	-	-	-
13	-	-	-	-	-	-	98.969	98.939	-	-	-	-
14	-	-	-	-	-	-	98.973	98.944	-	-	-	-
15	-	-	-	-	-	-	98.979	98.946	-	-	-	-
16	-	-	-	-	-	-	98.979	98.944	-	-	-	-
17	-	-	-	-	-	-	98.984	98.947	-	-	-	-
18	-	-	-	-	-	-	98.988	98.947	-	-	-	-
19	-	-	-	-	-	-	98.992	98.966	-	-	-	-
20	-	-	-	-	-	-	98.986	98.985	-	-	-	-
21	-	-	-	-	-	-	98.994	98.991	-	-	-	-
22	-	-	-	-	-	-	98.989	98.993	-	-	-	-
23	-	-	-	-	-	-	98.974	98.994	-	-	-	-
24	-	-	-	-	-	-	98.968	98.993	-	-	-	-
25	-	-	-	-	-	98.899	98.966	98.992	-	-	-	-
26	-	-	-	-	-	98.918	98.967	98.990	-	-	-	-
27	-	-	-	-	-	98.931	98.961	98.988	-	-	-	-
28	-	-	-	-	-	98.945	98.960	98.985	-	-	-	-
29	-	-	-	-	-	98.957	98.957	98.985	-	-	-	-
30	-	-	-	-	-	98.965	98.957	98.984	-	-	-	-
31	-	-	-	-	-	-	98.957	98.986	-	-	-	-
MIN	-	-	-	-	-	98.899	98.957	98.917	98.942	-	-	-
MEAN	-	-	-	-	-	98.936	98.972	98.956	98.964	-	-	-
MAX	-	-	-	-	-	98.965	98.994	98.994	98.986	-	-	-

E- ESTIMATED P – PARTIAL DAILY

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Patch Outflow**
LOCATION: **Outlet of Patch Lake**
COORDINATES: **13W 0436058 E, 7549173 N (NAD 83)**

MEASUREMENT DATE: **3 July 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK**
COMPUTATIONS BY: **NS / TY**

MEASUREMENT START TIME: **0935 h est.**
MEASUREMENT END TIME: **0945 h est.**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.03	0.000
1	0.05		0.05			0.00	0.10	0.000
2	0.20		0.10			0.18	0.20	0.004
3	0.45		0.36			0.43	0.25	0.039
4	0.70		0.48			0.39	0.25	0.047
5	0.95		0.52			0.30	0.25	0.039
6	1.20		0.56			0.29	0.25	0.041
7	1.45		0.60			0.32	0.25	0.048
8	1.70		0.55			0.22	0.25	0.030
9	1.95		0.47			0.20	0.25	0.024
10	2.20		0.44			0.18	0.25	0.020
11	2.45		0.31			0.10	0.25	0.008
12	2.70		0.28			0.03	0.25	0.002
								0.300

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Patch Outflow**
LOCATION: **Outlet of Patch Lake**
COORDINATES: **13W 0436058 E, 7549173 N (NAD 83)**

MEASUREMENT DATE: **22 July 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TA / PE**
COMPUTATIONS BY: **NS / TY**

MEASUREMENT START TIME: **1630 h est.**
MEASUREMENT END TIME: **1645 h est.**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.15	0.000
1	0.30		0.15			0.01	0.30	0.000
2	0.60		0.29			0.01	0.30	0.001
3	0.90		0.33			0.04	0.30	0.004
4	1.20		0.38			0.05	0.30	0.006
5	1.50		0.47			0.08	0.30	0.011
6	1.80		0.60			0.10	0.30	0.018
7	2.10		0.51			0.17	0.30	0.026
8	2.40		0.40			0.23	0.35	0.032
9	2.80		0.22			0.14	0.35	0.011
Left Bank	3.10		0.00			0.00	0.15	0.000
								0.109

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Patch Outflow**
LOCATION: **Outlet of Patch Lake**
COORDINATES: **13W 0436058 E, 7549173 N (NAD 83)**

MEASUREMENT DATE: **12 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS**
COMPUTATIONS BY: **NS / TY**

MEASUREMENT START TIME: **1400 h**
MEASUREMENT END TIME: **1419 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.05	0.000
1	0.10		0.23			0.06	0.10	0.001
2	0.20		0.22			0.15	0.10	0.003
3	0.30		0.22			0.21	0.10	0.005
4	0.40		0.20			0.22	0.10	0.004
5	0.50		0.20			0.28	0.10	0.006
6	0.60		0.20			0.31	0.10	0.006
7	0.70		0.19			0.30	0.10	0.006
8	0.80		0.17			0.41	0.10	0.007
9	0.90		0.16			0.44	0.10	0.007
10	1.00		0.16			0.36	0.10	0.006
11	1.10		0.16			0.37	0.10	0.006
12	1.20		0.16			0.40	0.10	0.006
13	1.30		0.15			0.39	0.10	0.006
14	1.40		0.16			0.29	0.10	0.005
15	1.50		0.16			0.22	0.10	0.004
16	1.60		0.15			0.19	0.10	0.003
17	1.70		0.14			0.15	0.10	0.002
18	1.80		0.15			0.07	0.10	0.001
19	1.90		0.15			0.04	0.15	0.001
20	2.10		0.13			0.02	0.20	0.001
21	2.30		0.11			0.00	0.20	0.000
22	2.50		0.09			0.00	0.20	0.000
Right Bank	2.70		0.00			0.00	0.10	0.000
								0.086

PROJECT NAME: **Miramar / EM2 Expansion / Patch Lake**

PROJECT NUMBER: **07 1373 0019 .4000**

DISCHARGE DATA

STREAM NAME: **Patch Lake Outflow** **MEASUREMENT DATE:** **10 July 2007**

LOCATION: **Outlet of Patch Lake** **METER NUMBER:** **Marsh-McBirney**

COORDINATES: **13W 0436274 E, 7548997 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **TY** **MEASUREMENT START TIME:** **0925 h**

COMPUTATIONS BY: **DC** **MEASUREMENT END TIME:** **0941 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m) (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.12	0.000
1	0.25		0.09			0.00	0.23	0.000
2	0.45		0.18			0.01	0.25	0.000
3	0.75		0.21			0.01	0.30	0.001
4	1.05		0.23			0.08	0.30	0.006
5	1.35		0.34			0.09	0.30	0.009
6	1.65		0.24			0.12	0.30	0.009
7	1.95		0.30			0.13	0.30	0.012
8	2.25		0.30			0.19	0.30	0.017
9	2.55		0.60			0.21	0.30	0.038
10	2.85		0.37			0.29	0.20	0.021
11	2.95		0.36			0.28	0.10	0.010
12	3.05		0.38			0.36	0.10	0.014
13	3.15		0.41			0.30	0.10	0.012
14	3.25		0.42			0.28	0.10	0.012
15	3.35		0.26			0.32	0.10	0.008
16	3.45		0.22			0.32	0.10	0.007
17	3.55		0.18			0.26	0.10	0.005
18	3.65		0.18			0.27	0.10	0.005
19	3.75		0.38			0.17	0.10	0.006
20	3.85		0.39			0.16	0.10	0.006
21	3.95		0.34			0.10	0.10	0.003
22	4.05		0.35			0.14	0.10	0.005
23	4.15		0.30			0.17	0.10	0.005
24	4.25		0.30			0.21	0.15	0.009
25	4.45		0.30			0.17	0.25	0.013
26	4.75		0.27			0.13	0.30	0.011
27	5.05		0.25			0.11	0.30	0.008
28	5.35		0.26			0.12	0.30	0.009
29	5.65		0.25			0.07	0.30	0.005
30	5.95		0.24			0.03	0.30	0.002
31	6.25		0.20			0.03	0.30	0.002
32	6.55		0.21			0.01	0.30	0.001
33	6.85		0.20			0.06	0.30	0.004
34	7.15		0.20			0.01	0.30	0.001
35	7.45		0.18			0.04	0.30	0.002
36	7.75		0.17			0.01	0.30	0.001
37	8.05		0.14			0.01	0.25	0.000
38	8.25		0.14			0.00	0.20	0.000
39	8.45		0.11			0.00	0.20	0.000
Right Bank	8.65		0.00			0.00	0.10	0.000
								0.279

PROJECT NAME: **Miramar/EM2 Expansion/Patch Lake**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Patch Lake Outflow** **MEASUREMENT DATE:** **20 July 2007**
LOCATION: **Outlet of Patch Lake** **METER NUMBER:** **Marsh McBirney**
COORDINATES: **13W 0436274 E, 7548997 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **HS** **MEASUREMENT START TIME:** **2000 h**
COMPUTATIONS BY: **DC** **MEASUREMENT END TIME:** **2020 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	1.55	0.000
1	3.10		0.16			-0.01	1.65	-0.003
2	3.30		0.18			0.00	0.20	0.000
3	3.50		0.21			0.09	0.20	0.004
4	3.70		0.30			0.23	0.10	0.007
5	4.00		0.30			0.57	0.15	0.026
6	4.30		0.29			0.50	0.30	0.044
7	4.60		0.29			0.69	0.30	0.060
8	4.90		0.31			0.14	0.30	0.013
9	5.20		0.22			0.02	0.30	0.001
10	5.50		0.18			-0.01	1.15	-0.002
Left Bank	7.50		0.00			0.00	1.00	0.000
								0.149

PROJECT NAME: **Miramar / EM2 Expansion / Patch Lake**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Patch Lake Outflow** **MEASUREMENT DATE:** **14 August 2007**
LOCATION: **Outlet of Patch Lake** **METER NUMBER:** **Marsh McBirney**
COORDINATES: **13W 0436274 E, 7548997 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **TY** **MEASUREMENT START TIME:** **0909 h**
COMPUTATIONS BY: **TJ / DC** **MEASUREMENT END TIME:** **0952 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.10	0.000
1	0.20		0.02			0.00	0.20	0.000
2	0.40		0.06			0.00	0.20	0.000
3	0.60		0.12			-0.02	0.20	0.000
4	0.80		0.14			-0.02	0.20	-0.001
5	1.00		0.15			-0.01	0.20	0.000
6	1.20		0.16			-0.02	0.20	-0.001
7	1.40		0.17			-0.02	0.20	-0.001
8	1.60		0.18			-0.03	0.20	-0.001
9	1.80		0.19			-0.03	0.20	-0.001
10	2.00		0.20			-0.02	0.20	-0.001
11	2.20		0.20			-0.02	0.20	-0.001
12	2.40		0.20			-0.02	0.20	-0.001
13	2.60		0.20			-0.02	0.20	-0.001
14	2.80		0.22			0.00	0.20	0.000
15	3.00		0.23			-0.01	0.20	0.000
16	3.20		0.23			-0.02	0.20	-0.001
17	3.40		0.23			-0.01	0.20	0.000
18	3.60		0.24			0.04	0.20	0.002
19	3.80		0.28			0.02	0.20	0.001
20	4.00		0.03			-0.01	0.20	0.000
21	4.20		0.33			0.03	0.20	0.002
22	4.40		0.33			0.02	0.20	0.001
23	4.60		0.35			0.03	0.20	0.002
24	4.80		0.38			0.18	0.20	0.014
25	5.00		0.36			0.34	0.20	0.024
26	5.20		0.36			0.28	0.20	0.020
27	5.40		0.40			0.35	0.20	0.028
28	5.60		0.40			0.30	0.20	0.024
29	5.80		0.40			0.10	0.20	0.008
30	6.00		0.30			0.01	0.20	0.001
31	6.20		0.20			0.00	0.20	0.000
32	6.40		0.16			0.00	0.20	0.000
33	6.60		0.12			0.00	0.20	0.000
34	6.80		0.10			0.00	0.60	0.000
Right Bank	7.80		0.02			0.00	0.50	0.000
								0.117

PROJECT NAME: **Miramar / EM2 Expansion / Patch Lake**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

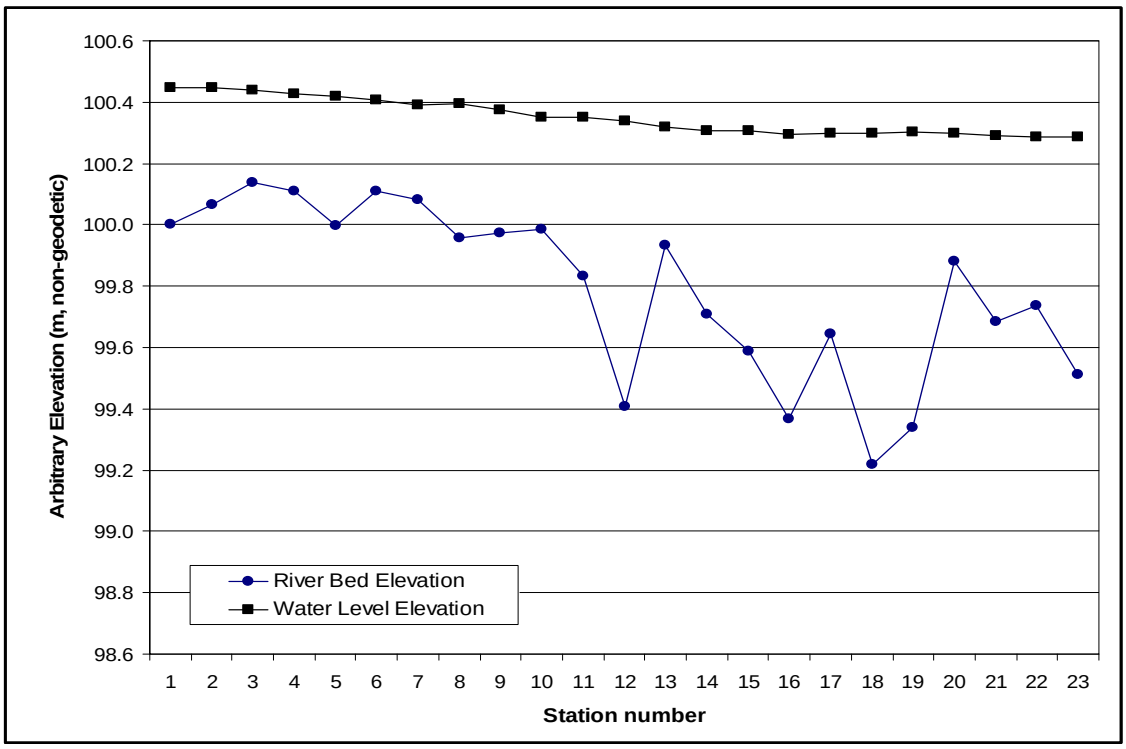
STREAM NAME: **Patch Lake Outflow**
LOCATION: **Outlet of Patch Lake**
COORDINATES: **13W 0436274 E, 7548997 N (NAD 83)**

MEASUREMENT DATE: **12 September 2007**
METER NUMBER: **Marsh McBirney**
Flo-Mate Model 2000

MEASUREMENT BY: **TY**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **0920 h**
MEASUREMENT END TIME: **0940 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.03			0.00	0.175	0.000
1	0.35		0.10			0.00	0.35	0.000
2	0.70		0.12			0.00	0.35	0.000
3	1.05		0.16			0.00	0.35	0.000
4	1.40		0.18			0.00	0.35	0.000
5	1.75		0.22			0.00	0.35	0.000
6	2.10		0.24			0.00	0.35	0.000
7	2.45		0.24			0.01	0.35	0.001
8	2.80		0.26			0.00	0.35	0.000
9	3.15		0.29			0.00	0.35	0.000
10	3.50		0.30			0.00	0.35	0.000
11	3.85		0.35			0.00	0.35	0.000
12	4.20		0.34			0.02	0.35	0.002
13	4.55		0.36			0.02	0.35	0.003
14	4.90		0.44			0.10	0.35	0.015
15	5.25		0.42			0.15	0.35	0.022
16	5.60		0.26			0.08	0.35	0.007
17	5.95		0.18			0.01	0.35	0.001
18	6.30		0.10			0.00	0.35	0.000
Left Bank	6.65		0.02			0.00	0.175	0.000
								0.051



Channel Survey between Patch Lake and PO Lake (2007)

OGAMA LAKE OUTFLOW HYDROMETRIC STATION

H82

FACTSHEET

LOCATION AND PURPOSE

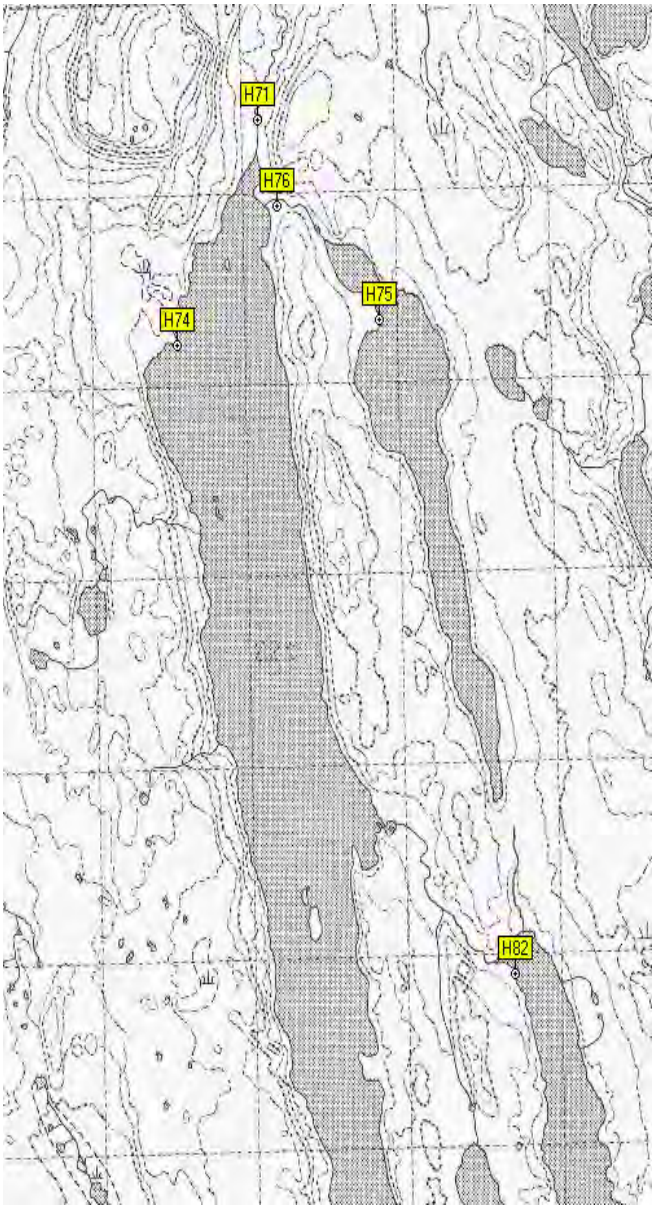
Located approximately 60 m upstream, of the left bank of Ogama Lake outflow.

Operational:	2006 (31 May – 8 September)	2007 (23 May – 14 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	72.1 km^2
Coordinates:	UTM: 435648 m E, 7555130 m N (NAD83)	Lat/Long:	68°06'10" N, 106°32'47" W
Datalogger:	Optimum Instruments #1167	Transducer:	Keller #00900 (5 psi, 20 m)

Station H82 looking east before snow melt.

Station H82 at the spot.

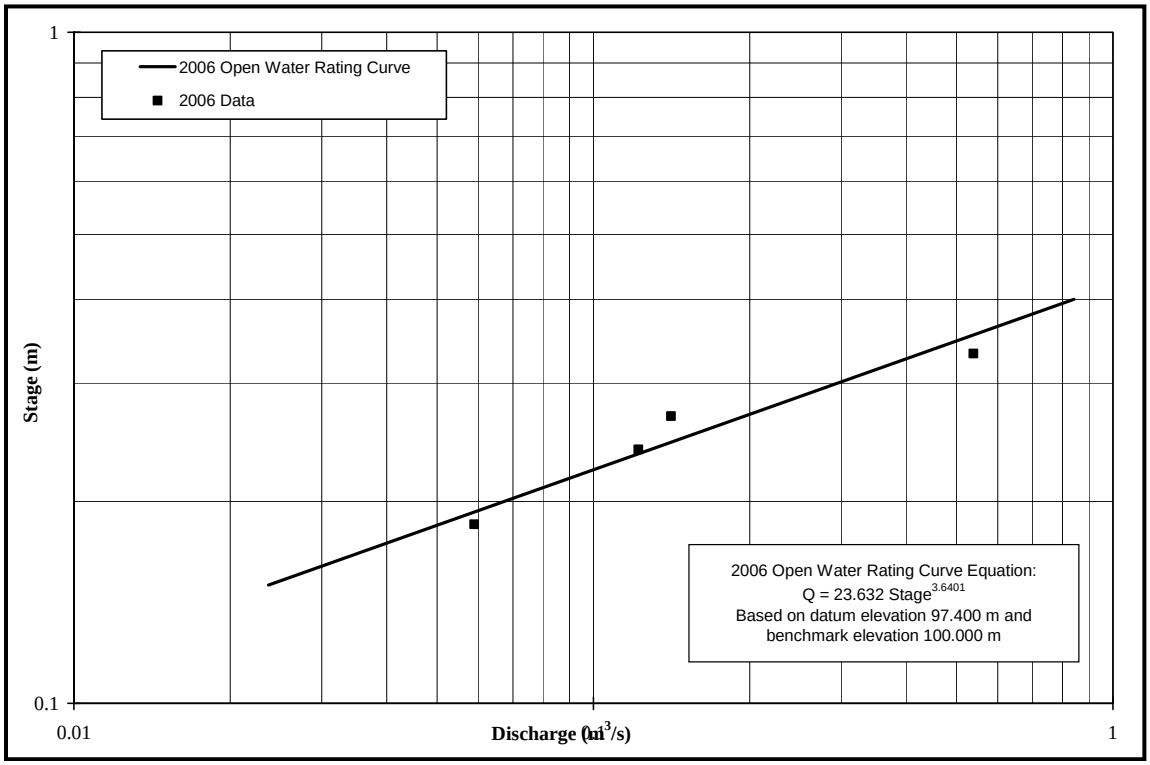
Station H82 looking northeast before snowmelt.



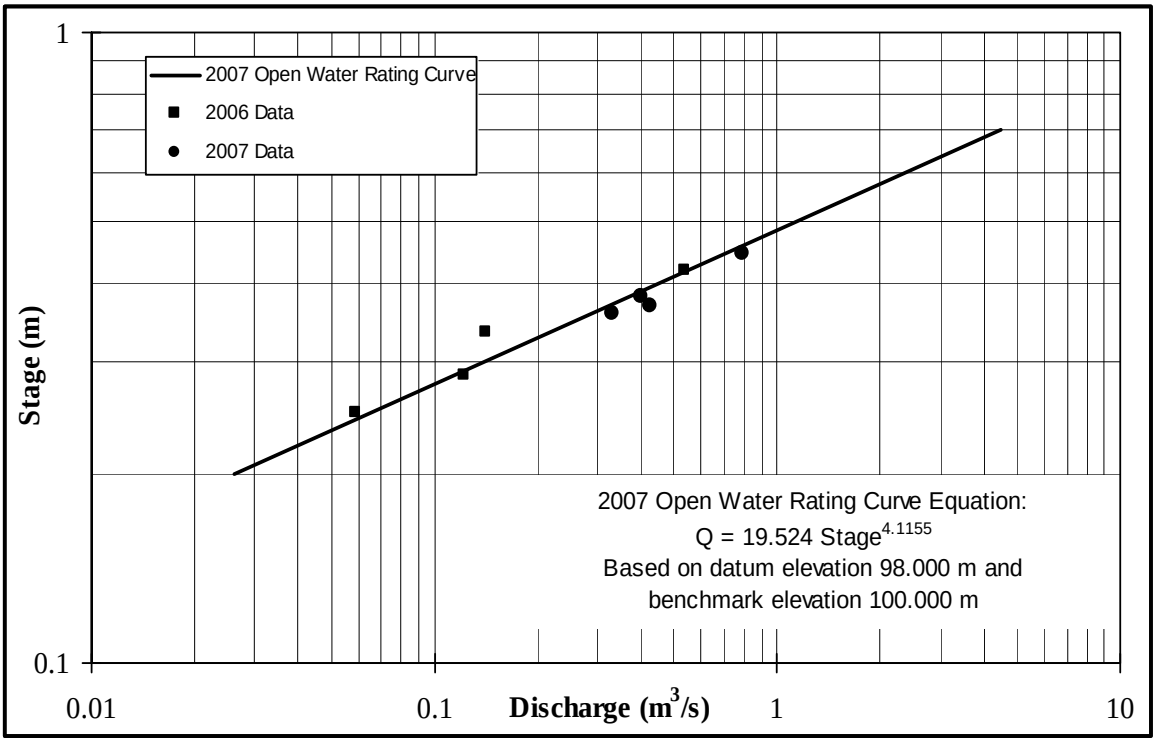
NTS Mapping of Area.

FACT-H82-2007.DOC

Golder Associates



Ogama Outflow Station H82 - Stage-Discharge Rating Curve (2006)



Ogama Outflow Station H82 - Stage-Discharge Rating Curve (2007)

Ogama Outflow Station H82 – Stage-Discharge Data (2006-2007)

Stage Datum 97.400 m (non-geodetic)

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
31/05/2006 16:27	0.9356	-		n/a	n/a	-
03/07/2006 10:10	1.1620	96.570		97.732	0.332	0.539
22/07/2006 15:30	1.0780	-		*97.668*	0.268	0.141
12/08/2006 15:30	1.0289	96.610		97.639	0.239	0.122
08/09/2006 16:09	0.9948	-	96.590	*97.585*	0.185	0.059
22/07/2007 11:20	1.0665		97.341	*98.408*	0.408	1.236
transducer shift down by 0.317 m on 22-Jun-2007 1830 h						
03/07/2007 11:30	1.4346	97.072		98.507	0.507	n/a
10/07/2007 14:00	1.3920	97.054		98.446	0.446	0.789
19/07/2007 00:05	1.3651	96.995		98.360	0.360	0.329
16/08/2007 14:10	1.4331	96.937		98.370	0.370	0.425
14/09/2007 10:10	1.4289	96.952	97.024	98.381	0.381	0.400

H82 Ogama Outflow - 2006
MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	0.039	0.580	0.146	0.040	-	-	-
2	-	-	-	-	-	0.334	0.560	0.137	0.040	-	-	-
3	-	-	-	-	-	0.947	0.530	0.132	0.043	-	-	-
4	-	-	-	-	-	2.002	0.490	0.130	0.042	-	-	-
5	-	-	-	-	-	3.122	0.466	0.127	0.043	-	-	-
6	-	-	-	-	-	3.514	0.426	0.123	0.043	-	-	-
7	-	-	-	-	-	3.497	0.404	0.116	0.045	-	-	-
8	-	-	-	-	-	3.388	0.378	0.111	0.045 P	-	-	-
9	-	-	-	-	-	3.281	0.356	0.108	-	-	-	-
10	-	-	-	-	-	3.119	0.344	0.105	-	-	-	-
11	-	-	-	-	-	2.901	0.338	0.098	-	-	-	-
12	-	-	-	-	-	2.726	0.329	0.095	-	-	-	-
13	-	-	-	-	-	2.568	0.308	0.093	-	-	-	-
14	-	-	-	-	-	2.380	0.306	0.092	-	-	-	-
15	-	-	-	-	-	2.101	0.305	0.086	-	-	-	-
16	-	-	-	-	-	1.881	0.290	0.079	-	-	-	-
17	-	-	-	-	-	1.721	0.269	0.076	-	-	-	-
18	-	-	-	-	-	1.530	0.242	0.075	-	-	-	-
19	-	-	-	-	-	1.393	0.236	0.069	-	-	-	-
20	-	-	-	-	-	1.246	0.240	0.068	-	-	-	-
21	-	-	-	-	-	1.140	0.229	0.068	-	-	-	-
22	-	-	-	-	-	1.043	0.211	0.068	-	-	-	-
23	-	-	-	-	-	0.981	0.207	0.068	-	-	-	-
24	-	-	-	-	-	0.866	0.206	0.061	-	-	-	-
25	-	-	-	-	-	0.794	0.203	0.059	-	-	-	-
26	-	-	-	-	-	0.795	0.190	0.055	-	-	-	-
27	-	-	-	-	-	0.808	0.152	0.051	-	-	-	-
28	-	-	-	-	-	0.702	0.157	0.053	-	-	-	-
29	-	-	-	-	-	0.630	0.157	0.052	-	-	-	-
30	-	-	-	-	-	0.590	0.160	0.051	-	-	-	-
31	-	-	-	-	0.017 P	-	0.149	0.045	-	-	-	-
MIN	-	-	-	-	0.017	0.039	0.149	0.045	0.040	-	-	-
MEAN	-	-	-	-	0.017	1.735	0.304	0.087	0.042	-	-	-
MAX	-	-	-	-	0.017	3.514	0.580	0.146	0.045	-	-	-

H82 Ogama Outflow - 2006 (Continued)
MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	97.569	97.761	97.647	97.573	-	-	-
2	-	-	-	-	-	97.699	97.758	97.643	97.573	-	-	-
3	-	-	-	-	-	97.811	97.752	97.640	97.577	-	-	-
4	-	-	-	-	-	97.906	97.745	97.639	97.576	-	-	-
5	-	-	-	-	-	97.973	97.740	97.638	97.576	-	-	-
6	-	-	-	-	-	97.992	97.732	97.636	97.577	-	-	-
7	-	-	-	-	-	97.992	97.727	97.632	97.578	-	-	-
8	-	-	-	-	-	97.986	97.721	97.629	97.579 P	-	-	-
9	-	-	-	-	-	97.981	97.716	97.628	-	-	-	-
10	-	-	-	-	-	97.973	97.713	97.626	-	-	-	-
11	-	-	-	-	-	97.962	97.711	97.621	-	-	-	-
12	-	-	-	-	-	97.952	97.709	97.620	-	-	-	-
13	-	-	-	-	-	97.943	97.703	97.618	-	-	-	-
14	-	-	-	-	-	97.932	97.703	97.618	-	-	-	-
15	-	-	-	-	-	97.914	97.703	97.614	-	-	-	-
16	-	-	-	-	-	97.899	97.698	97.609	-	-	-	-
17	-	-	-	-	-	97.887	97.692	97.607	-	-	-	-
18	-	-	-	-	-	97.871	97.684	97.606	-	-	-	-
19	-	-	-	-	-	97.859	97.682	97.601	-	-	-	-
20	-	-	-	-	-	97.845	97.683	97.600	-	-	-	-
21	-	-	-	-	-	97.835	97.680	97.601	-	-	-	-
22	-	-	-	-	-	97.824	97.673	97.600	-	-	-	-
23	-	-	-	-	-	97.817	97.672	97.600	-	-	-	-
24	-	-	-	-	-	97.803	97.672	97.595	-	-	-	-
25	-	-	-	-	-	97.794	97.670	97.593	-	-	-	-
26	-	-	-	-	-	97.794	97.666	97.589	-	-	-	-
27	-	-	-	-	-	97.795	97.649	97.585	-	-	-	-
28	-	-	-	-	-	97.780	97.652	97.587	-	-	-	-
29	-	-	-	-	-	97.769	97.652	97.587	-	-	-	-
30	-	-	-	-	-	97.763	97.653	97.585	-	-	-	-
31	-	-	-	-	97.536 P	-	97.649	97.578	-	-	-	-
MIN	-	-	-	-	97.536	97.569	97.649	97.578	97.573	-	-	-
MEAN	-	-	-	-	97.536	97.864	97.697	97.612	97.576	-	-	-
MAX	-	-	-	-	97.536	97.992	97.761	97.647	97.579	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE

H82 Ogama Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	0.940	0.256	1.415	0.270 E	-	-
2	-	-	-	-	-	-	0.879	0.247	1.330	0.240 E	-	-
3	-	-	-	-	-	-	0.811	0.241	1.249	0.210 E	-	-
4	-	-	-	-	-	-	0.741	0.234	1.173	0.180 E	-	-
5	-	-	-	-	-	-	0.677	0.230	1.145	0.150 E	-	-
6	-	-	-	-	-	-	0.620	0.236	1.103	0.120 E	-	-
7	-	-	-	-	-	-	0.570	0.236	1.048	0.090 E	-	-
8	-	-	-	-	-	-	0.536	0.238	1.008	0.060 E	-	-
9	-	-	-	-	-	-	0.520	0.346	0.950	0.030 E	-	-
10	-	-	-	-	-	-	0.531	0.394	0.906	-	-	-
11	-	-	-	-	-	-	0.568	0.428	0.906	-	-	-
12	-	-	-	-	-	-	0.583	0.483	0.862	-	-	-
13	-	-	-	-	-	-	0.562	0.562	0.805	-	-	-
14	-	-	-	-	-	-	0.536	0.631	0.780 P	-	-	-
15	-	-	-	-	-	0.079 E	0.517	0.692	0.750 E	-	-	-
16	-	-	-	-	-	0.179 E	0.482	0.779	0.720 E	-	-	-
17	-	-	-	-	-	0.279 E	0.449	0.853	0.690 E	-	-	-
18	-	-	-	-	-	0.378 E	0.435	0.935	0.660 E	-	-	-
19	-	-	-	-	-	0.478 P	0.422	1.183	0.630 E	-	-	-
20	-	-	-	-	-	0.578	0.429	1.499	0.600 E	-	-	-
21	-	-	-	-	-	0.615	0.417	1.707	0.570 E	-	-	-
22	-	-	-	-	-	0.620	0.371	1.859	0.540 E	-	-	-
23	-	-	-	-	-	0.711	0.354	1.915	0.510 E	-	-	-
24	-	-	-	-	-	0.865	0.345	1.926	0.480 E	-	-	-
25	-	-	-	-	-	0.986	0.338	1.885	0.450 E	-	-	-
26	-	-	-	-	-	1.076	0.321	1.819	0.420 E	-	-	-
27	-	-	-	-	-	1.118	0.305	1.703	0.390 E	-	-	-
28	-	-	-	-	-	1.116	0.294	1.661	0.360 E	-	-	-
29	-	-	-	-	-	1.080	0.285	1.596	0.330 E	-	-	-
30	-	-	-	-	-	1.016	0.287	1.551	0.300 E	-	-	-
31	-	-	-	-	-	-	0.267	1.502	-	-	-	-
MIN	-	-	-	-	-	0.079	0.267	0.230	0.300	0.030	-	-
MEAN	-	-	-	-	-	0.698	0.497	0.962	0.769	0.150	-	-
MAX	-	-	-	-	-	1.118	0.940	1.926	1.415	0.270	-	-

MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	98.478	98.349	98.528	-	-	-
2	-	-	-	-	-	-	98.471	98.346	98.521	-	-	-
3	-	-	-	-	-	-	98.462	98.344	98.513	-	-	-
4	-	-	-	-	-	-	98.451	98.341	98.505	-	-	-
5	-	-	-	-	-	-	98.442	98.340	98.502	-	-	-
6	-	-	-	-	-	-	98.432	98.342	98.497	-	-	-
7	-	-	-	-	-	-	98.424	98.342	98.491	-	-	-
8	-	-	-	-	-	-	98.417	98.342	98.487	-	-	-
9	-	-	-	-	-	-	98.414	98.375	98.480	-	-	-
10	-	-	-	-	-	-	98.417	98.387	98.474	-	-	-
11	-	-	-	-	-	-	98.423	98.395	98.474	-	-	-
12	-	-	-	-	-	-	98.426	98.407	98.469	-	-	-
13	-	-	-	-	-	-	98.422	98.422	98.461	-	-	-
14	-	-	-	-	-	-	98.418	98.434	98.457 P	-	-	-
15	-	-	-	-	-	-	98.414	98.444	-	-	-	-
16	-	-	-	-	-	-	98.407	98.457	-	-	-	-
17	-	-	-	-	-	-	98.400	98.467	-	-	-	-
18	-	-	-	-	-	-	98.397	98.478	-	-	-	-
19	-	-	-	-	-	98.405 P	98.394	98.505	-	-	-	-
20	-	-	-	-	-	98.425	98.395	98.536	-	-	-	-
21	-	-	-	-	-	98.432	98.393	98.553	-	-	-	-
22	-	-	-	-	-	98.432	98.382	98.565	-	-	-	-
23	-	-	-	-	-	98.447	98.377	98.569	-	-	-	-
24	-	-	-	-	-	98.469	98.375	98.570	-	-	-	-
25	-	-	-	-	-	98.484	98.373	98.567	-	-	-	-
26	-	-	-	-	-	98.494	98.368	98.562	-	-	-	-
27	-	-	-	-	-	98.499	98.364	98.553	-	-	-	-
28	-	-	-	-	-	98.499	98.361	98.549	-	-	-	-
29	-	-	-	-	-	98.495	98.358	98.544	-	-	-	-
30	-	-	-	-	-	98.488	98.359	98.540	-	-	-	-
31	-	-	-	-	-	-	98.352	98.536	-	-	-	-
MIN	-	-	-	-	-	98.405	98.352	98.340	98.457	-	-	-
MEAN	-	-	-	-	-	98.464	98.405	98.457	98.490	-	-	-
MAX	-	-	-	-	-	98.499	98.478	98.570	98.528	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Outflow**
LOCATION: **Outlet of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **3 July 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1005 h est.**
MEASUREMENT END TIME: **1025 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.13	0.000
1	0.25		0.04			0.00	0.38	0.000
2	0.75		0.07			0.00	0.50	0.000
3	1.25		0.08			0.00	0.50	0.000
4	1.75		0.13			0.02	0.38	0.001
5	2.00		0.21			0.19	0.25	0.010
6	2.25		0.28			0.48	0.25	0.034
7	2.50		0.34			0.23	0.25	0.020
8	2.75		0.34			0.56	0.25	0.048
9	3.00		0.33			0.58	0.25	0.048
10	3.25		0.35			0.31	0.25	0.027
11	3.50		0.34			0.57	0.25	0.048
12	3.75		0.36			0.64	0.25	0.058
13	4.00		0.36			0.62	0.25	0.056
14	4.25		0.37			0.64	0.25	0.059
15	4.50		0.33			0.42	0.25	0.035
16	4.75		0.36			0.33	0.25	0.030
17	5.00		0.35			0.49	0.25	0.043
18	5.25		0.30			0.31	0.25	0.023
19	5.50		0.13			0.01	0.50	0.001
20	6.25		0.05			0.00	0.44	0.000
Right Bank	6.38		0.00			0.00	0.06	0.000
								0.539

