RECEIVED
By Licensing Administrator at 11:18 am, May 06, 2011

Appendix F5

Report: *Intake Barge Fisheries Study*

TECHNICAL MEMORANDUM

Agnico Eagle Mines Ltd: Meadowbank Division
Environmental Department
Meadowbank, Nunavut, X0X 0A0
867.793.4610

DATE: **March 2011**

SUBJECT: Intake Barge Fisheries Study

Completed by the Meadowbank Environment Department between July and September 2010.

Background and Objectives

The intake barge is located on Third Portage Lake directly east of the camp facilities and provides freshwater camp use and support for mill operations. In 2009, the DFO requested that a study be completed at the intake barge to determine if fish habitat and fish populations were impacted following the installation of the intake barge (refer to DFO letter dated January 20, 2010 NU-08-0040- Revised Freshwater Intake).

The objective of this study was to monitor the small bodied fish population throughout the summer and briefly set gill nets near the intake barge to target large bodied fish to establish fish usage of habitat near the intake barge. The small bodied fish study included electrofishing and setting minnow traps near the shore of the intake barge. Large bodied fish studies were conducted in less then a week and included setting gill nets in the same bay, thus providing a caption of the fish population occupying the intake barge[1]. This memo reports the data collected in 2010 and discusses the results of this study.

See Figure 1 for the location of the intake barge within the mine site.

Methodology

Electrofishing and Minnow Trapping

Fish collection using backpack electrofishing techniques was conducted from late July 2010 through to late August 2010. All of the procedures were based on the use of a Halltech model HT-2000 battery backpack electrofishing unit with an 18 inch anode ring. Electrofishing standard operating procedures were followed at Meadowbank. The collections were undertaken by a certified electrofishing crew leader accompanied by at least one other crew member. The exact GPS coordinates were recorded in each sampling area (presented in Table 1). Water quality measurements such as water temperature, dissolved oxygen, conductivity and pH were also recorded before each sampling. The substrate and water depth in each sampling area were carefully evaluated to maximize the chance of capturing small bodied fish. It has been

[1] In 2009, AEM conducted Habitat Monitoring along the East Dike face. Although a number of methods were used to evaluate the face of the east dike (including sonar transects, observational studies and periphyton studies), the method that produced the best indication of fish usage was short set index gill netting (AEM, 2010).

shown that backpack electrofishing sampling of slimy sculpin in Lac de Gras, Northwest Territories has been most successful when targeting areas of natural rock with smaller cobble in less than 40 cm water depth (Gray et al., 2004).

Trial runs were conducted in low value habitat areas near the target areas before the actual sampling events in order to determine the appropriate voltage and frequency settings. During the trial run, an initial low voltage and low frequency setting was used. Voltage and frequency was increased as necessary. Total shocking time (in seconds) was recorded in each sampling area at the end of sampling. All of the captured fish were measured for length (to the nearest 1mm) and weighed (to the nearest 0.1g). Fish captured inside the reference area (Bay-Goose) area were released into Third Portage Lake. All of the other fish were released in the area proximate to where they were captured.

Fish collection by means of minnow trapping was conducted in August and September 2010 as an extension of the effort to capture small bodied fish. Two to four standard minnow traps were deployed at each sampling station for each sampling event. Minnow traps were deployed for 2-3 days at each station and were typically checked daily for fish. The exact GPS coordinates were recorded at each sampling station and presented in Table 1.

Table 1 : Electrofishing and Minnow Trap Sampling Locations, 2010

Area	Station ID	Station description	GPS Coordinates	Sampling Method
Barge	Barge - 1	Fresh water in-take Trial	14 W 0639001 UTM 7212467	Electrofishing Minnow traps
	Barge - 2	Fresh water in-take pipe	14 W 0637357 UTM 7213782	Electrofishing Minnow traps
Bay-Goose	BayGoose - 1	Bay Goose East – Old dock	14 W 0638935 UTM 7213288	Electrofishing Minnow traps
	Bay Goose - 2	Bay Goose West – South Camp	14 W 0638212 UTM 7213011	Electrofishing

Gill netting

Large Bodied fish studies were conducted between August 13 and August 15th, 2010. The fish were captured using the same gear that was employed for the Bay-Goose Basin fishout. One, six panel gill nets of stretched mesh sizes 126, 102, 76, 51, 38, and 25 mm was used to collect a representative population of large bodied fish in the area of the intake barge. The panels were 1.8 m deep by 22.7 m. Nets were slightly shifted over the 2 days to ensure full coverage near the barge.

