Appendix G7

Report: *2013 Habitat Compensation Monitoring Report*

AGNICO EAGLE

MEADOWBANK GOLD MINE

2013 HABITAT COMPENSATION MONITORING REPORT

In Accordance with

DFO Fisheries Authorizations NU-03-0191.2, NU-03-0191.3 and NU-03-0191.4

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EXECUTIVE SUMMARY

According to Fisheries and Oceans Canada (DFO) Authorizations NU-03-0191.2, NU-03-0191.3 and NU-03-0191.4, AEM maintains a Habitat Compensation Monitoring Plan (HCMP; AEM, 2013) to ensure that fish habitat compensation features are constructed and functioning as intended. Based on the schedule described in the HCMP, monitoring of compensation features currently occurs every 2 years.

In 2013, monitoring was conducted for the constructed spawning pad, located at stream crossing R02 along the all-weather access road (AWAR). Monitoring was not required for the mine site habitat compensation features. As described in the schedule of monitoring events, the AWAR study included a visual assessment of stability, as well biological monitoring to confirm use by Arctic grayling.

The field analysis was conducted from June 14 – 29, 2013. The major component of the program consisted of length and weight measurements and maturity identifications of adult fish captured in hoopnets. Nets were set to capture both upstream and downstream movements, and were set as soon as ice conditions allowed. Additionally, reproductive success in this reach was assessed using larval drift traps.

The constructed spawning pads were visually confirmed to be stable as designed. Rates of shifting of material have not exceeded expectations at construction. Generally, condition factors of adult fish, population size distributions and timing of migration were within the range of values seen in previous years, confirming continued use of this area by Arctic grayling. It is suspected that the primary upstream migration occurs below ice cover or immediately at ice-off, since Arctic grayling larval drift has been consistently caught within 1-3 days of study initiation. Larval drift rates of collection continue to exceed those observed prior to construction of the spawning pad, suggesting a positive impact on Arctic grayling reproduction, either through direct use or reduced pressure on upstream spawning areas.

Overall, the constructed spawning pads have not only increased the quantity of high-value habitat, but appear to be effectively increasing production rates in the local population.

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SECTION 1 • INTRODUCTION

1.1 BACKGROUND

In accordance with Fisheries and Oceans Canada (DFO) Authorizations NU-03-0191.2, NU-03-0191.3 and NU-03-0191.4, AEM maintains a Habitat Compensation Monitoring Plan (AEM, 2013) to ensure that fish habitat compensation described in Meadowbank's No Net Loss Plans (Cumberland, 2008; AEM, 2012) is constructed and functioning as intended. This program is carried out as a targeted monitoring plan under the Meadowbank Aquatic Effects Monitoring Program (AEMP).

1.2 SUMMARY OF COMPENSATION FEATURES

Habitat compensation features have been implemented or are planned to be constructed in three general areas: along the All Weather Access Road (NU-0191.2), in the Portage (main minesite) area (NU-03-0191.3), and in the Vault area (NU-03-0191.4). A brief description of habitat compensation features in each area is provided below. Further details are available in the Habitat Compensation Monitoring Plan (AEM, 2013).

1.2.1 AWAR Compensation

Construction of the 110 km All Weather Access Road (AWAR) between the Hamlet of Baker Lake and the Meadowbank Mine was completed in the spring of 2008, under DFO Authorization NU-03-0190-2. Four AWAR crossings were found to impact fish-bearing streams, so habitat compensation was required by DFO to account for any potential reductions in productivity.

In 2009, a habitat compensation project consisting of four gravel spawning pads was constructed at crossing R02 according to design specifications that met biological criteria aimed at enhancing Arctic grayling productivity. The construction focused on creating high value spawning and nursery habitat to compensate for the loss of the low and medium value habitat affected by bridge abutment construction at the four crossings.

Per Condition 5 of the Authorization, monitoring studies have been conducted to evaluate fish migrations at the four AWAR crossings where "harmful alteration, disruption or destruction" (HADD) of fish habitat occurred (R02, R06, R09, and R15), and where compensation was implemented (R02). The details of this program are described in the original HCMP (Azimuth, 2007). In 2013, AEM and DFO reviewed the information collected to date, and determined that conditions of the Authorization pertaining to monitoring of HADD sites were fulfilled, and that further monitoring would focus on the habitat compensation features. Updates to the scheduled monitoring activities at R02 were made in 2013 (AEM, 2013).