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Outflow**
LOCATION: **Outlet of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **22 July 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TA / PE**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1530 h**
MEASUREMENT END TIME: **1545 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.51			0.04	0.35	0.007
1	0.70		0.37			0.10	0.70	0.026
2	1.40		0.52			0.07	0.70	0.025
3	2.10		0.36			0.17	0.70	0.043
4	2.80		0.30			0.12	0.70	0.025
5	3.50		0.26			0.02	0.70	0.004
6	4.20		0.19			0.06	0.70	0.008
7	4.90		0.24			0.01	0.70	0.002
8	5.60		0.19			0.01	0.70	0.001
Right Bank	6.30		0.00			0.00	0.35	0.000
								0.141

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Outflow**
LOCATION: **Outlet of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **12 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS / KM**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1522 h**
MEASUREMENT END TIME: **1537 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.10	0.000
1	0.20		0.12			0.38	0.20	0.009
2	0.40		0.16			-0.05	0.15	-0.001
3	0.50		0.16			0.47	0.10	0.008
4	0.60		0.16			0.54	0.15	0.013
5	0.80		0.22			0.31	0.20	0.014
6	1.00		0.18			0.62	0.20	0.022
7	1.20		0.19			0.44	0.20	0.017
8	1.40		0.20			0.28	0.20	0.011
9	1.60		0.19			0.04	0.20	0.002
10	1.80		0.16			0.12	0.20	0.004
11	2.00		0.10			0.28	0.20	0.006
12	2.20		0.09			0.40	0.20	0.007
13	2.40		0.11			0.23	0.20	0.005
14	2.60		0.10			0.16	0.20	0.003
15	2.80		0.15			0.09	0.15	0.002
16	2.90		0.13			0.13	0.10	0.002
Right Bank	3.00		0.00			0.00	0.05	0.000
								0.122

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Outflow**
LOCATION: **Outlet of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **8 September 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK / PE**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1620 h**
MEASUREMENT END TIME: **1640 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.01	0.000
1	0.02		0.08			0.00	0.16	0.000
2	0.32		0.14			0.00	0.30	0.000
3	0.62		0.23			0.02	0.30	0.001
4	0.92		0.16			0.09	0.30	0.004
5	1.22		0.40			0.06	0.30	0.007
6	1.52		0.42			0.14	0.30	0.018
7	1.82		0.38			0.05	0.30	0.006
8	2.12		0.28			0.09	0.30	0.008
9	2.42		0.30			0.10	0.30	0.009
10	2.72		0.22			0.08	0.30	0.005
11	3.02		0.20			0.01	0.30	0.001
12	3.32		0.18			0.00	0.30	0.000
13	3.62		0.02			0.00	0.16	0.000
Right Bank	3.64		0.00			0.00	0.01	0.000
								0.059

PROJECT NAME: **Miramar / M2 Program / Ogama Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Lake Outflow** **MEASUREMENT DATE:** **22 June 2007**
LOCATION: **Outflow of Ogama Lake** **METER NUMBER:** **Marsh McBirney**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **PE** **MEASUREMENT START TIME:** **1101 h**
COMPUTATIONS BY: **TJ/DC** **MEASUREMENT END TIME:** **1120 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.72			0.00	0.55	0.000
1	1.10		0.50			0.59	1.10	0.325
2	2.20		0.52			0.61	1.10	0.349
3	3.30		0.46			0.63	1.10	0.319
4	4.40		0.30			0.53	1.10	0.175
5	5.50		0.36			0.10	1.10	0.040
6	6.60		0.32			0.03	1.10	0.011
7	7.70		0.10			0.14	1.10	0.015
8	8.80		0.28			0.01	1.10	0.003
9	9.90		0.15			0.00	0.65	0.000
Right Bank	10.10		0.19			0.00	0.10	0.000
								1.236

PROJECT NAME: **Miramar / M2 Program / Ogama Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Lake Outflow** **MEASUREMENT DATE:** **10 July 2007**
LOCATION: **Outflow of Ogama Lake** **METER NUMBER:** **Marsh-McBirney**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **TY** **MEASUREMENT START TIME:** **1358 h**
COMPUTATIONS BY: **DC** **MEASUREMENT END TIME:** **1410 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.08	0.000
1	0.15		0.06			0.00	0.33	0.000
2	0.65		0.13			0.00	0.60	0.000
3	1.35		0.12			0.00	0.45	0.000
4	1.55		0.15			0.00	0.15	0.000
5	1.65		0.17			0.02	0.15	0.000
6	1.85		0.22			0.03	0.20	0.001
7	2.05		0.27			0.46	0.20	0.025
8	2.25		0.32			0.65	0.20	0.041
9	2.45		0.33			0.56	0.20	0.037
10	2.65		0.36			0.70	0.20	0.050
11	2.85		0.35			0.73	0.20	0.051
12	3.05		0.35			0.69	0.20	0.048
13	3.25		0.36			0.65	0.20	0.047
14	3.45		0.36			0.80	0.20	0.058
15	3.65		0.35			0.82	0.20	0.057
16	3.85		0.36			0.77	0.20	0.056
17	4.05		0.39			0.72	0.20	0.056
18	4.25		0.38			0.70	0.20	0.053
19	4.45		0.37			0.79	0.20	0.059
20	4.65		0.36			0.74	0.20	0.053
21	4.85		0.31			0.78	0.20	0.048
22	5.05		0.30			0.67	0.15	0.030
23	5.15		0.29			0.50	0.10	0.014
24	5.25		0.28			0.15	0.10	0.004
25	5.35		0.20			0.00	0.15	0.000
26	5.55		0.12			0.00	0.35	0.000
27	6.05		0.10			0.00	0.40	0.000
Left Bank	6.35		0.00			0.00	0.15	0.000
								0.789

PROJECT NAME: **Miramar / M2 Program / Ogama Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Lake Outflow**
LOCATION: **Outflow of Ogama Lake**
COORDINATES: **13W 435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **19 July 2007**
METER NUMBER: **Marsh McBirney**
Flo-Mate Model 2000

MEASUREMENT BY: **MK/HS**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **2345 h**
MEASUREMENT END TIME: **0010 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.50	0.000
1	1.00		0.25			0.02	0.65	0.003
2	1.30		0.18			0.20	0.30	0.011
3	1.60		0.10			0.18	0.30	0.005
4	1.90		0.25			0.12	0.35	0.011
5	2.30		0.34			0.02	0.40	0.003
6	2.70		0.34			0.55	0.40	0.075
7	3.10		0.38			0.55	0.40	0.084
8	3.50		0.39			0.62	0.35	0.085
9	3.80		0.33			0.44	0.33	0.047
10	4.15		0.20			0.03	0.95	0.006
Left Bank	5.70		0.00			0.00	0.78	0.000
								0.329

PROJECT NAME: **Miramar / M2 Program / Ogama Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Lake Outflow**
LOCATION: **Outflow of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **16 August 2007**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TY**
COMPUTATIONS BY: **TJ / DC**

MEASUREMENT START TIME: **1420 h**
MEASUREMENT END TIME: **1450 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.10	0.000
1	0.20		0.05			0.00	0.20	0.000
2	0.40		0.07			-0.01	0.20	0.000
3	0.60		0.10			0.01	0.20	0.000
4	0.80		0.18			0.23	0.20	0.008
5	1.00		0.20			0.49	0.20	0.020
6	1.20		0.21			0.63	0.20	0.026
7	1.40		0.22			0.66	0.20	0.029
8	1.60		0.22			0.70	0.20	0.031
9	1.80		0.23			0.65	0.20	0.030
10	2.00		0.24			0.70	0.20	0.034
11	2.20		0.24			0.69	0.20	0.033
12	2.40		0.24			0.65	0.20	0.031
13	2.60		0.25			0.61	0.20	0.031
14	2.80		0.26			0.60	0.20	0.031
15	3.00		0.26			0.59	0.20	0.031
16	3.20		0.26			0.55	0.20	0.029
17	3.40		0.26			0.56	0.20	0.029
18	3.60		0.27			0.52	0.20	0.028
19	3.80		0.26			0.10	0.20	0.005
Left Bank	4.00		0.13			0.00	0.10	0.000
								0.425

PROJECT NAME: **Miramar / M2 Program / Ogama Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Ogama Lake Outflow**
LOCATION: **Outflow of Ogama Lake**
COORDINATES: **13W 0435648 E, 7555130 N (NAD 83)**

MEASUREMENT DATE: **14 September 2007**
METER NUMBER: **Marsh McBirney**
Flo-Mate Model 2000

MEASUREMENT BY: **TY**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **0955 h**
MEASUREMENT END TIME: **1015 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.02			0.00	0.15	0.000
1	0.30		0.07			0.00	0.30	0.000
2	0.60		0.20			0.00	0.30	0.000
3	0.90		0.28			0.02	0.30	0.002
4	1.20		0.28			0.11	0.30	0.009
5	1.50		0.27			0.17	0.30	0.014
6	1.80		0.26			0.15	0.30	0.012
7	2.10		0.28			0.21	0.30	0.018
8	2.40		0.31			0.18	0.30	0.017
9	2.70		0.29			0.04	0.30	0.003
10	3.00		0.31			0.22	0.30	0.020
11	3.30		0.37			0.10	0.30	0.011
12	3.60		0.34			0.04	0.30	0.004
13	3.90		0.34			0.14	0.30	0.014
14	4.20		0.34			0.39	0.30	0.040
15	4.50		0.28			0.48	0.30	0.040
16	4.80		0.32			0.37	0.30	0.036
17	5.10		0.34			0.18	0.30	0.018
18	5.40		0.29			0.35	0.30	0.030
19	5.70		0.40			0.41	0.30	0.049
20	6.00		0.36			0.18	0.30	0.019
21	6.30		0.32			0.18	0.30	0.017
26	6.60		0.45			0.19	0.30	0.026
27	6.90		0.36			0.00	0.20	0.000
Left Bank	7.00		0.00			0.00	0.05	0.000
								0.400

AIMAOKATALOK RIVER HYDROMETRIC STATION

H83

FACTSHEET

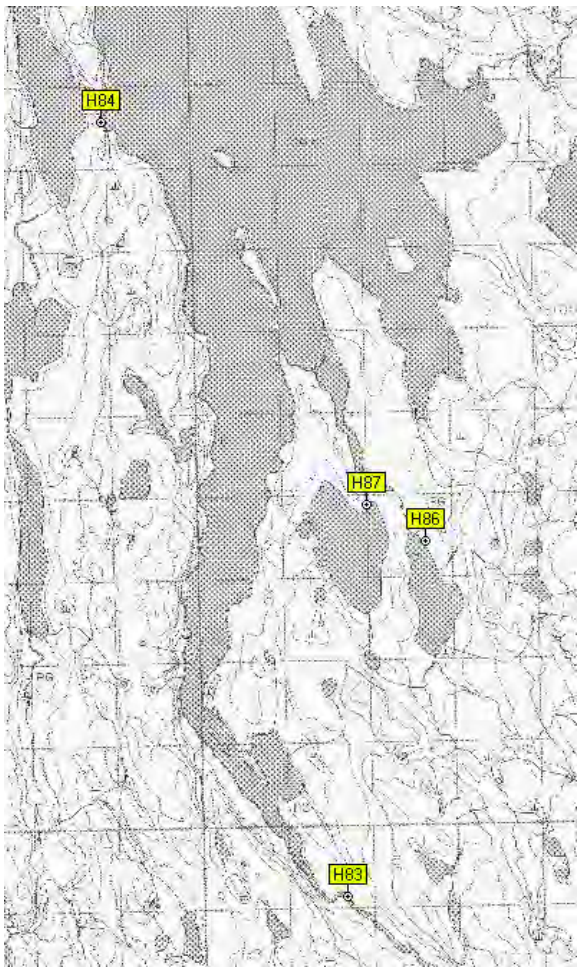
LOCATION AND PURPOSE

Located on the right upstream bank of Aimaokatalok River, approximately 200 m upstream of Aimaokatalok Lake.

Operational:	2006 (2 June – 10 September)	2007 (26 May – 9 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	769 km^2
Coordinates:	UTM: 441634 m E, 7499360 m N (NAD83)	Lat/Long:	67°36'14" N, 106°22'22" W
Datalogger:	Optimum Instruments #628	Transducer:	Keller #202698 (5 psi, 15 m)

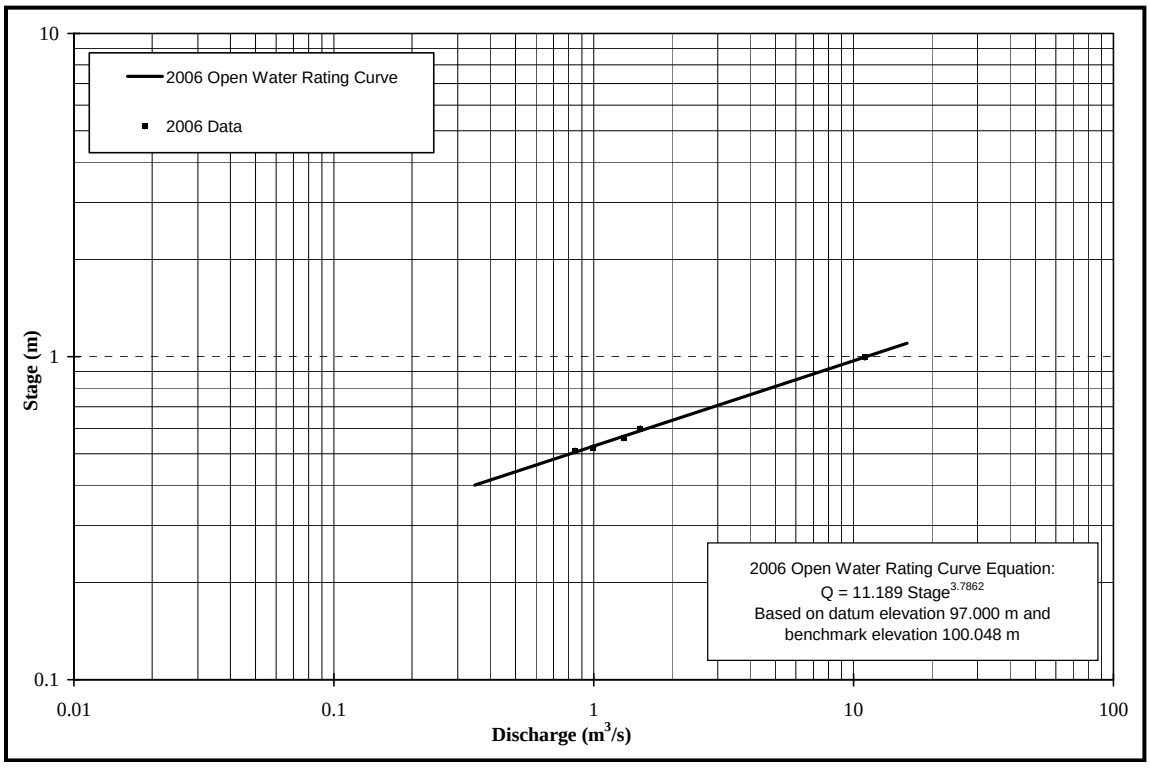
Station H83 looking West from right bank, with benchmark.

Station H83 looking north (downstream) during spring melt.



NTS Mapping of Area.

FACT-H83-2007.DOC



Aimaokatalok Inflow Station H83 - Stage-Discharge Rating Curve (2006)

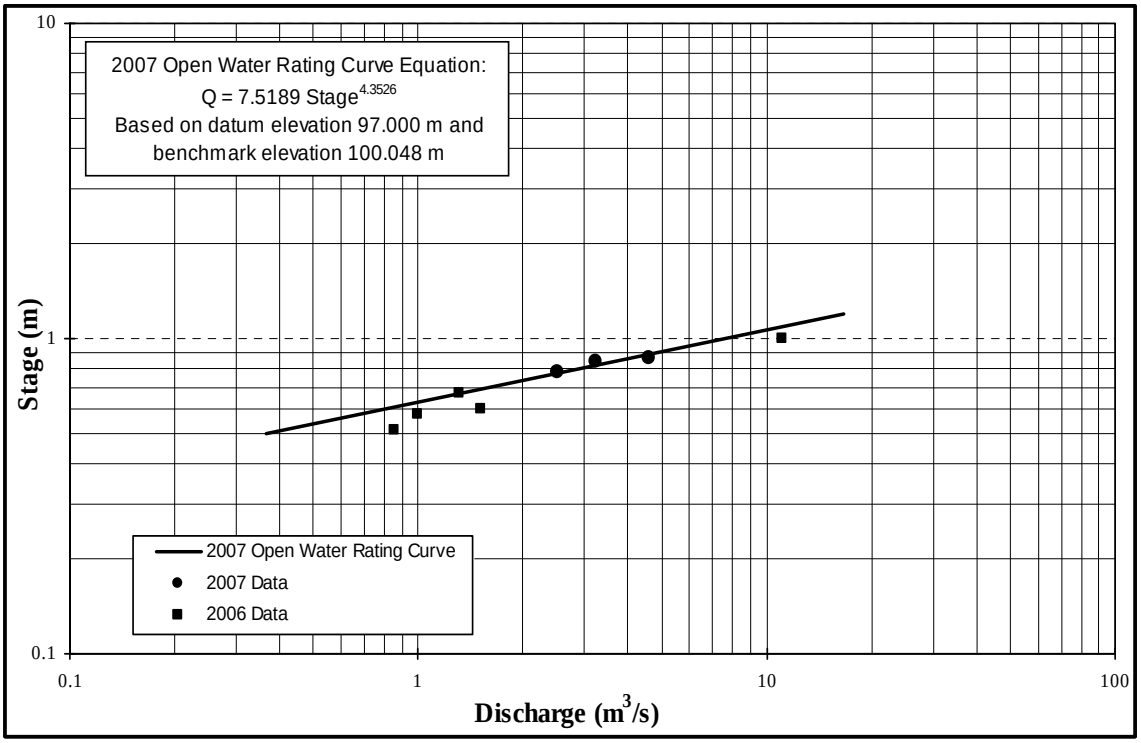


Figure I 1

Aimaokatalok River Station H83 - Stage-Discharge Rating Curve (2007)

Aimaokatalok River Station H83 – Stage-Discharge Data (2006-2007)

			Stage Datum	97.000 m	(assumed)	
Date & Time	Transducer Reading	Transducer Elevation	Average Transducer Elevation	Water Surface Elevation	Stage	Measured Discharge
	(m)	(m)	(m)	(m)	(m)	(m^3/s)
02/06/2006 17:07	0.9089	97.554		98.463	1.463	
23/06/2006 14:59	0.4884	97.507		97.995	0.995	11.060
17/07/2006 11:00	0.0691		97.530	*97.599*	0.599	
Transducer repositioned due to low water						
17/07/2006 11:15	0.6821			*97.589*	0.589	1.512
09/08/2006 16:35	0.6033	96.907		97.510	0.510	0.850
13/08/2006 13:10	0.6159			*97.523*	0.523	0.994
10/09/2006 15:17	0.6531		96.907	*97.560*	0.560	1.305
04/07/2007 09:45						6.697
transducer damaged 21 June; replaced below riffle on 21 Jul at 20:00 h						
21/07/2007 20:45	0.5322	97.3108		97.843	0.843	3.226
18/08/2007 12:01	0.5649			97.866	0.866	4.606
09/09/2007 15:46	0.4908	97.2922	97.301	97.783	0.783	2.503

H83 Aimaokatalok Inflow - 2006
MEAN DAILY DISCHARGE (m3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	6.823	1.123	0.968	-	-	-
2	-	-	-	-	-	-	6.201	1.114	0.954	-	-	-
3	-	-	-	-	-	-	5.711	1.081	0.919	-	-	-
4	-	-	-	-	-	-	5.322	1.063	0.928	-	-	-
5	-	-	-	-	-	-	4.858	1.041	1.011	-	-	-
6	-	-	-	-	-	-	4.476	1.006	1.016	-	-	-
7	-	-	-	-	-	-	4.091	0.979	1.014	-	-	-
8	-	-	-	-	-	-	3.564	0.953	1.064	-	-	-
9	-	-	-	-	-	-	3.299	0.932	1.185	-	-	-
10	-	-	-	-	-	-	3.216	0.891	1.194	-	-	-
11	-	-	-	-	-	-	2.877	0.873	1.223	-	-	-
12	-	-	-	-	-	-	2.605	0.860	1.248	-	-	-
13	-	-	-	-	-	-	2.437	0.864	1.246 P	-	-	-
14	-	-	-	-	-	-	2.245	0.889	-	-	-	-
15	-	-	-	-	-	-	2.093	1.014	-	-	-	-
16	-	-	-	-	-	-	1.975	0.963	-	-	-	-
17	-	-	-	-	-	-	1.874	0.880	-	-	-	-
18	-	-	-	-	-	-	1.789	0.852	-	-	-	-
19	-	-	-	-	-	-	1.695	0.826	-	-	-	-
20	-	-	-	-	-	-	1.515	0.814	-	-	-	-
21	-	-	-	-	-	-	1.388	0.832	-	-	-	-
22	-	-	-	-	-	-	1.324	0.799	-	-	-	-
23	-	-	-	-	-	-	1.237	0.776	-	-	-	-
24	-	-	-	-	-	-	1.162	0.763	-	-	-	-
25	-	-	-	-	-	-	1.096	0.736	-	-	-	-
26	-	-	-	-	-	11.648 P	1.115	0.727	-	-	-	-
27	-	-	-	-	-	10.903	1.103	0.853	-	-	-	-
28	-	-	-	-	-	9.783	1.118	0.974	-	-	-	-
29	-	-	-	-	-	8.720	1.073	0.974	-	-	-	-
30	-	-	-	-	-	7.745	1.010	0.982	-	-	-	-
31	-	-	-	-	-	-	1.161	0.996	-	-	-	-
MIN	-	-	-	-	-	7.745	1.010	0.727	0.919	-	-	-
MEAN	-	-	-	-	-	9.760	2.628	0.917	1.075	-	-	-
MAX	-	-	-	-	-	11.648	6.823	1.123	1.248	-	-	-

H83 Aimaokatalok Inflow – 2006 (Continued)

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.482 m (ASSUMED)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	97.822	97.537	97.518	-	-	-
2	-	-	-	-	-	98.526 P	97.802	97.534	97.530	-	-	-
3	-	-	-	-	-	98.624	97.785	97.529	97.531	-	-	-
4	-	-	-	-	-	98.776	97.767	97.526	97.530	-	-	-
5	-	-	-	-	-	98.787	97.739	97.522	97.537	-	-	-
6	-	-	-	-	-	98.861	97.724	97.519	97.553	-	-	-
7	-	-	-	-	-	98.809	97.719	97.513	97.554	-	-	-
8	-	-	-	-	-	98.820	97.698	97.510	97.557	-	-	-
9	-	-	-	-	-	98.770	97.680	97.508	97.560	-	-	-
10	-	-	-	-	-	98.715	97.669	97.508	97.560 P	-	-	-
11	-	-	-	-	-	98.649	97.654	97.512	-	-	-	-
12	-	-	-	-	-	98.587	97.642	97.530	-	-	-	-
13	-	-	-	-	-	98.523	97.633	97.523	-	-	-	-
14	-	-	-	-	-	98.462	97.624	97.511	-	-	-	-
15	-	-	-	-	-	98.395	97.616	97.507	-	-	-	-
16	-	-	-	-	-	98.336	97.607	97.502	-	-	-	-
17	-	-	-	-	-	98.275	97.590	97.500	-	-	-	-
18	-	-	-	-	-	98.227	97.576	97.503	-	-	-	-
19	-	-	-	-	-	98.176	97.569	97.498	-	-	-	-
20	-	-	-	-	-	98.125	97.559	97.494	-	-	-	-
21	-	-	-	-	-	98.080	97.550	97.492	-	-	-	-
22	-	-	-	-	-	98.051	97.541	97.487	-	-	-	-
23	-	-	-	-	-	98.018	97.544	97.486	-	-	-	-
24	-	-	-	-	-	97.993	97.542	97.507	-	-	-	-
25	-	-	-	-	-	97.965	97.544	97.525	-	-	-	-
26	-	-	-	-	-	97.936	97.538	97.525	-	-	-	-
27	-	-	-	-	-	97.907	97.530	97.526	-	-	-	-
28	-	-	-	-	-	97.877	97.550	97.528	-	-	-	-
29	-	-	-	-	-	97.856	97.545	97.524	-	-	-	-
30	-	-	-	-	-	97.837	97.544	97.522	-	-	-	-
31	-	-	-	-	-	-	97.539	97.517	-	-	-	-
MIN	-	-	-	-	-	97.837	97.530	97.486	97.518	-	-	-
MEAN	-	-	-	-	-	98.344	97.627	97.514	97.543	-	-	-
MAX	-	-	-	-	-	98.861	97.822	97.537	97.560	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

H83 Aimaokatalok River - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	1.833	3.153	1.124 E	-	-
2	-	-	-	-	-	-	-	1.745	3.084	1.051 E	-	-
3	-	-	-	-	-	-	-	1.651	3.050	0.978 E	-	-
4	-	-	-	-	-	-	6.697 E	1.576	3.122	0.905 E	-	-
5	-	-	-	-	-	-	6.480 E	1.506	2.909	0.832 E	-	-
6	-	-	-	-	-	-	6.260 E	1.502	2.863	0.759 E	-	-
7	-	-	-	-	-	-	6.050 E	1.479	2.839	0.686 E	-	-
8	-	-	-	-	-	-	5.850 E	1.458	2.803	0.613 E	-	-
9	-	-	-	-	-	-	5.660 E	1.805	2.736 P	0.540 E	-	-
10	-	-	-	-	-	-	5.470 E	2.338	2.657 E	0.467 E	-	-
11	-	-	-	-	-	-	5.280 E	2.970	2.584 E	0.394 E	-	-
12	-	-	-	-	-	-	5.090 E	3.648	2.511 E	0.321 E	-	-
13	-	-	-	-	-	-	4.900 E	4.076	2.438 E	0.248 E	-	-
14	-	-	-	-	-	-	4.710 E	4.039	2.365 E	0.175 E	-	-
15	-	-	-	-	-	-	4.520 E	4.329	2.292 E	0.102 E	-	-
16	-	-	-	-	-	-	4.330 E	4.306	2.219 E	0.029 E	-	-
17	-	-	-	-	-	-	4.140 E	4.244	2.146 E	-	-	-
18	-	-	-	-	-	-	3.950 E	4.085	2.073 E	-	-	-
19	-	-	-	-	-	-	3.760 E	4.268	2.000 E	-	-	-
20	-	-	-	-	-	-	3.570 E	4.371	1.927 E	-	-	-
21	-	-	-	-	-	-	3.380 E	4.111	1.854 E	-	-	-
22	-	-	-	-	-	-	3.349 P	3.744	1.781 E	-	-	-
23	-	-	-	-	-	-	2.915	3.616	1.708 E	-	-	-
24	-	-	-	-	-	-	2.830	3.495	1.635 E	-	-	-
25	-	-	-	-	-	-	2.636	3.377	1.562 E	-	-	-
26	-	-	-	-	-	-	2.504	3.296	1.489 E	-	-	-
27	-	-	-	-	-	-	2.395	3.212	1.416 E	-	-	-
28	-	-	-	-	-	-	2.236	3.240	1.343 E	-	-	-
29	-	-	-	-	-	-	2.118	3.281	1.270 E	-	-	-
30	-	-	-	-	-	-	2.019	3.254	1.197 E	-	-	-
31	-	-	-	-	-	-	1.914	3.201	-	-	-	-
MIN	-	-	-	-	-	-	1.914	1.458	1.197	0.029	-	-
MEAN	-	-	-	-	-	-	4.108	3.066	2.234	0.577	-	-
MAX	-	-	-	-	-	-	6.697	4.371	3.153	1.124	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.482 m (ASSUMED)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	97.723	97.819	-	-	-
2	-	-	-	-	-	-	-	97.715	97.815	-	-	-
3	-	-	-	-	-	-	-	97.706	97.813	-	-	-
4	-	-	-	-	-	-	-	97.698	97.817	-	-	-
5	-	-	-	-	-	-	-	97.691	97.804	-	-	-
6	-	-	-	-	-	-	-	97.691	97.801	-	-	-
7	-	-	-	-	-	-	-	97.688	97.800	-	-	-
8	-	-	-	-	-	-	-	97.686	97.797	-	-	-
9	-	-	-	-	-	-	-	97.720	97.793 P	-	-	-
10	-	-	-	-	-	-	-	97.763	-	-	-	-
11	-	-	-	-	-	-	-	97.808	-	-	-	-
12	-	-	-	-	-	-	-	97.845	-	-	-	-
13	-	-	-	-	-	-	-	97.869	-	-	-	-
14	-	-	-	-	-	-	-	97.867	-	-	-	-
15	-	-	-	-	-	-	-	97.881	-	-	-	-
16	-	-	-	-	-	-	-	97.880	-	-	-	-
17	-	-	-	-	-	-	-	97.877	-	-	-	-
18	-	-	-	-	-	-	-	97.869	-	-	-	-
19	-	-	-	-	-	-	-	97.878	-	-	-	-
20	-	-	-	-	-	-	-	97.883	-	-	-	-
21	-	-	-	-	-	-	-	97.870	-	-	-	-
22	-	-	-	-	-	-	97.830 P	97.852	-	-	-	-
23	-	-	-	-	-	-	97.804	97.845	-	-	-	-
24	-	-	-	-	-	-	97.799	97.839	-	-	-	-
25	-	-	-	-	-	-	97.786	97.832	-	-	-	-
26	-	-	-	-	-	-	97.777	97.827	-	-	-	-
27	-	-	-	-	-	-	97.769	97.823	-	-	-	-
28	-	-	-	-	-	-	97.757	97.824	-	-	-	-
29	-	-	-	-	-	-	97.747	97.827	-	-	-	-
30	-	-	-	-	-	-	97.739	97.825	-	-	-	-
31	-	-	-	-	-	-	97.730	97.822	-	-	-	-
MIN	-	-	-	-	-	-	97.730	97.686	97.793	-	-	-
MEAN	-	-	-	-	-	-	97.774	97.804	97.806	-	-	-
MAX	-	-	-	-	-	-	97.830	97.883	97.819	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: **Miramar/M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Aimaokatalok Inflow**
LOCATION: **Southern Inflow to Aimaokatalok Lake**
COORDINATES: **13W 0441607 E, 7499368 N (NAD 83)**

MEASUREMENT DATE: **23 June 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK / PE**
COMPUTATIONS BY: **TJ / NS**

MEASUREMENT START TIME: **1450 h**
MEASUREMENT END TIME: **1515 h est.**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.20	0.000
1	0.40		0.09			0.00	1.20	0.000
2	2.40		0.33			0.34	1.50	0.168
3	3.40		0.75			0.48	1.50	0.540
4	5.40		0.74			0.41	2.00	0.607
5	7.40		0.73			0.66	2.00	0.964
6	9.40		0.76			0.69	2.00	1.049
7	11.40		0.75			0.82	2.00	1.230
8	13.40		0.84			0.70	2.00	1.176
9	15.40		0.79			0.99	2.00	1.564
10	17.40		0.63			0.92	2.00	1.159
11	19.40		0.67			0.84	2.00	1.126
12	21.40		0.63			0.77	2.00	0.970
13	23.40		0.44			0.39	2.00	0.343
14	25.40		0.44			0.11	2.00	0.097
15	27.40		0.24			0.01	2.00	0.005
16	29.40		0.15			0.26	1.65	0.064
Left Bank	30.70		0.00			0.00	0.65	0.000
								11.06

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER.: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Inflow**
LOCATION: **Southern Inflow to Aimaokatalok Lake**
COORDINATES: **13W 0441607 E, 7499368 N (NAD 83)**

MEASUREMENT DATE: **17 July 2006**
METER NUMBER: **Marsh-McBirney**
Flo-Mate Model 2000

MEASUREMENT BY: **HS / KM**
COMPUTATIONS BY: **TJ / NS**

MEASUREMENT START TIME: **1100 h**
MEASUREMENT END TIME: **1120 h est.**

STATION	DISTANCE FROM LEFT D/S BANK	ICE THICKNESS	DEPTH	VELOCITY			WIDTH	DISCHARGE
				0.2 Depth	0.8 Depth	0.6 Depth		
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m)	(m^3/s)
Left Bank	0.00		0.00			0.00	0.55	0.000
19	1.10		0.40			0.00	1.05	0.000
18	2.10		0.20			0.00	1.00	0.000
17	3.10		0.09			0.10	1.00	0.009
16	4.10		0.10			0.07	1.00	0.007
15	5.10		0.20			0.12	1.00	0.024
14	6.10		0.25			0.02	1.00	0.005
13	7.10		0.25			0.22	1.00	0.055
12	8.10		0.32			0.33	1.00	0.106
11	9.10		0.36			0.32	1.00	0.115
10	10.10		0.31			0.27	1.00	0.084
9	11.10		0.29			0.46	1.00	0.133
8	12.10		0.44			0.40	1.00	0.176
7	13.10		0.44			0.47	1.00	0.207
6	14.10		0.39			0.48	1.00	0.187
5	15.10		0.45			0.41	1.00	0.185
4	16.10		0.47			0.34	1.00	0.160
3	17.10		0.35			0.13	1.00	0.046
2	18.10		0.28			0.05	1.00	0.014
1	19.10		0.22			0.00	0.70	0.000
Right Bank	19.50		0.00			0.00	0.20	0.000
								1.512

PROJECT NAME: **Miramar / M2 Program**

PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Aimaokatalok Inflow**
LOCATION: **Southern Inflow to Aimaokatalok Lake**
COORDINATES: **13W 0441607 E, 7499368 N (NAD 83)**

MEASUREMENT DATE: **9 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS / KM**
COMPUTATIONS BY: **TJ / NS**

MEASUREMENT START TIME: **1555 h**
MEASUREMENT END TIME: **1622 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.25	0.000
1	0.50		0.10			0.07	0.60	0.007
2	1.20		0.16			0.15	0.85	0.028
3	2.20		0.22			0.18	1.00	0.038
4	3.20		0.21			0.24	1.00	0.041
5	4.20		0.17			0.23	1.00	0.051
6	5.20		0.22			0.35	1.00	0.091
7	6.20		0.26			0.27	1.00	0.054
8	7.20		0.20			0.31	1.00	0.047
9	8.20		0.15			0.41	1.00	0.119
10	9.20		0.29			0.20	1.00	0.046
11	10.20		0.23			0.36	1.00	0.101
12	11.20		0.28			0.38	1.00	0.129
13	12.20		0.34			0.08	1.00	0.027
14	13.20		0.31			0.13	1.00	0.040
15	14.20		0.23			0.15	0.70	0.024
16	14.60		0.20			0.13	0.30	0.008
Right Bank	14.80		0.00			0.00	0.10	0.000
								0.850

PROJECT NAME: **Miramar / M2 Program**

PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Aimaokatalok Inflow**
LOCATION: **Southern Inflow to Aimaokatalok Lake**
COORDINATES: **13W 0441607 E, 7499368 N (NAD 83)**