To ensure maximum survival rates and reduce handling, fish that appeared healthy were identified to species and only measured for fork length (±1 mm). All fish that appeared unhealthy or dead were collected, identified to species, weighed (±25 g), and measured for fork length in the lab. Autopsies were completed on a select number of these retained fish.

The approximate location of the net sets relative to the barge area are presented in Figure 2.
For the purposes of this study, no reference area was selected for the large bodied fish study.

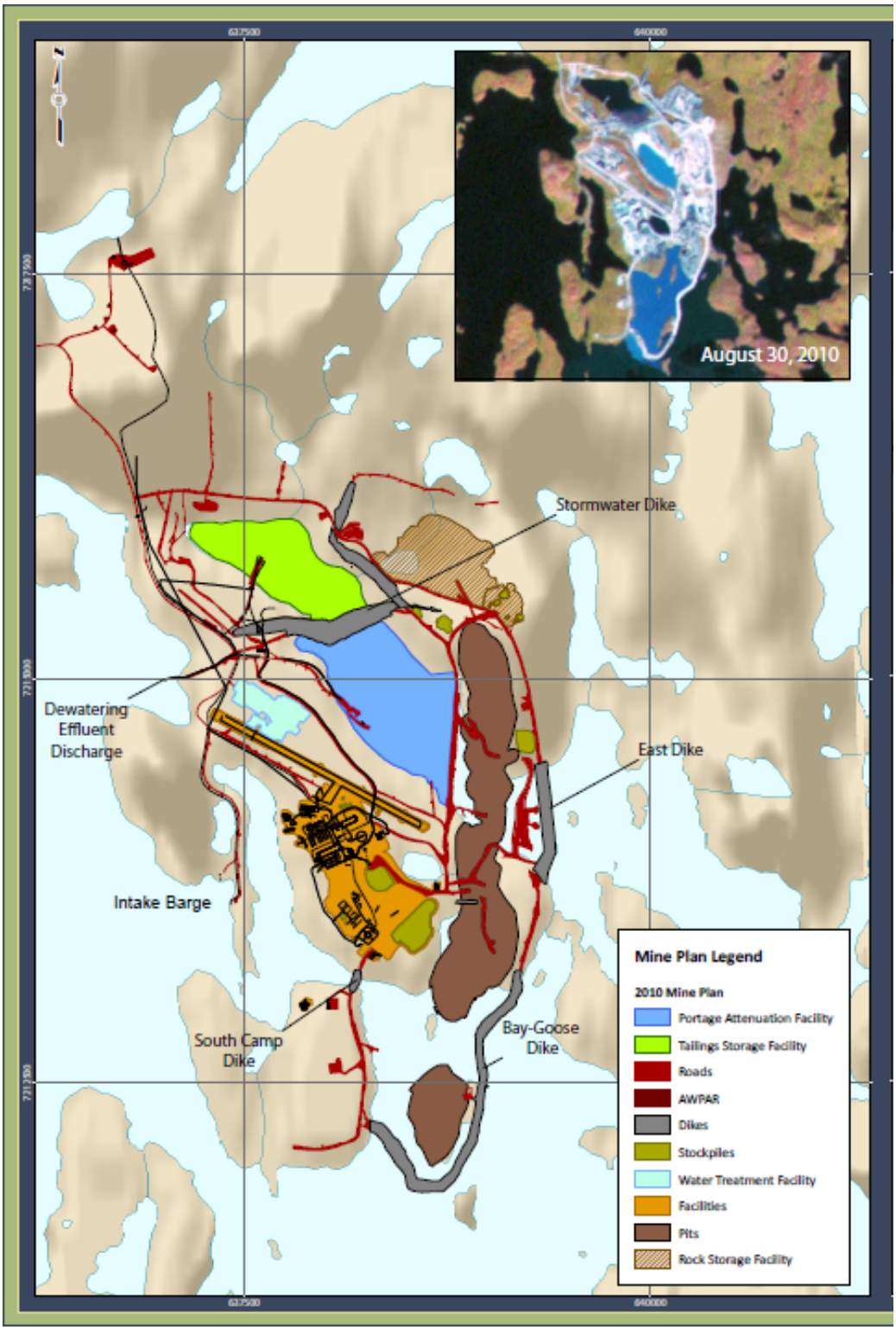


Figure 1: Location of the Intake Barge

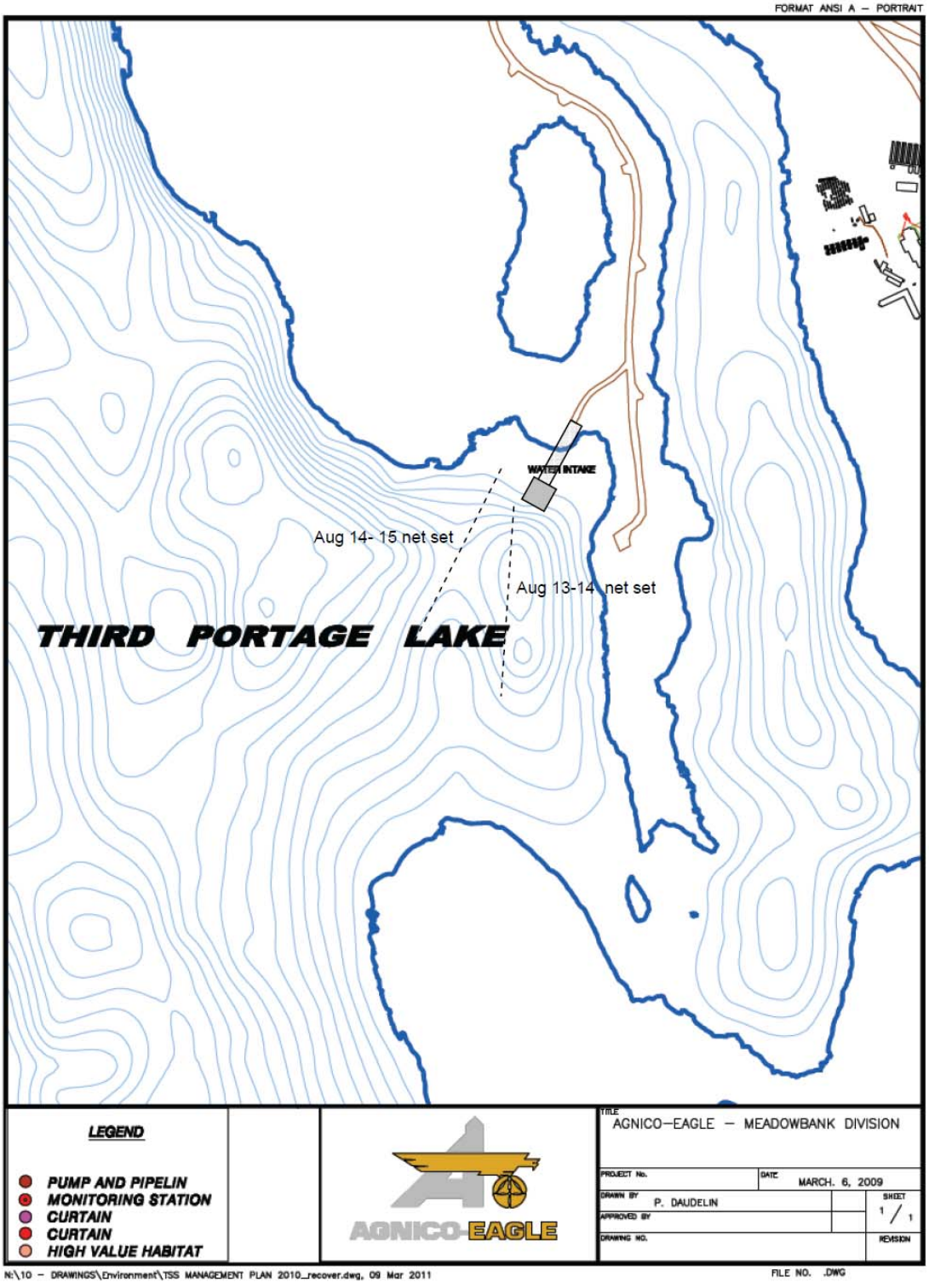


Figure 2: Net set Locations

Results

Electrofishing

In total only three slimy sculpin and three lake trout were collected by electrofishing technique in Third Portage Lake. Two slimy sculpin and one juvenile lake trout were collected in the fresh water in-take barge area; the other slimy sculpin and two juvenile lake trout were collected inside the bay-goose reference area. A small number (<3) of fish were spotted in the sampling areas during electrofishing sampling; however, the fish were not affected by the electrical current sent out by the backpack electrofishing unit and escaped.