1.2.2 Portage Area Compensation

Habitat losses in the Portage area are largely due to the dewatering of the northwest arm of Second Portage Lake for the mine's tailings storage facility (TSF), and the Bay-Goose Basin of Third Portage Lake for construction of the Portage and Goose Island pits. These areas were impounded from the rest of their lakes using dewatering dikes constructed from material quarried onsite. Compensation consists largely of re-flooding the de-watered basins, and gains from land-to-lake conversion. Minor gains are achieved through surface water diversion channels which increase the flooded area of the nearby Dogleg Ponds.

1.2.2.1 Re-Flooding Bay-Goose Basin

While the TSF area will be a permanent loss, the Bay-Goose dike will be breached post-closure and the impounded pit areas will be gradually re-flooded to re-gain the temporarily lost habitat.

Prior to re-flooding, a number of habitat improvement measures will be implemented to increase the productive capacity of this area. Construction of a boulder garden feature along the west side of the soft-sediment Bay-Goose Basin will increase habitat suitability in this area. This feature will consist of at least 2.97 ha of heterogeneous, coarse substrate habitat in the <4 m depth zone, just west of the Goose Pit. Construction of mine-related features (pit caps, roads and dikes) from coarse rock material throughout the basin will create shoals and reefs after re-flooding. In addition, approximately 30% of the area of Portage Pit will be backfilled to a depth of 4-10 m below lake level during the construction phase, reducing the amount of ultra-deep water areas, and increasing habitat suitability in this area.

1.2.2.2 Dogleg Pond Enhancements

Dogleg Pond and the "North Portage" ponds, Dogleg North Pond and NP-2, are isolated ponds located near the waste rock area, just north of Second Portage Lake. Since drainage of NP-2 became blocked by the waste rock pile on the northern edge of the TSF, a connecting channel was excavated to direct flow from NP-2 to Dogleg North, effectively increasing the drainage area of Dogleg and Dogleg North Pond. The accompanying increase in wetted area is estimated at 5% for Dogleg Pond, 15% for Dogleg North Pond, and 5% for NP-2. Through construction of a diversion channel, connectivity between the ponds has been improved, and previously inaccessible habitat in Dogleg North Pond will be available for use by lake trout and round whitefish currently inhabiting Dogleg Pond and NP-2.

1.2.2.3 Finger Dikes

In keeping with the original NNLP, finger dikes will also be constructed on the Bay-Goose Dike extending into Third Portage Lake. These features will provide additional "shoreline" habitat that is used by most species for spawning, and will have a total area of 1 ha at their base.

1.2.3 Vault Area Compensation

Vault Lake, located north of the Portage area, drains into the adjacent Wally Lake, but the connection is not passable to fish. To allow construction of the Vault pit, Vault Lake has been separated from Wally Lake with a dike and has been dewatered.

1.2.3.1 Pit Re-Flooding

Post-closure, Vault Lake will be re-flooded and the connection to Wally Lake re-established with a deeper channel. Lake W3, which has a known population of Arctic char, will be connected to Wally Lake (where Arctic char have not been found), allowing these fish to populate both Wally and Vault Lakes (see Section 1.2.3.2). Vault Lake will be expanded by construction of the Vault pit, a portion of which is in a terrestrial zone. Alterations of the basin area outside the pit will improve habitat through the development of shoals and mixed substrate areas.

1.2.3.2 Wally 3 Connection

Wally 3 (W3) is a smaller lake (approximately 100 ha) seasonally connected hydraulically to Wally Lake via an impassable channel. Lake trout, round whitefish and Arctic char were found to inhabit this relatively small but deep lake. Topographical surveys conducted in this area indicated that water levels in Wally Lake and W3 are similar, and therefore slight deepening of the connecting channel through selective substrate removal and excavation during the winter would provide access to Wally Lake for the isolated arctic char population in W3.

1.3 OBJECTIVES

The following describes the monitoring objectives for compensation features by location. These objectives are fulfilled according to the methods and schedule described in detail in Section 2, below, and in the HCMP (2013).

1.3.1 AWAR Monitoring Objectives

Based on Condition 5.2 of DFO Authorization NU-03-0190.2, the objectives of the AWAR monitoring program are as follows:

- Assess the stability and successful utilization of all compensation features during the spawning and nursery period for Arctic grayling (Condition 5.2.1).