MEASUREMENT DATE: **13 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS / KM**
COMPUTATIONS BY: **TJ / NS**

MEASUREMENT START TIME: **1310 h**
MEASUREMENT END TIME: **1325 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.05	0.000
1	0.10		0.10			0.00	0.20	0.000
2	0.40		0.17			0.01	0.35	0.001
3	0.80		0.18			0.08	0.45	0.006
4	1.30		0.23			0.21	0.50	0.024
5	1.80		0.23			0.20	0.50	0.023
6	2.30		0.28			0.25	0.50	0.035
7	2.80		0.18			0.26	0.50	0.023
8	3.30		0.16			0.30	0.50	0.024
9	3.80		0.24			0.24	0.50	0.029
10	4.30		0.25			0.23	0.50	0.029
11	4.80		0.25			0.33	0.50	0.041
12	5.30		0.31			0.36	0.50	0.056
13	5.80		0.31			0.23	0.50	0.036
14	6.30		0.24			0.43	0.50	0.052
15	6.80		0.23			0.47	0.50	0.054
16	7.30		0.30			0.21	0.50	0.032
17	7.80		0.31			0.44	0.50	0.068
18	8.30		0.34			0.27	0.50	0.046
19	8.80		0.29			0.23	0.50	0.033
20	9.30		0.29			0.00	0.50	0.000
21	9.80		0.24			0.32	0.50	0.038
22	10.30		0.29			0.39	0.50	0.057
23	10.80		0.26			0.46	0.45	0.054
24	11.20		0.31			0.26	0.30	0.024
25	11.40		0.13			0.36	0.30	0.014
26	11.80		0.14			0.38	0.45	0.024
27	12.30		0.19			0.31	0.50	0.029
28	12.80		0.35			0.24	0.50	0.042
29	13.30		0.33			0.22	0.50	0.036
30	13.80		0.37			0.32	0.50	0.059
31	14.30		0.18			0.08	0.35	0.005
32	14.50		0.13			0.02	0.15	0.000
33	14.60		0.17			-0.02	0.25	-0.001
Right Bank	15.00		0.00			0.00	0.20	0.000
								0.994

PROJECT NAME: **Miramar / M2 Program**

PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Aimaokatalok Inflow**
LOCATION: **Southern Inflow to Aimaokatalok Lake**
COORDINATES: **13W 0441607 E, 7499368 N (NAD 83)**

MEASUREMENT DATE: **10 September 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK / PE**
COMPUTATIONS BY: **TJ / NS**

MEASUREMENT START TIME: **1526 h**
MEASUREMENT END TIME: **1545 h est.**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	0.90	0.000
1	1.80		0.18			0.10	1.80	0.075
2	3.60		0.32			0.23	1.80	0.219
3	5.40		0.40			0.38	1.80	0.288
4	7.20		0.37			0.40	1.80	0.200
5	9.00		0.39			0.30	1.80	0.267
6	10.80		0.29			0.38	1.80	0.120
7	12.60		0.27			0.23	1.80	0.131
8	14.40		0.17			0.27	1.80	0.006
9	16.20		0.10			0.02	1.80	0.000
10	18.00		0.05			0.00	0.90	0.000
Left Bank	18.00		0.00			0.00	0.00	0.000
								1.306

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Inflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok River** **MEASUREMENT DATE:** **4 July 2007**
LOCATION: **Inflow of Aimaokatalok Lake** **METER NUMBER:** **Marsh-McBirney**
COORDINATES: **13W 0443539 E, 7509431 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **PE** **MEASUREMENT START TIME:** **0735 h**
COMPUTATIONS BY: **TJ / DC** **MEASUREMENT END TIME:** **0813 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.20			0.00	0.45	0.000
1	0.90		0.40			0.30	1.00	0.120
2	2.00		0.52			0.40	1.05	0.218
3	3.00		0.51			0.46	1.00	0.235
4	4.00		0.56			0.37	1.00	0.207
5	5.00		0.48			0.56	1.00	0.269
6	6.00		0.58			0.55	1.00	0.319
7	7.00		0.52			0.62	1.00	0.322
8	8.00		0.61			0.63	1.00	0.384
9	9.00		0.54			0.59	1.00	0.319
10	10.00		0.71			0.61	1.00	0.433
11	11.00		0.61			0.66	1.00	0.403
12	12.00		0.48			0.76	1.00	0.365
13	13.00		0.46			0.81	1.00	0.373
14	14.00		0.54			0.76	1.00	0.410
15	15.00		0.56			0.86	1.00	0.482
16	16.00		0.46			0.90	1.00	0.414
17	17.00		0.59			0.74	1.00	0.437
18	18.00		0.58			0.15	1.00	0.087
19	19.00		0.50			0.81	1.00	0.405
20	20.00		0.42			0.44	1.00	0.185
21	21.00		0.31			0.23	1.00	0.071
22	22.00		0.36			0.27	1.00	0.097
23	23.00		0.40			0.23	1.00	0.092
24	24.00		0.20			0.25	1.00	0.050
25	25.00		0.04			0.00	1.00	0.000
26	26.00		0.04			0.02	1.00	0.001
Left Bank	27.00		0.02			0.00	0.50	0.000
								6.697

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Inflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Lake Inflow**
LOCATION: **Inflow of Aimaokatalok Lake**
COORDINATES: **13W 0443539 E, 7509431 N (NAD 83)**

MEASUREMENT DATE: **21 July 2007**
METER NUMBER: **Marsh McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **MK / HS**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **2040 hrs**
MEASUREMENT END TIME: **2100 hrs**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.45		0.00			0.00	0.33	0.000
1	3.10		0.09			-0.02	0.78	-0.001
2	4.00		0.08			-0.01	1.00	-0.001
3	5.10		0.10			0.02	1.05	0.002
4	6.10		0.06			-0.05	1.00	-0.003
5	7.10		0.15			0.02	1.00	0.003
6	8.10		0.16			0.01	1.45	0.002
7	10.00		0.29			0.44	1.95	0.249
8	12.00		0.40			0.42	2.00	0.336
9	14.00		0.55			0.46	2.00	0.506
10	16.00		0.69			0.42	2.00	0.580
11	18.00		0.55			0.40	2.00	0.440
12	20.00		0.52			0.37	2.00	0.385
13	22.00		0.52			0.40	2.00	0.416
14	24.00		0.44			0.31	2.00	0.273
15	26.00		0.38			0.09	1.15	0.039
Right Bank	26.30		0.00			0.00	0.15	0.000
								3.226

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Inflow**
PROJECT NUMBER: **07 1373 0019.4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Lake Inflow**
LOCATION: **Inflow of Aimaokatalok Lake**
COORDINATES: **13W 0443539 E, 7509431 N (NAD 83)**

MEASUREMENT DATE: **18 August 2007**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TY**
COMPUTATIONS BY: **TJ / JV**

MEASUREMENT START TIME: **1330 h**
MEASUREMENT END TIME: **1402 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.04			0.00	0.50	0.000
1	1.00		0.18			0.00	1.00	0.000
2	2.00		0.52			0.35	1.00	0.182
3	3.00		0.82	0.36	-0.04	0.16	1.00	0.131
4	4.00		0.64			0.33	1.00	0.211
5	5.00		0.56			0.47	1.00	0.263
6	6.00		0.56			0.50	1.00	0.280
7	7.00		0.57			0.51	1.00	0.291
8	8.00		0.62			0.46	1.00	0.285
9	9.00		0.65			0.53	1.00	0.345
10	10.00		0.66			0.47	1.00	0.310
11	11.00		0.69			0.53	1.00	0.366
12	12.00		0.62			0.60	1.00	0.372
13	13.00		0.63			0.55	1.00	0.347
14	14.00		0.51			0.54	1.00	0.275
15	15.00		0.46			0.58	1.00	0.267
16	16.00		0.42			0.57	1.00	0.239
17	17.00		0.40			0.56	1.00	0.224
18	18.00		0.36			0.45	1.00	0.162
19	19.00		0.25			0.20	1.00	0.050
20	20.00		0.22			0.05	1.00	0.011
21	21.00		0.14			-0.02	1.00	-0.003
22	22.00		0.10			-0.02	1.00	-0.002
23	23.00		0.07			0.00	1.00	0.000
Left Bank	24.00		0.12			0.00	0.50	0.000
								4.606

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Inflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Lake Inflow** **MEASUREMENT DATE:** **09 Sept 2007**
LOCATION: **Inflow of Aimaokatalok Lake** **METER NUMBER:** **Marsh McBirney**
COORDINATES: **13W 0443539 E, 7509431 N (NAD 83)** **Flo-Mate Model 2000**

MEASUREMENT BY: **TY** **MEASUREMENT START TIME:** **1600 h**
COMPUTATIONS BY: **DC** **MEASUREMENT END TIME:** **1800h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.03			0.00	0.10	0.000
1	0.20		0.06			0.00	1.10	0.000
2	2.20		0.08			0.00	2.25	0.000
3	4.70		0.12			0.10	1.75	0.021
4	5.70		0.16			0.10	1.00	0.016
5	6.70		0.22			0.20	1.00	0.044
6	7.70		0.30			0.25	1.00	0.075
7	8.70		0.40			0.35	1.00	0.140
8	9.70		0.38			0.28	1.00	0.106
9	10.70		0.45			0.36	1.00	0.162
10	11.70		0.49			0.32	1.00	0.157
11	12.70		0.58			0.34	1.00	0.197
12	13.70		0.66			0.35	1.00	0.231
13	14.70		0.64			0.30	1.00	0.192
14	15.70		0.58			0.21	1.00	0.122
15	16.70		0.54			0.29	1.00	0.157
16	17.70		0.56			0.32	1.00	0.179
17	18.70		0.56			0.27	1.00	0.151
18	19.70		0.60			0.30	1.00	0.180
19	20.70		0.66			0.22	1.00	0.145
20	21.70		0.66			0.20	1.00	0.132
21	22.70		0.80			0.07	0.95	0.053
22	23.60		0.37			0.12	0.95	0.042
Right Bank	24.60		0.00			0.00	0.50	0.000
								2.503

AIMAOKATALOK LAKE OUTFLOW HYDROMETRIC STATION

H84

FACTSHEET

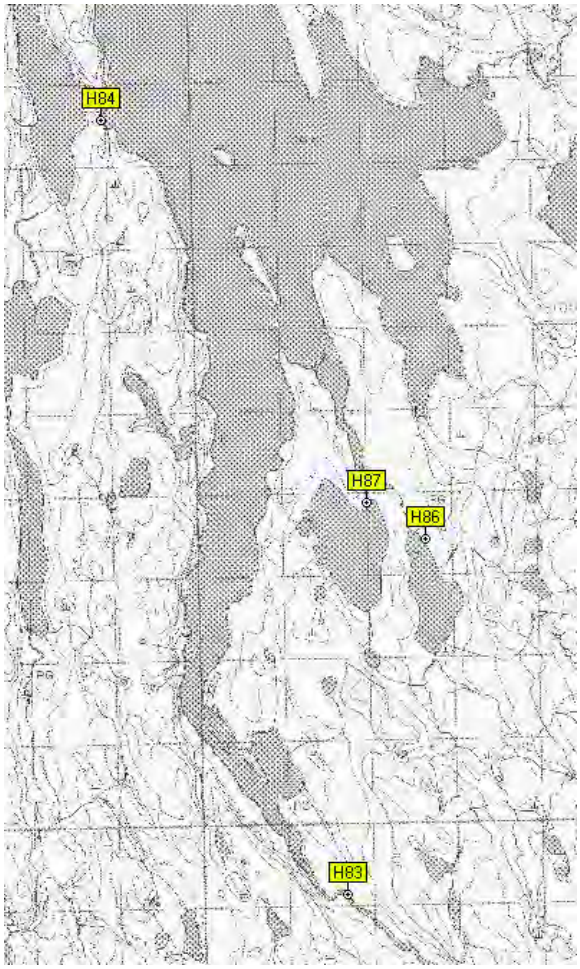
LOCATION AND PURPOSE

Located approximately 80 m upstream, on the left bank of Aimaokatalok Lake outflow.

Operational:	2006 (2 June – 31 December)	2007 (1 January – 31 December)	
Benchmark:	Top of embedded boulder;	Drainage Area:	1241 km2
Coordinates:	UTM: 438892 m E, 7508794 m N (NAD83)	Lat/Long:	67°41'17" N, 106°26'33" W
Datalogger:	Optimum Instruments #0689 (cold tested)	Transducer:	Keller #00932 (5 psi, 20 m)

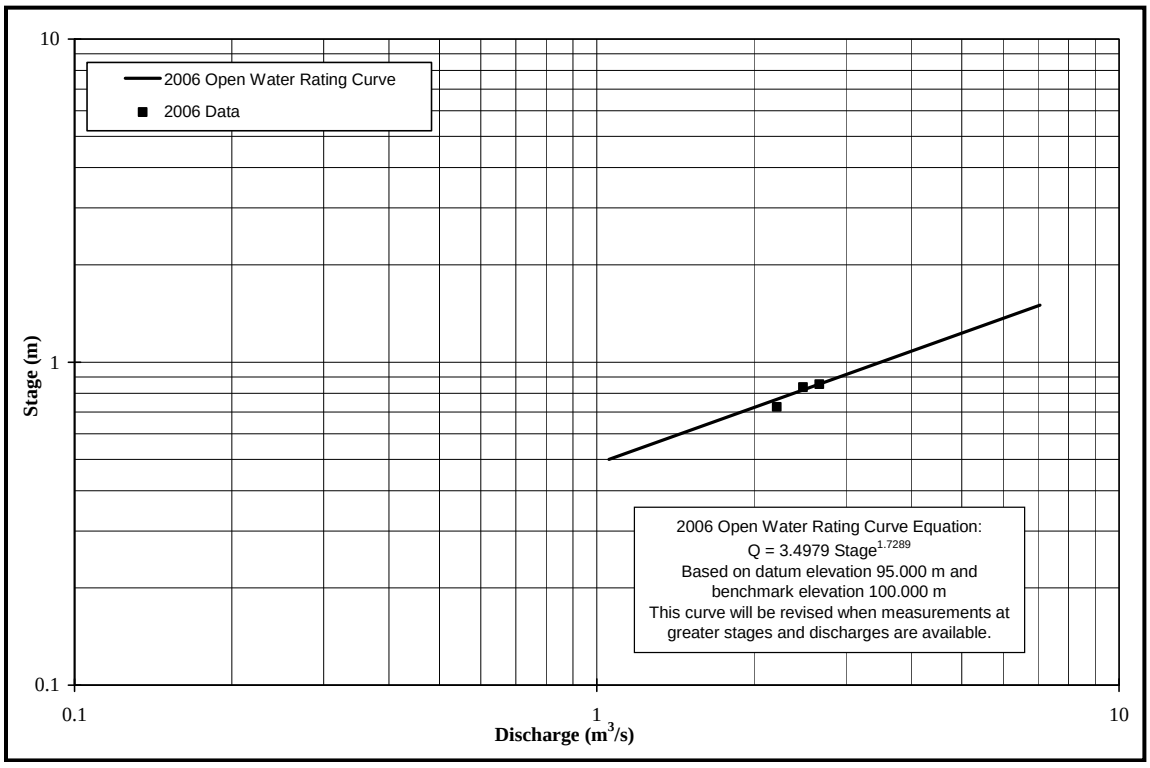
Station H84 looking North (downstream) from left bank, with benchmark.

Station H84 looking south (upstream) during spring melt.

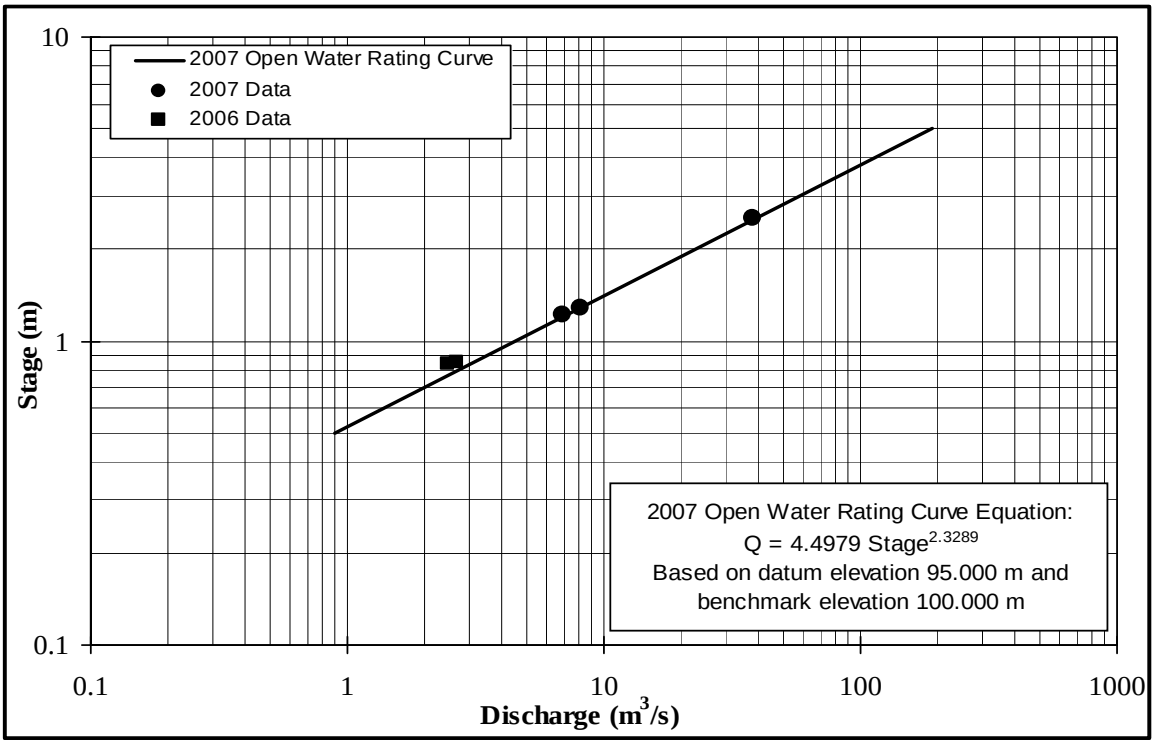


NTS Mapping of Area.

FACT-H84-2007.DOC



Aimaokatalok Outflow Station H84 - Stage-Discharge Rating Curve (2006)



Aimaokatalok Outflow Station H84 - Stage-Discharge Rating Curve (2007)

Aimaokatalok Outflow Station H84 – Survey Data (2006-2007)

Stage Datum 95.000 m non-geodetic

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
02/06/2006 13:45	0.4500	96.846	96.846	97.296	2.296	-
transducer relocated into deeper water for overwintering						
08/07/2006 13:02	0.9165	-		*96.426*	1.426	-
09/08/2006 11:00	0.3452	95.510	95.510	95.855	0.855	2.668
09/08/2006 11:43	3.3820	92.473		95.855	0.855	2.668
13/08/2006 15:00	3.3633	-		*95.836*	0.836	2.482
10/09/2006 12:53	3.2535	-	92.473	*95.726*	0.726	-
04/07/2007 09:45	4.9069	92.6131		97.520	2.520	37.8
20/07/2007 08:55	4.1661	92.5539		96.720	1.720	-
18/08/2007 08:55	3.6740	92.7270		96.401	1.401	8.13
10/09/2007 10:55	3.6147	92.4673	92.590	96.082	1.082	6.88

H84 Aimaokatalok Outflow - 2006

MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK EL. 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	95.985	95.739	95.847	95.791	95.698
2	-	-	-	-	-	-	-	95.933	95.733	95.847	95.788	95.696
3	-	-	-	-	-	-	-	95.922	95.732	95.846	95.785	95.694
4	-	-	-	-	-	-	-	95.913	95.729	95.847	95.781	95.692
5	-	-	-	-	-	-	-	95.904	95.728	95.845	95.778	95.691
6	-	-	-	-	-	-	-	95.896	95.727	95.838	95.775	95.689
7	-	-	-	-	-	-	-	95.882	95.725	95.834	95.772	95.687
8	-	-	-	-	-	-	96.399 P	95.872	95.725	95.830	95.768	95.684
9	-	-	-	-	-	-	96.354	95.859	95.726	95.825	95.763	95.682
10	-	-	-	-	-	-	96.323	95.850	95.844	95.821	95.760	95.681
11	-	-	-	-	-	-	96.229	95.846	95.844	95.817	95.756	95.680
12	-	-	-	-	-	-	96.166	95.842	95.843	95.816	95.752	95.678
13	-	-	-	-	-	-	96.223	95.837	95.846	95.815	95.748	95.677
14	-	-	-	-	-	-	96.192	95.830	95.844	95.816	95.744	95.676
15	-	-	-	-	-	-	96.108	95.821	95.844	95.815	95.741	95.674
16	-	-	-	-	-	-	96.166	95.813	95.845	95.814	95.738	95.672
17	-	-	-	-	-	-	96.151	95.807	95.847	95.813	95.735	95.671
18	-	-	-	-	-	-	96.202	95.803	95.848	95.812	95.731	95.669
19	-	-	-	-	-	-	96.145	95.795	95.850	95.810	95.728	95.666
20	-	-	-	-	-	-	96.093	95.786	95.853	95.808	95.725	95.665
21	-	-	-	-	-	-	96.051	95.780	95.853	95.806	95.723	95.664
22	-	-	-	-	-	-	96.069	95.773	95.853	95.803	95.720	95.663
23	-	-	-	-	-	-	96.187	95.767	95.853	95.800	95.717	95.663
24	-	-	-	-	-	-	96.124	95.770	95.853	95.798	95.714	95.661
25	-	-	-	-	-	-	96.146	95.768	95.853	95.795	95.711	95.660
26	-	-	-	-	-	-	96.097	95.764	95.853	95.796	95.710	95.657
27	-	-	-	-	-	-	96.057	95.759	95.851	95.795	95.708	95.656
28	-	-	-	-	-	-	96.070	95.754	95.850	95.794	95.706	95.655
29	-	-	-	-	-	-	96.000	95.753	95.848	95.796	95.703	95.654
30	-	-	-	-	-	-	95.951	95.751	95.847	95.797	95.701	95.653
31	-	-	-	-	-	-	95.964	95.747	-	95.795	-	95.654
MIN	-	-	-	-	-	-	95.951	95.747	95.725	95.794	95.701	95.653
MEAN	-	-	-	-	-	-	96.145	95.825	95.813	95.816	95.742	95.673
MAX	-	-	-	-	-	-	96.399	95.985	95.853	95.847	95.791	95.698

H84 Aimaokatalok Outflow – 2006 (Continued)
MEAN DAILY DISCHARGES (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	3.415	2.076	-	-	-
2	-	-	-	-	-	-	-	3.104	2.044	-	-	-
3	-	-	-	-	-	-	-	3.043	2.038	-	-	-
4	-	-	-	-	-	-	-	2.991	2.027	-	-	-
5	-	-	-	-	-	-	-	2.940	2.019	-	-	-
6	-	-	-	-	-	-	-	2.891	2.015	-	-	-
7	-	-	-	-	-	-	-	2.816	2.008	-	-	-
8	-	-	-	-	-	-	6.249 P	2.759	2.006	-	-	-
9	-	-	-	-	-	-	5.911	2.690	2.011	-	-	-
10	-	-	-	-	-	-	5.679	2.640	2.013 P	-	-	-
11	-	-	-	-	-	-	5.012	2.618	-	-	-	-
12	-	-	-	-	-	-	4.582	2.597	-	-	-	-
13	-	-	-	-	-	-	4.965	2.571	-	-	-	-
14	-	-	-	-	-	-	4.749	2.535	-	-	-	-
15	-	-	-	-	-	-	4.212	2.488	-	-	-	-
16	-	-	-	-	-	-	4.580	2.445	-	-	-	-
17	-	-	-	-	-	-	4.483	2.416	-	-	-	-
18	-	-	-	-	-	-	4.815	2.396	-	-	-	-
19	-	-	-	-	-	-	4.441	2.351	-	-	-	-
20	-	-	-	-	-	-	4.116	2.309	-	-	-	-
21	-	-	-	-	-	-	3.844	2.278	-	-	-	-
22	-	-	-	-	-	-	3.939	2.241	-	-	-	-
23	-	-	-	-	-	-	4.707	2.211	-	-	-	-
24	-	-	-	-	-	-	4.286	2.227	-	-	-	-
25	-	-	-	-	-	-	4.432	2.214	-	-	-	-
26	-	-	-	-	-	-	4.120	2.196	-	-	-	-
27	-	-	-	-	-	-	3.856	2.169	-	-	-	-
28	-	-	-	-	-	-	3.937	2.149	-	-	-	-
29	-	-	-	-	-	-	3.510	2.141	-	-	-	-
30	-	-	-	-	-	-	3.221	2.132	-	-	-	-
31	-	-	-	-	-	-	3.290	2.112	-	-	-	-
MIN	-	-	-	-	-	-	3.221	2.112	2.006	-	-	-
MEAN	-	-	-	-	-	-	4.456	2.519	2.026	-	-	-
MAX	-	-	-	-	-	-	6.249	3.415	2.076	-	-	-

NOTES: D – DERIVED BASED ON DOWNSTREAM DISCHARGES E - ESTIMATED P – PARTIAL DAILY AVERAGE

H84 Aimaokatalok Outflow - 2007

MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK EL. 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	95.657	95.624	95.605	95.585	95.588	95.576	97.564	96.346	96.275	-	-	-
2	95.656	95.624	95.606	95.585	95.588	95.575	97.555	96.318	96.269	-	-	-
3	95.656	95.623	95.607	95.584	95.587	95.574	97.533	96.291	96.262	-	-	-
4	95.655	95.622	95.607	95.582	95.587	95.574	97.500	96.264	96.257	-	-	-
5	95.655	95.621	95.605	95.582	95.587	95.573	97.462	96.240	96.252	-	-	-
6	95.654	95.621	95.603	95.581	95.586	95.571	97.418	96.220	96.245	-	-	-
7	95.653	95.619	95.602	95.579	95.589	95.572	97.371	96.200	96.238	-	-	-
8	95.652	95.617	95.604	95.580	95.588	95.574	97.323	96.181	96.230	-	-	-
9	95.651	95.617	95.604	95.581	95.588	95.574	97.275	96.182	96.222	-	-	-
10	95.650	95.615	95.605	95.582	95.587	95.575	97.226	96.184	96.214 P	-	-	-
11	95.648	95.616	95.604	95.581	95.586	95.578	97.178	96.186	-	-	-	-
12	95.648	95.615	95.601	95.581	95.585	95.590	97.130	96.195	-	-	-	-
13	95.647	95.613	95.601	95.582	95.585	95.619	97.080	96.211	-	-	-	-
14	95.644	95.612	95.601	95.582	95.585	95.681	97.032	96.225	-	-	-	-
15	95.643	95.611	95.600	95.582	95.587	95.759	96.984	96.240	-	-	-	-
16	95.642	95.612	95.596	95.581	95.587	95.838	96.939	96.252	-	-	-	-
17	95.641	95.611	95.595	95.580	95.585	95.908	96.890	96.262	-	-	-	-
18	95.639	95.610	95.595	95.580	95.586	95.994	96.843	96.270	-	-	-	-
19	95.638	95.609	95.595	95.579	95.584	96.098	96.798	96.281	-	-	-	-
20	95.637	95.608	95.594	95.578	95.583	96.212	96.758	96.292	-	-	-	-
21	95.636	95.608	95.592	95.578	95.582	96.362	96.721	96.298	-	-	-	-
22	95.634	95.607	95.592	95.578	95.581	96.554	96.679	96.302	-	-	-	-
23	95.634	95.606	95.591	95.578	95.581	96.754	96.642	96.303	-	-	-	-
24	95.633	95.605	95.589	95.577	95.580	96.952	96.606	96.302	-	-	-	-
25	95.631	95.605	95.589	95.578	95.579	97.126	96.570	96.300	-	-	-	-
26	95.630	95.604	95.588	95.584	95.579	97.273	96.535	96.297	-	-	-	-
27	95.629	95.604	95.588	95.588	95.579	97.392	96.501	96.291	-	-	-	-
28	95.628	95.604	95.587	95.588	95.578	97.476	96.468	96.289	-	-	-	-
29	95.627	-	95.587	95.587	95.578	97.529	96.436	96.288	-	-	-	-
30	95.626	-	95.586	95.587	95.577	97.557	96.406	96.284	-	-	-	-
31	95.625	-	95.585	-	95.577	-	96.377	96.280	-	-	-	-
MIN	95.625	95.604	95.585	95.577	95.577	95.571	96.377	96.181	96.214	-	-	-
MEAN	95.642	95.613	95.597	95.582	95.584	96.166	96.961	96.260	96.246	-	-	-
MAX	95.657	95.624	95.607	95.588	95.589	97.557	97.564	96.346	96.275	-	-	-

MEAN DAILY DISCHARGES (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	40.308	8.986	7.919	-	-	-
2	-	-	-	-	-	-	39.958	8.562	7.834	-	-	-
3	-	-	-	-	-	-	39.167	8.154	7.732	-	-	-
4	-	-	-	-	-	-	37.993	7.768	7.665	-	-	-
5	-	-	-	-	-	-	36.667	7.428	7.593	-	-	-
6	-	-	-	-	-	-	35.157	7.150	7.498	-	-	-
7	-	-	-	-	-	-	33.605	6.879	7.399	-	-	-
8	-	-	-	-	-	-	32.043	6.631	7.281	-	-	-
9	-	-	-	-	-	-	30.502	6.643	7.169	-	-	-
10	-	-	-	-	-	-	28.997	6.672	7.068 P	-	-	-
11	-	-	-	-	-	-	27.559	6.688	-	-	-	-
12	-	-	-	-	-	-	26.159	6.813	-	-	-	-
13	-	-	-	-	-	1.472	24.774	7.026	-	-	-	-
14	-	-	-	-	-	1.842	23.457	7.209	-	-	-	-
15	-	-	-	-	-	2.367	22.186	7.417	-	-	-	-
16	-	-	-	-	-	2.985	21.023	7.590	-	-	-	-
17	-	-	-	-	-	3.597	19.822	7.735	-	-	-	-
18	-	-	-	-	-	4.439	18.679	7.845	-	-	-	-
19	-	-	-	-	-	5.599	17.638	8.007	-	-	-	-
20	-	-	-	-	-	7.051	16.744	8.164	-	-	-	-
21	-	-	-	-	-	9.255	15.928	8.257	-	-	-	-
22	-	-	-	-	-	12.577	15.040	8.310	-	-	-	-
23	-	-	-	-	-	16.672	14.268	8.330	-	-	-	-
24	-	-	-	-	-	21.391	13.558	8.319	-	-	-	-
25	-	-	-	-	-	26.060	12.866	8.288	-	-	-	-
26	-	-	-	-	-	30.458	12.206	8.240	-	-	-	-
27	-	-	-	-	-	34.308	11.576	8.160	-	-	-	-
28	-	-	-	-	-	37.153	10.998	8.128	-	-	-	-
29	-	-	-	-	-	39.032	10.456	8.107	-	-	-	-
30	-	-	-	-	-	40.065	9.954	8.056	-	-	-	-
31	-	-	-	-	-	-	9.477	7.992	-	-	-	-
MIN	-	-	-	-	-	1.472	9.477	6.631	7.068	-	-	-
MEAN	-	-	-	-	-	16.462	22.863	7.728	7.516	-	-	-
MAX	-	-	-	-	-	40.065	40.308	8.986	7.919	-	-	-

NOTES: D – DERIVED BASED ON DOWNSTREAM DISCHARGES E - ESTIMATED P – PARTIAL DAILY AVERAGE

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Outflow**
LOCATION: **Outlet of Aimaokatalok Lake**
COORDINATES: **13W 0438828 E, 7508926 N (NAD 83)**

MEASUREMENT DATE: **9 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1300 h**
MEASUREMENT END TIME: **1335 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.05	0.000
1	0.10		0.33			0.02	0.45	0.003
2	0.90		0.18			0.04	1.00	0.007
3	2.10		0.28			0.12	0.90	0.030
4	2.70		0.13			0.15	0.65	0.013
5	3.40		0.30			0.20	0.45	0.027
6	3.60		0.02			0.10	0.50	0.001
7	4.40		0.16			0.27	0.85	0.037
8	5.30		0.29			0.25	0.75	0.054
9	5.90		0.38			0.35	0.55	0.073
10	6.40		0.48			0.39	0.50	0.094
11	6.90		0.15			0.53	0.60	0.048
12	7.60		0.17			0.55	0.60	0.056
13	8.10		0.53			0.22	0.55	0.064
14	8.70		0.20			0.40	0.65	0.052
15	9.40		0.33			0.44	0.85	0.123
16	10.40		0.42			0.38	1.00	0.160
17	11.40		0.45			0.34	1.00	0.153
18	12.40		0.40			0.36	1.25	0.180
19	13.90		0.42			0.13	1.25	0.068
20	14.90		0.28			0.43	1.00	0.120
21	15.90		0.38			0.34	1.00	0.129
22	16.90		0.35			0.38	1.00	0.133
23	17.90		0.46			0.41	1.00	0.189
24	18.90		0.34			0.38	1.00	0.129
25	19.90		0.28			0.36	1.00	0.101
26	20.90		0.30			0.35	1.00	0.105
27	21.90		0.31			0.31	1.00	0.096
28	22.90		0.30			0.22	1.00	0.066
29	23.90		0.30			0.27	1.00	0.081
30	24.90		0.22			0.37	1.00	0.081
31	25.90		0.40			0.15	1.00	0.060
32	26.90		0.26			0.24	1.00	0.062
33	27.90		0.24			0.22	0.90	0.048
34	28.70		0.03			0.10	0.70	0.002
35	29.30		0.17			0.08	1.60	0.022
Right Bank	31.90		0.00			0.00	1.30	0.000
								2.668

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Outflow**
LOCATION: **Outlet of Aimaokatalok Lake**
COORDINATES: **13W 0438828 E, 7508926 N (NAD 83)**

MEASUREMENT DATE: **13 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS / KM**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1444 h**
MEASUREMENT END TIME: **1502 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	17.05		0.00			0.00	0.07	0.000
1	17.20		0.20			0.00	0.17	0.000
2	17.40		0.18			0.04	0.25	0.002
3	17.70		0.29			0.07	0.30	0.006
4	18.00		0.19			0.13	0.35	0.009
5	18.40		0.16			0.29	0.35	0.016
6	18.70		0.20			0.23	0.30	0.014
7	19.00		0.22			-0.04	0.35	-0.003
8	19.40		0.23			0.20	0.35	0.016
9	19.70		0.17			0.24	0.40	0.016
10	20.20		0.32			0.17	0.50	0.027
11	20.70		0.18			0.24	0.60	0.026
12	21.40		0.22			0.20	0.75	0.033
13	22.20		0.30			0.19	0.65	0.037
14	22.70		0.42			0.31	0.65	0.085
15	23.50		0.69			0.14	0.65	0.063
16	24.00		0.48			0.32	0.75	0.115
17	25.00		0.36			0.40	1.00	0.144
18	26.00		0.63			0.17	1.00	0.107
19	27.00		0.54			0.23	1.00	0.124
20	28.00		0.42			0.17	1.00	0.071
21	29.00		0.36			0.22	1.00	0.079
22	30.00		0.35			0.30	1.00	0.105
23	31.00		0.39			0.40	1.00	0.156
24	32.00		0.42			0.39	1.00	0.164
25	33.00		0.30			0.40	1.00	0.120
26	34.00		0.43			0.32	1.00	0.138
27	35.00		0.31			0.50	1.00	0.155
28	36.00		0.30			0.44	1.00	0.132
29	37.00		0.29			0.31	1.00	0.090
30	38.00		0.31			0.15	0.80	0.037
31	38.60		0.37			0.12	0.50	0.022
32	39.00		0.24			-0.04	0.45	-0.004
33	39.50		0.32			0.02	0.50	0.003
34	40.00		0.32			0.28	0.75	0.067
35	41.00		0.30			0.40	1.00	0.120
36	42.00		0.22			0.29	1.00	0.064
37	43.00		0.18			0.15	1.00	0.027
38	44.00		0.07			0.35	1.00	0.025
39	45.00		0.15			0.31	1.00	0.047
40	46.00		0.10			0.21	1.00	0.021
41	47.00		0.08			0.12	0.75	0.007
42	47.50		0.10			0.03	0.50	0.002
43	48.00		0.09			0.01	0.55	0.000
44	48.60		0.10			0.01	0.35	0.000
Right Bank	48.70		0.00			0.00	0.05	0.000

2.485

PROJECT NAME: **Miramar / M2 Program**

PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Aimaokatalok Outflow**
LOCATION: **Outlet of Aimaokatalok Lake**
COORDINATES: **13W 0438828 E, 7508926 N (NAD 83)**

MEASUREMENT DATE: **10 September 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK**
COMPUTATIONS BY: **NS / TY**