Table 2 provides a summary of the results of the fish collected by electrofishing. Due to the inadequate amount of fish collected, the data was not statistically compared between stations. Statistical analysis on fish conditions such as age distribution, size distribution, sex ratio, and condition factor (K) were not performed on the data collected.

Table 2 : Summary of Fish Collection by Electrofishing in Third Portage Lake, 2010

Fish #	Species	Date	Station ID	Length (mm)	Weight (g)	Notes
1	Slimy sculpin	07/22/2010	Barge - 1	61	2.8	Specimen #1
2	Lake trout	07/27/2010	Bay Goose-1	63	4.1	Released
3	Lake trout	07/27/2010	Bay Goose-1	69	5.0	Released
4	Slimy sculpin	07/27/2010	Bay Goose-2	52	2.3	Specimen #2
5	Lake trout	07/28/2010	Barge - 2	67	4.3	Released
6	Slimy sculpin	08/11/2010	Barge - 2	80	3.5	Specimen #3

Minnow Trapping

Two minnow traps were deployed near the intake station Barge-1 and four minnow traps were deployed at station Barge 2 from August 18 to August 21, 2010; two slimy sculpin were captured in minnow traps at station Barge 2. Four minnow traps were deployed at station Bay-Goose 1 from August 29 to August 31, 2010; two nine-spine sticklebacks were captured inside the Bay-Goose area near the old dock. Table 3 provides a summary of the results of the fish collected by minnow traps.

Due to the inadequate amount of fish collected, the data could not be used for statistical comparisons.

Table 3: Summary of Fish Collection by Minnow Trap in Third Portage Lake, 2010						