Additional Conditions pertaining to monitoring of HADD sites were no longer required as per the HCMP (that was designed in consultation with DFO) and as part of the DFO authorization amendment process.

1.3.2 Portage and Vault Area Monitoring Objectives

Based on Condition 6 of DFO Authorizations NU-03-0190.3 and NU-03-0191.4, the objectives of the Portage area monitoring program are as follows:

- Assess the stability and successful utilization of all fish habitat compensation features according to the methodology and schedule detailed in the Habitat Compensation Monitoring Plan; and

- Provide a photographic record before, during and after construction, during decommissioning and post-restoration to indicate that all works and undertakings have been completed according to the conditions of the Authorization and the NNLP.

1.4 SCHEDULE OF MONITORING

The schedule of monitoring events from the HCMP is provided here as Appendix A. Monitoring activities conducted in the current year are indicated.

SECTION 2 • CURRENT-YEAR MONITORING METHODOLOGY

A description of the standard methods used to monitor each habitat compensation feature according to the objectives of DFO Authorizations is provided in the HCMP. Specific details (e.g. dates, locations) and any adjustments to standard methods in the reporting year's monitoring events are described below.

As per the schedule of monitoring events (HCMP and provided here in Appendix A), the only monitoring conducted in 2013 was for the AWAR compensation feature (Authorization NU-0191.2; Condition 5.2.1). Detailed methods of this event are described here, according to the objectives presented in Section 1.3.1.

Visual observations were recorded to assess the stability of the compensation feature. To assess successful utilization, larval drift traps were set upstream and downstream of the R02 spawning pads. In addition, current year fish tagging using strategically located hoopnets provided data to determine the tendencies, patterns and movements of Arctic grayling near the R02 habitat compensation area.

2.1 STABILITY

The compensation features were visually assessed to determine general stability in comparison to previous years. In particular, signs of any significant movement of the coarse substrate material used to construct the berms were noted.

2.2 LARVAL DRIFT TRAPS

In total, 9 larval drift traps (DT) were set at R02 from June 15 – 25, 27 and 29, 2013 (Figure 1, Table 1). Four traps (DT A1 to A4) were upstream of the R02 habitat compensation area. Three traps (DT B1 – B3) were immediately downstream of the R02 habitat compensation, and the two remaining traps (DT C1 and C2) were set slightly upstream of the bridge. Seven of the larval drift traps consisted of a square sided cone with a ridged frame that funnelled into a 0.5 mm nitex mesh bag. Attached at the back of the nitex bag was a Nalgene®-type container where the drift was collected. The remaining traps consisted of a ~60cm x 30cm square frame which has a 0.5 mm nitex mesh bag, attached to a hard plastic container where the drift was collected. The frame was submerged at least halfway under water and secured by poles on each side. Drift traps were checked at least every other day. Larval drift was identified in the field and preserved in vials of diluted formalin.

Table 1. UTM coordinates and set dates for drift traps at R02, 2013. All traps were set Jun 15 – 25, 27 and 29.

Drift Trap ID	GPS Coordinates
A1*	14W 0643438
	UTM 7143416
A2	14W 0643452
	UTM 7143426
A3	14W 0643444
	UTM 7143432
A4	14W 0643449
	UTM 7143430
B1*	14W 0643682
	UTM 7143529
B2	14W 0643699
	UTM 7143520
B3*	14W 0643716
	UTM 7143574
C1*	14W 0643762
	UTM 7143400
C2	14W 0643770
	UTM 7143406

2.3 HOOPNETS

Hoopnets were set upstream of HADD crossing R02 to monitor the passage of fish and evaluate population structure. Nets consisted of either a 4 ft (1.22 m) or 3 ft (0.9 m) diameter front hoop, with interior hoops and traps that prevent fish from escaping but provide enough space for fish to survive. Wings were attached to the front hoop to direct fish into the net. The captured fish were gently removed by field technicians, placed in large tubs filled on location with stream water for biological processing and then placed in a recovery tub. The fish were released up or downstream of the hoopnets, depending on the fish's migration direction.

Biological processing included:

- measurement of fork length;
- measurement of weight using a Pesola field scale (+/-2 to 5 g); and
- classification of maturity by gently palpitating the abdomen and visually identifying distinguishable male or female features.