MEASUREMENT START TIME: **1300 h**
MEASUREMENT END TIME: **1335 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.02			0.00	1.50	0.000
1	3.00		0.10			0.01	3.00	0.003
2	6.00		0.27			0.03	2.50	0.020
3	8.00		0.36			0.25	3.00	0.270
4	12.00		0.23			0.30	3.50	0.242
5	15.00		0.25			0.37	3.00	0.278
6	18.00		0.36			0.35	3.00	0.378
7	21.00		0.33			0.30	3.00	0.297
8	24.00		0.42			0.12	3.00	0.151
9	27.00		0.39			0.27	3.00	0.316
10	30.00		0.40			0.17	3.00	0.204
11	33.00		0.29			0.06	3.00	0.052
Right Bank	36.00		0.13			0.00	1.50	0.000
								2.211

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Lake Outflow**
LOCATION: **Ouflow of Aimaokatalok Lake**
COORDINATES: **13W 0434320 E, 7562920 N (NAD 27)**

MEASUREMENT DATE: **4 July 2007**
METER NUMBER: **Marsh McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **PE**
COMPUTATIONS BY: **TJ / DC**

MEASUREMENT START TIME: **1000 h**
MEASUREMENT END TIME: **1300 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.08			0.00	1.00	0.000
1	2.00		0.40			0.25	2.00	0.200
2	4.00		0.49			0.27	2.00	0.265
3	6.00		0.88	0.28	0.69	0.49	2.50	1.067
4	9.00		0.75	0.93	0.66	0.80	2.50	1.491
5	11.00		0.94	0.57	0.68	0.63	1.50	0.881
6	12.00		0.92	0.67	0.78	0.73	2.00	1.334
7	15.00		1.10	0.92	0.95	0.94	2.50	2.571
8	17.00		1.20	0.98	0.91	0.95	2.00	2.268
9	19.00		1.30	1.41	1.33	1.37	2.00	3.562
10	21.00		1.00	0.91	1.33	1.12	2.00	2.240
12	23.00		1.00	1.33	1.23	1.28	2.00	2.560
13	25.00		1.10	1.25	1.37	1.31	2.00	2.882
14	27.00		1.10	1.15	1.42	1.29	2.00	2.827
15	29.00		1.00	0.91	1.24	1.08	2.00	2.150
16	31.00		1.10	1.15	1.31	1.23	2.00	2.706
17	33.00		1.30	1.04	1.13	1.09	2.00	2.821
18	35.00		1.10	0.81	0.90	0.86	2.00	1.881
19	37.00		1.10	0.73	0.81	0.77	2.00	1.694
20	39.00		0.78	0.58	0.60	0.59	2.00	0.920
21	41.00		0.84	0.21	0.40	0.31	2.00	0.512
22	43.00		0.72	0.15	0.33	0.24	2.00	0.346
23	45.00		0.72			0.31	2.00	0.446
24	47.00		0.10			0.04	2.00	0.008
25	49.00		0.54			0.08	2.00	0.086
26	51.00		0.32			0.04	2.00	0.026
27	53.00		0.30			0.01	2.50	0.008
Right Bank	56.00		0.08			0.00	1.50	0.000
								37.8

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **AIM River Outflow**
LOCATION: **Ouflow of Aim River**
COORDINATES: **13W 0434320 E, 7562920 N (NAD 27)**

MEASUREMENT DATE: **18 August 2007**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TY**
COMPUTATIONS BY: **TJ / JV**

MEASUREMENT START TIME: **0930 h**
MEASUREMENT END TIME: **1035 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	1.25	0.000
1	2.50		0.29			0.13	2.50	0.094
2	5.00		0.42			0.25	2.50	0.263
3	7.50		0.52			0.56	2.50	0.728
4	10.00		0.46			0.56	2.50	0.644
5	12.50		0.72			0.51	2.50	0.918
6	15.00		0.60			0.60	2.50	0.900
7	17.50		0.56			0.62	2.50	0.868
8	20.00		0.72			0.61	2.50	1.098
9	22.50		0.53			0.69	2.50	0.914
10	25.00		0.42			0.32	2.50	0.336
12	27.50		0.37			0.67	2.50	0.620
13	30.00		0.28			0.66	2.50	0.462
14	32.50		0.25			0.40	2.50	0.250
15	35.00		0.16			0.06	3.75	0.036
16	40.00		0.04			0.01	5.00	0.002
Right Bank	45.00		0.00			0.00	2.50	0.000

8.13

PROJECT NAME: **Miramar / EM2 Expansion / Aimaokatalok Lake Outflow**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Aimaokatalok Lake Outflow**
LOCATION: **Outflow of Aimaokatalok Lake**
COORDINATES: **13W 0434320 E, 7562920 N (NAD 27)**

MEASUREMENT DATE: **10 Sept 2007**
METER NUMBER: **Marsh McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **MK / HS**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **1035 h**
MEASUREMENT END TIME: **1100 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.18			0.03	1.00	0.005
1	2.00		0.21			0.33	2.00	0.139
2	4.00		0.40			0.33	2.15	0.284
3	6.30		0.42			0.41	2.00	0.344
4	8.00		0.58			0.33	1.75	0.335
5	9.80		0.46			0.36	2.40	0.397
6	12.80		0.60			0.45	2.50	0.675
7	14.80		0.58			0.50	2.00	0.580
8	16.80		0.50			0.51	2.00	0.510
9	18.80		0.62			0.51	2.15	0.680
10	21.10		0.42			0.53	2.15	0.479
11	23.10		0.70			0.56	2.25	0.882
12	25.60		0.66			0.50	2.35	0.776
13	27.80		0.64			0.28	2.35	0.421
14	30.30		0.50			0.15	2.40	0.180
15	32.60		0.36			0.25	1.80	0.162
16	33.90		0.20			0.13	1.20	0.031
17	35.00		0.16			0.02	1.00	0.003
Right Bank	35.90		0.00			0.00	0.90	0.000
								6.88

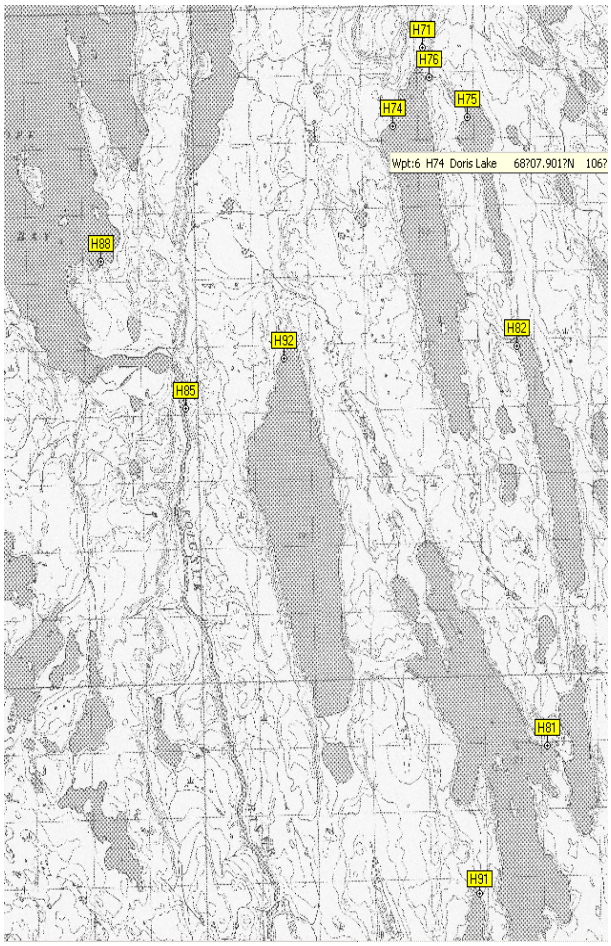
KOIGNUK RIVER HYDROMETRIC STATION

H85 FACTSHEET

LOCATION AND PURPOSE

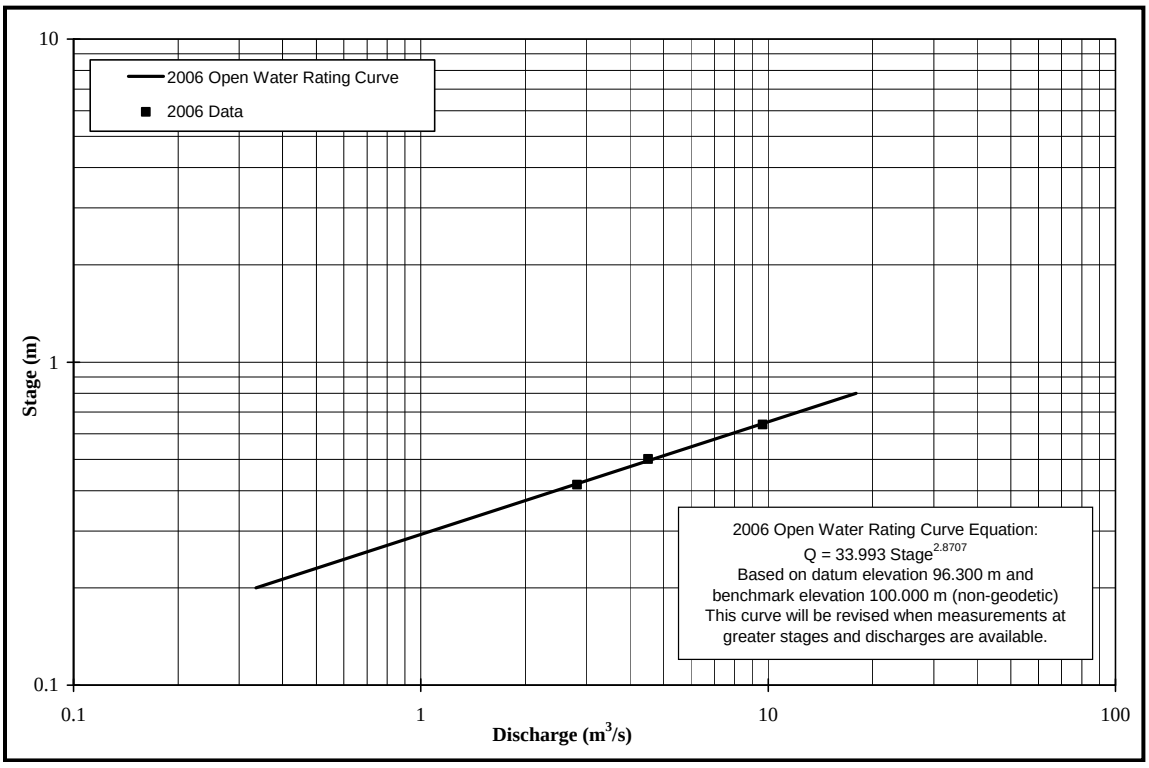
Operational:	2006 (3 June – 10 September)	2007 (26 May – 9 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	3192 km2
Coordinates:	UTM: 429739 m E, 7554336 m N (NAD83)	Lat/Long:	68°05'39" N, 106°41'16" W
Datalogger:	Optimum Instruments #741	Transducer:	Keller #912 (15 psi, 60 m)

Station H85 looking south (upstream) during spring melt.

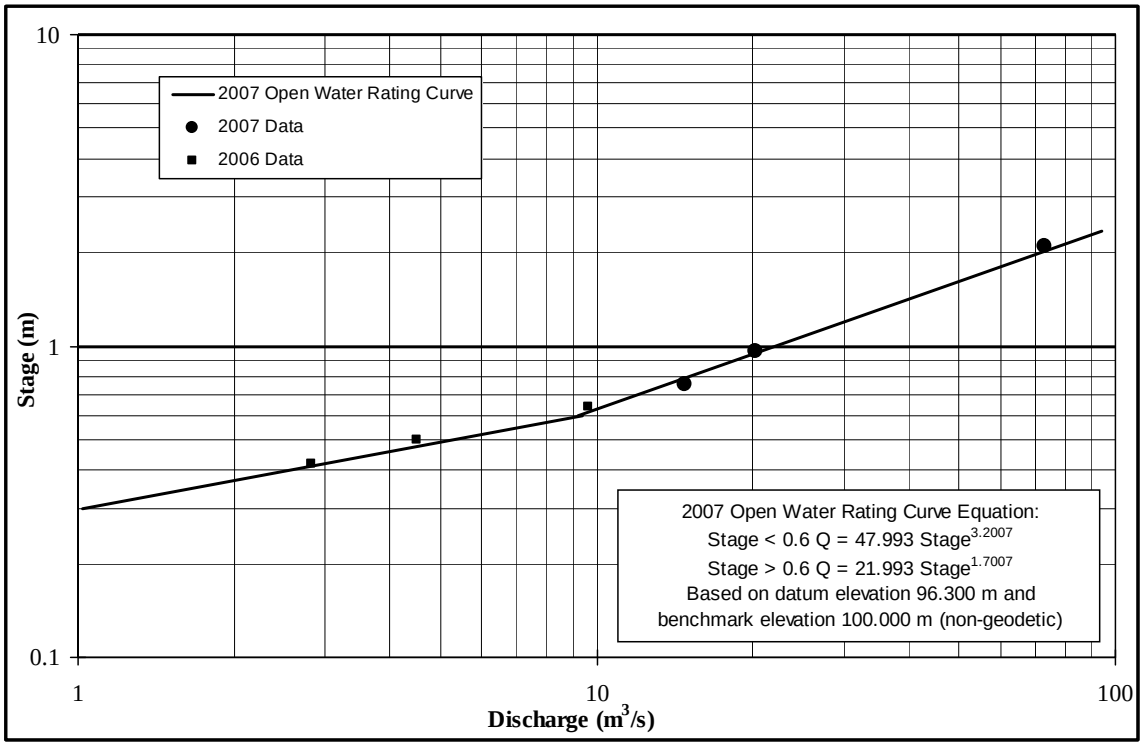


NTS Mapping of Area

FACT-H85-2007.DOC



Koignuk River Station H85 - Stage-Discharge Rating Curve (2006)



Koignuk River Station H85 - Stage-Discharge Rating Curve (2007)

Koignuk River Station H85 – Survey Data (2006-2007)

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Stage Datum Staff Gauge Reading (m)	95.800 m Water Surface Elevation (m)	non-geodetic Stage (m)
29/05/2006 11:52	0.4538	97.072		97.526	1.726	-
03/07/2006 15:22	0.3075	97.089	97.080	97.396	1.596	-
transducer moved to deeper water						
03/07/2006 15:37	0.6775	96.718		97.396	1.596	-
21/07/2006 14:50	0.2640			*96.941*	1.141	9.640
14/08/2006 10:00	0.0619	96.739	96.729	96.801	1.001	4.511
transducer moved to deeper water						
14/08/2006 10:30	0.5135	96.287		96.801	1.001	4.511
08/09/2006 14:25	0.4711	96.246	96.267	96.717	0.917	2.817
07/02/2007 15:00	1.891	96.496		98.387	2.087	72.9
08/31/2007 14:45	0.872	96.393		97.265	0.965	20.2
09/13/2007 13:30	0.666	96.390	96.426	97.056	0.756	14.8

H85 Koignuk River - 2006

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	97.831	97.425	96.883	96.727	-	-	-
2	-	-	-	-	-	97.841	97.412	96.868	96.733	-	-	-
3	-	-	-	-	-	97.963	97.396	96.852	96.755	-	-	-
4	-	-	-	-	-	98.245	97.356	96.846	96.752	-	-	-
5	-	-	-	-	-	98.394	97.336	96.838	96.749	-	-	-
6	-	-	-	-	-	98.461	97.311	96.832	96.760	-	-	-
7	-	-	-	-	-	98.573	97.257	96.829	96.736	-	-	-
8	-	-	-	-	-	98.554	97.228	96.816	96.729 P	-	-	-
9	-	-	-	-	-	98.538	97.208	96.807	-	-	-	-
10	-	-	-	-	-	98.545	97.179	96.823	-	-	-	-
11	-	-	-	-	-	98.558	97.164	96.844	-	-	-	-
12	-	-	-	-	-	98.535	97.141	96.795	-	-	-	-
13	-	-	-	-	-	98.506	97.115	96.789	-	-	-	-
14	-	-	-	-	-	98.473	97.096	96.790	-	-	-	-
15	-	-	-	-	-	98.408	97.072	96.781	-	-	-	-
16	-	-	-	-	-	98.355	97.065	96.778	-	-	-	-
17	-	-	-	-	-	98.267	97.045	96.776	-	-	-	-
18	-	-	-	-	-	98.205	97.011	96.777	-	-	-	-
19	-	-	-	-	-	98.118	96.997	96.769	-	-	-	-
20	-	-	-	-	-	98.014	96.996	96.749	-	-	-	-
21	-	-	-	-	-	97.979	96.993	96.749	-	-	-	-
22	-	-	-	-	-	97.928	97.006	96.761	-	-	-	-
23	-	-	-	-	-	97.837	96.963	96.770	-	-	-	-
24	-	-	-	-	-	97.761	96.972	96.796	-	-	-	-
25	-	-	-	-	-	97.666	96.943	96.782	-	-	-	-
26	-	-	-	-	-	97.651	96.938	96.768	-	-	-	-
27	-	-	-	-	-	97.628	96.963	96.758	-	-	-	-
28	-	-	-	-	-	97.568	96.872	96.726	-	-	-	-
29	-	-	-	-	97.553 P	97.512	96.888	96.745	-	-	-	-
30	-	-	-	-	97.629	97.459	96.905	96.758	-	-	-	-
31	-	-	-	-	97.746	-	96.890	96.753	-	-	-	-
MIN	-	-	-	-	97.553	97.459	96.872	96.726	96.727	-	-	-
MEAN	-	-	-	-	97.642	98.112	97.101	96.794	96.743	-	-	-
MAX	-	-	-	-	97.746	98.573	97.425	96.883	96.760	-	-	-

H85 Koignuk River - 2006 (Continued)
MEAN DAILY DISCHARGES (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	7.217	2.956	-	-	-
2	-	-	-	-	-	-	-	6.700	3.110	-	-	-
3	-	-	-	-	-	-	-	6.183	3.585	-	-	-
4	-	-	-	-	-	-	-	5.992	3.488	-	-	-
5	-	-	-	-	-	-	-	5.743	3.435	-	-	-
6	-	-	-	-	-	-	-	5.544	3.709	-	-	-
7	-	-	-	-	-	-	-	5.465	3.142	-	-	-
8	-	-	-	-	-	-	-	5.078	3.002 P	-	-	-
9	-	-	-	-	-	-	-	4.830	-	-	-	-
10	-	-	-	-	-	-	-	5.372	-	-	-	-
11	-	-	-	-	-	-	-	6.143	-	-	-	-
12	-	-	-	-	-	-	-	4.552	-	-	-	-
13	-	-	-	-	-	-	-	4.371	-	-	-	-
14	-	-	-	-	-	-	-	4.396	-	-	-	-
15	-	-	-	-	-	-	-	4.162	-	-	-	-
16	-	-	-	-	-	-	-	4.077	-	-	-	-
17	-	-	-	-	-	-	-	4.043	-	-	-	-
18	-	-	-	-	-	-	-	4.072	-	-	-	-
19	-	-	-	-	-	-	-	3.874	-	-	-	-
20	-	-	-	-	-	-	-	3.416	-	-	-	-
21	-	-	-	-	-	-	12.007 P	3.421	-	-	-	-
22	-	-	-	-	-	-	12.633	3.680	-	-	-	-
23	-	-	-	-	-	-	10.506	3.898	-	-	-	-
24	-	-	-	-	-	-	10.918	4.666	-	-	-	-
25	-	-	-	-	-	-	9.601	4.275	-	-	-	-
26	-	-	-	-	-	-	9.363	3.893	-	-	-	-
27	-	-	-	-	-	-	10.849	3.623	-	-	-	-
28	-	-	-	-	-	-	6.942	2.948	-	-	-	-
29	-	-	-	-	-	-	7.411	3.325	-	-	-	-
30	-	-	-	-	-	-	8.034	3.625	-	-	-	-
31	-	-	-	-	-	-	7.475	3.501	-	-	-	-
MIN	-	-	-	-	-	-	6.942	2.948	2.956	-	-	-
MEAN	-	-	-	-	-	-	9.613	4.583	3.303	-	-	-
MAX	-	-	-	-	-	-	12.633	7.217	3.709	-	-	-

NOTES: P – PARTIAL DAILY AVERAGE E - ESTIMATED

H85 Koignuk River - 2007

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	97.071	97.288	-	-	-
2	-	-	-	-	-	-	98.279 P	97.069	97.248	-	-	-
3	-	-	-	-	-	-	98.221	97.056	97.242	-	-	-
4	-	-	-	-	-	-	98.147	97.037	97.204	-	-	-
5	-	-	-	-	-	-	98.127	97.018	97.214	-	-	-
6	-	-	-	-	-	-	98.070	97.010	97.206	-	-	-
7	-	-	-	-	-	-	97.991	97.012	97.198	-	-	-
8	-	-	-	-	-	-	97.914	97.040	97.163	-	-	-
9	-	-	-	-	-	-	97.847	97.089	97.148	-	-	-
10	-	-	-	-	-	-	97.788	97.052	97.122	-	-	-
11	-	-	-	-	-	-	97.734	97.048	97.119	-	-	-
12	-	-	-	-	-	-	97.685	97.064	97.129	-	-	-
13	-	-	-	-	-	-	97.631	97.157	97.097 P	-	-	-
14	-	-	-	-	-	-	97.587	97.267	-	-	-	-
15	-	-	-	-	-	-	97.553	97.328	-	-	-	-
16	-	-	-	-	-	-	97.511	97.354	-	-	-	-
17	-	-	-	-	-	-	97.463	97.400	-	-	-	-
18	-	-	-	-	-	-	97.430	97.411	-	-	-	-
19	-	-	-	-	-	-	97.410	97.450	-	-	-	-
20	-	-	-	-	-	-	97.376	97.501	-	-	-	-
21	-	-	-	-	-	-	97.370	97.501	-	-	-	-
22	-	-	-	-	-	-	97.308	97.483	-	-	-	-
23	-	-	-	-	-	-	97.274	97.461	-	-	-	-
24	-	-	-	-	-	-	97.238	97.439	-	-	-	-
25	-	-	-	-	-	-	97.230	97.420	-	-	-	-
26	-	-	-	-	-	-	97.208	97.395	-	-	-	-
27	-	-	-	-	-	-	97.185	97.366	-	-	-	-
28	-	-	-	-	-	-	97.176	97.329	-	-	-	-
29	-	-	-	-	-	-	97.152	97.326	-	-	-	-
30	-	-	-	-	-	-	97.135	97.308	-	-	-	-
31	-	-	-	-	-	-	97.118	97.307	-	-	-	-
MIN	-	-	-	-	-	-	97.118	97.010	97.097	-	-	-
MEAN	-	-	-	-	-	-	97.572	97.251	97.183	-	-	-
MAX	-	-	-	-	-	-	98.279	97.501	97.288	-	-	-

MEAN DAILY DISCHARGES (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	14.14	21.54	-	-	-
2	-	-	-	-	-	-	70.23 P	14.09	20.10	-	-	-
3	-	-	-	-	-	-	66.74	13.67	19.88	-	-	-
4	-	-	-	-	-	-	62.46	13.10	18.52	-	-	-
5	-	-	-	-	-	-	61.32	12.52	18.86	-	-	-
6	-	-	-	-	-	-	58.09	12.29	18.60	-	-	-
7	-	-	-	-	-	-	53.72	12.36	18.33	-	-	-
8	-	-	-	-	-	-	49.64	13.25	17.13	-	-	-
9	-	-	-	-	-	-	46.19	14.73	16.60	-	-	-
10	-	-	-	-	-	-	43.23	13.57	15.76	-	-	-
11	-	-	-	-	-	-	40.61	13.45	15.67	-	-	-
12	-	-	-	-	-	-	38.25	13.91	16.00	-	-	-
13	-	-	-	-	-	-	35.78	16.96	14.97 P	-	-	-
14	-	-	-	-	-	-	33.79	20.78	-	-	-	-
15	-	-	-	-	-	-	32.26	23.04	-	-	-	-
16	-	-	-	-	-	-	30.45	24.06	-	-	-	-
17	-	-	-	-	-	-	28.45	25.88	-	-	-	-
18	-	-	-	-	-	-	27.08	26.29	-	-	-	-
19	-	-	-	-	-	-	26.27	27.91	-	-	-	-
20	-	-	-	-	-	-	24.90	30.05	-	-	-	-
21	-	-	-	-	-	-	24.66	30.02	-	-	-	-
22	-	-	-	-	-	-	22.33	29.26	-	-	-	-
23	-	-	-	-	-	-	21.03	28.35	-	-	-	-
24	-	-	-	-	-	-	19.72	27.44	-	-	-	-
25	-	-	-	-	-	-	19.45	26.66	-	-	-	-
26	-	-	-	-	-	-	18.65	25.65	-	-	-	-
27	-	-	-	-	-	-	17.87	24.50	-	-	-	-
28	-	-	-	-	-	-	17.56	23.11	-	-	-	-
29	-	-	-	-	-	-	16.76	22.99	-	-	-	-
30	-	-	-	-	-	-	16.18	22.30	-	-	-	-
31	-	-	-	-	-	-	15.63	22.26	-	-	-	-
MIN	-	-	-	-	-	-	15.63	12.29	14.97	-	-	-
MEAN	-	-	-	-	-	-	34.64	20.60	17.84	-	-	-
MAX	-	-	-	-	-	-	70.23	30.05	21.54	-	-	-

NOTES: P – PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**

DISCHARGE DATA

STREAM NAME: **Koignuk River**
LOCATION: **Near the mouth**
COORDINATES: **13W 0429739 E, 7554336 N (NAD 83)**

MEASUREMENT DATE: **21 July 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **TA / PE**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1450 h**
MEASUREMENT END TIME: **1510 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	2.50	0.000
1	5.00		0.20			0.17	5.00	0.170
2	10.00		0.34			0.37	5.00	0.629
3	15.00		0.44			0.48	5.00	1.056
4	20.00		0.62			0.57	5.00	1.767
5	25.00		0.68			0.61	5.00	2.074
6	30.00		0.60			0.46	5.00	1.380
7	35.00		0.46			0.24	5.00	0.552
8	40.00		0.50			0.37	5.00	0.925
9	45.00		0.42			0.34	5.00	0.714
10	50.00		0.41			0.26	3.50	0.373
Right Bank	52.00		0.00			0.00	1.00	0.000
								9.640

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Koignuk River**
LOCATION: **Near the mouth**
COORDINATES: **13W 0429739 E, 7554336 N (NAD 83)**

MEASUREMENT DATE: **14 August 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **NS / HS**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1011 h**
MEASUREMENT END TIME: **1029 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	38.10		0.00			0.00	0.30	0.000
1	37.50		0.12			-0.06	0.55	-0.004
2	37.00		0.19			-0.09	0.50	-0.009
3	36.50		0.20			-0.07	0.50	-0.007
4	36.00		0.28			0.03	0.75	0.006
5	35.00		0.38			0.43	1.00	0.163
6	34.00		0.55			0.64	1.00	0.352
7	33.00		0.66			0.64	1.00	0.422
8	32.00		0.67			0.82	1.00	0.549
9	31.00		0.66			0.88	1.00	0.581
10	30.00		0.59			0.88	1.00	0.519
11	29.00		0.50			0.71	1.00	0.355
12	28.00		0.47			0.79	1.00	0.371
13	27.00		0.42			0.74	1.00	0.311
14	26.00		0.40			0.60	1.00	0.240
15	25.00		0.37			0.50	1.00	0.185
16	24.00		0.30			0.47	1.00	0.141
17	23.00		0.26			0.34	1.00	0.088
18	22.00		0.22			0.38	1.00	0.084
19	21.00		0.20			0.23	1.00	0.046
20	20.00		0.20			0.18	1.00	0.036
21	19.00		0.20			0.20	1.00	0.040
22	18.00		0.19			0.15	1.00	0.029
23	17.00		0.17			0.08	1.00	0.014
24	16.00		0.14			0.00	1.00	0.000
25	15.00		0.15			-0.01	1.50	-0.002
26	13.00		0.06			0.00	1.65	0.000
Left Bank	11.70		0.00			0.00	0.65	0.000
								4.511

PROJECT NAME: **Miramar / M2 Program**
PROJECT NUMBER: **06 1373 027 .4000**
DISCHARGE DATA

STREAM NAME: **Koignuk River**
LOCATION: **Near the mouth**
COORDINATES: **13W 0429739 E, 7554336 N (NAD 83)**

MEASUREMENT DATE: **8 September 2006**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **KK / PE**
COMPUTATIONS BY: **NS / TJ**

MEASUREMENT START TIME: **1412 h**
MEASUREMENT END TIME: **1422 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.00			0.00	1.80	0.000
1	3.60		0.26			0.03	3.55	0.028
2	7.10		0.27			0.25	3.50	0.236
3	10.60		0.41			0.54	3.50	0.775
4	14.10		0.46			0.53	3.50	0.853
5	17.60		0.38			0.60	3.50	0.798
6	21.10		0.41			0.03	3.50	0.043
7	24.60		0.16			0.11	3.50	0.062
8	28.10		0.08			0.08	3.50	0.022
9	31.60		0.10			0.00	3.08	0.000
Left Bank	34.25		0.00			0.00	1.33	0.000
								2.817

PROJECT NAME: **Miramar / Doris North / Nunavut**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Koignuk River**
LOCATION: **Koignuk River**
COORDINATES: **13W 0429739 E, 7554336 N (NAD83)**

MEASUREMENT DATE: **1 July 2007**
METER NUMBER: **Marsh McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **PE**
COMPUTATIONS BY: **TJ / DC**

MEASUREMENT START TIME: **1230 h**
MEASUREMENT END TIME: **1600 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.01			0.00	1.985	0.000
1	3.97		0.62			0.57	3.89	1.375
2	7.78		1.00	0.77	0.74	0.755	4.205	3.175
3	12.38		1.50	0.61	0.95	0.78	4.275	5.002
4	16.33		1.70	0.61	0.67	0.64	4.045	4.401
5	20.47		1.90	0.29	0.47	0.38	3.74	2.700
6	23.81		2.20	0.91	1.10	1.005	3.775	8.347
7	28.02		2.50	0.32	0.86	0.59	3.815	5.627
8	31.44		2.37	0.57	0.74	0.655	4.45	6.908
9	36.92		1.65	1.01	1.02	1.015	4.445	7.444
10	40.33		1.65	0.57	1.03	0.8	3.935	5.194
11	44.79		1.25	0.71	0.79	0.75	3.94	3.694
12	48.21		1.19	0.59	1.05	0.82	3.6	3.513
13	51.99		1.15	0.28	0.61	0.445	4.21	2.154
14	56.63		1.15	0.29	1.02	0.655	4.015	3.024
15	60.02		1.06	0.46	1.01	0.735	3.73	2.906
16	64.09		1.00	0.44	0.81	0.625	3.785	2.366
17	67.59		0.90	0.57	0.68	0.625	3.905	2.197
18	71.90		0.65			0.69	4.435	1.989
19	76.46		0.38			0.48	4.225	0.771
20	80.35		0.21			0.17	4.205	0.150
Left Bank	84.87		0.01			0.00	2.26	0.000

72.9

PROJECT NAME: **Miramar / Doris North / Nunavut**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: **Koignuk River**
LOCATION: **Koignuk River**
COORDINATES: **13W 0429739 E, 7554336 N (NAD83)**

MEASUREMENT DATE: **31 Aug 2007**
METER NUMBER: **Marsh-McBirney Flo-Mate Model 2000**

MEASUREMENT BY: **PE**
COMPUTATIONS BY: **DC**

MEASUREMENT START TIME: **1200 h**
MEASUREMENT END TIME: **1520 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.05			0.00	1.50	0.000
1	3.00		0.68			0.14	3.00	0.286
2	6.00		0.86	0.15	0.14	0.15	3.00	0.374
3	9.00		0.93	0.25	0.07	0.16	3.00	0.446
4	12.00		1.00	0.31	0.22	0.27	3.00	0.795
5	15.00		0.84	0.40	0.28	0.34	3.00	0.857
6	18.00		0.88	0.53	0.41	0.47	3.00	1.241
7	21.00		0.83	0.57	0.48	0.53	3.00	1.307
8	24.00		0.84	0.73	0.59	0.66	3.00	1.663
9	27.00		0.92	0.79	0.57	0.68	3.00	1.877
10	30.00		0.90	0.85	0.51	0.68	3.00	1.836
11	33.00		0.92	0.80	0.75	0.78	3.00	2.139
12	36.00		0.68			0.61	3.00	1.244
13	39.00		0.45			0.47	3.00	0.635
14	42.00		0.36			0.68	3.00	0.734
15	45.00		0.34			0.59	3.00	0.602
16	48.00		0.32			0.57	3.00	0.547
17	51.00		0.32			0.56	3.00	0.538
18	54.00		0.32			0.58	3.00	0.557
19	57.00		0.25			0.45	3.00	0.338
20	60.00		0.22			0.42	3.00	0.277
21	63.00		0.15			0.44	3.00	0.198
22	66.00		0.18			0.45	3.00	0.243
23	69.00		0.16			0.51	3.00	0.245
24	72.00		0.18			0.44	3.00	0.238
25	75.00		0.25			0.19	3.00	0.143
26	78.00		0.38			0.33	3.00	0.376
27	81.00		0.27			0.44	3.00	0.356
28	84.00		0.17			0.26	2.50	0.111
Left Bank	86.00		0.25			0.00	1.00	0.000

20.2

PROJECT NAME: **Miramar/Doris North/Nunavut**
PROJECT NUMBER: **07 1373 0019 .4000**
DISCHARGE DATA

STREAM NAME: Koignuk River **MEASUREMENT DATE: 13 September 2007**
LOCATION: Koignuk River **METER NUMBER: Marsh-McBirney**
COORDINATES: 13W 0429739 E, 7554336 N (NAD83)

MEASUREMENT BY: PE **MEASUREMENT START TIME: 1045 h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 13:00h**

STATION	DISTANCE FROM RIGHT D/S BANK	ICE THICKNESS	DEPTH	VELOCITY			WIDTH	DISCHARGE
				0.2 Depth	0.8 Depth	0.6 Depth		
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m)	(m^3/s)
Right Bank	0.00		0.03			0.00	1.00	0.000
1	2.00		0.03			0.00	2.00	0.000
2	4.00		0.06			0.19	2.00	0.023
3	6.00		0.09			0.02	2.00	0.004
4	8.00		0.26			0.03	2.00	0.016
5	10.00		0.24			0.35	2.00	0.168
6	12.00		0.19			0.52	2.00	0.198
7	14.00		0.20			0.52	2.00	0.208
8	16.00		0.36			0.38	2.00	0.274
9	18.00		0.52			0.31	2.00	0.322
10	20.00		0.59			0.31	2.00	0.366
11	22.00		0.53			0.22	2.00	0.233
12	24.00		0.46			0.29	2.00	0.267
13	26.00		0.45			0.36	2.00	0.324
14	28.00		0.31			0.49	2.00	0.304
15	30.00		0.48			0.61	2.00	0.586
16	32.00		0.44			0.54	2.00	0.475
17	34.00		0.46			0.59	2.00	0.543
18	36.00		0.51			0.27	2.00	0.275
19	38.00		0.50			0.01	2.00	0.010
20	40.00		0.30			0.64	2.00	0.384
21	42.00		0.35			0.65	2.00	0.455
22	44.00		0.46			0.71	2.00	0.653
23	46.00		0.62			0.64	2.00	0.794
24	48.00		0.73			0.71	2.00	1.037
25	50.00		0.74			0.83	2.00	1.228
26	52.00		0.70			0.74	2.00	1.036
27	54.00		0.72			0.65	2.00	0.936
28	56.00		0.80	0.80	0.62	0.71	2.00	1.136
29	58.00		1.00	0.82	0.71	0.77	2.00	1.530
30	60.00		1.00	0.75	0.56	0.66	1.50	0.983
31	61.00		0.82	0.05	0.09	0.07	0.75	0.043
Left Bank	61.50		0.02			0.00	0.25	0.000

14.8

FICKLE DUCK LAKE OUTFLOW HYDROMETRIC STATION

H86

FACTSHEET

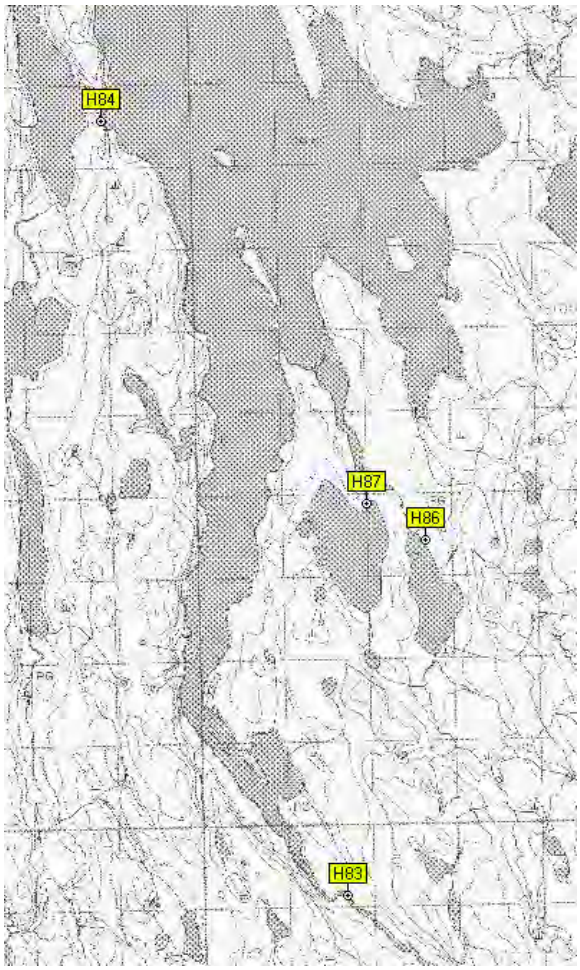
LOCATION AND PURPOSE

Located approximately 50 m upstream, on the right bank of F ickle Duck Lake. F lood plain evidence found on both sides of the lake. Station temporally located on the flat flood plain, may need to move later during in the summer.