Fish #	**Species**	**Date**	**Station ID**	**Length (mm)**	**Weight (g)**	**Notes**
7	Slimy sculpin	08/20/2010	Barge - 2	74	3.4	Specimen #4
8	Slimy sculpin	08/21/2010	Barge - 2	55	2.7	Specimen #5
9	Nine-spine stickleback	08/30/2010	Bay Goose-1	54	1.8	Released
10	Nine-spine stickleback	08/31/2010	Bay Goose-1	56	1.8	Released

Gill Netting

One index net collected 23 fish having been set for a total of 21hrs and 50 minutes from August 13th to August 14th. The net was redeployed and set for another 23 hours and removed on August 15th. A total of 42 large bodied fish were caught, 21% arctic char and 79% lake trout. No other large bodied fish species were collected near the intake barge. Twenty four (24) of the 42 fish were released without harm, the remaining were retained for weight and laboratory analysis (as part of another project study).

Arctic char had an average length of 395mm (n=9), weight of 507g and condition factor of 0.90 (n=7[2]); and lake trout had an average length of 514 mm (n=33), weight of 1494 g and a condition factor of 1.00 (n=24) (See Table 4). The size distribution between each species was even with the greatest number of arctic char and lake trout around the mean but overall a large range of lengths of fish were collected (See Figure 3a and b). All of the large bodied field and laboratory data are presented in Table 5.