Hoopnets were first deployed on June 14, 2013 and were removed on June 29, 2013 (Table 2). Without jeopardizing the safety of the field personnel, the nets were placed in the thalweg of the

streams depending on ice-flow conditions and stream velocities, to ensure the maximum effort to capture migrating fish.

Hoopnet locations (Figure 1) were selected upstream (R02A) and downstream (R02B) of the constructed spawning pads as in previous years to provide evidence of use of this compensation feature. The majority of nets were oriented to observe upstream movements.

Table 2. Approximate hoopnet locations, net orientation (upstream-moving fish, US; downstream-moving fish, DS), dates of deployment and approximate stream coverage at crossings R02 in 2013.

Location	GPS Coordinates	Dates	# Nets		% Coverage
			US	DS	
R02A	14W 0643511	June 14 – 15	1	0	15
	UTM 7143458	June 15 – 17	1	1	20
		June 17 – 23	2	1	30
		June 23 - 29	3	2	75
R02B	14W 0643745	June 14 – 17	3	0	20
	UTM 7143596	June 17 – 20	4	1	25
		June 20 – 22	5	0	30
		June 22 - 29	3	2	30

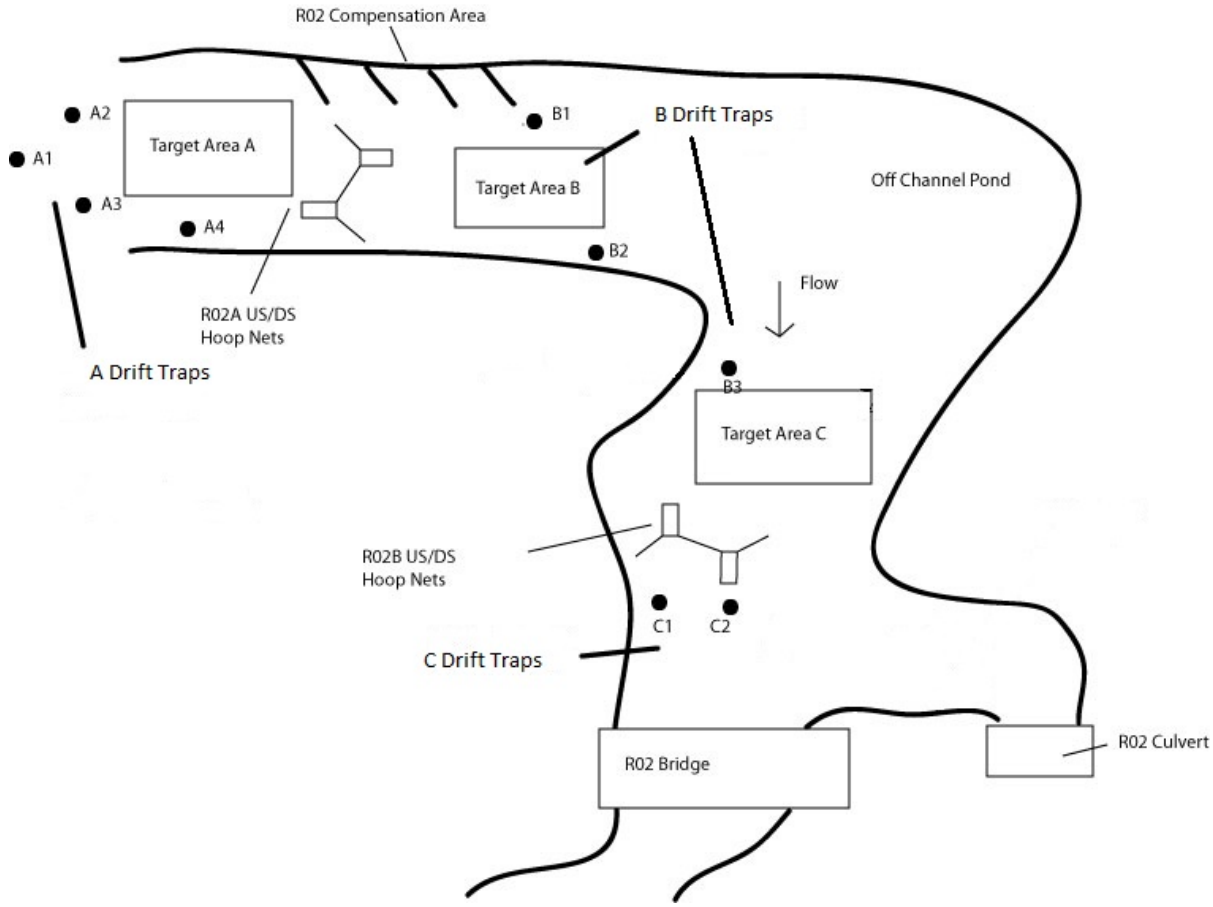

Figure 1. Locations of hoopnets and larval drift traps in 2013 with respect to the R02 habitat compensation feature.

2.4 WATER LEVEL AND TEMPERATURE

Relative water level measurements were taken daily using a staff gage (1.2 m measuring stick with 1-cm increments). Water temperature measurements were recorded using a standard mercury thermometer. Although these are not a component of compensation monitoring, they help to provide a record of the environmental setting under which migrations are occurring.

SECTION 3 • RESULTS AND DISCUSSION

Historically two peaks of Arctic grayling migrations have been observed in Meadowbank area streams. Generally, the first peak of older fish occurs at temperatures <7°C, with a second peak with more immature fish 2-3 weeks later (~mid-July; >10°C). This may be because the larger stronger fish are better able to navigate the faster currents that typically occur closer to ice-off. In 2013, nets were pulled earlier than usual and it is likely that only the first peak was captured, since water temperatures were always less than 8ºC. This is confirmed by a larger average size in 2013 compared to 2011, and a much lower proportion of immature fish (see Section 3.3.3). Other ways in which the shorter monitoring period may have affected inter-year comparisons are discussed in the relevant sections below.