Operational:	2006 (2 June – 10 September)	2007 (26 May – 9 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	31.3 km2
Coordinates:	UTM: 442699 m E, 7503688 m N (NAD83)	Lat/Long:	67°38’35” N, 106°21’00” W
Datalogger:	Optimum Instruments #1382 (cold tested)	Transducer:	Keller #00942 (5 psi, 20 m)

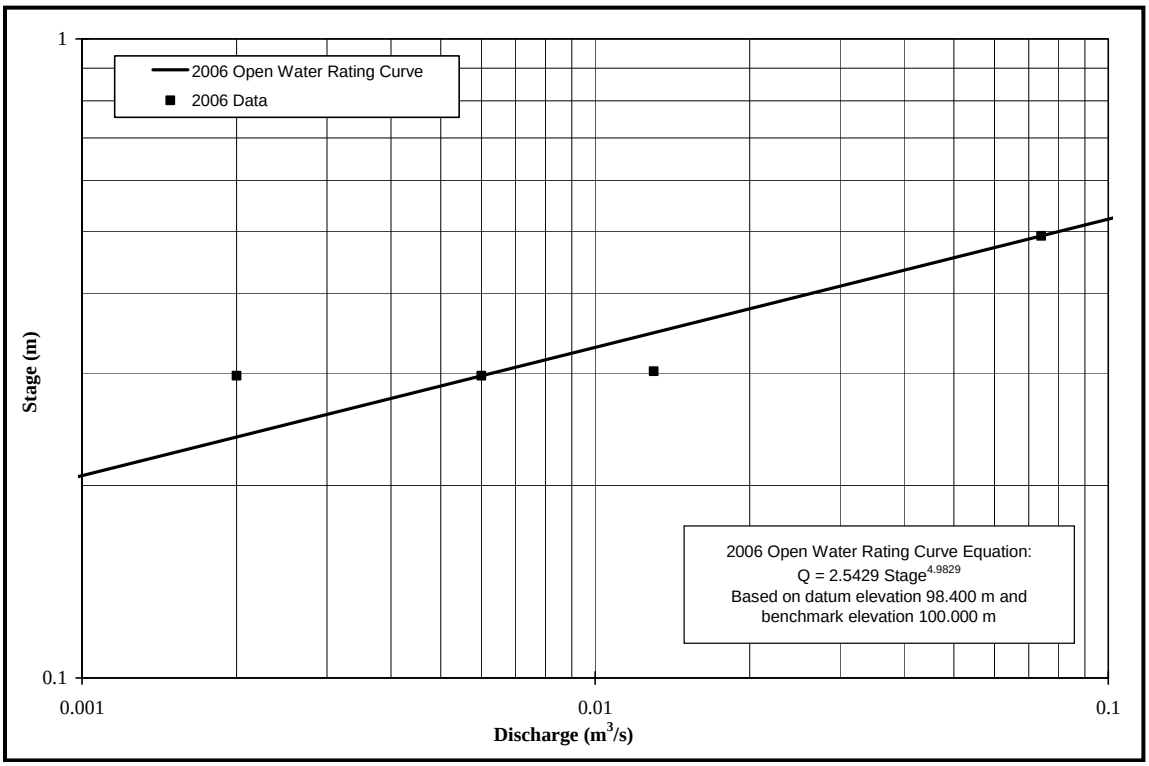
Station H86 looking west from right bank, with benchmark.

Station H86 looking northwest (downstream) during spring melt flood.

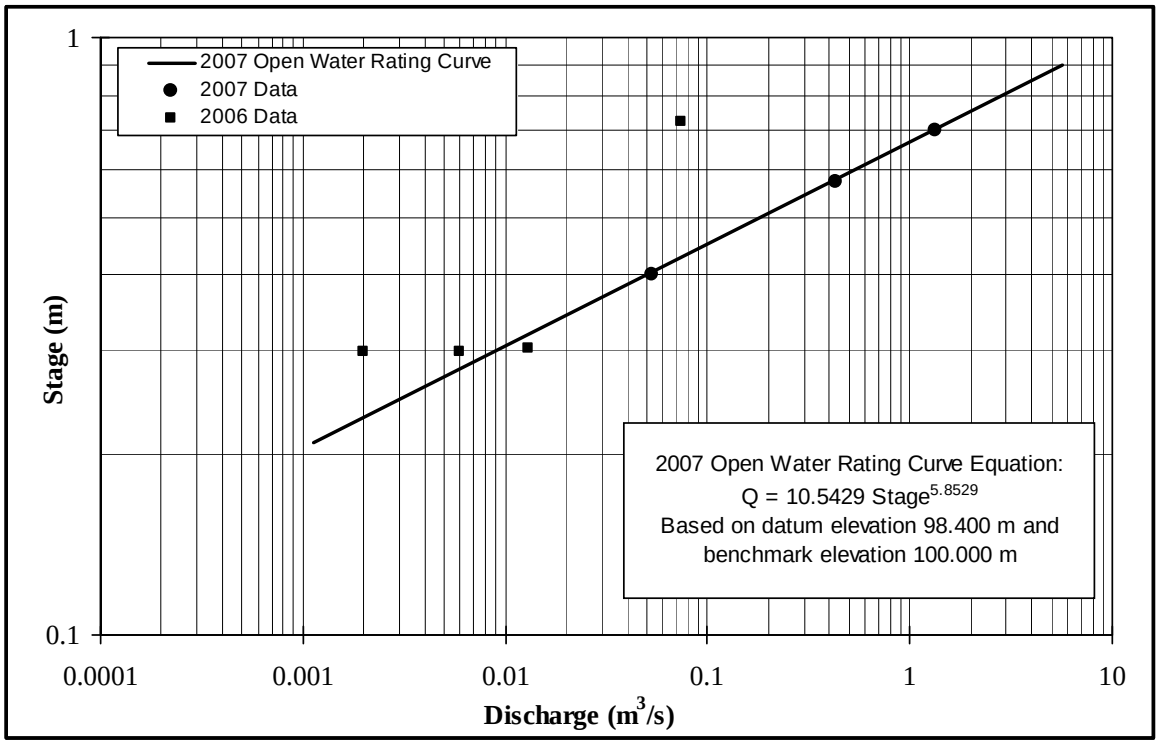


NTS Mapping of Area.

FACT-H86-2007.DOC



Fickle Duck Outflow Station H86 – Stage-Discharge Rating Curve (2006)



Fickle Duck Outflow Station H86 – Stage-Discharge Rating Curve (2007)

Fickle Duck Outflow Station H86 – Stage-Discharge Data (2006-2007)

Stage Datum 98.400 m (non-geodetic)

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
03/06/2006 9:30	0.2211	98.866		99.087	0.687	-
24/06/2006 10:50	0.0258			*98.892*	0.492	0.074
08/07/2006 13:49	0.0042		98.866	98.697	0.297	0.002
transducer reset due to drop in water level						
08/07/2006 14:04	0.9438	97.753		98.697	0.297	0.002
17/07/2006 17:30	0.8861			*98.646*	0.246	0.000
13/08/2006 10:30	0.8956	97.801		98.697	0.297	0.006
10/09/2006 16:25	0.9778	97.724	97.760	98.702	0.302	0.013
23/06/2007 12:15				98.470	0.070	1.327
19/08/2007 10:25				98.972	0.572	0.427
09/09/2007 14:00				98.800	0.400	0.053

H86 Fickle Duck Outflow - 2006
MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
1	-	-	-	-	-	-	-	98.528	98.727	-	-
2	-	-	-	-	-	-	-	98.512	98.732	-	-
3	-	-	-	-	-	99.095 P	-	98.531	98.732	-	-
4	-	-	-	-	-	99.073	-	98.567	98.732	-	-
5	-	-	-	-	-	99.046	-	98.596	98.733	-	-
6	-	-	-	-	-	99.031	-	98.624	98.725	-	-
7	-	-	-	-	-	99.021	-	98.621	98.719	-	-
8	-	-	-	-	-	99.013	98.728 P	98.625	98.720	-	-
9	-	-	-	-	-	99.006	98.719	98.651	98.734	-	-
10	-	-	-	-	-	98.994	98.717	98.667	98.741 P	-	-
11	-	-	-	-	-	98.987	98.720	98.654	-	-	-
12	-	-	-	-	-	98.992	98.723	98.650	-	-	-
13	-	-	-	-	-	98.978	98.720	98.647	-	-	-
14	-	-	-	-	-	98.968	98.712	98.645	-	-	-
15	-	-	-	-	-	98.948	98.700	98.656	-	-	-
16	-	-	-	-	-	98.926	98.683	98.668	-	-	-
17	-	-	-	-	-	98.907	98.661	98.671	-	-	-
18	-	-	-	-	-	-	98.646	98.676	-	-	-
19	-	-	-	-	-	-	98.632	98.682	-	-	-
20	-	-	-	-	-	-	98.619	98.689	-	-	-
21	-	-	-	-	-	-	98.594	98.690	-	-	-
22	-	-	-	-	-	-	98.566	98.703	-	-	-
23	-	-	-	-	-	-	98.553	98.732	-	-	-
24	-	-	-	-	-	-	98.562	98.742	-	-	-
25	-	-	-	-	-	-	98.547	98.740	-	-	-
26	-	-	-	-	-	-	98.532	98.736	-	-	-
27	-	-	-	-	-	-	98.533	98.733	-	-	-
28	-	-	-	-	-	-	98.562	98.735	-	-	-
29	-	-	-	-	-	-	98.570	98.735	-	-	-
30	-	-	-	-	-	-	98.563	98.731	-	-	-
31	-	-	-	-	-	-	98.547	98.728	-	-	-
MIN	-	-	-	-	-	98.907	98.532	98.512	98.719	-	-
MEAN	-	-	-	-	-	98.999	98.630	98.663	98.730	-	-
MAX	-	-	-	-	-	99.095	98.728	98.742	98.741	-	-

H86 Fickle Duck Outflow – 2006 (Continued)

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
1	-	-	-	-	-	-	-	0.000	0.010	-	-
2	-	-	-	-	-	-	-	0.000	0.011	-	-
3	-	-	-	-	-	0.416 P	-	0.000	0.010	-	-
4	-	-	-	-	-	0.355	-	0.000	0.011	-	-
5	-	-	-	-	-	0.289	-	0.001	0.011	-	-
6	-	-	-	-	-	0.257	-	0.001	0.009	-	-
7	-	-	-	-	-	0.239	-	0.001	0.009	-	-
8	-	-	-	-	-	0.223	0.010 P	0.002	0.009	-	-
9	-	-	-	-	-	0.211	0.009	0.003	0.011	-	-
10	-	-	-	-	-	0.191	0.008	0.004	0.012 P	-	-
11	-	-	-	-	-	0.180	0.009	0.003	-	-	-
12	-	-	-	-	-	0.188	0.009	0.003	-	-	-
13	-	-	-	-	-	0.166	0.009	0.002	-	-	-
14	-	-	-	-	-	0.153	0.008	0.002	-	-	-
15	-	-	-	-	-	0.128	0.006	0.003	-	-	-
16	-	-	-	-	-	0.104	0.005	0.004	-	-	-
17	-	-	-	-	-	0.087	0.003	0.004	-	-	-
18	-	-	-	-	-	-	0.002	0.004	-	-	-
19	-	-	-	-	-	-	0.002	0.005	-	-	-
20	-	-	-	-	-	-	0.001	0.005	-	-	-
21	-	-	-	-	-	-	0.001	0.005	-	-	-
22	-	-	-	-	-	-	0.000	0.007	-	-	-
23	-	-	-	-	-	-	0.000	0.010	-	-	-
24	-	-	-	-	-	-	0.000	0.012	-	-	-
25	-	-	-	-	-	-	0.000	0.012	-	-	-
26	-	-	-	-	-	-	0.000	0.011	-	-	-
27	-	-	-	-	-	-	0.000	0.011	-	-	-
28	-	-	-	-	-	-	0.000	0.011	-	-	-
29	-	-	-	-	-	-	0.000	0.011	-	-	-
30	-	-	-	-	-	-	0.000	0.010	-	-	-
31	-	-	-	-	-	-	0.000	0.010	-	-	-
MIN	-	-	-	-	-	0.087	0.000	0.000	0.009	-	-
MEAN	-	-	-	-	-	0.212	0.004	0.005	0.010	-	-
MAX	-	-	-	-	-	0.416	0.010	0.012	0.012	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

H86 Fickle Duck Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	0.0002	-	-	-	-
2	-	-	-	-	-	-	-	0.0001	-	-	-	-
3	-	-	-	-	-	-	-	0.0001	-	-	-	-
4	-	-	-	-	-	-	-	0.0001	-	-	-	-
5	-	-	-	-	-	-	-	0.0001	-	-	-	-
6	-	-	-	-	-	-	-	0.0001	-	-	-	-
7	-	-	-	-	-	-	-	0.0001	-	-	-	-
8	-	-	-	-	-	-	-	0.0001	-	-	-	-
9	-	-	-	-	-	-	-	0.0003	-	-	-	-
10	-	-	-	-	-	-	-	0.0009	-	-	-	-
11	-	-	-	-	-	-	-	0.0041	-	-	-	-
12	-	-	-	-	-	-	-	0.0138	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	0.0003 P	-	-	-	-	-
24	-	-	-	-	-	-	0.0003	-	-	-	-	-
25	-	-	-	-	-	-	0.0002	-	-	-	-	-
26	-	-	-	-	-	-	0.0002	-	-	-	-	-
27	-	-	-	-	-	-	0.0002	-	-	-	-	-
28	-	-	-	-	-	-	0.0002	-	-	-	-	-
29	-	-	-	-	-	-	0.0002	-	-	-	-	-
30	-	-	-	-	-	-	0.0002	-	-	-	-	-
31	-	-	-	-	-	-	0.0002	-	-	-	-	-
MIN	-	-	-	-	-	-	0.0002	0.0001	-	-	-	-
MEAN	-	-	-	-	-	-	0.0002	0.0017	-	-	-	-
MAX	-	-	-	-	-	-	0.0003	0.0138	-	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	98.550	-	-	-	-
2	-	-	-	-	-	-	-	98.548	-	-	-	-
3	-	-	-	-	-	-	-	98.545	-	-	-	-
4	-	-	-	-	-	-	-	98.541	-	-	-	-
5	-	-	-	-	-	-	-	98.539	-	-	-	-
6	-	-	-	-	-	-	-	98.541	-	-	-	-
7	-	-	-	-	-	-	-	98.542	-	-	-	-
8	-	-	-	-	-	-	-	98.542	-	-	-	-
9	-	-	-	-	-	-	-	98.566	-	-	-	-
10	-	-	-	-	-	-	-	98.598	-	-	-	-
11	-	-	-	-	-	-	-	98.658	-	-	-	-
12	-	-	-	-	-	-	-	98.707 P	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	98.568 P	-	-	-	-	-
24	-	-	-	-	-	-	98.565	-	-	-	-	-
25	-	-	-	-	-	-	98.560	-	-	-	-	-
26	-	-	-	-	-	-	98.557	-	-	-	-	-
27	-	-	-	-	-	-	98.555	-	-	-	-	-
28	-	-	-	-	-	-	98.554	-	-	-	-	-
29	-	-	-	-	-	-	98.552	-	-	-	-	-
30	-	-	-	-	-	-	98.553	-	-	-	-	-
31	-	-	-	-	-	-	98.550	-	-	-	-	-
MIN	-	-	-	-	-	-	98.550	98.539	-	-	-	-
MEAN	-	-	-	-	-	-	98.557	98.573	-	-	-	-
MAX	-	-	-	-	-	-	98.568	98.707	-	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Outflow
LOCATION: Outlet of Fickle Duck Lake
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT DATE: 24 June 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1050 h
MEASUREMENT END TIME: 1100 h est.

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	1.45		0.00			0	0.025	0.000
1	1.50		0.05			0	0.125	0.000
2	1.70		0.14			0.01	0.2	0.000
3	1.90		0.13			0.02	0.2	0.001
4	2.10		0.23			0.05	0.2	0.002
5	2.30		0.26			0.39	0.2	0.020
6	2.50		0.30			0.53	0.2	0.032
7	2.70		0.28			0.32	0.2	0.018
8	2.90		0.13			0.03	0.2	0.001
9	3.10		0.11			0.01	0.2	0.000
10	3.30		0.06			0	0.275	0.000
Right Bank	3.65		0.00			0	0.175	0.000
								0.074

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Outflow
LOCATION: Outlet of Fickle Duck Lake
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT DATE: 8 July 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1630 h est.
MEASUREMENT END TIME: 1645 h est.

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.66		0.00			0	0.02	0.000
1	0.70		0.06			0	0.07	0.000
2	0.80		0.10			0	0.1	0.000
3	0.90		0.10			0	0.1	0.000
4	1.00		0.10			0	0.1	0.000
5	1.10		0.06			0.01	0.1	0.000
6	1.20		0.05			0.01	0.1	0.000
7	1.30		0.09			0.02	0.1	0.000
8	1.40		0.11			0.03	0.1	0.000
9	1.50		0.10			0.03	0.1	0.000
10	1.60		0.12			0.02	0.1	0.000
11	1.70		0.10			0.04	0.1	0.000
12	1.80		0.09			0.02	0.1	0.000
13	1.90		0.05			0	0.07	0.000
Right Bank	1.94		0.00			0	0.02	0.000
								0.002

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Outflow **MEASUREMENT DATE: 17 July 2006**
LOCATION: Outlet of Fickle Duck Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT BY: HS/KM **MEASUREMENT START TIME: 1700 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1710 h est.**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.60		0.08			0.00	0.05	0.000
1	2.50		0.01			0.00	0.1	0.000
2	2.40		0.06			0.00	0.1	0.000
3	2.30		0.04			0.00	0.1	0.000
4	2.20		0.09			0.00	0.1	0.000
5	2.10		0.06			0.00	0.1	0.000
6	2.00		0.05			0.00	0.1	0.000
7	1.90		0.04			0.00	0.125	0.000
Right Bank	1.75		0.00			0.00	0.075	0.000
								0.000

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Outflow
LOCATION: Outlet of Fickle Duck Lake
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT DATE: 13 August 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: NS
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1010 h
MEASUREMENT END TIME: 1020 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.80		0.00			0.00	0.1	0.000
1	1.00		0.10			0.00	0.15	0.000
2	1.10		0.10			0.00	0.1	0.000
3	1.20		0.10			0.04	0.1	0.000
4	1.30		0.12			0.03	0.1	0.000
5	1.40		0.13			0.12	0.1	0.002
6	1.50		0.14			0.10	0.1	0.001
7	1.60		0.13			0.10	0.1	0.001
8	1.70		0.13			0.05	0.1	0.001
9	1.80		0.13			0.03	0.1	0.000
10	1.90		0.14			0.01	0.1	0.000
11	2.00		0.10			0.02	0.125	0.000
Right Bank	2.15		0.00			0.00	0.075	0.000
								0.006

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Outflow
LOCATION: Outlet of Fickle Duck Lake
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT DATE: 10 September 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK/PE
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1625 h
MEASUREMENT END TIME: 1635 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	1.76		0.00			0.00	0.02	0.000
1	1.80		0.02			0.00	0.07	0.000
2	1.90		0.10			0.00	0.1	0.000
3	2.00		0.08			0.01	0.1	0.000
4	2.10		0.13			0.02	0.1	0.000
5	2.20		0.10			0.19	0.1	0.002
6	2.30		0.10			0.13	0.1	0.001
7	2.40		0.08			0.14	0.1	0.001
8	2.50		0.08			0.15	0.1	0.001
9	2.60		0.10			0.24	0.1	0.002
10	2.70		0.09			0.23	0.1	0.002
11	2.80		0.12			0.25	0.1	0.003
12	2.90		0.16			0.00	0.07	0.000
Right Bank	2.94		0.00			0.00	0.02	0.000
								0.013

PROJECT NUMBER: 07-1373-0019.4000

DISCHARGE DATA

STREAM NAME: Fickle Duck Lake Outflow **MEASUREMENT DATE: 23 June 2007**

LOCATION: Outlet of Fickle Duck Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1130 h**

COMPUTATIONS BY: DC **MEASUREMENT END TIME: 1145 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	1.90		0.19			0.02	0.95	0.004
1	3.80		0.31			0.09	1.9	0.053
2	5.70		0.32			0.3	1.9	0.182
3	7.60		0.40			0.02	1.9	0.015
4	9.50		0.46			0.05	1.9	0.044
5	11.40		0.52			0.31	1.9	0.306
6	13.30		0.44			0.84	1.9	0.702
7	15.20		0.18			0.06	1.9	0.021
19	17.10		0.13			0	1.9	0.000
Right Bank	19.00		0.05			0	0.95	0.000
								1.327

PROJECT NAME: Miramar/M2 Project/Fickle Duck Lake Outflow

PROJECT NUMBER: 07-1373-0019.4000

DISCHARGE DATA

STREAM NAME: Fickle Duck Lake Outflow **MEASUREMENT DATE: 19 August 2007**

LOCATION: Outlet of Fickle Duck Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1036 h**

COMPUTATIONS BY: TJ/JV **MEASUREMENT END TIME: 1102 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	6.00		0.28			0.06	0.15	0.003
1	6.30		0.15			0.1	0.3	0.005
2	6.60		0.42			0.03	0.3	0.004
3	6.90		0.49			0.15	0.3	0.022
4	7.20		0.44			0.04	0.3	0.005
5	7.50		0.49			0.04	0.3	0.006
6	7.80		0.54			0.09	0.3	0.015
7	8.10		0.56			0.47	0.3	0.079
8	8.40		0.56			0.52	0.3	0.087
9	8.70		0.44			0.23	0.3	0.030
10	9.00		0.43			0.31	0.3	0.040
11	9.30		0.40			0.29	0.3	0.035
12	9.60		0.36			0.51	0.3	0.055
13	9.90		0.33			0.23	0.3	0.023
14	10.20		0.26			0.08	0.3	0.006
15	10.50		0.22			0.06	0.4	0.005
16	11.00		0.16			0.05	0.5	0.004
17	11.50		0.16			0.07	0.5	0.006
18	12.00		0.15			-0.01	0.5	-0.001
19	12.50		0.10			-0.02	0.5	-0.001
Right Bank	13.00		0.00			0	0.25	0.000
								0.427

PROJECT NAME: Miramar/M2 Project/Fickle Duck Lake Outflow
PROJECT NUMBER: 07-1373-0019.4000
DISCHARGE DATA

STREAM NAME: Fickle Duck Lake Outflow **MEASUREMENT DATE: 09 Sept 2007**
LOCATION: Outlet of Fickle Duck Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1420 h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 1445 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	6.00		0.00			0	0.165	0.000
1	6.33		0.17			0.14	0.225	0.005
2	6.45		0.22			0.27	0.11	0.007
3	6.55		0.17			0.33	0.1	0.006
4	6.65		0.20			0.34	0.1	0.007
5	6.75		0.16			0.36	0.1	0.006
6	6.85		0.16			0.28	0.1	0.004
7	6.95		0.17			0.38	0.1	0.006
8	7.05		0.17			0.42	0.1	0.007
9	7.15		0.18			0.28	0.1	0.005
10	7.25		0.14			0.01	0.1	0.000
11	7.35		0.10			-0.04	0.15	-0.001
12	7.55		0.10			0.01	0.145	0.000
13	7.64		0.00			0	0.045	0.000
Right Bank							-3.82	0.000
								0.053

STICKLEBACK LAKE OUTFLOW HYDROMETRIC STATION

H87

FACTSHEET

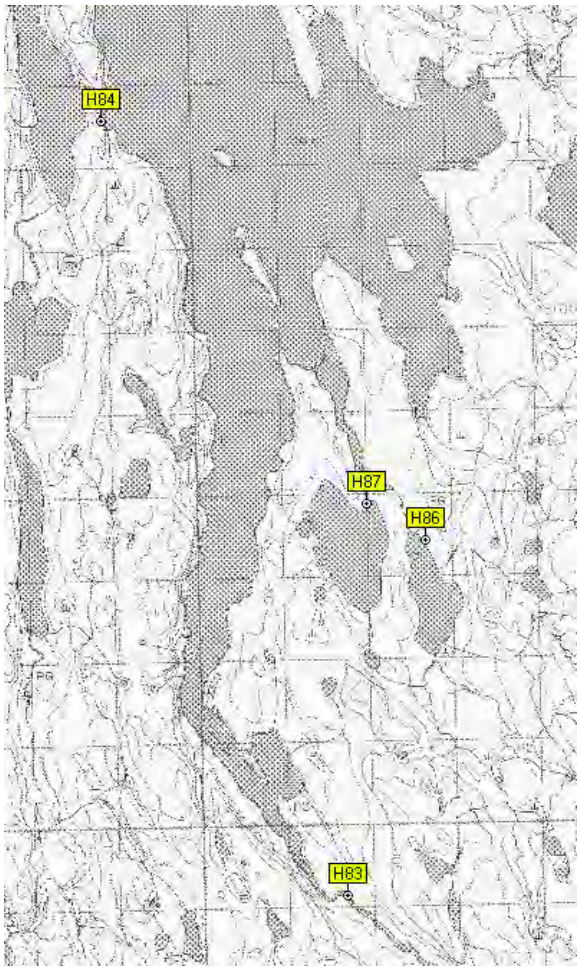
LOCATION AND PURPOSE

Located approximately 20 m upstream, on the right bank of Stickleback Lake outflow, existing w ater control structure found on the outflow.

Operational:	2006 (3 June – 10 September)	2007 (25 May – 6 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	2.8 km^2
Coordinates:	UTM: 442009 m E, 7504121 m N (NAD83)	Lat/Long:	67°38'48" N, 106°22'00" W
Datalogger:	Optimum Instruments #0948	Transducer:	Keller #402787 (5 psi, 15 m)

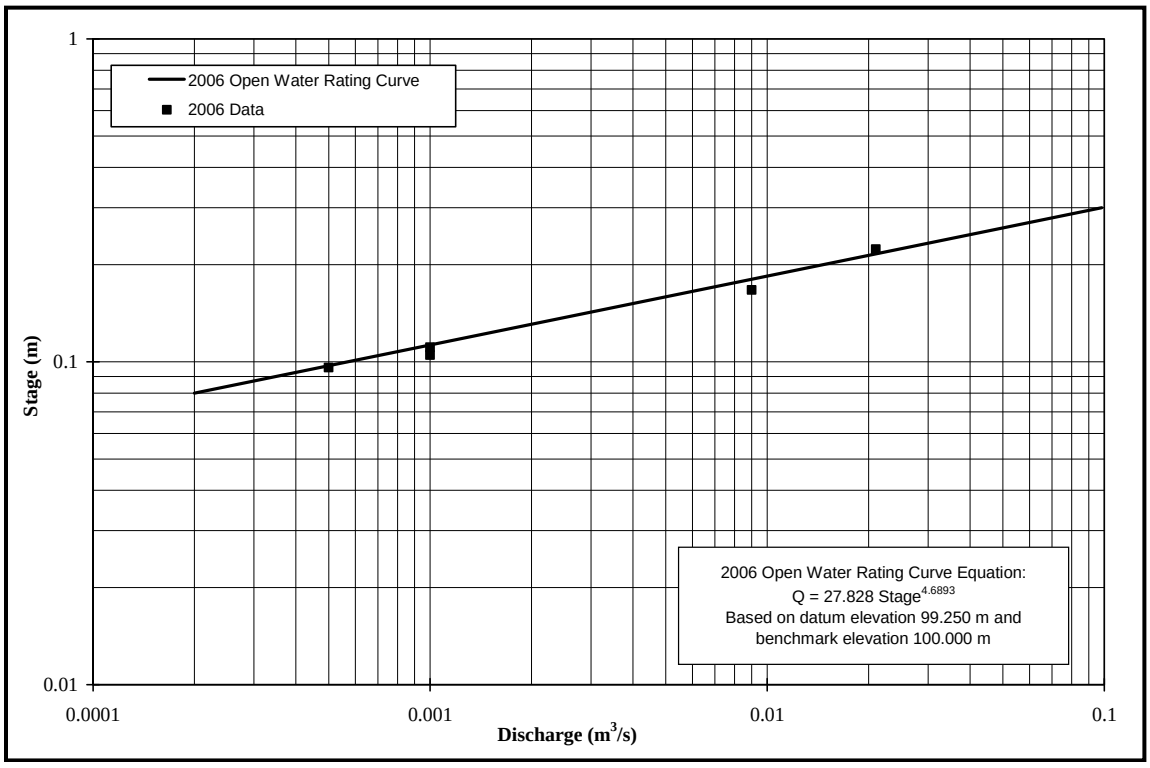
Station H87 looking southwest from right bank, with benchmark.

Existing water control structure on the outflow stream. Looking west from right bank.

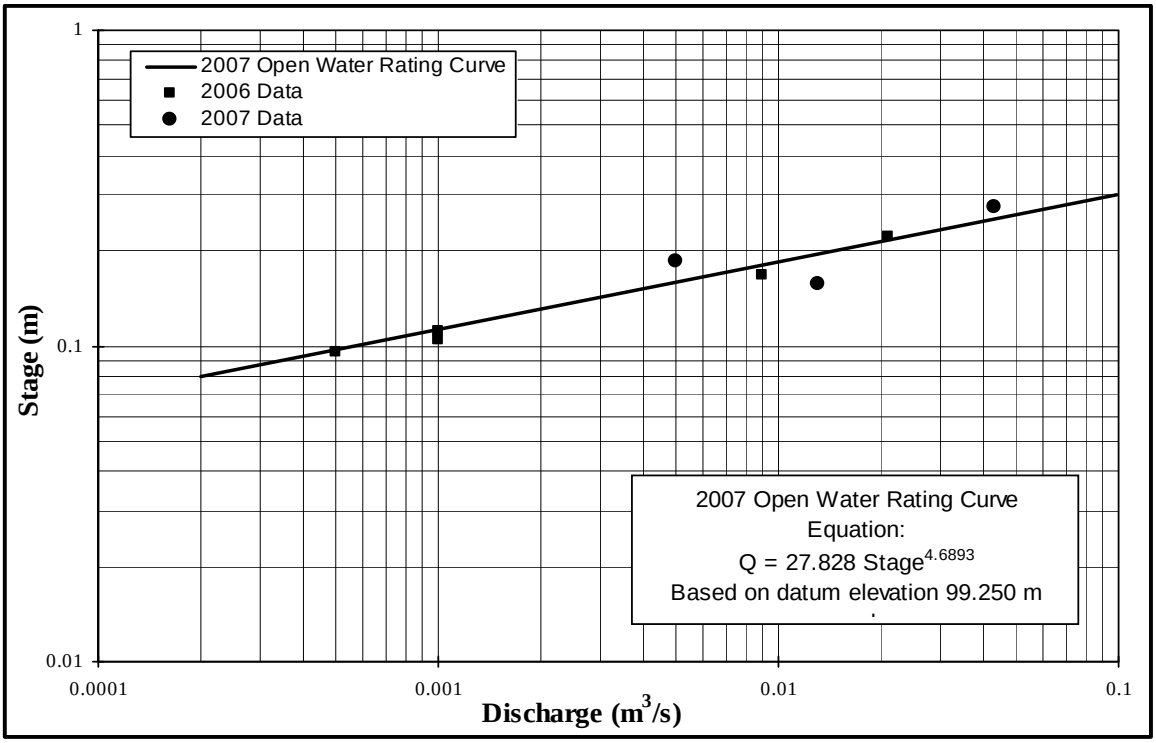


NTS Mapping of Area.