Table 4: The Mean, Maximum, and Minimum Length, Weight and Condition Factor by Species of Large Bodied Fish Collected Near the Intake Barge						
Species		**Fork Length (mm)**	**n**	**Weight (g)**	**n**	**Condition Factor (K)**
Arctic Char	*Mean*	395.22	9	507.14	7	0.90
	Maximum	600		1425		1.09
	Minimum	206		50		0.57
Lake Trout	*Mean*	514.03	33	1494.12	17	1.00
	Maximum	930		4600		1.33
	Minimum	128		25		0.42
Total			***42***		***24***	

[2] The number of fish (n) weighed is different compared to length as 24 of the fish were released were released without being weighed in the laboratory.

Table 4: Large Bodied Fish Results Collected at the Intake Barge							
Date	Time	Species	Fish #	Fork Length (mm)	Weight (g)	Sex and Maturity	Note:
13-Aug-10	17:45						Net Set
14-Aug-10	15:35	LKTR	1	760			
14-Aug-10	15:35	LKTR	2	660			
14-Aug-10	15:35	LKTR	3	530			
14-Aug-10	15:35	LKTR	4	730			
14-Aug-10	15:35	LKTR	5	755			
14-Aug-10	15:35	LKTR	6	530			
14-Aug-10	15:35	LKTR	7	525			
14-Aug-10	15:35	LKTR	8	930			
14-Aug-10	15:35	LKTR	9	210			
14-Aug-10	15:35	ARCH	10	284	225	F1	
14-Aug-10	15:35	ARCH	11	396	675	M6	
14-Aug-10	15:35	ARCH	12	390	575	F1	
14-Aug-10	15:35	LKTR	13	745	4600	F3	
14-Aug-10	15:35	LKTR	14	590	1775	F3	
14-Aug-10	15:35	LKTR	15	524	1675	M8	
14-Aug-10	15:35	LKTR	16	438	775	F3	
14-Aug-10	15:35	LKTR	17	462	1000	M8	
14-Aug-10	15:35	LKTR	18	341	400	M6	
14-Aug-10	15:35	LKTR	19	237	150	M6	
14-Aug-10	15:35	LKTR	20	261	75	M6	
14-Aug-10	15:35	LKTR	21	210	75	M6	
14-Aug-10	15:35	LKTR	22	128	25	M6	
14-Aug-10	16:20	LKTR	23	131	30	F1	Net Reset
15-Aug-10	14:35	LKTR	24	570			Net checked
15-Aug-10	14:35	LKTR	25	730			
15-Aug-10	14:35	ARCH	26	550			
15-Aug-10	14:35	LKTR	27	525			
15-Aug-10	14:35	LKTR	28	305			
15-Aug-10	14:35	LKTR	29	376			
15-Aug-10	14:35	LKTR	30	759			
15-Aug-10	14:35	LKTR	31	586			
15-Aug-10	14:35	ARCH	32	600			
15-Aug-10	14:35	ARCH	33	515	1425	F3	
15-Aug-10	14:35	ARCH	34	371	500	M6	
15-Aug-10	14:35	ARCH	35	245	100	M6	
15-Aug-10	14:35	ARCH	36	206	50	M6	
15-Aug-10	14:35	LKTR	37	136	25	M6	
15-Aug-10	14:35	LKTR	38	754	4125	F3	
15-Aug-10	14:35	LKTR	39	716	3475	F3	
15-Aug-10	14:35	LKTR	40	643	3125	M8	
15-Aug-10	14:35	LKTR	41	631	2425	F3	
15-Aug-10	15:15	LKTR	42	535	1425	M8	Net pulled