3.1 STABILITY

Visual observations indicated little movement of the spawning berm material since 2011. The berms appear to be functioning as intended to reduce water flow rates and depths. Gravel substrate on the downstream side of each berm is intact.

3.2 LARVAL DRIFT TRAPS

In 2013, 479 Arctic grayling larvae (young of the year) were collected in the R02 reach studied. The majority of larvae (320) were collected in traps A1 – A4, which were placed upstream of the compensation area and downstream of natural spawning habitat (Table 3). In total, 98 Arctic grayling larvae were collected in traps B1 – B3, which were located just downstream of the habitat compensation area. Drift traps C1 – C2 were placed further downstream, and collected a total of 61 larvae. Maximum collection in one day occurred at drift trap A3 (38 larvae).

Table 3. Total, daily average and daily maximum catch of Arctic grayling larvae at R02 in 2013.

Drift Trap ID	Total	Average	Max
A1	16	1.2	5
A2	70	5.4	31
A3	136	10.5	38
A4	98	7.5	21
Total	320		
B1	54	4.2	17
B2	19	1.5	6
B3	25	1.9	7
Total	98		
C1	73	4.9	17
C2	28	2.2	6
Total	61		

Arctic grayling are spring spawners that migrate from lakes and large rivers to smaller streams to spawn over gravel or rocky bottoms (Evans et al. 2002). The literature suggests that spawning

occurs between 7 and 10°C (Evans et al. 2002, McPhail and Lindsey, 1970, & Scott and Crossman, 1973). Young are thought to hatch within 16-18 days at water temperatures of 9°C or within 8 to 32 days of water temperature of 15.5°C (McPhail and Lindsey, 1970 and Krueger, 1981). At R02, the peak larval drift catch occurred around June 22 in 2013, when the water temperature was 8°C (Figure 2). As was found in previous studies at R02, and contrary to the cited literature, the primary Arctic grayling spawning run may be occurring at temperature less than 5°C, below the ice or immediately at ice off since larvae are always caught immediately upon study initiation.