FACT-H87-2007.DOC



Stickleback Outflow Station H87 – Stage-Discharge Rating Curve (2006)



Stickleback Outflow Station H87 – Stage-Discharge Rating Curve (2007)

Stickleback Outflow Station H87 – Stage-Discharge Data (2006-2007)

Stage Datum 99.250 m (non-geodetic)

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
02/06/2006 20:00	1.0620	98.436		99.498	0.248	-
24/06/2006 12:39	1.0416	98.431		99.473	0.223	0.021
08/07/2006 15:05	1.0073	98.410	98.426	99.417	0.167	0.009
transducer moved during field visit						
08/07/2006 15:05	1.0258	98.391		99.417	0.167	0.009
21/07/2006 14:00	0.9889	-		*99.355*	0.105	0.001
13/08/2006 9:24	0.9946	98.366		99.361	0.111	0.001
10/09/2006 16:45	1.0056	98.340	98.366	99.346	0.096	0.0005
06/23/2007 09:50	0.0889			98.876	0.276	0.043
08/19/2007 11:39	-0.0027	98.760		98.757	0.157	0.013
09/06/2007 11:15	-0.0292	98.814	98.787	98.785	0.185	0.005

H87 Stickleback Outflow - 2006
MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	0.010	0.003	0.003	-	-	-
2	-	-	-	-	-	0.024 P	0.009	0.002	0.003	-	-	-
3	-	-	-	-	-	0.024	0.009	0.002	0.004	-	-	-
4	-	-	-	-	-	0.026	0.008	0.002	0.004	-	-	-
5	-	-	-	-	-	0.030	0.007	0.002	0.004	-	-	-
6	-	-	-	-	-	0.032	0.007	0.002	0.004	-	-	-
7	-	-	-	-	-	0.028	0.006	0.002	0.003	-	-	-
8	-	-	-	-	-	0.026	0.006	0.002	0.004	-	-	-
9	-	-	-	-	-	0.028	0.006	0.002	0.004	-	-	-
10	-	-	-	-	-	0.029	0.006	0.002	0.004 P	-	-	-
11	-	-	-	-	-	0.028	0.006	0.002	-	-	-	-
12	-	-	-	-	-	0.028	0.005	0.002	-	-	-	-
13	-	-	-	-	-	0.028	0.005	0.002	-	-	-	-
14	-	-	-	-	-	0.026	0.005	0.002	-	-	-	-
15	-	-	-	-	-	0.024	0.004	0.002	-	-	-	-
16	-	-	-	-	-	0.023	0.004	0.002	-	-	-	-
17	-	-	-	-	-	0.021	0.004	0.002	-	-	-	-
18	-	-	-	-	-	0.021	0.003	0.002	-	-	-	-
19	-	-	-	-	-	0.020	0.003	0.002	-	-	-	-
20	-	-	-	-	-	0.019	0.003	0.002	-	-	-	-
21	-	-	-	-	-	0.018	0.003	0.002	-	-	-	-
22	-	-	-	-	-	0.017	0.002	0.002	-	-	-	-
23	-	-	-	-	-	0.016	0.002	0.002	-	-	-	-
24	-	-	-	-	-	0.015	0.003	0.003	-	-	-	-
25	-	-	-	-	-	0.013	0.003	0.003	-	-	-	-
26	-	-	-	-	-	0.013	0.003	0.003	-	-	-	-
27	-	-	-	-	-	0.012	0.003	0.003	-	-	-	-
28	-	-	-	-	-	0.011	0.003	0.003	-	-	-	-
29	-	-	-	-	-	0.010	0.003	0.003	-	-	-	-
30	-	-	-	-	-	0.010	0.003	0.003	-	-	-	-
31	-	-	-	-	-	-	0.003	0.003	-	-	-	-
MIN	-	-	-	-	-	0.010	0.002	0.002	0.003	-	-	-
MEAN	-	-	-	-	-	0.021	0.005	0.003	0.004	-	-	-
MAX	-	-	-	-	-	0.032	0.010	0.003	0.004	-	-	-

H87 Stickleback Outflow - 2006 (Continued)

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	99.432	99.387	99.396	-	-	-
2	-	-	-	-	-	99.472 P	99.430	99.387	99.396	-	-	-
3	-	-	-	-	-	99.472	99.429	99.386	99.398	-	-	-
4	-	-	-	-	-	99.476	99.425	99.385	99.397	-	-	-
5	-	-	-	-	-	99.483	99.422	99.384	99.398	-	-	-
6	-	-	-	-	-	99.486	99.421	99.383	99.397	-	-	-
7	-	-	-	-	-	99.479	99.418	99.382	99.397	-	-	-
8	-	-	-	-	-	99.477	99.417	99.381	99.399	-	-	-
9	-	-	-	-	-	99.479	99.417	99.381	99.399	-	-	-
10	-	-	-	-	-	99.481	99.415	99.379	99.399 P	-	-	-
11	-	-	-	-	-	99.480	99.413	99.383	-	-	-	-
12	-	-	-	-	-	99.479	99.410	99.385	-	-	-	-
13	-	-	-	-	-	99.479	99.408	99.385	-	-	-	-
14	-	-	-	-	-	99.475	99.406	99.385	-	-	-	-
15	-	-	-	-	-	99.472	99.405	99.385	-	-	-	-
16	-	-	-	-	-	99.470	99.401	99.385	-	-	-	-
17	-	-	-	-	-	99.466	99.398	99.385	-	-	-	-
18	-	-	-	-	-	99.465	99.394	99.386	-	-	-	-
19	-	-	-	-	-	99.464	99.392	99.386	-	-	-	-
20	-	-	-	-	-	99.461	99.389	99.385	-	-	-	-
21	-	-	-	-	-	99.459	99.387	99.384	-	-	-	-
22	-	-	-	-	-	99.455	99.384	99.385	-	-	-	-
23	-	-	-	-	-	99.454	99.387	99.387	-	-	-	-
24	-	-	-	-	-	99.450	99.394	99.394	-	-	-	-
25	-	-	-	-	-	99.446	99.394	99.395	-	-	-	-
26	-	-	-	-	-	99.444	99.394	99.395	-	-	-	-
27	-	-	-	-	-	99.440	99.390	99.393	-	-	-	-
28	-	-	-	-	-	99.439	99.394	99.394	-	-	-	-
29	-	-	-	-	-	99.434	99.396	99.395	-	-	-	-
30	-	-	-	-	-	99.434	99.395	99.394	-	-	-	-
31	-	-	-	-	-	-	99.391	99.394	-	-	-	-
MIN	-	-	-	-	-	99.434	99.384	99.379	99.396	-	-	-
MEAN	-	-	-	-	-	99.465	99.405	99.387	99.398	-	-	-
MAX	-	-	-	-	-	99.486	99.432	99.395	99.399	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

H87 Stickleback Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	0.014	0.002	0.007	-	-	-
2	-	-	-	-	-	-	0.013	0.002	0.007	-	-	-
3	-	-	-	-	-	-	0.013	0.002	0.007	-	-	-
4	-	-	-	-	-	-	0.013	0.001	0.006	-	-	-
5	-	-	-	-	-	-	0.012	0.001	0.006	-	-	-
6	-	-	-	-	-	-	0.011	0.001	0.006	-	-	-
7	-	-	-	-	-	-	0.011	0.001	0.006	-	-	-
8	-	-	-	-	-	0.006 E	0.011	0.001	0.005	-	-	-
9	-	-	-	-	-	0.008 E	0.011	0.003	0.005 P	-	-	-
10	-	-	-	-	-	0.011	0.011	0.004	0.004 E	-	-	-
11	-	-	-	-	-	0.013	0.011	0.005	0.004 E	-	-	-
12	-	-	-	-	-	0.030	0.011	0.006	0.004 E	-	-	-
13	-	-	-	-	-	0.075	0.010	0.008	0.003 E	-	-	-
14	-	-	-	-	-	0.145	0.010	0.008	0.003 E	-	-	-
15	-	-	-	-	-	0.184	0.009	0.009	0.003 E	-	-	-
16	-	-	-	-	-	0.143	0.009	0.009	0.002 E	-	-	-
17	-	-	-	-	-	0.077	0.008	0.008	0.002 E	-	-	-
18	-	-	-	-	-	0.038	0.007	0.008	0.001 E	-	-	-
19	-	-	-	-	-	0.039	0.007	0.010	0.001 E	-	-	-
20	-	-	-	-	-	0.068	0.006	0.010	-	-	-	-
21	-	-	-	-	-	0.091	0.007	0.009	-	-	-	-
22	-	-	-	-	-	0.083	0.005	0.010	-	-	-	-
23	-	-	-	-	-	0.066	0.004	0.009	-	-	-	-
24	-	-	-	-	-	0.061	0.004	0.009	-	-	-	-
25	-	-	-	-	-	0.036	0.003	0.008	-	-	-	-
26	-	-	-	-	-	0.037	0.003	0.008	-	-	-	-
27	-	-	-	-	-	0.022	0.004	0.007	-	-	-	-
28	-	-	-	-	-	0.015	0.003	0.007	-	-	-	-
29	-	-	-	-	-	0.014	0.003	0.007	-	-	-	-
30	-	-	-	-	-	0.014	0.003	0.007	-	-	-	-
31	-	-	-	-	-	-	0.003	0.007	-	-	-	-
MIN	-	-	-	-	-	0.006	0.003	0.001	0.001	-	-	-
MEAN	-	-	-	-	-	0.056	0.008	0.006	0.004	-	-	-
MAX	-	-	-	-	-	0.184	0.014	0.010	0.007	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	98.798	98.735	98.771	-	-	-
2	-	-	-	-	-	-	98.796	98.730	98.769	-	-	-
3	-	-	-	-	-	-	98.795	98.727	98.769	-	-	-
4	-	-	-	-	-	-	98.794	98.723	98.766	-	-	-
5	-	-	-	-	-	-	98.790	98.720	98.764	-	-	-
6	-	-	-	-	-	98.785 P	98.789	98.720	98.763	-	-	-
7	-	-	-	-	-	98.786	98.789	98.720	98.763	-	-	-
8	-	-	-	-	-	98.786	98.788	98.722	98.760	-	-	-
9	-	-	-	-	-	98.786	98.787	98.739	98.758 P	-	-	-
10	-	-	-	-	-	98.786	98.787	98.750	-	-	-	-
11	-	-	-	-	-	98.793	98.788	98.758	-	-	-	-
12	-	-	-	-	-	98.831	98.787	98.768	-	-	-	-
13	-	-	-	-	-	98.881	98.785	98.774	-	-	-	-
14	-	-	-	-	-	98.925	98.783	98.777	-	-	-	-
15	-	-	-	-	-	98.943	98.782	98.779	-	-	-	-
16	-	-	-	-	-	98.925	98.778	98.778	-	-	-	-
17	-	-	-	-	-	98.882	98.774	98.778	-	-	-	-
18	-	-	-	-	-	98.845	98.772	98.777	-	-	-	-
19	-	-	-	-	-	98.846	98.771	98.783	-	-	-	-
20	-	-	-	-	-	98.875	98.767	98.784	-	-	-	-
21	-	-	-	-	-	98.895	98.769	98.781	-	-	-	-
22	-	-	-	-	-	98.889	98.757	98.783	-	-	-	-
23	-	-	-	-	-	98.875	98.751	98.782	-	-	-	-
24	-	-	-	-	-	98.871	98.748	98.779	-	-	-	-
25	-	-	-	-	-	98.841	98.746	98.776	-	-	-	-
26	-	-	-	-	-	98.843	98.746	98.774	-	-	-	-
27	-	-	-	-	-	98.818	98.748	98.772	-	-	-	-
28	-	-	-	-	-	98.800	98.745	98.772	-	-	-	-
29	-	-	-	-	-	98.798	98.743	98.773	-	-	-	-
30	-	-	-	-	-	98.799	98.743	98.772	-	-	-	-
31	-	-	-	-	-	-	98.740	98.773	-	-	-	-
MIN	-	-	-	-	-	98.785	98.740	98.720	98.758	-	-	-
MEAN	-	-	-	-	-	98.844	98.772	98.761	98.765	-	-	-
MAX	-	-	-	-	-	98.943	98.798	98.784	98.771	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Stickleback Outflow **MEASUREMENT DATE: 24 June 2006**
LOCATION: Outlet of Stickleback Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT BY: KK **MEASUREMENT START TIME: 1239 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1246 h est.**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.75		0.00			0.00	0.075	0.000
1	0.90		0.02			0.00	0.175	0.000
2	1.10		0.06			0.00	0.2	0.000
3	1.30		0.06			0.00	0.15	0.000
4	1.40		0.10			0.13	0.1	0.001
5	1.50		0.13			0.31	0.1	0.004
6	1.60		0.25			0.43	0.1	0.011
7	1.70		0.12			0.26	0.15	0.005
8	1.90		0.01			0.00	0.175	0.000
Right Bank	2.05		0.00			0.00	0.075	0.000
								0.021

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Stickleback Outflow
LOCATION: Outlet of Stickleback Lake
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT DATE: 8 July 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1505 h
MEASUREMENT END TIME: 1510 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.03	0.000
1	0.06		0.12			0.59	0.06	0.004
2	0.12		0.12			0.49	0.06	0.004
3	0.18		0.06			0.43	0.06	0.002
Right Bank	0.24		0.00			0.00	0.03	0.000
								0.009

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Stickleback Outflow **MEASUREMENT DATE: 21 July 2006**
LOCATION: Stickleback Duck Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 442609 m E, 7503658 m N (NAD 83)

MEASUREMENT BY: HS/KM **MEASUREMENT START TIME: 1429 h**
COMPUTATIONS BY: NS/TY **MEASUREMENT END TIME: 1445 h**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	1.25		0.00			0.00	0.075	0.000
1	1.40		0.04			0.00	0.05	0.000
2	1.50		0.38			0.04	0.05	0.001
3	1.60		0.34			0.03	0.05	0.001
4	1.70		0.20			0.01	0.05	0.000
5	1.80		0.05			0.00	0.05	0.000
6	1.90		0.02			0.00	0.05	0.000
7	2.00		0.03			0.00	0.15	0.000
Right Bank	2.30		0.00			0.00	0.15	0.000
								0.001

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Stickleback Outflow
LOCATION: Outlet of Stickleback Lake
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT DATE: 13 August 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: NS
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 0945 h
MEASUREMENT END TIME: 0955 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.50		0.00			0.00	0.025	0.000
1	0.55		0.07			0.00	0.05	0.000
2	0.60		0.16			0.00	0.035	0.000
3	0.62		0.26			0.00	0.025	0.000
4	0.65		0.28			0.00	0.025	0.000
5	0.67		0.28			0.01	0.025	0.000
6	0.70		0.28			0.00	0.055	0.000
Right Bank	0.78		0.00			0.00	0.04	0.000
								0.000

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Stickleback Outflow
LOCATION: Outlet of Stickleback Lake
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT DATE: 10 September 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK/PE
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1650 h
MEASUREMENT END TIME: 1650 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank								
1	No measurable flow							
Right Bank								
								0.000

PROJECT NUMBER: 07-1373-0019, 4000
DISCHARGE DATA

STREAM NAME: Stickleback Lake Outflow **MEASUREMENT DATE: 23 June 2007**
LOCATION: Outlet of Stickleback Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 0906 h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 0915 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	3.40		0.04			0.00	0.15	0.000
1	3.10		0.24			0.20	0.3	0.014
2	2.80		0.28			0.23	0.3	0.019
3	2.50		0.21			0.14	0.3	0.009
4	2.20		0.15			0.01	0.3	0.000
5	1.90		0.14			0.01	0.3	0.000
6	1.60		0.08			0.00	0.3	0.000
7	1.30		0.06			0.00	0.3	0.000
8	1.00		0.04			0.00	0.3	0.000
Left Bank	0.70		0.02			0.00	0.15	0.000
								0.043

PROJECT NAME: Miramar/M2 Project/Stickleback Lake Outflow
PROJECT NUMBER: 07-1373-0019, 4000
DISCHARGE DATA

STREAM NAME: Stickleback Lake Outflow **MEASUREMENT DATE: 19 August 2007**
LOCATION: Outlet of Stickleback Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1150 h**
COMPUTATIONS BY: TJ/DC **MEASUREMENT END TIME: 1205 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m) (m)	DEPTH (m) (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m) (m)	DISCHARGE (m^3/s)
Right Bank	5.00		0.02			0.00	0.05	0.000
1	5.10		0.02			0.00	0.1	0.000
2	5.20		0.04			-0.02	0.1	0.000
3	5.30		0.08			-0.02	0.1	0.000
4	5.40		0.10			-0.01	0.1	0.000
5	5.50		0.13			-0.01	0.1	0.000
6	5.60		0.15			0.00	0.1	0.000
7	5.70		0.15			0.00	0.1	0.000
8	5.80		0.16			0.04	0.1	0.001
9	5.90		0.29			0.12	0.1	0.003
10	6.00		0.36			0.26	0.1	0.009
11	6.10		0.26			-0.01	0.1	0.000
Left Bank	6.20		0.06			-0.01	0.05	0.000
								0.013

PROJECT NAME: Miramar/M2 Project/Stickleback Lake Outflow
PROJECT NUMBER: 07-1373-0019, 4000
DISCHARGE DATA

STREAM NAME: Stickleback Lake Outflow **MEASUREMENT DATE: 06 Sept 2007**
LOCATION: Outlet of Stickleback Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 441934 m E, 7504127 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1115hrs**
COMPUTATIONS BY:DC **MEASUREMENT END TIME: 1130hrs**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	7.15					0.00	0.225	0.000
1	6.70		0.34			0.02	0.05	0.000
2	6.65		0.38			0.06	0.05	0.001
3	6.60		0.38			0.08	0.05	0.002
4	6.55		0.36			0.07	0.05	0.001
5	6.50		0.26			0.04	0.05	0.001
6	6.45		0.25			0.01	0.05	0.000
7	6.40		0.12			-0.02	0.075	0.000
8	6.35		0.10			-0.03	0.05	0.000
9	6.25		0.08			-0.02	0	0.000
Left Bank								0.000
								0.005

HOPE BAY TIDAL HYDROMETRIC STATION

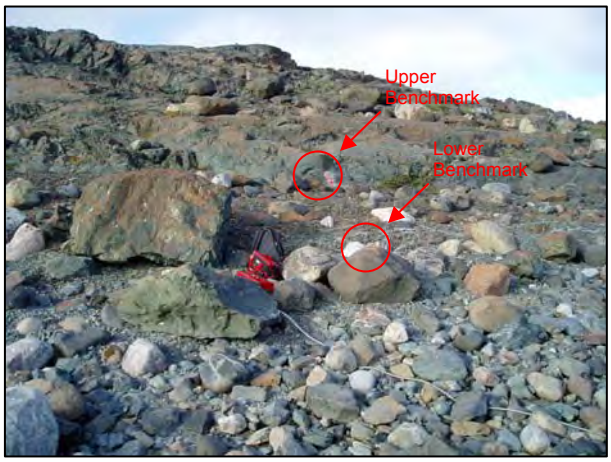
H88

FACTSHEET

LOCATION AND PURPOSE

Located on the south side of Hope Bay to characterize tidal variation. This station was operated for one open-water season only in 2006. Two benchmarks (high in bedrock; low on a boulder) were established at the site.

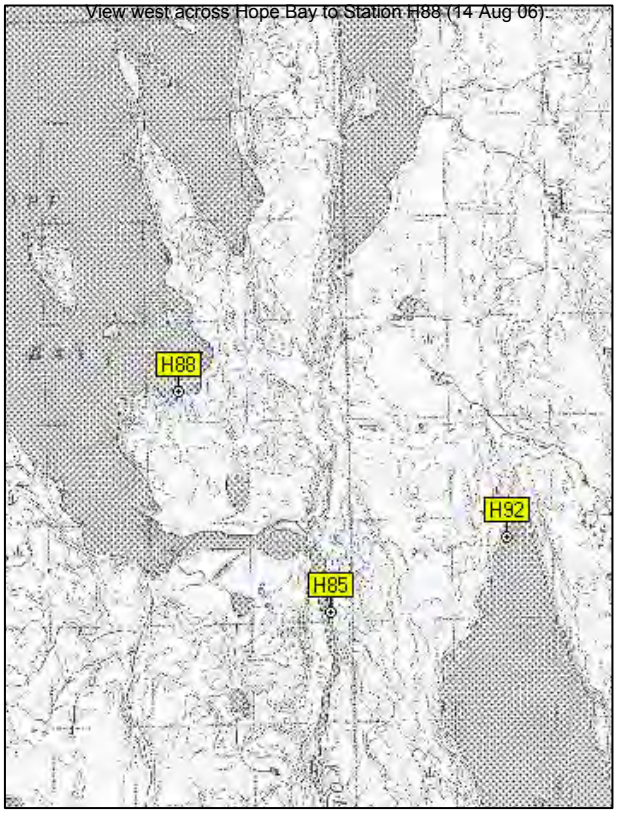
Operational:	2006 (3 July – 8 September)		
Benchmarks:	Top of embedded boulder; bedrock face	Drainage Area:	n/a
Coordinates:	UTM: 428367 m E, 7556545 m N (NAD83)	Lat/Long:	68°05'12" N, 106°43'12" W
Datalogger:	Optimum Instruments #0949 (cold tested)	Transducer:	Keller #0202699 (8 psi, 20 m)



Station H88 looking west, showing benchmark locations (14 Aug 06).

View west across Hope Bay to Station H88 (14 Aug 06).

Station H88 aerial view from northwest (5 Jun 06).



Hope Bay Tide Gauge Station H88 – Stage Data (2006)

			Stage Datum	0.000 m	(non-geodetic)	
Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
03/07/2006 14:20	1.3295	-1.240		0.090	0.090	n/a
21/07/2006 14:20	1.3820	-		*0.106*	*0.106*	n/a
14/08/2006 8:45	1.0384	-1.276		-0.238	-0.238	n/a
08/09/2006 14:49	1.3666	-1.274	-1.263	0.093	0.093	n/a

H88 Hope Bay Tide Gauge - 2006

MAXIMUM DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 2.404 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	0.126	0.072	-	-	-
2	-	-	-	-	-	-	-	0.107	0.221	-	-	-
3	-	-	-	-	-	-	0.316 P	0.090	0.256	-	-	-
4	-	-	-	-	-	-	0.326	0.103	0.217	-	-	-
5	-	-	-	-	-	-	0.180	0.138	0.242	-	-	-
6	-	-	-	-	-	-	0.271	0.172	0.271	-	-	-
7	-	-	-	-	-	-	0.228	0.173	0.171	-	-	-
8	-	-	-	-	-	-	0.118	0.112	0.103 P	-	-	-
9	-	-	-	-	-	-	0.157	0.196	-	-	-	-
10	-	-	-	-	-	-	0.126	0.343	-	-	-	-
11	-	-	-	-	-	-	0.094	0.472	-	-	-	-
12	-	-	-	-	-	-	0.128	0.306	-	-	-	-
13	-	-	-	-	-	-	0.159	0.169	-	-	-	-
14	-	-	-	-	-	-	0.257	0.061	-	-	-	-
15	-	-	-	-	-	-	0.246	-0.022	-	-	-	-
16	-	-	-	-	-	-	0.225	0.042	-	-	-	-
17	-	-	-	-	-	-	0.256	0.082	-	-	-	-
18	-	-	-	-	-	-	0.239	0.108	-	-	-	-
19	-	-	-	-	-	-	0.239	0.168	-	-	-	-
20	-	-	-	-	-	-	0.152	0.116	-	-	-	-
21	-	-	-	-	-	-	0.157	0.024	-	-	-	-
22	-	-	-	-	-	-	0.431	0.081	-	-	-	-
23	-	-	-	-	-	-	0.361	0.211	-	-	-	-
24	-	-	-	-	-	-	0.394	0.357	-	-	-	-
25	-	-	-	-	-	-	0.258	0.345	-	-	-	-
26	-	-	-	-	-	-	0.314	0.296	-	-	-	-
27	-	-	-	-	-	-	0.551	0.256	-	-	-	-
28	-	-	-	-	-	-	0.434	0.145	-	-	-	-
29	-	-	-	-	-	-	0.187	0.025	-	-	-	-
30	-	-	-	-	-	-	0.205	-0.071	-	-	-	-
31	-	-	-	-	-	-	0.150	-0.015	-	-	-	-
MIN	-	-	-	-	-	-	0.094	-0.071	0.072	-	-	-
MEAN	-	-	-	-	-	-	0.247	0.152	0.194	-	-	-
MAX	-	-	-	-	-	-	0.551	0.472	0.271	-	-	-

MINIMUM DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 2.404 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	-0.185	-0.181	-	-	-
2	-	-	-	-	-	-	-	-0.183	-0.150	-	-	-
3	-	-	-	-	-	-	0.065 P	-0.197	0.011	-	-	-
4	-	-	-	-	-	-	-0.013	-0.205	-0.210	-	-	-
5	-	-	-	-	-	-	-0.141	-0.197	-0.178	-	-	-
6	-	-	-	-	-	-	-0.134	-0.178	-0.044	-	-	-
7	-	-	-	-	-	-	-0.084	-0.212	-0.175	-	-	-
8	-	-	-	-	-	-	-0.199	-0.287	-0.175 P	-	-	-
9	-	-	-	-	-	-	-0.238	-0.277	-	-	-	-
10	-	-	-	-	-	-	-0.221	-0.115	-	-	-	-
11	-	-	-	-	-	-	-0.295	-0.003	-	-	-	-
12	-	-	-	-	-	-	-0.312	-0.075	-	-	-	-
13	-	-	-	-	-	-	-0.264	-0.165	-	-	-	-
14	-	-	-	-	-	-	-0.199	-0.269	-	-	-	-
15	-	-	-	-	-	-	-0.165	-0.383	-	-	-	-
16	-	-	-	-	-	-	-0.231	-0.292	-	-	-	-
17	-	-	-	-	-	-	-0.199	-0.200	-	-	-	-
18	-	-	-	-	-	-	-0.178	-0.135	-	-	-	-
19	-	-	-	-	-	-	-0.135	-0.200	-	-	-	-
20	-	-	-	-	-	-	-0.200	-0.178	-	-	-	-
21	-	-	-	-	-	-	-0.149	-0.284	-	-	-	-
22	-	-	-	-	-	-	-0.085	-0.325	-	-	-	-
23	-	-	-	-	-	-	-0.051	-0.245	-	-	-	-
24	-	-	-	-	-	-	-0.011	-0.069	-	-	-	-
25	-	-	-	-	-	-	-0.101	-0.002	-	-	-	-
26	-	-	-	-	-	-	-0.177	-0.052	-	-	-	-
27	-	-	-	-	-	-	-0.059	-0.048	-	-	-	-
28	-	-	-	-	-	-	0.026	-0.113	-	-	-	-
29	-	-	-	-	-	-	-0.136	-0.191	-	-	-	-
30	-	-	-	-	-	-	-0.130	-0.272	-	-	-	-
31	-	-	-	-	-	-	-0.177	-0.335	-	-	-	-
MIN	-	-	-	-	-	-	-0.312	-0.383	-0.210	-	-	-
MEAN	-	-	-	-	-	-	-0.145	-0.189	-0.138	-	-	-
MAX	-	-	-	-	-	-	0.065	-0.002	0.011	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

WOLVERINE LAKE OUTFLOW HYDROMETRIC STATION

H91

FACTSHEET

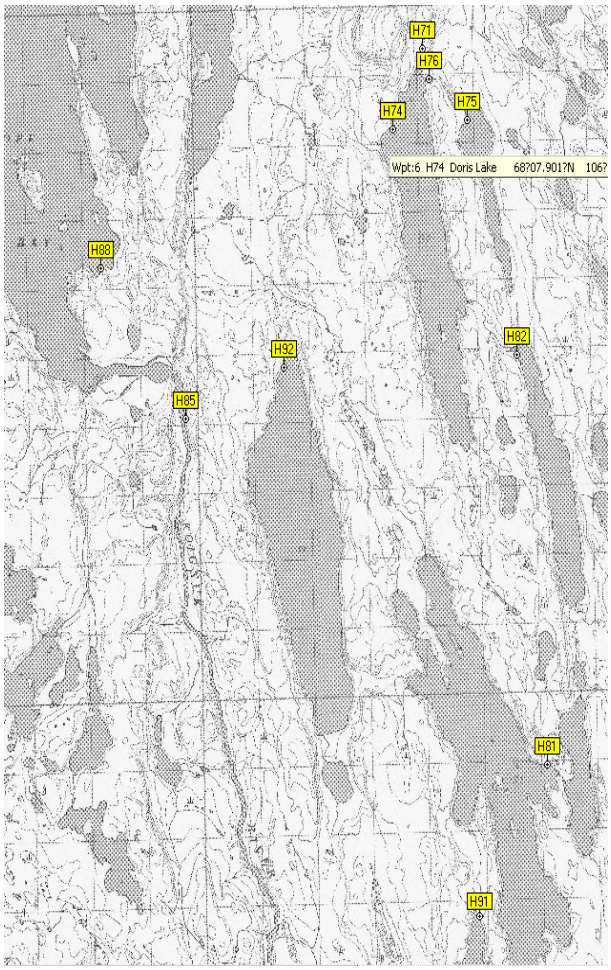
LOCATION AND PURPOSE

Located approximately 50 m upstream, on the right bank of W olverine Lake outflow. Benchmark w as made about 50 m offshore to the east, due to lack of bedrock near the Hydrostation.

Operational:	2006 (1 Jun – 8 September)		2007 (23 May – 14 September)
Benchmark:	Top of embedded boulder;	Drainage Area:	1.97 km2
Coordinates:	UTM: 435222 m E, 7545888 m N (NAD83)	Lat/Long:	68°01'11" N, 106°33'03" W
Datalogger:	Optimum Instruments #1397	Transducer:	Keller #000900 (5 psi, 20 m)

Station H91 looking northwest, downstream of Wolverine Lake Outflow.

Station H91 looking east, offshore, with benchmark.



NTS Mapping of Area

FACT-H91-2007.DOC

Wolverine Outflow Station H91 – Stage-Discharge Data (2006-2007)

Stage Datum 97.700 m

Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
01/06/2006 16:02	0.7267	-		-	-	n/a
03/07/2006 8:32	0.8285	97.521		98.349	0.649	n/a
23/07/2006 10:30	0.7851	-		*98.293*	0.593	n/a
12/08/2006 13:30	0.7521	97.521		98.273	0.573	n/a
08/09/2006 17:08	0.7229	97.481	97.508	98.204	0.504	n/a
07/07/2007 21:15	0.7264	96.5276		97.254	-0.446	n/a
14/08/2007 12:25	0.7498	96.4032	96.4654	97.153	-0.547	n/a

H91 Wolverine Outflow - 2006

MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK EL. 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	98.237 P	98.335	98.267	98.186	-	-	-
2	-	-	-	-	-	98.244	98.335	98.268	98.182	-	-	-
3	-	-	-	-	-	98.256	98.335	98.271	98.183	-	-	-
4	-	-	-	-	-	98.264	98.325	98.273	98.186	-	-	-
5	-	-	-	-	-	98.269	98.318	98.275	98.192	-	-	-
6	-	-	-	-	-	98.278	98.311	98.276	98.197	-	-	-
7	-	-	-	-	-	98.282	98.303	98.277	98.200	-	-	-
8	-	-	-	-	-	98.282	98.295	98.278	98.202 P	-	-	-
9	-	-	-	-	-	98.289	98.289	98.280	-	-	-	-
10	-	-	-	-	-	98.300	98.285	98.276	-	-	-	-
11	-	-	-	-	-	98.302	98.285	98.270	-	-	-	-
12	-	-	-	-	-	98.309	98.290	98.257	-	-	-	-
13	-	-	-	-	-	98.315	98.294	98.252	-	-	-	-
14	-	-	-	-	-	98.321	98.296	98.247	-	-	-	-
15	-	-	-	-	-	98.324	98.300	98.241	-	-	-	-
16	-	-	-	-	-	98.322	98.299	98.238	-	-	-	-
17	-	-	-	-	-	98.325	98.296	98.236	-	-	-	-
18	-	-	-	-	-	98.322	98.290	98.238	-	-	-	-
19	-	-	-	-	-	98.317	98.287	98.231	-	-	-	-
20	-	-	-	-	-	98.312	98.292	98.226	-	-	-	-
21	-	-	-	-	-	98.311	98.294	98.225	-	-	-	-
22	-	-	-	-	-	98.314	98.292	98.225	-	-	-	-
23	-	-	-	-	-	98.321	98.289	98.225	-	-	-	-
24	-	-	-	-	-	98.318	98.287	98.223	-	-	-	-
25	-	-	-	-	-	98.320	98.282	98.222	-	-	-	-
26	-	-	-	-	-	98.326	98.276	98.218	-	-	-	-
27	-	-	-	-	-	98.337	98.262	98.211	-	-	-	-
28	-	-	-	-	-	98.339	98.256	98.205	-	-	-	-
29	-	-	-	-	-	98.339	98.258	98.204	-	-	-	-
30	-	-	-	-	-	98.335	98.259	98.201	-	-	-	-
31	-	-	-	-	-	-	98.264	98.193	-	-	-	-
MIN	-	-	-	-	-	98.237	98.256	98.193	98.182	-	-	-
MEAN	-	-	-	-	-	98.304	98.293	98.243	98.191	-	-	-
MAX	-	-	-	-	-	98.339	98.335	98.280	98.202	-	-	-

NOTES: P – PARTIAL DAILY AVERAGE

H91 Wolverine Outflow - 2007

MEAN DAILY WATER LEVELS (m) BASED ON BENCHMARK EL. 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	97.211	97.176	97.233	97.186	97.190	-
2	-	-	-	-	-	-	97.209	97.172	97.230	97.185	97.189	-
3	-	-	-	-	-	-	97.206	97.169	97.229	97.185	97.190	-
4	-	-	-	-	-	-	97.202	97.165	97.228	97.186	97.190	-
5	-	-	-	-	-	-	97.199	97.161	97.225	97.184	97.188	-
6	-	-	-	-	-	-	97.198	97.159	97.224	97.184	97.188	-
7	-	-	-	-	-	-	97.193	97.158	97.225	97.185	97.187	-
8	-	-	-	-	-	-	97.192	97.164	97.225	97.187	97.186	-
9	-	-	-	-	-	-	97.191	97.178	97.222	97.193	97.186	-
10	-	-	-	-	-	-	97.194	97.186	97.218	97.191	97.186	-
11	-	-	-	-	-	-	97.193	97.190	97.215	97.190	97.185	-
12	-	-	-	-	-	-	97.194	97.199	97.215	97.189	97.185	-
13	-	-	-	-	-	96.970	97.196	97.208	97.212	97.188	97.184	-
14	-	-	-	-	-	96.986	97.198	97.215	97.210	97.187	97.183	-
15	-	-	-	-	-	97.013	97.200	97.217	97.206	97.186	97.184	-
16	-	-	-	-	-	97.038	97.201	97.218	97.204	97.187	97.184	-
17	-	-	-	-	-	97.063	97.199	97.218	97.201	97.188	97.183	-
18	-	-	-	-	-	97.105	97.199	97.219	97.199	97.187	97.183	-
19	-	-	-	-	-	97.116	97.200	97.236	97.198	97.189	97.182	-
20	-	-	-	-	-	97.123	97.201	97.251	97.198	97.190	97.181	-
21	-	-	-	-	-	97.141	97.205	97.253	97.196	97.192	97.181	-
22	-	-	-	-	-	97.153	97.205	97.252	97.195	97.193	97.181	-
23	-	-	-	-	-	97.164	97.197	97.252	97.195	97.196	97.181	-
24	-	-	-	-	-	97.190	97.195	97.248	97.196	97.196	97.180	-
25	-	-	-	-	-	97.205	97.193	97.244	97.196	97.195	97.179	-
26	-	-	-	-	-	97.208	97.194	97.242	97.194	97.194	97.180	-
27	-	-	-	-	-	97.210	97.190	97.238	97.192	97.194	97.180	-
28	-	-	-	-	-	97.210	97.189	97.236	97.190	97.194	97.178	-
29	-	-	-	-	-	97.212	97.186	97.236	97.190	97.193	97.178	-
30	-	-	-	-	-	97.213	97.184	97.234	97.188	97.192	97.178	-
31	-	-	-	-	-	-	97.183	97.234	-	97.191	-	-
MIN	-	-	-	-	-	96.970	97.183	97.158	97.188	97.184	97.178	-
MEAN	-	-	-	-	-	97.129	97.197	97.211	97.208	97.190	97.184	-
MAX	-	-	-	-	-	97.213	97.211	97.253	97.233	97.196	97.190	-

NOTES: P – PARTIAL DAILY AVERAGE

WINDY LAKE OUTFLOW HYDROMETRIC STATION

H92

FACTSHEET

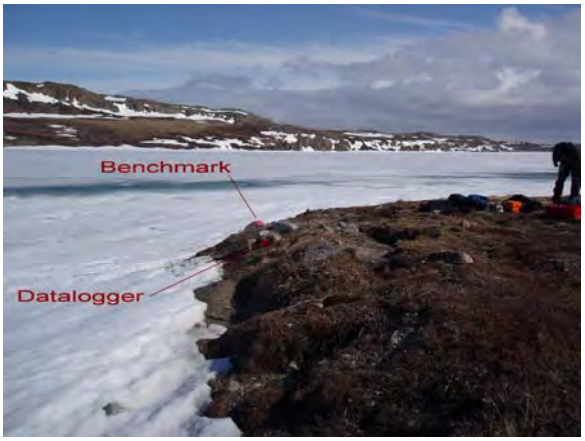
LOCATION AND PURPOSE

Located approximately 100 m upstream, on the left bank of Windy Lake outflow.

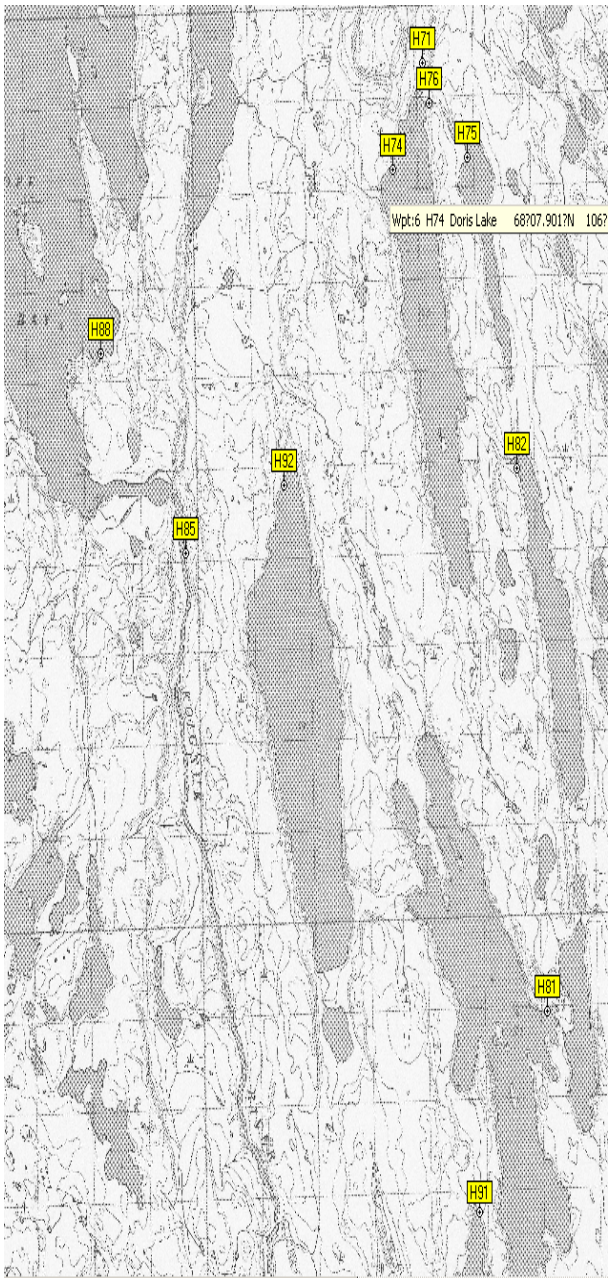
Operational:	2006 (29 May – 8 September)		2007 (24 May – 15 September)
Benchmark:	Top of embedded boulder;	Drainage Area:	13.9 km2
Coordinates:	UTM: 431507 m E, 7555043 m N (NAD83)	Lat/Long:	68°06'04" N, 106°38'45" W
Datalogger:	Optimum Instruments #0639(cold tested)	Transducer:	Keller #402786 (5 psi, 15 m)

Station H92 aerial view, Looking North.