Figure 3a: Length-Frequency Histogram of Arctic Char at the Intake Barge

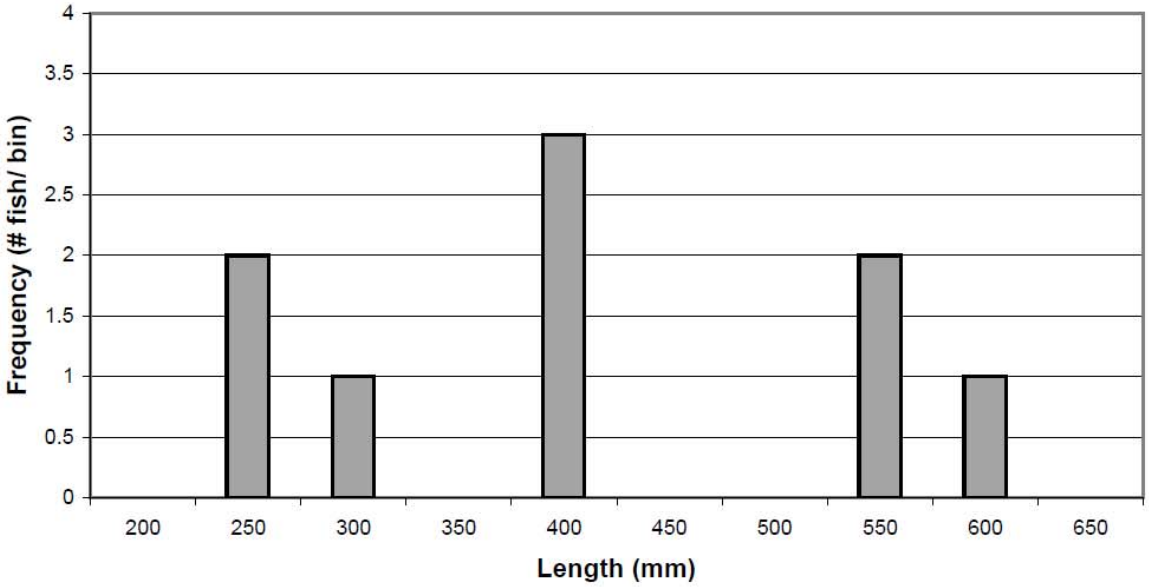
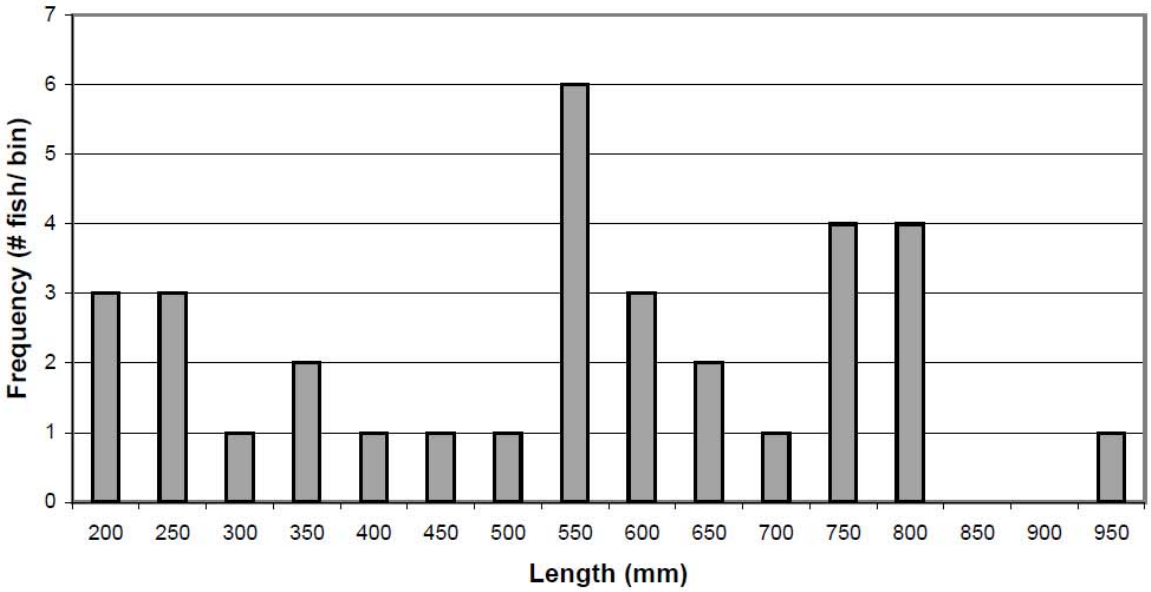


Figure 3b: Length-Frequency Histogram of Lake Trout at the Intake Barge



Discussion and Conclusions

In total 42 large bodied fish with good condition factors and an even distribution through all size ranges were collected near the intake barge. Only arctic char and lake trout species of fish were collected (no round whitefish or burbot), which is likely due to the short duration of net sets and the nature of the targeted habitat near the intake barge. Based on the ~48 hour net sets and the high number of fish collected, the results indicate a health population of large bodied fish occupying the basin near the intake barge.