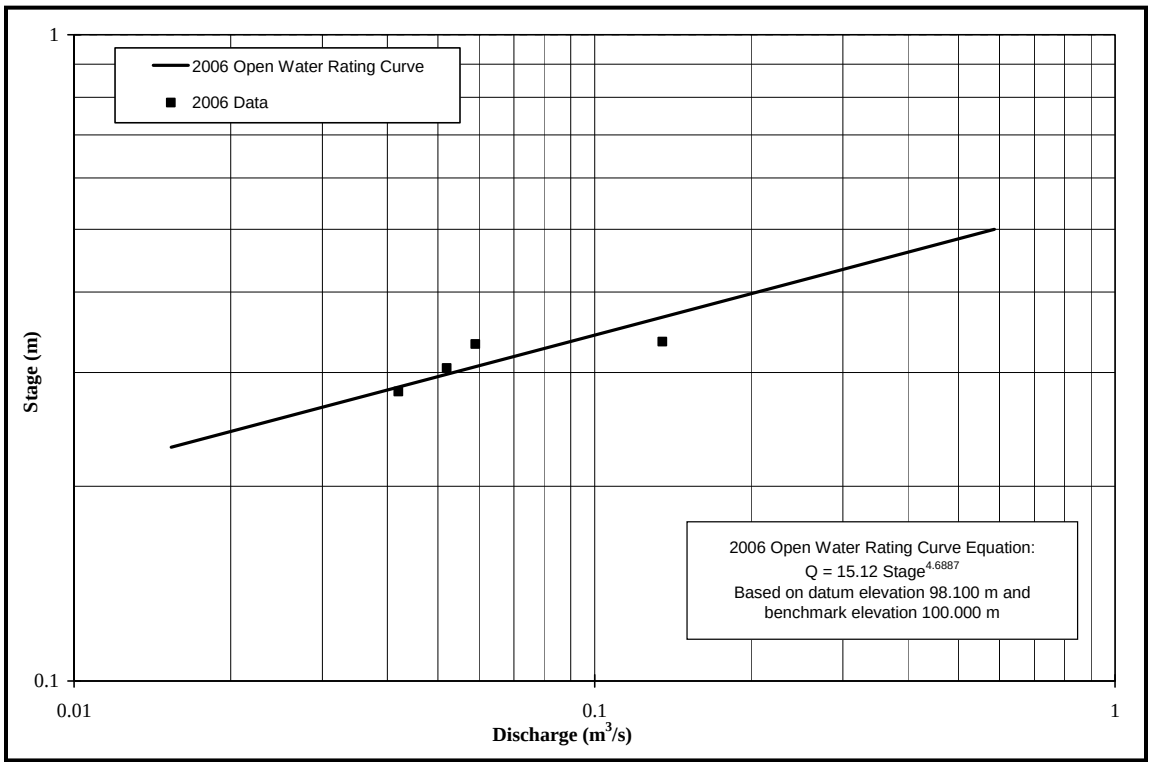
Station (circle) H92 aerial view, looking Northwest.



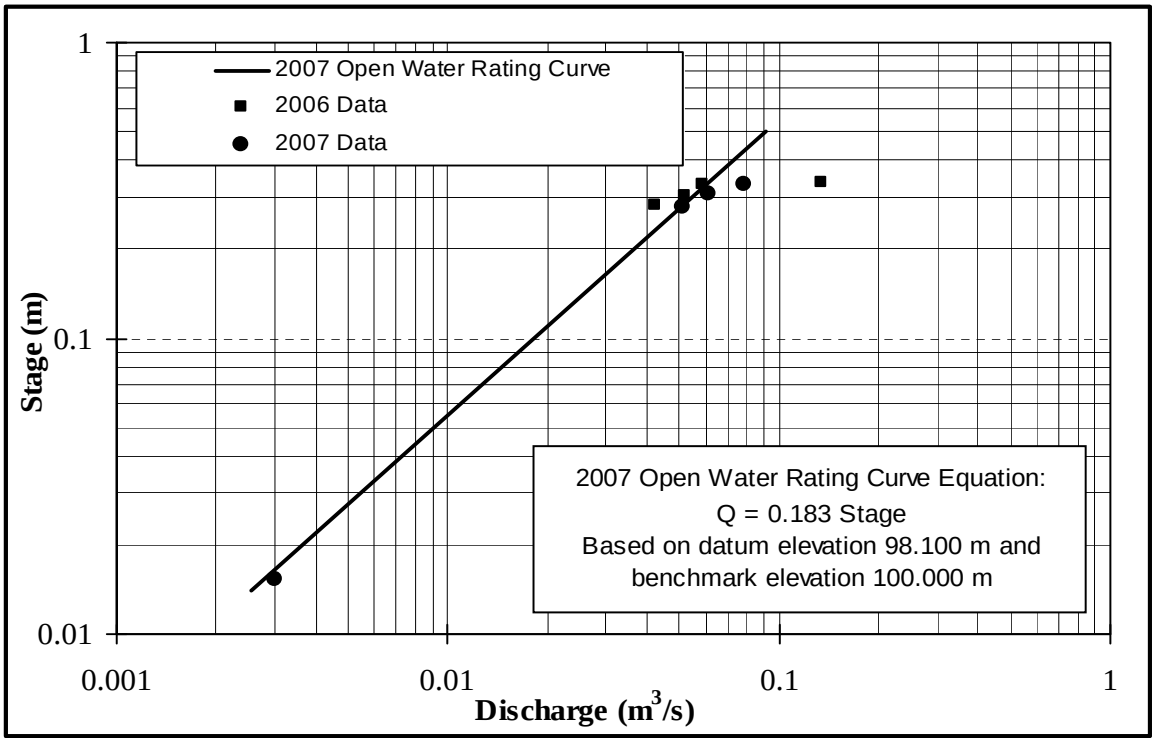
Station H92 looking east, with benchmark.



NTS Mapping of Area



Windy Outflow Station H92 – Stage-Discharge Rating Curve (2006)



Windy Outflow Station H92 – Stage-Discharge Rating Curve (2007)

Windy Outflow Station H92 – Stage-Discharge Data (2006-2007)

				Stage Datum	98.100m	
Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
29/05/2006 16:14	0.4783	-		-	-	-
03/07/2006 16:00	0.6455	97.790		98.435	0.335	0.135
19/07/2006 18:30	0.6560	-		*98.411*	0.311	0.059
12/08/2006 16:26	0.6422	97.763		98.405	0.305	0.052
08/09/2006 15:14	0.6044	-	97.755	*98.381*	0.281	0.042
22/06/2007 09:35	0.0414			*98.115*	0.015	0.003
03/07/2007 11:10	0.3167					n/a
20/07/2007 15:00	0.3050	98.074		98.379	0.279	0.051
13/08/2007 12:20	n/a			98.432	0.332	0.078
15/09/2007 16:30	n/a		98.074	98.409	0.309	0.061

H92 Windy Outflow - 2006

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	0.135 A	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	0.042 A	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	0.052 A	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	0.059 A	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
MIN	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	-	-	-	-	-	-	-	-	-	-	-
MAX	-	-	-	-	-	-	-	-	-	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 26.301 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	98.435 A	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	98.317 A	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	98.405 A	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	-	-	98.364 A	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-	-	-	-	-	-
MIN	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	-	-	-	-	-	-	-	-	-	-	-	-
MAX	-	-	-	-	-	-	-	-	-	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED A – MANUAL MEASUREMENT

H92 Windy Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	0.052	0.051	-	-	-	-
2	-	-	-	-	-	-	0.053	0.050	-	-	-	-
3	-	-	-	-	-	-	0.053	0.050	-	-	-	-
4	-	-	-	-	-	-	0.052	0.049	-	-	-	-
5	-	-	-	-	-	-	0.052	-	-	-	-	-
6	-	-	-	-	-	-	0.052	-	-	-	-	-
7	-	-	-	-	-	-	0.053	-	-	-	-	-
8	-	-	-	-	-	-	0.052	-	-	-	-	-
9	-	-	-	-	-	-	0.052	-	-	-	-	-
10	-	-	-	-	-	-	0.053	-	-	-	-	-
11	-	-	-	-	-	-	0.052	-	-	-	-	-
12	-	-	-	-	-	-	0.052	-	-	-	-	-
13	-	-	-	-	-	-	0.052	-	-	-	-	-
14	-	-	-	-	-	-	0.052	-	-	-	-	-
15	-	-	-	-	-	-	0.052	-	-	-	-	-
16	-	-	-	-	-	-	0.052	-	-	-	-	-
17	-	-	-	-	-	-	0.051	-	-	-	-	-
18	-	-	-	-	-	-	0.051	-	-	-	-	-
19	-	-	-	-	-	-	0.052	-	-	-	-	-
20	-	-	-	-	-	-	0.053	-	-	-	-	-
21	-	-	-	-	-	-	0.054	-	-	-	-	-
22	-	-	-	-	-	0.011 P	0.053	-	-	-	-	-
23	-	-	-	-	-	0.022	0.053	-	-	-	-	-
24	-	-	-	-	-	0.031	0.053	-	-	-	-	-
25	-	-	-	-	-	0.040	0.053	-	-	-	-	-
26	-	-	-	-	-	0.044	0.053	-	-	-	-	-
27	-	-	-	-	-	0.047	0.053	-	-	-	-	-
28	-	-	-	-	-	0.049	0.053	-	-	-	-	-
29	-	-	-	-	-	0.050	0.052	-	-	-	-	-
30	-	-	-	-	-	0.051	0.052	-	-	-	-	-
31	-	-	-	-	-	-	0.052	-	-	-	-	-
MIN	-	-	-	-	-	0.011	0.051	0.049	-	-	-	-
MEAN	-	-	-	-	-	0.038	0.052	0.050	-	-	-	-
MAX	-	-	-	-	-	0.051	0.054	0.051	-	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 26.301 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	98.387	98.377	-	-	-	-
2	-	-	-	-	-	-	98.387	98.376	-	-	-	-
3	-	-	-	-	-	-	98.387	98.373	-	-	-	-
4	-	-	-	-	-	-	98.386	98.374 P	-	-	-	-
5	-	-	-	-	-	-	98.386	-	-	-	-	-
6	-	-	-	-	-	-	98.387	-	-	-	-	-
7	-	-	-	-	-	-	98.387	-	-	-	-	-
8	-	-	-	-	-	-	98.387	-	-	-	-	-
9	-	-	-	-	-	-	98.387	-	-	-	-	-
10	-	-	-	-	-	-	98.387	-	-	-	-	-
11	-	-	-	-	-	-	98.386	-	-	-	-	-
12	-	-	-	-	-	-	98.384	-	-	-	-	-
13	-	-	-	-	-	-	98.384	-	-	-	-	-
14	-	-	-	-	-	-	98.383	-	-	-	-	-
15	-	-	-	-	-	-	98.384	-	-	-	-	-
16	-	-	-	-	-	-	98.383	-	-	-	-	-
17	-	-	-	-	-	-	98.380	-	-	-	-	-
18	-	-	-	-	-	-	98.381	-	-	-	-	-
19	-	-	-	-	-	-	98.385	-	-	-	-	-
20	-	-	-	-	-	-	98.387	-	-	-	-	-
21	-	-	-	-	-	-	98.396	-	-	-	-	-
22	-	-	-	-	-	98.160 P	98.387	-	-	-	-	-
23	-	-	-	-	-	98.218	98.387	-	-	-	-	-
24	-	-	-	-	-	98.271	98.390	-	-	-	-	-
25	-	-	-	-	-	98.318	98.391	-	-	-	-	-
26	-	-	-	-	-	98.340	98.390	-	-	-	-	-
27	-	-	-	-	-	98.355	98.389	-	-	-	-	-
28	-	-	-	-	-	98.367	98.388	-	-	-	-	-
29	-	-	-	-	-	98.375	98.386	-	-	-	-	-
30	-	-	-	-	-	98.381	98.387	-	-	-	-	-
31	-	-	-	-	-	-	98.383	-	-	-	-	-
MIN	-	-	-	-	-	98.160	98.380	98.373	-	-	-	-
MEAN	-	-	-	-	-	98.310	98.386	98.375	-	-	-	-
MAX	-	-	-	-	-	98.381	98.396	98.377	-	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED A – MANUAL MEASUREMENT

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Windy Outflow **MEASUREMENT DATE: 3 July 2006**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: TA/PE **MEASUREMENT START TIME: 1613 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1625 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	1.45		0.00			0.00	0.025	0.000
1	1.50		0.04			0.00	0.075	0.000
2	1.60		0.08			0.04	0.1	0.000
3	1.70		0.22			0.34	0.1	0.007
4	1.80		0.20			0.65	0.1	0.013
5	1.90		0.21			0.72	0.1	0.015
6	2.00		0.23			0.67	0.1	0.015
7	2.10		0.22			0.69	0.1	0.015
8	2.20		0.22			0.67	0.1	0.015
9	2.30		0.23			0.63	0.1	0.014
10	2.40		0.22			0.59	0.1	0.013
11	2.50		0.21			0.57	0.1	0.012
12	2.60		0.20			0.45	0.1	0.009
13	2.70		0.20			0.28	0.1	0.006
14	2.80		0.11			0.01	0.1	0.000
15	2.90		0.07			0.00	0.165	0.000
Right Bank	3.13		0.00			0.00	0.115	0.000
								0.135

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Windy Outflow **MEASUREMENT DATE: 19 July 2006**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: HS/KM **MEASUREMENT START TIME: 1830 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1850 h est.**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	14.50		0.02			0.00	0.5	0.000
1	13.50		0.02			0.00	1	0.000
2	12.50		0.05			0.00	0.75	0.000
3	12.00		0.08			0.00	0.5	0.000
4	11.50		0.10			0.00	0.5	0.000
5	11.00		0.13			0.00	0.5	0.000
6	10.50		0.16			0.00	0.5	0.000
7	10.00		0.31			0.00	0.375	0.000
8	9.75		0.32			0.01	0.25	0.001
9	9.50		0.34			0.02	0.25	0.002
10	9.25		0.35			0.13	0.25	0.011
11	9.00		0.36			0.17	0.25	0.015
12	8.75		0.44			0.20	0.25	0.022
13	8.50		0.36			0.06	0.25	0.005
14	8.25		0.38			0.03	0.25	0.003
15	8.00		0.30			0.00	0.25	0.000
16	7.75		0.30			0.00	0.25	0.000
17	7.50		0.22			0.00	0.375	0.000
18	7.00		0.16			0.00	0.5	0.000
19	6.50		0.12			0.00	0.5	0.000
20	6.00		0.30			0.00	0.5	0.000
21	5.50		0.01			0.00	0.5	0.000
22	5.00		0.03			0.00	0.5	0.000
23	4.50		0.05			0.00	0.5	0.000
24	4.00		0.05			0.00	0.5	0.000
25	3.50		0.06			0.00	0.5	0.000
26	3.00		0.04			0.00	0.5	0.000
27	2.50		0.01			0.00	0.35	0.000
Right Bank	2.30		0.00			0.00	0.1	0.000
								0.059

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Windy Outflow **MEASUREMENT DATE: 12 August 2006**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: NS/KM **MEASUREMENT START TIME: 1640 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1655 h**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.00		0.00			0.00	0.2	0.000
1	2.40		0.16			0.00	0.35	0.000
2	2.70		0.22			0.00	0.3	0.000
3	3.00		0.26			0.05	0.25	0.003
4	3.20		0.26			0.15	0.2	0.008
5	3.40		0.30			0.14	0.2	0.008
6	3.60		0.32			0.18	0.2	0.012
7	3.80		0.34			0.16	0.2	0.011
8	4.00		0.34			0.11	0.2	0.007
9	4.20		0.33			0.02	0.2	0.001
10	4.40		0.31			0.02	0.2	0.001
11	4.60		0.26			0.00	0.2	0.000
12	4.80		0.25			0.01	0.2	0.001
13	5.00		0.22			0.00	0.4	0.000
Right Bank	5.60		0.00			0.00	0.3	0.000
								0.052

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000

DISCHARGE DATA

STREAM NAME: Windy Outflow **MEASUREMENT DATE: 8 September 2006**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: KK/PE **MEASUREMENT START TIME: 1529 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1536 h**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	1.58		0.00			0.00	0.01	0.000
1	1.60		0.01			0.00	0.085	0.000
2	1.75		0.10			0.03	0.15	0.000
3	1.90		0.18			0.22	0.15	0.006
4	2.05		0.19			0.31	0.15	0.009
5	2.20		0.14			0.41	0.15	0.009
6	2.35		0.10			0.40	0.15	0.006
7	2.50		0.20			0.30	0.15	0.009
8	2.65		0.18			0.11	0.15	0.003
9	2.80		0.07			0.01	0.15	0.000
10	2.95		0.02			0.00	0.095	0.000
Right Bank	2.99		0.00			0.00	0.02	0.000
								0.042

PROJECT NAME: Miramar/EM2 Project/Windy Lake Outflow

PROJECT NUMBER: 07 1373 0019.4000

DISCHARGE DATA

STREAM NAME: Windy Lake Outflow **MEASUREMENT DATE: 22 June 2007**

LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: PE **MEASUREMENT START TIME: 0935 h**

COMPUTATIONS BY:TJ **MEASUREMENT END TIME: 0950 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m) (m)	DEPTH (m) (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m) (m)	DISCHARGE (m^3/s)
Right Bank	1.50		0.02			0.00	0.165	0.000
1	1.83		0.07			0.00	0.33	0.000
2	2.16		0.12			0.00	0.33	0.000
3	2.49		0.17			0.01	0.33	0.001
4	2.82		0.20			0.02	0.33	0.001
5	3.15		0.19			0.01	0.33	0.001
6	3.48		0.21			0.00	0.33	0.000
7	3.81		0.12			0.00	0.33	0.000
8	4.14		0.10			0.00	0.33	0.000
9	4.47		0.04			0.00	0.33	0.000
Left Bank	4.80		0.50			0.00	0.165	0.000
								0.003

PROJECT NAME: Miramar/EM2 Project/Windy Lake Outflow

PROJECT NUMBER: 07 1373 0019.4000

DISCHARGE DATA

STREAM NAME: Windy Lake Outflow **MEASUREMENT DATE: 20 July 2007**

LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY: MK **MEASUREMENT START TIME:**

COMPUTATIONS BY:DC **MEASUREMENT END TIME:**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	7.70		0.22			-0.03	0.125	-0.001
1	7.95		0.38			0.00	0.25	0.000
2	8.20		0.40			0.09	0.25	0.009
3	8.45		0.45			0.11	0.25	0.012
4	8.70		0.44			0.18	0.25	0.020
5	8.95		0.50			0.15	0.25	0.019
6	9.20		0.39			0.04	0.25	0.004
7	9.45		0.35			0.00	0.25	0.000
8	9.70		0.34			-0.03	0.275	-0.003
9	10.00		0.22			-0.03	1.35	-0.009
Left Bank	12.40		0.00			0.00	1.2	0.000
								0.051

PROJECT NAME: Miramar/EM2 Project/Windy Lake Outflow
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: Windy Lake Outflow **MEASUREMENT DATE: 13 August 2007**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY:TY **MEASUREMENT START TIME: 1045 h**
COMPUTATIONS BY:TJ **MEASUREMENT END TIME: 1206 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	1.00		0.00			0.00	0.05	0.000
1	1.10		0.02			0.00	0.1	0.000
2	1.20		0.04			0.00	0.1	0.000
3	1.30		0.05			0.00	0.1	0.000
4	1.40		0.05			-0.03	0.1	0.000
5	1.50		0.17			-0.03	0.1	-0.001
6	1.60		0.30			-0.03	0.1	-0.001
7	1.70		0.32			0.09	0.1	0.003
8	1.80		0.34			0.17	0.1	0.006
9	1.90		0.35			0.21	0.1	0.007
10	2.00		0.35			0.22	0.1	0.008
11	2.10		0.34			0.27	0.1	0.009
12	2.20		0.34			0.25	0.1	0.008
13	2.30		0.35			0.28	0.1	0.010
14	2.40		0.35			0.30	0.1	0.011
15	2.50		0.33			0.27	0.1	0.009
16	2.60		0.32			0.18	0.1	0.006
17	2.70		0.30			0.12	0.1	0.004
18	2.80		0.30			0.06	0.1	0.002
19	2.90		0.31			-0.01	0.15	0.000
20	3.10		0.25			-0.03	0.2	-0.002
21	3.30		0.16			0.00	0.2	0.000
22	3.50		0.12			0.00	0.35	0.000
23	4.00		0.04			0.00	0.35	0.000
Left Bank	4.20		0.00			0.00	0.1	0.000
								0.078

PROJECT NAME: Miramar/EM2 Project/Windy Lake Outflow
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: Windy Lake Outflow **MEASUREMENT DATE: 15 September 2007**
LOCATION: Outlet of Windy Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 431507 m E, 7555043 m N (NAD 83)

MEASUREMENT BY:TY **MEASUREMENT START TIME: 1615 h**
COMPUTATIONS BY:DC **MEASUREMENT END TIME: 1640 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m) (m)	DEPTH (m) (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m) (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.02			0.00	0.2	0.000
1	0.40		0.02			0.00	0.4	0.000
2	0.80		0.02			0.00	0.4	0.000
	1.20		0.02			0.00	0.4	0.000
3	1.60		0.02			0.00	0.4	0.000
4	2.00		0.08			0.00	0.4	0.000
5	2.40		0.12			0.00	0.4	0.000
6	2.80		0.14			0.00	0.4	0.000
7	3.20		0.20			0.00	0.4	0.000
8	3.60		0.28			0.00	0.4	0.000
9	4.00		0.40			0.01	0.4	0.002
10	4.40		0.42			0.06	0.4	0.010
11	4.80		0.42			0.12	0.4	0.020
12	5.20		0.36			0.20	0.4	0.029
13	5.60		0.30			0.00	0.4	0.000
14	6.00		0.22			0.00	0.4	0.000
15	6.40		0.12			0.00	0.4	0.000
16	6.80		0.08			0.00	0.4	0.000
17	7.20		0.08			0.00	0.4	0.000
18	7.60		0.08			0.00	0.4	0.000
19	8.00		0.08			0.00	0.4	0.000
20	8.40		0.08			0.00	0.4	0.000
21	8.80		0.08			0.00	0.4	0.000
22	9.20		0.03			0.00	0.4	0.000
Left Bank	9.60		0.02			0.00	0.2	0.000
								0.061

GLENN LAKE OUTFLOW HYDROMETRIC STATION

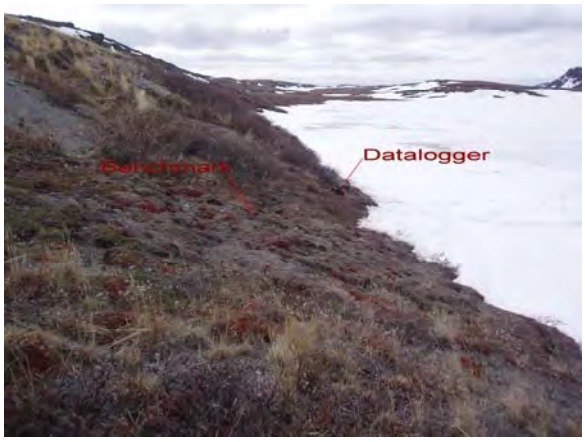
H93

FACTSHEET

LOCATION AND PURPOSE

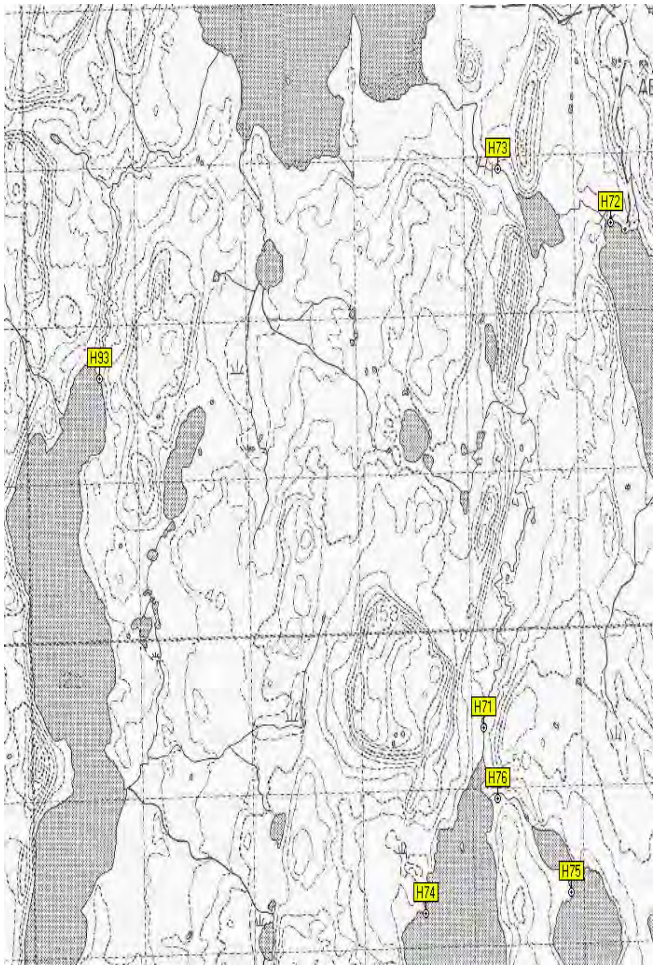
Located approximately 50 m upstream, on the right bank of Glenn Lake outflow.

Operational:	2006 (29 May – 8 September)	2007 (24 May – 15 September)	
Benchmark:	Top of embedded boulder;	Drainage Area:	31.6 km^2
Coordinates:	UTM: 430512 m E, 7562013 m N (NAD83)	Lat/Long:	68°09'48" N, 106°40'27" W
Datalogger:	Optimum Instruments # 1382	Transducer:	Keller #000942 (5 psi, 20 m)



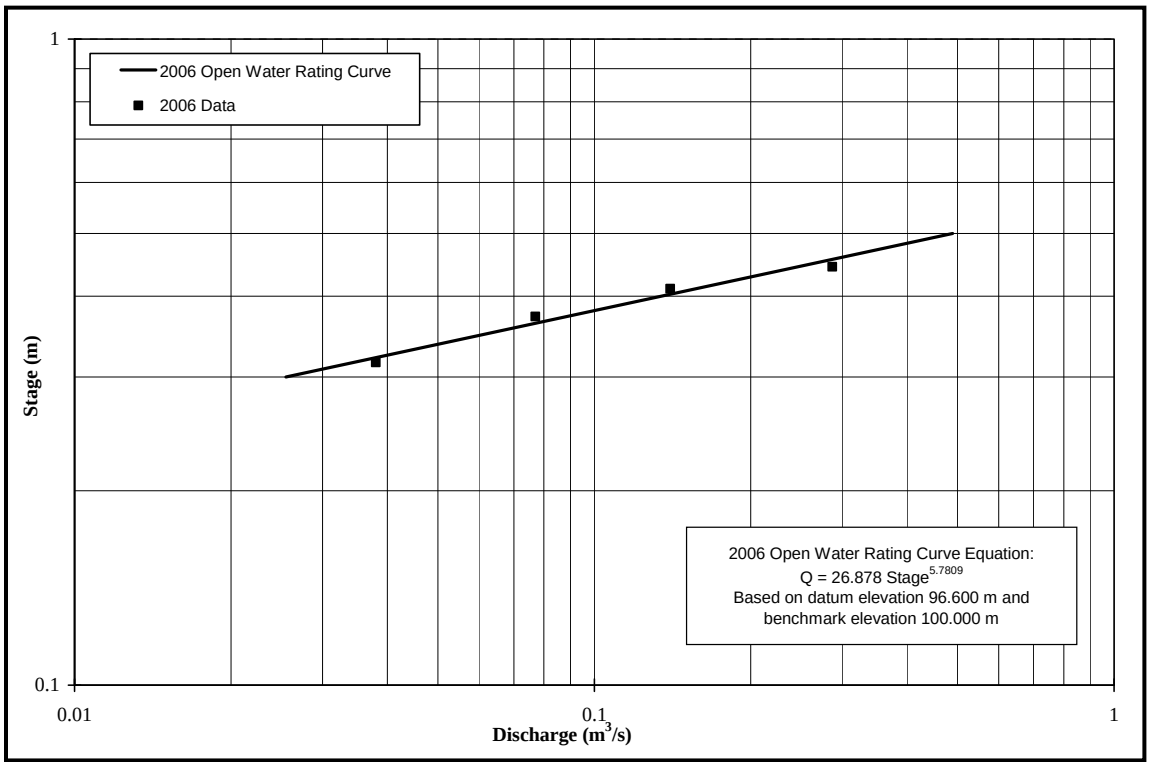
Station H93, Looking South(upstream), on the right bank.

Station H93, Looking North (downstream), on the right bank.

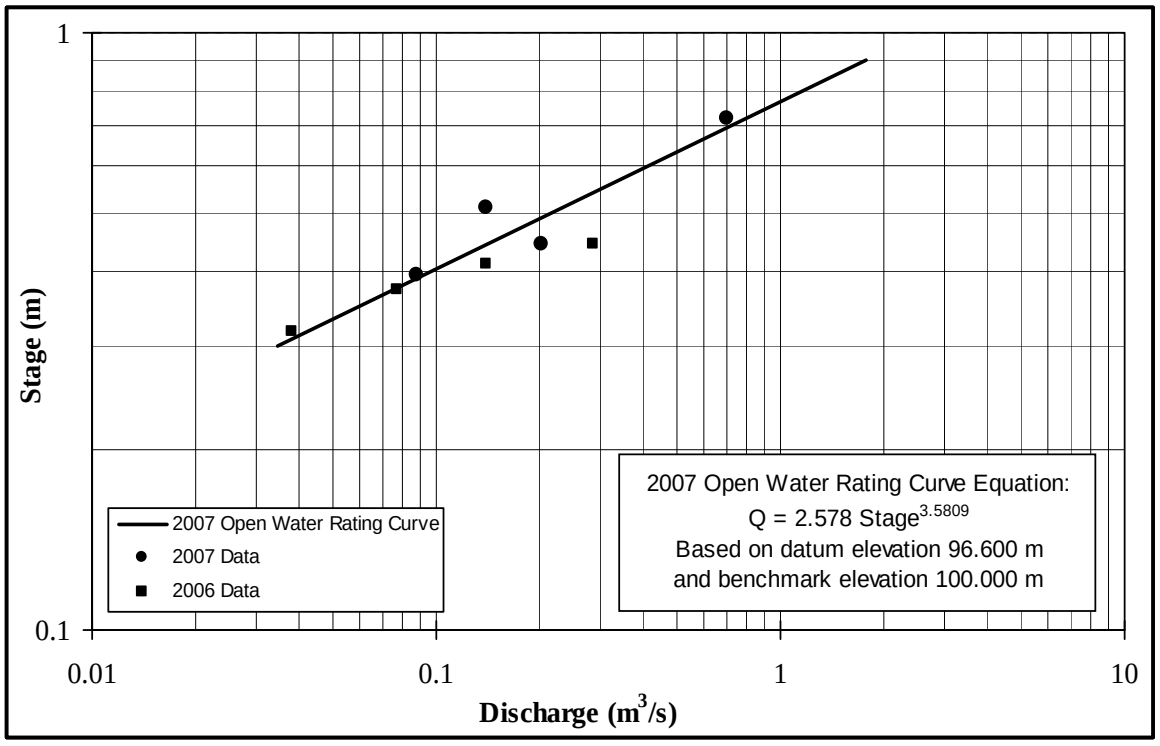


NTS Mapping of Area

FACT-H93-2007.DOC



Glenn Outflow Station H93 – Stage-Discharge Rating Curve (2006)



Glenn Outflow Station H93 – Stage-Discharge Rating Curve (2007)

Glenn Outflow Station H93 – Stage-Discharge Data (2006-2007)

			Stage Datum	99.250 m	(non-geodetic)	
Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
29/05/2006 9:45	1.7642	95.436		97.200	0.600	n/a
16/06/2006 22:45	1.7061	*95.381*		*97.087*	0.487	n/a
transducer shifted by unknown disturbance						
17/06/2006 13:00	1.2041			*97.084*	0.484	n/a
25/06/2006 23:15	1.1790	*95.880*		*97.059*	0.459	n/a
transducer shifted by unknown disturbance						
25/06/2006 23:30	1.1258			*97.059*	0.459	n/a
03/07/2006 13:33	1.1193	95.925		97.044	0.444	0.287
21/07/2006 14:00	1.0776			*97.011*	0.411	0.140
12/08/2006 11:50	1.0388	95.933		96.972	0.372	0.077
08/09/2006 12:59	0.9811	95.935	95.931	96.916	0.316	0.038
22/06/2007 08:45	2.0429			*97.317*	0.717	0.695
07/07/2007 20:36	1.9331	95.274		97.207	0.607	n/a
19/07/2007 20:54	1.9233	95.119		97.042	0.442	0.201
16/08/2007 12:45	1.8819			96.994	0.394	0.088
15/09/2007 15:15	1.8023		95.274	97.108	0.508	0.139

H93 Glenn Outflow - 2006

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	97.147	97.052	96.991	-	-	-	-
2	-	-	-	-	-	97.136	97.052	96.990	-	-	-	-
3	-	-	-	-	-	97.133	97.051	96.988	-	-	-	-
4	-	-	-	-	-	97.130	97.048	96.987	-	-	-	-
5	-	-	-	-	-	97.131	97.045	96.986	-	-	-	-
6	-	-	-	-	-	97.131	97.041	96.984	-	-	-	-
7	-	-	-	-	-	97.123	97.037	96.982	-	-	-	-
8	-	-	-	-	-	97.116	97.033	96.980	-	-	-	-
9	-	-	-	-	-	97.115	97.030	96.980	-	-	-	-
10	-	-	-	-	-	97.114	97.027	96.978	-	-	-	-
11	-	-	-	-	-	97.112	97.025	96.974	-	-	-	-
12	-	-	-	-	-	97.110	97.023	96.973	-	-	-	-
13	-	-	-	-	-	97.108	97.021	-	-	-	-	-
14	-	-	-	-	-	97.105	97.021	-	-	-	-	-
15	-	-	-	-	-	97.099	97.020	-	-	-	-	-
16	-	-	-	-	-	97.091	97.017	-	-	-	-	-
17	-	-	-	-	-	97.084	97.014	-	-	-	-	-
18	-	-	-	-	-	97.079	97.009	-	-	-	-	-
19	-	-	-	-	-	97.076	97.008	-	-	-	-	-
20	-	-	-	-	-	97.074	97.009	-	-	-	-	-
21	-	-	-	-	-	97.070	97.007	-	-	-	-	-
22	-	-	-	-	-	97.066	97.003	-	-	-	-	-
23	-	-	-	-	-	97.063	97.005	-	-	-	-	-
24	-	-	-	-	-	97.059	97.007	-	-	-	-	-
25	-	-	-	-	-	97.060	97.006	-	-	-	-	-
26	-	-	-	-	-	97.054	97.002	-	-	-	-	-
27	-	-	-	-	-	97.052	96.994	-	-	-	-	-
28	-	-	-	-	-	97.051	96.995	-	-	-	-	-
29	-	-	-	-	97.151 P	97.048	96.994	-	-	-	-	-
30	-	-	-	-	97.163	97.048	96.992	-	-	-	-	-
31	-	-	-	-	97.162	-	96.992	-	-	-	-	-
MIN	-	-	-	-	97.151	97.048	96.992	96.973	-	-	-	-
MEAN	-	-	-	-	97.159	97.093	97.019	96.983	-	-	-	-
MAX	-	-	-	-	97.163	97.147	97.052	96.991	-	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	0.819	0.272	0.118	-	-	-	-
2	-	-	-	-	-	0.732	0.272	0.116	-	-	-	-
3	-	-	-	-	-	0.705	0.269	0.113	-	-	-	-
4	-	-	-	-	-	0.687	0.261	0.111	-	-	-	-
5	-	-	-	-	-	0.693	0.249	0.109	-	-	-	-
6	-	-	-	-	-	0.693	0.236	0.106	-	-	-	-
7	-	-	-	-	-	0.634	0.225	0.103	-	-	-	-
8	-	-	-	-	-	0.585	0.214	0.100	-	-	-	-
9	-	-	-	-	-	0.579	0.203	0.100	-	-	-	-
10	-	-	-	-	-	0.577	0.195	0.097	-	-	-	-
11	-	-	-	-	-	0.561	0.190	0.091	-	-	-	-
12	-	-	-	-	-	0.545	0.186	0.089	-	-	-	-
13	-	-	-	-	-	0.534	0.182	-	-	-	-	-
14	-	-	-	-	-	0.516	0.180	-	-	-	-	-
15	-	-	-	-	-	0.484	0.178	-	-	-	-	-
16	-	-	-	-	-	0.441	0.170	-	-	-	-	-
17	-	-	-	-	-	0.404	0.164	-	-	-	-	-
18	-	-	-	-	-	0.383	0.152	-	-	-	-	-
19	-	-	-	-	-	0.369	0.152	-	-	-	-	-
20	-	-	-	-	-	0.357	0.153	-	-	-	-	-
21	-	-	-	-	-	0.340	0.148	-	-	-	-	-
22	-	-	-	-	-	0.324	0.141	-	-	-	-	-
23	-	-	-	-	-	0.313	0.144	-	-	-	-	-
24	-	-	-	-	-	0.300	0.149	-	-	-	-	-
25	-	-	-	-	-	0.304	0.146	-	-	-	-	-
26	-	-	-	-	-	0.278	0.139	-	-	-	-	-
27	-	-	-	-	-	0.273	0.124	-	-	-	-	-
28	-	-	-	-	-	0.268	0.125	-	-	-	-	-
29	-	-	-	-	0.858 P	0.258	0.123	-	-	-	-	-
30	-	-	-	-	0.967	0.260	0.120	-	-	-	-	-
31	-	-	-	-	0.962	-	0.119	-	-	-	-	-
MIN	-	-	-	-	0.858	0.258	0.119	0.089	-	-	-	-
MEAN	-	-	-	-	0.929	0.474	0.180	0.105	-	-	-	-
MAX	-	-	-	-	0.967	0.819	0.272	0.118	-	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