One juvenile lake trout and four (4) slimy sculpin specimens, were collected through the combination of electrofishing collection and minnow trap collection. The same number of small bodied fish were collected in the reference area (Two ninespine-stickleback, two juvenile lake trout and 1 slimy sculpin). Previous minnow trapping during baseline data collection and during habitat monitoring in 2009 did not collect any fish (zero success minnow trapping). Although the number of small bodied fish collected appears to be low, these results represent the best success for minnow trapping and the first time electrofishing has been attempted at Meadowbank. Ultimately, the low numbers are a characteristic of ultra-oligotrophic lakes like third portage lake, where small bodied fish such as slimy sculpin are not abundant. The minor success indicates that the small bodied fish population is doing well.

Overall, based on the results of this study, the fish habitat near the intake barge does not appear to be impacted by the infrastructure installed in 2009. Observationally, the physical habitat in the area is in good condition as compared to reference areas in the adjacent basin; furthermore no fish have been recorded to have been trapped near the intake barge. The fisheries data collected from July to late August 2010 supports these observational findings and provides a good indication that small bodied fish (including a juvenile lake trout indicating that this area is likely a spawning area) and large bodied fish are inhabiting the bay near the intake barge.

References

AEM. 2010. Aquatic Effects Monitoring Program- Addendum to the 2008 Fish-out of the Northwest Arm of Second Portage Lake: Habitat Mapping of the Northwest Arm of Second Portage Lake 2009. April 2010.

Department of Fisheries and Oceans. 2010. Freshwater Intake Barge- Revised Permit Application. Agnico-Eagle Mines Ltd. AEM, Meadowbank- NU-08-0400- letter addressed to Rachel Gould January 20, 2010.

Gray, M., K. Munkittrick, V.P. Palace, C.L. Baron. 2005. Assessment of slimy sculpin (*Cottus cognatus*) collected from East Island, Lac de Gras, NWT. Report prepared for Diavik Diamond Mines Inc.

Appendix A: Photo Presentation

Photo 1: Electrofishing with a backpack electrofishing unit.

Photo 2: Water quality data recorded before sampling with YSI meter.

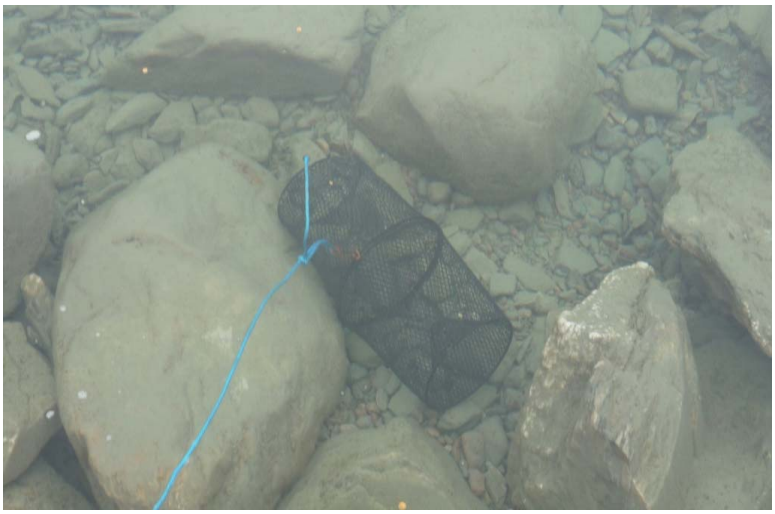


Photo 3: Minnow trap used in this study.

Photo 4: Captured slimy sculpin.

Photo 5: Captured juvenile lake trout. These fish were later release back to where they were captured.