H93 Glenn Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	0.501	1.073	-	-	-	-	-
2	-	-	-	-	-	0.432	0.866	-	-	-	-	-
3	-	-	-	-	-	0.330	0.633	-	-	-	-	-
4	-	-	-	-	-	0.375	-	-	-	-	-	-
5	-	-	-	-	-	0.410	-	-	-	-	-	-
6	-	-	-	-	-	0.477	-	-	-	-	-	-
7	-	-	-	-	-	0.535	-	-	-	-	-	-
8	-	-	-	-	-	0.493	-	-	-	-	-	-
9	-	-	-	-	-	0.477	-	-	-	-	-	-
10	-	-	-	-	-	0.546	-	-	-	-	-	-
11	-	-	-	-	-	0.552	-	-	-	-	-	-
12	-	-	-	-	-	0.501	-	-	-	-	-	-
13	-	-	-	-	-	0.519	-	-	-	-	-	-
14	-	-	-	-	-	0.508	-	-	-	-	-	-
15	-	-	-	-	-	0.529	-	-	-	-	-	-
16	-	-	-	-	-	0.630	-	-	-	-	-	-
17	-	-	-	-	-	0.755	-	-	-	-	-	-
18	-	-	-	-	-	0.954	-	-	-	-	-	-
19	-	-	-	-	-	1.091	-	-	-	-	-	-
20	-	-	-	-	-	0.973	-	-	-	-	-	-
21	-	-	-	-	-	0.876	-	-	-	-	-	-
22	-	-	-	-	-	0.759	-	-	-	-	-	-
23	-	-	-	-	-	0.704	-	-	-	-	-	-
24	-	-	-	-	0.433 P	0.724	-	-	-	-	-	-
25	-	-	-	-	0.495	0.651	-	-	-	-	-	-
26	-	-	-	-	0.538	0.649	-	-	-	-	-	-
27	-	-	-	-	0.403	0.750	-	-	-	-	-	-
28	-	-	-	-	0.333	0.604	-	-	-	-	-	-
29	-	-	-	-	0.481	0.613	-	-	-	-	-	-
30	-	-	-	-	0.416	0.622	-	-	-	-	-	-
31	-	-	-	-	0.452	-	-	-	-	-	-	-
MIN	-	-	-	-	0.333	0.330	0.633	-	-	-	-	-
MEAN	-	-	-	-	0.444	0.618	0.857	-	-	-	-	-
MAX	-	-	-	-	0.538	1.091	1.073	-	-	-	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	97.233	97.367	-	-	-	-	-
2	-	-	-	-	-	97.207	97.334	-	-	-	-	-
3	-	-	-	-	-	97.163	97.273	-	-	-	-	-
4	-	-	-	-	-	97.184	-	-	-	-	-	-
5	-	-	-	-	-	97.198	-	-	-	-	-	-
6	-	-	-	-	-	97.224	-	-	-	-	-	-
7	-	-	-	-	-	97.244	-	-	-	-	-	-
8	-	-	-	-	-	97.230	-	-	-	-	-	-
9	-	-	-	-	-	97.224	-	-	-	-	-	-
10	-	-	-	-	-	97.248	-	-	-	-	-	-
11	-	-	-	-	-	97.250	-	-	-	-	-	-
12	-	-	-	-	-	97.232	-	-	-	-	-	-
13	-	-	-	-	-	97.238	-	-	-	-	-	-
14	-	-	-	-	-	97.235	-	-	-	-	-	-
15	-	-	-	-	-	97.242	-	-	-	-	-	-
16	-	-	-	-	-	97.275	-	-	-	-	-	-
17	-	-	-	-	-	97.309	-	-	-	-	-	-
18	-	-	-	-	-	97.356	-	-	-	-	-	-
19	-	-	-	-	-	97.386	-	-	-	-	-	-
20	-	-	-	-	-	97.362	-	-	-	-	-	-
21	-	-	-	-	-	97.339	-	-	-	-	-	-
22	-	-	-	-	-	97.310	-	-	-	-	-	-
23	-	-	-	-	-	97.292	-	-	-	-	-	-
24	-	-	-	-	97.208 P	97.298	-	-	-	-	-	-
25	-	-	-	-	97.230	97.277	-	-	-	-	-	-
26	-	-	-	-	97.245	97.276	-	-	-	-	-	-
27	-	-	-	-	97.194	97.297	-	-	-	-	-	-
28	-	-	-	-	97.164	97.261	-	-	-	-	-	-
29	-	-	-	-	97.225	97.265	-	-	-	-	-	-
30	-	-	-	-	97.201	97.269	-	-	-	-	-	-
31	-	-	-	-	97.215	-	-	-	-	-	-	-
MIN	-	-	-	-	97.164	97.163	97.273	-	-	-	-	-
MEAN	-	-	-	-	97.210	97.264	97.325	-	-	-	-	-
MAX	-	-	-	-	97.245	97.386	97.367	-	-	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Glenn Outflow **MEASUREMENT DATE: 3 July 2006**
LOCATION: Outlet of Glenn Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT BY: TA/PE **MEASUREMENT START TIME: 1333 h**
COMPUTATIONS BY: NS/TJ **MEASUREMENT END TIME: 1350 h est.**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.79		0.00			0.00	0.105	0.000
1	1.00		0.02			0.00	0.355	0.000
2	1.50		0.05			0.00	0.5	0.000
3	2.00		0.12			0.00	0.375	0.000
4	2.25		0.17			0.00	0.25	0.000
5	2.50		0.18			0.06	0.25	0.003
6	2.75		0.26			0.47	0.25	0.031
7	3.00		0.32			0.53	0.25	0.042
8	3.25		0.32			0.63	0.25	0.050
9	3.50		0.33			0.70	0.25	0.058
10	3.75		0.27			0.67	0.25	0.045
11	4.00		0.35			0.52	0.25	0.046
12	4.25		0.23			0.21	0.25	0.012
13	4.50		0.03			0.00	0.19	0.000
Right Bank	4.63		0.00			0.00	0.065	0.000
								0.287

PROJECT NAME: Miramar/M2 Program
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Glenn Outflow
LOCATION: Outlet of Glenn Lake
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT DATE: 21 July 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: TA/PE
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1400 h
MEASUREMENT END TIME: 1415 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.20		0.00			0.00	0.1	0.000
1	2.40		0.16			0.30	0.2	0.010
2	2.60		0.18			0.45	0.2	0.016
3	2.80		0.20			0.45	0.2	0.018
4	3.00		0.20			0.56	0.2	0.022
5	3.20		0.20			0.41	0.2	0.016
6	3.40		0.20			0.45	0.2	0.018
7	3.60		0.20			0.36	0.2	0.014
8	3.80		0.20			0.22	0.2	0.009
9	4.00		0.18			0.44	0.2	0.016
Right Bank	4.20		0.04			0.00	0.1	0.000
								0.140

PROJECT NAME: Miramar/M2 Program/ Glenn Lake Outflow
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Glenn Outflow
LOCATION: Outlet of Glenn Lake
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT DATE: 12 August 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: NS
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1104 h
MEASUREMENT END TIME: 1119 h

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.90		0.00			0.00	0.05	0.000
1	3.00		0.05			0.00	0.1	0.000
2	3.10		0.09			0.27	0.1	0.002
3	3.20		0.10			0.25	0.1	0.003
4	3.30		0.11			0.29	0.1	0.003
5	3.40		0.14			0.29	0.1	0.004
6	3.50		0.18			0.42	0.1	0.008
7	3.60		0.16			0.52	0.1	0.008
8	3.70		0.15			0.56	0.1	0.008
9	3.80		0.14			0.54	0.1	0.008
10	3.90		0.15			0.40	0.1	0.006
11	4.00		0.15			0.26	0.1	0.004
12	4.10		0.15			0.18	0.1	0.003
13	4.20		0.14			0.14	0.1	0.002
14	4.30		0.13			0.09	0.1	0.001
15	4.40		0.12			0.27	0.1	0.003
16	4.50		0.11			0.37	0.1	0.004
17	4.60		0.08			0.29	0.1	0.002
18	4.70		0.09			0.26	0.1	0.002
19	4.80		0.09			0.27	0.1	0.002
20	4.90		0.05			0.23	0.1	0.001
21	5.00		0.08			0.21	0.075	0.001
Right Bank	5.05		0.00			0.00	0.025	0.000
								0.077

PROJECT NAME: Miramar/M2 Program/ Glenn Lake Outflow
PROJECT NO.: 06-1373-028.4000
DISCHARGE DATA

STREAM NAME: Glenn Outflow
LOCATION: Outlet of Glenn Lake
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT DATE: 8 September 2006
METER NUMBER: Marsh-McBirney

MEASUREMENT BY: KK/PE
COMPUTATIONS BY: NS/TJ

MEASUREMENT START TIME: 1259 h
MEASUREMENT END TIME: 1320 h est.

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	2.20		0.00			0.00	0.1	0.000
1	2.40		0.05			0.00	0.2	0.000
2	2.60		0.08			0.00	0.2	0.000
3	2.80		0.17			0.01	0.2	0.000
4	3.00		0.18			0.04	0.2	0.001
5	3.20		0.22			0.10	0.2	0.004
6	3.40		0.23			0.31	0.2	0.014
7	3.60		0.21			0.23	0.2	0.010
8	3.80		0.20			0.12	0.2	0.005
9	4.00		0.19			0.07	0.2	0.003
10	4.20		0.16			0.01	0.15	0.000
11	4.30		0.03			0.00	0.055	0.000
Right Bank	4.31		0.00			0.00	0.005	0.000
								0.038

PROJECT NAME: Miramar/EM2 Expansion/Glenn Lake Outflow

PROJECT NUMBER: 07 1373 0019.4000

DISCHARGE DATA

STREAM NAME: Glenn Lake Outflow **MEASUREMENT DATE: 22 June 2007**

LOCATION: Outlet of Glenn Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT BY: PE **MEASUREMENT START TIME: 0838 h**

COMPUTATIONS BY: TJ/DC **MEASUREMENT END TIME: 0850 h**

STATION	DISTANCE FROM LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	8.00		0.04			0.00	0.325	0.000
1	7.35		0.17			0.00	0.65	0.000
2	6.70		0.23			0.03	0.65	0.004
3	6.05		0.24			0.05	0.65	0.008
4	5.40		0.34			0.36	0.65	0.080
5	4.75		0.54			0.31	0.65	0.109
6	4.10		0.58			0.56	0.65	0.211
7	3.45		0.54			0.68	0.65	0.239
8	2.80		0.28			0.20	0.65	0.036
9	2.15		0.10			0.15	0.575	0.009
Right Bank	1.65		0.02			0.00	0.25	0.000
								0.695

PROJECT NAME: Miramar/EM2 Expansion/Glenn Lake Outflow
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: Glenn Lake Outflow **MEASUREMENT DATE: 19 July 2007**
LOCATION: Outlet of Glenn Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT BY: MK/HS **MEASUREMENT START TIME: 2105h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 2120h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	0.68		0.00			0.00	0.03	0.000
1	0.74		0.02			-0.33	0.085	-0.001
2	0.85		0.09			0.25	0.105	0.002
3	0.95		0.16			0.21	0.1	0.003
4	1.05		0.28			0.33	0.1	0.009
5	1.15		0.33			0.39	0.1	0.013
6	1.25		0.34			0.52	0.1	0.018
7	1.35		0.34			0.49	0.1	0.017
8	1.45		0.36			0.62	0.1	0.022
9	1.55		0.35			0.57	0.1	0.020
10	1.65		0.32			0.55	0.1	0.018
11	1.75		0.32			0.48	0.1	0.015
12	1.85		0.31			0.41	0.1	0.013
13	1.95		0.29			0.40	0.1	0.012
14	2.05		0.29			0.38	0.1	0.011
15	2.15		0.28			0.26	0.1	0.007
16	2.25		0.28			0.18	0.1	0.005
17	2.35		0.22			0.17	0.1	0.004
18	2.45		0.24			0.22	0.1	0.005
19	2.55		0.23			0.14	0.1	0.003
20	2.65		0.24			0.10	0.1	0.002
21	2.75		0.18			0.08	0.1	0.001
22	2.85		0.08			0.03	0.1	0.000
Right Bank	2.95		0.02			0.00	0.05	0.000
								0.201

PROJECT NAME: Miramar/EM2 Expansion/Glenn Lake Outflow
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: Glenn Lake Outflow **MEASUREMENT DATE: 16 August 2007**
LOCATION: Outlet of Glenn Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1230 h**
COMPUTATIONS BY: TJ/DC **MEASUREMENT END TIME: 1258 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	1.30		0.02			0.00	0.15	0.000
1	1.60		0.08			-0.03	0.30	-0.001
2	1.90		0.22			-0.03	0.30	-0.002
3	2.20		0.27			-0.03	0.30	-0.002
4	2.50		0.50			-0.04	0.30	-0.006
5	2.80		0.65			-0.04	0.30	-0.008
6	3.10		0.72			-0.04	0.30	-0.009
7	3.40		0.74			-0.03	0.30	-0.007
8	3.70		0.73			-0.03	0.30	-0.007
9	4.00		0.75	-0.03	-0.04	-0.04	0.30	-0.008
10	4.30		0.79	-0.01	0.03	0.01	0.30	0.002
11	4.60		0.88	0.03	0.01	0.02	0.30	0.005
12	4.90		0.86	0.08	0.07	0.08	0.30	0.019
13	5.20		0.83	0.11	0.09	0.10	0.30	0.025
14	5.50		0.80	0.16	0.09	0.13	0.30	0.030
15	5.80		0.77	0.19	0.14	0.17	0.30	0.038
16	6.10		0.70			0.15	0.30	0.032
17	6.40		0.70			0.04	0.30	0.008
18	6.70		0.68			0.00	0.30	0.000
19	7.00		0.68			-0.02	0.40	-0.005
20	7.50		0.60			-0.02	0.50	-0.006
21	8.00		0.42			-0.03	0.75	-0.009
22	9.00		0.19			-0.01	1.00	-0.002
LeftBank	10.00		0.02			0.00	0.50	0.000
								0.088

PROJECT NAME: Miramar/EM2 Expansion/Glenn Lake Outflow
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: Glenn Lake Outflow **MEASUREMENT DATE: 15 September 2007**
LOCATION: Outlet of Glenn Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 430616 m E, 7561906 m N (NAD 83)

MEASUREMENT BY: TY **MEASUREMENT START TIME: 1515 h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 1530 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	0.00		0.02			0.00	0.1	0.000
1	0.20		0.18			0.01	0.2	0.000
2	0.40		0.22			0.02	0.2	0.001
3	0.60		0.24			0.05	0.2	0.002
4	0.80		0.28			0.05	0.2	0.003
5	1.00		0.28			0.14	0.2	0.008
6	1.20		0.27			0.16	0.2	0.009
7	1.40		0.29			0.19	0.2	0.011
8	1.60		0.24			0.31	0.2	0.015
9	1.80		0.28			0.38	0.2	0.021
10	2.00		0.26			0.36	0.2	0.019
11	2.20		0.26			0.41	0.2	0.021
12	2.40		0.26			0.36	0.2	0.019
13	2.60		0.24			0.21	0.2	0.010
LeftBank	2.80		0.04			0.00	0.1	0.000
								0.139

PO LAKE
HYDROMETRIC STATION

H89

FACTSHEET

LOCATION AND PURPOSE

Operational:	2007 (14 June – 14 September)		
Benchmarks:	Top of embedded boulder; bedrock face	Drainage Area:	64.9 km2
Coordinates:	UTM: 436565 m E, 7550014 m N (NAD83)	Lat/Long:	68°03'26" N, 106°31'16" W
Datalogger:	Optimum Instruments #1396	Transducer:	Keller #000932 (5 psi, 20 m)

PO Lake Hydrometric Station 1- Lake Station

Upstream PO Lake Outlet Station, looking downstream

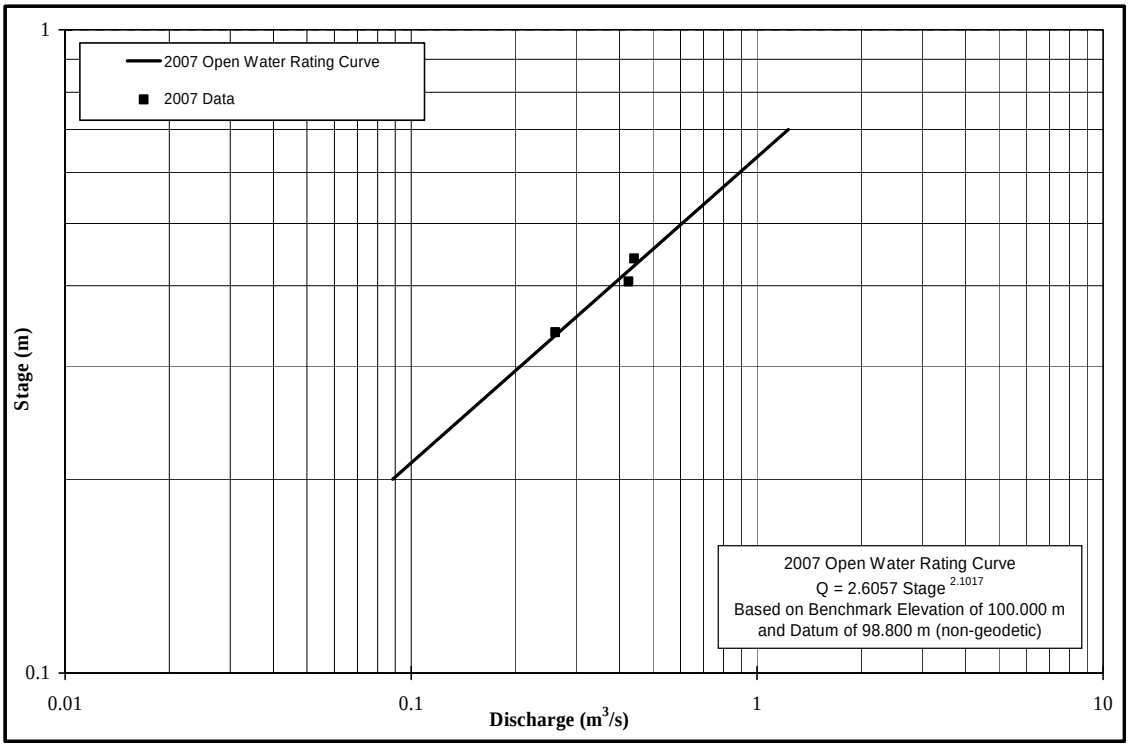
Upstream PO Lake Outlet Station, looking offshore

PO Lake Hydrometric Station 2 – Outlet

Downstream PO Lake outlet station showing location of temporary benchmark

Downstream PO Lake Outlet Station showing old staff gauge

FACT-H89-2007.DOC



PO Lake Outflow Station H89 – Stage-Discharge Rating Curve (2007)

PO Lake Outflow Station H89 – Stage-Discharge Data (2007)

			Stage Datum	98.800 m	(non-geodetic)	
Date & Time	Transducer Reading (m)	Transducer Elevation (m)	Average Transducer Elevation (m)	Water Surface Elevation (m)	Stage (m)	Measured Discharge (m^3/s)
22/07/2007 14:25						0.111
10/07//2007 12:50	0.5700	98.6710		99.241	0.441	0.441
14/08/2007 13:30	0.5350			*99.206*	0.406	0.425
14/09/2007 08:30	0.4676		98.6710	*99.139*	0.339	0.261

H89 PO Lake Outflow - 2007

MEAN DAILY DISCHARGE (m^3/s)

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	0.670	0.132	0.414	0.109 E	-	-
2	-	-	-	-	-	-	0.602	0.126	0.397	0.100 E	-	-
3	-	-	-	-	-	-	0.557	0.120	0.381	0.091 E	-	-
4	-	-	-	-	-	-	0.521	0.115	0.364	0.082 E	-	-
5	-	-	-	-	-	-	0.498	0.108	0.358	0.073 E	-	-
6	-	-	-	-	-	-	0.488	0.107	0.347	0.064 E	-	-
7	-	-	-	-	-	-	0.451	0.103	0.334	0.055 E	-	-
8	-	-	-	-	-	-	0.456	0.102	0.328	0.046 E	-	-
9	-	-	-	-	-	-	0.433	0.147	0.320	0.037 E	-	-
10	-	-	-	-	-	-	0.461	0.187	0.307	0.028 E	-	-
11	-	-	-	-	-	-	0.438	0.213	0.304	0.019 E	-	-
12	-	-	-	-	-	-	0.406	0.251	0.295	0.010 E	-	-
13	-	-	-	-	-	-	0.377	0.321	0.272	-	-	-
14	-	-	-	-	-	-	0.354	0.383	0.263	-	-	-
15	-	-	-	-	-	-	0.332	0.419	0.254 E	-	-	-
16	-	-	-	-	-	-	0.302	0.441	0.245 E	-	-	-
17	-	-	-	-	-	-	0.278	0.438	0.236 E	-	-	-
18	-	-	-	-	-	0.817 P	0.263	0.424	0.227 E	-	-	-
19	-	-	-	-	-	0.792	0.249	0.500	0.218 E	-	-	-
20	-	-	-	-	-	0.740	0.238	0.686	0.209 E	-	-	-
21	-	-	-	-	-	0.732	0.228	0.753	0.200 E	-	-	-
22	-	-	-	-	-	0.678	0.202	0.724	0.191 E	-	-	-
23	-	-	-	-	-	0.615	0.192	0.664	0.182 E	-	-	-
24	-	-	-	-	-	0.713	0.186	0.622	0.173 E	-	-	-
25	-	-	-	-	-	0.853	0.182	0.578	0.164 E	-	-	-
26	-	-	-	-	-	0.901	0.175	0.540	0.155 E	-	-	-
27	-	-	-	-	-	0.891	0.167	0.498	0.146 E	-	-	-
28	-	-	-	-	-	0.855	0.159	0.476	0.137 E	-	-	-
29	-	-	-	-	-	0.785	0.154	0.461	0.128 E	-	-	-
30	-	-	-	-	-	0.724	0.151	0.451	0.118 E	-	-	-
31	-	-	-	-	-	-	0.141	0.439	-	-	-	-
MIN	-	-	-	-	-	0.615	0.141	0.102	0.118	0.010	-	-
MEAN	-	-	-	-	-	0.777	0.333	0.372	0.255	0.060	-	-
MAX	-	-	-	-	-	0.901	0.670	0.753	0.414	0.109	-	-

MEAN DAILY WATER SURFACE ELEVATION (m) BASED ON BENCHMARK ELEVATION 100.000 m

DATE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1	-	-	-	-	-	-	99.086	99.042	99.217	-	-	-
2	-	-	-	-	-	-	99.084	99.037	99.208	-	-	-
3	-	-	-	-	-	-	99.079	99.032	99.200	-	-	-
4	-	-	-	-	-	-	99.073	99.026	99.192	-	-	-
5	-	-	-	-	-	-	99.068	99.020	99.189	-	-	-
6	-	-	-	-	-	-	99.062	99.019	99.183	-	-	-
7	-	-	-	-	-	-	99.059	99.015	99.176	-	-	-
8	-	-	-	-	-	-	99.054	99.014	99.173	-	-	-
9	-	-	-	-	-	-	99.045	99.054	99.169	-	-	-
10	-	-	-	-	-	-	99.239	99.085	99.162	-	-	-
11	-	-	-	-	-	-	99.228	99.104	99.160	-	-	-
12	-	-	-	-	-	-	99.213	99.128	99.154	-	-	-
13	-	-	-	-	-	-	99.198	99.169	99.141	-	-	-
14	-	-	-	-	-	-	99.187	99.201	99.136 P	-	-	-
15	-	-	-	-	-	-	99.175	99.219	-	-	-	-
16	-	-	-	-	-	-	99.158	99.229	-	-	-	-
17	-	-	-	-	-	-	99.145	99.228	-	-	-	-
18	-	-	-	-	-	99.235 P	99.136	99.222	-	-	-	-
19	-	-	-	-	-	99.221	99.127	99.255	-	-	-	-
20	-	-	-	-	-	99.206	99.120	99.330	-	-	-	-
21	-	-	-	-	-	99.192	99.114	99.354	-	-	-	-
22	-	-	-	-	-	99.181	99.096	99.344	-	-	-	-
23	-	-	-	-	-	99.167	99.089	99.322	-	-	-	-
24	-	-	-	-	-	99.151	99.085	99.306	-	-	-	-
25	-	-	-	-	-	99.139	99.082	99.288	-	-	-	-
26	-	-	-	-	-	99.132	99.077	99.273	-	-	-	-
27	-	-	-	-	-	99.123	99.071	99.255	-	-	-	-
28	-	-	-	-	-	99.118	99.064	99.245	-	-	-	-
29	-	-	-	-	-	99.104	99.060	99.238	-	-	-	-
30	-	-	-	-	-	99.093	99.058	99.234	-	-	-	-
31	-	-	-	-	-	-	99.049	99.228	-	-	-	-
MIN	-	-	-	-	-	99.093	99.045	99.014	99.136	-	-	-
MEAN	-	-	-	-	-	99.159	99.109	99.178	99.176	-	-	-
MAX	-	-	-	-	-	99.235	99.239	99.354	99.217	-	-	-

NOTES: P - PARTIAL DAILY AVERAGE E - ESTIMATED

PROJECT NAME: Miramar/EM2 Expansion/PO Lake
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: PO Lake Outflow **MEASUREMENT DATE: 22 June 2007**
LOCATION: Outlet of PO Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 13W 0436664 E 7550193 N

MEASUREMENT BY: PE/ **MEASUREMENT START TIME: 1330 h**
COMPUTATIONS BY: TJ/DC **MEASUREMENT END TIME: 1350 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Right Bank	0.00		0.10			0.00	1.025	0.000
1	2.05		0.27			0.00	2.05	0.000
2	4.10		0.29			0.01	2.05	0.006
3	6.15		0.28			0.04	2.05	0.023
4	8.20		0.26			0.02	2.05	0.011
5	10.25		0.26			0.02	1.8	0.009
6	11.80		0.00			0.00	1.025	0.000
7	12.30		0.72			0.09	0.7	0.045
8	13.20		0.00			0.00	1.025	0.000
9	14.35		0.31			0.01	1.6	0.005
10	16.40		0.28			0.02	2.05	0.011
11	18.45		0.24			0.00	2.05	0.000
12	20.50		0.14			0.00	1.275	0.000
Right Bank	21.00		0.10			0.00	0.25	0.000
								0.111

PROJECT NAME: Miramar/EM2 Expansion/PO Lake
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: PO Lake Outflow **MEASUREMENT DATE:10 July 2007**
LOCATION: Outlet of PO Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 13W 0436664 E 7550193 N

MEASUREMENT BY: NS **MEASUREMENT START TIME: 1230 h**
COMPUTATIONS BY:DC/NS **MEASUREMENT END TIME: 1245 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	1.80		0.00			0.00	0.15	0.000
1	2.10		0.10			0.00	0.3	0.000
2	2.40		0.08			0.00	0.2	0.000
3	2.50		0.16			0.00	0.1	0.000
4	2.60		0.45		0.06	0.02	0.15	0.001
5	2.80		0.48		0.30	0.10	0.2	0.009
6	3.00		0.50		0.58	0.19	0.2	0.019
7	3.20		0.52		0.64	0.21	0.2	0.022
8	3.40		0.54		0.64	0.21	0.2	0.023
9	3.60		0.57		0.55	0.18	0.2	0.021
10	3.80		0.52		0.69	0.23	0.2	0.024
11	4.00		0.60		0.81	0.27	0.2	0.032
12	4.20		0.60		0.88	0.29	0.2	0.035
13	4.40		0.60		0.75	0.25	0.2	0.030
14	4.60		0.65		0.51	0.17	0.2	0.022
15	4.80		0.66		0.60	0.20	0.2	0.026
16	5.00		0.68		0.73	0.24	0.2	0.033
17	5.20		0.68		0.78	0.26	0.2	0.035
18	5.40		0.70		0.88	0.29	0.2	0.040
19	5.60		0.74		0.61	0.20	0.2	0.030
20	5.80		0.74		0.58	0.19	0.2	0.028
21	6.00		0.74		0.25	0.08	0.2	0.012
22	6.20		0.71		0.11	0.04	0.15	0.004
23	6.30		0.68		-0.07	-0.02	0.1	-0.002
24	6.40		0.30		-0.05	-0.02	0.2	-0.001
Right Bank	6.70		0.00		0	0.00	0.15	0.000
								0.441

PROJECT NAME: Miramar/EM2 Expansion/PO Lake

PROJECT NUMBER: 07 1373 0019.4000

DISCHARGE DATA

STREAM NAME: PO Lake Outflow **MEASUREMENT DATE:14 August 2007**

LOCATION: Outlet of PO Lake **METER NUMBER: Marsh McBirney**

COORDINATES: 13W 0436664 E 7550193 N

MEASUREMENT BY: TY/
COMPUTATIONS BY:
TJ/DC

MEASUREMENT START TIME: 1119 h

MEASUREMENT END TIME: 1154 h

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	7.50		0.00			0.00	0.25	0.000
1	7.00		0.14			0.00	0.75	0.000
2	6.00		0.14			-0.04	0.2	-0.001
3	6.60		0.20			-0.01	-0.1	0.000
4	6.20		0.20			-0.05	0.3	-0.003
5	6.00		0.52			-0.02	0.2	-0.002
6	5.80		0.56			0.08	0.25	0.011
7	5.50		0.60			0.01	0.25	0.002
8	5.30		0.65			0.12	0.2	0.016
9	5.10		0.69			0.16	0.2	0.022
10	4.90		0.62			0.20	0.2	0.025
11	4.70		0.70			0.11	0.2	0.015
12	4.50		0.73			0.22	0.2	0.032
13	4.30		0.70			0.29	0.2	0.041
14	4.10		0.70			0.20	0.2	0.028
15	3.90		0.65			0.18	0.2	0.023
16	3.70		0.64			0.18	0.2	0.023
17	3.50		0.64			0.26	0.2	0.033
18	3.30		0.62			0.26	0.2	0.032
19	3.10		0.62			0.21	0.2	0.026
20	2.90		0.60			0.21	0.3	0.038
21	2.50		0.60			0.21	0.3	0.038
22	2.30		0.66			0.13	0.2	0.017
23	2.10		0.54			0.05	0.2	0.005
24	1.90		0.56			0.03	0.2	0.003
Right Bank	1.70		0.56			0.00	0.1	0.000
								0.425

PROJECT NAME: Miramar/EM2 Expansion/PO Lake
PROJECT NUMBER: 07 1373 0019.4000
DISCHARGE DATA

STREAM NAME: PO Lake Outflow **MEASUREMENT DATE: 14 September 2007**
LOCATION: Outlet of PO Lake **METER NUMBER: Marsh McBirney**
COORDINATES: 13W 0436664 E 7550193 N

MEASUREMENT BY: PE **MEASUREMENT START TIME: 1025 h**
COMPUTATIONS BY: DC **MEASUREMENT END TIME: 1040 h**

STATION	DISTANCE FROM RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY			WIDTH (m)	DISCHARGE (m^3/s)
				0.2 Depth (m/s)	0.8 Depth (m/s)	0.6 Depth (m/s)		
Left Bank	0.00		0.02			0.00	0.125	0.000
1	0.25		0.08			0.00	0.25	0.000
2	0.50		0.12			0.00	0.25	0.000
3	0.75		0.14			0.00	0.25	0.000
4	1.00		0.14			0.00	0.25	0.000
5	1.25		0.49			0.04	0.25	0.005
6	1.50		0.51			0.07	0.25	0.009
7	1.75		0.48			0.07	0.25	0.008
8	2.00		0.50			0.08	0.25	0.010
9	2.25		0.54			0.14	0.25	0.019
10	2.50		0.66			0.10	0.25	0.017
11	2.75		0.65			0.16	0.25	0.026
12	3.00		0.62			0.12	0.25	0.019
13	3.25		0.64			0.18	0.25	0.029
14	3.50		0.62			0.20	0.25	0.031
15	3.75		0.60			0.17	0.25	0.026
16	4.00		0.58			0.18	0.25	0.026
17	4.25		0.54			0.14	0.25	0.019
18	4.50		0.54			0.10	0.25	0.014
19	4.75		0.52			0.02	0.25	0.003
20	5.00		0.50			0.01	0.25	0.001
21	5.25		0.48			0.01	0.25	0.001
Right Bank	5.50		0.42			0.00	0.125	0.000
								0.261

MISCELLANEOUS ADDITIONAL STREAM DISCHARGE MEASUREMENTS

PROJECT NAME: Miramar M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Aimaokatalok East Inflow **MEASUREMENT DATE: 23 June 2006**
LOCATION: East Inflow of Aimaokatalok Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 443539 m E, 7509431 m N (NAD 83)

MEASUREMENT BY: KK/PE **MEASUREMENT START TIME: 1100 h**
COMPUTATIONS BY: TJ/NS **MEASUREMENT END TIME: 1110 h**

STATION	DISTANCE TO LEFT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Left Bank	0.00		0.00			0.00	0.90	0.000
1	1.80		0.00			0.00	1.00	0.000
2	2.00		0.14			0.03	0.60	0.003
3	3.00		0.27			0.66	1.00	0.178
4	4.00		0.52			0.71	1.00	0.369
5	5.00		0.69			0.92	1.00	0.635
6	6.00		0.48			1.61	1.00	0.773
7	7.00		0.58			1.05	1.00	0.609
8	8.00		0.56			0.58	1.00	0.325
9	9.00		0.63			1.21	1.00	0.762
10	10.00		0.41			1.15	1.00	0.472
11	11.00		0.19			0.59	0.60	0.067
Right Bank	11.20		0.00			0.00	0.10	0.000
								4.192

PROJECT NAME: Miramar M2 Program
PROJECT NO.: 06-1373-027.4000
DISCHARGE DATA

STREAM NAME: Aimaokatalok East Inflow **MEASUREMENT DATE: 16 July 2006**
LOCATION: East Inflow of Aimaokatalok Lake **METER NUMBER: Marsh-McBirney**
COORDINATES: 443539 m E, 7509431 m N (NAD 83)

MEASUREMENT BY: KK/PE **MEASUREMENT START TIME: 1100 h**
COMPUTATIONS BY: TJ/NS **MEASUREMENT END TIME: 1110 h**

STATION	DISTANCE TO RIGHT D/S BANK (m)	ICE THICKNESS (m)	DEPTH (m)	VELOCITY 0.2 Depth (m/s)	VELOCITY 0.8 Depth (m/s)	VELOCITY 0.6 Depth (m/s)	WIDTH (m)	DISCHARGE (m^3/s)
Right Bank	1.80		0.16			0.00	0.35	0.000
1	2.50		0.26			0.08	0.60	0.012
2	3.00		0.42			0.10	0.65	0.027
3	3.80		0.48			0.15	0.75	0.054
4	4.50		0.56			0.20	0.60	0.067
5	5.00		0.45			0.15	0.50	0.034
6	5.50		0.72			0.17	0.50	0.061
7	6.00		0.72			0.20	0.50	0.072
8	6.50		0.70			0.20	0.50	0.070
9	7.00		0.61			0.15	0.50	0.046
10	7.50		0.53			0.25	0.50	0.066
11	8.00		0.53			0.10	0.50	0.027
12	8.50		0.68			0.10	0.80	0.054
13	9.60		0.15			0.05	1.20	0.009
Left Bank	10.90		0.00			0.00	0.65	0.000
								0.600