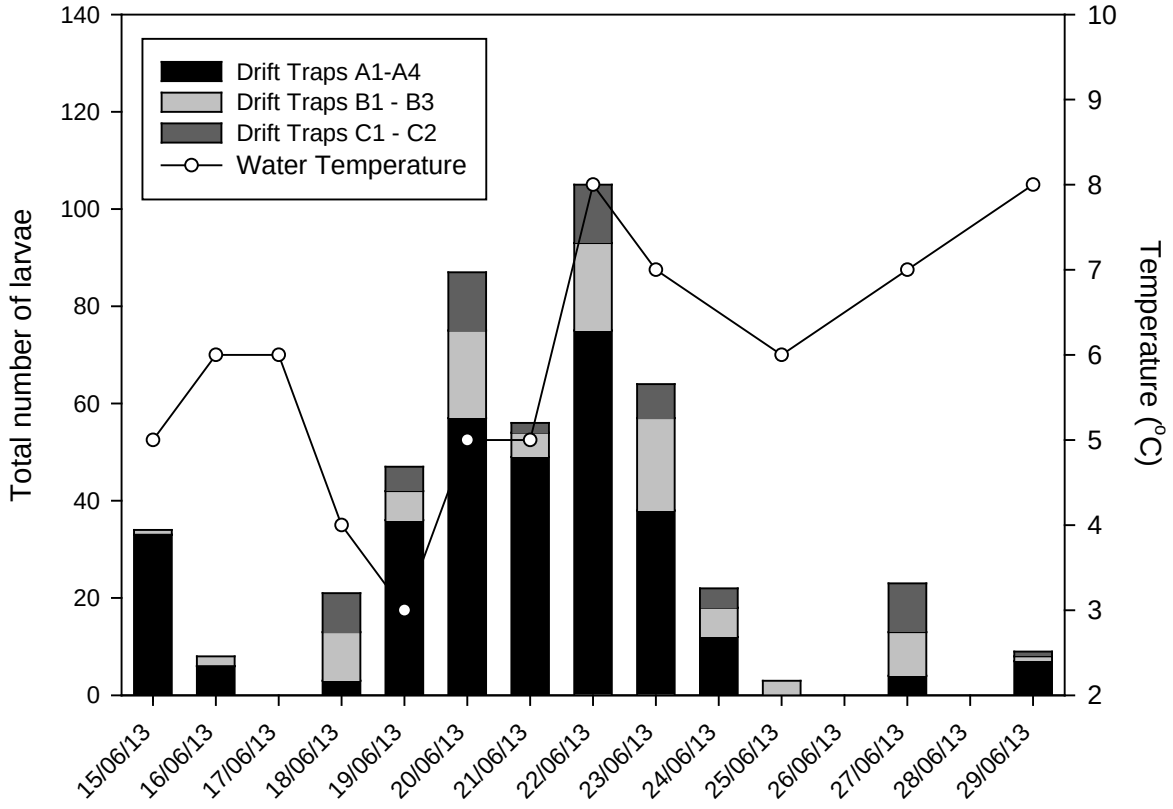

Figure 2. Water temperature and total number of Arctic grayling larvae collected at drift trap areas A, B and C from June 15 – 29, 2013.

Since 2005, the number of drift traps and dates of monitoring have varied at R02 (Table 4). Therefore, the larval drift observed in annual monitoring programs is best compared if values are standardized to the number of traps and number of days monitored. The trapping period in 2013 was the shortest, at 13 days in June. In 2006, 2008 and 2011, the monitoring period was about 24 days, from mid-late June to mid-late July (e.g. June 22 – July 17, 2011). In 2007, 2009 and 2010, the trapping period was extended to late July or early August, and was 37 – 45 days long. In late July of each year, larval drift was essentially reduced to nil, and including these days in the total relative count distorts values in 2007, 2009 and 2010 compared to other years. In order to make a more

appropriate comparison, the first 24 days of each monitoring period are examined. In 2005, no Arctic grayling larvae were collected at R02, likely because only one drift trap was set and trapping began at least 5 days later than other years. This is not considered to be a representative sample, so is excluded from the comparison.

Table 4. Summary of larval drift trap sets at R02 from 2005 to 2013.

Drift Traps	2005	2006	2007	2008	2009	2010	2011	2013
Date in	Jun 29	Jun 24	Jun 23	Jun 21	Jun 24	Jun 24	Jun 22	Jun 14
Date out	Jul 17	Jul 19	Jul 29	Jul 16	Aug 07	Aug 01	Jul 17	Jun 29
Max # traps	1	2	7	8	9	12	12	9
# trap days	19	46	259	160	405	468	288	117

In total, the number of Arctic grayling larvae caught at R02 in 2009 – 2013 was higher than in any year before the compensation structure was built, indicating increased spawning within this stream reach (Figure 3). While the catch per trap day was reduced in 2013 compared to 2011, values were similar to 2010.

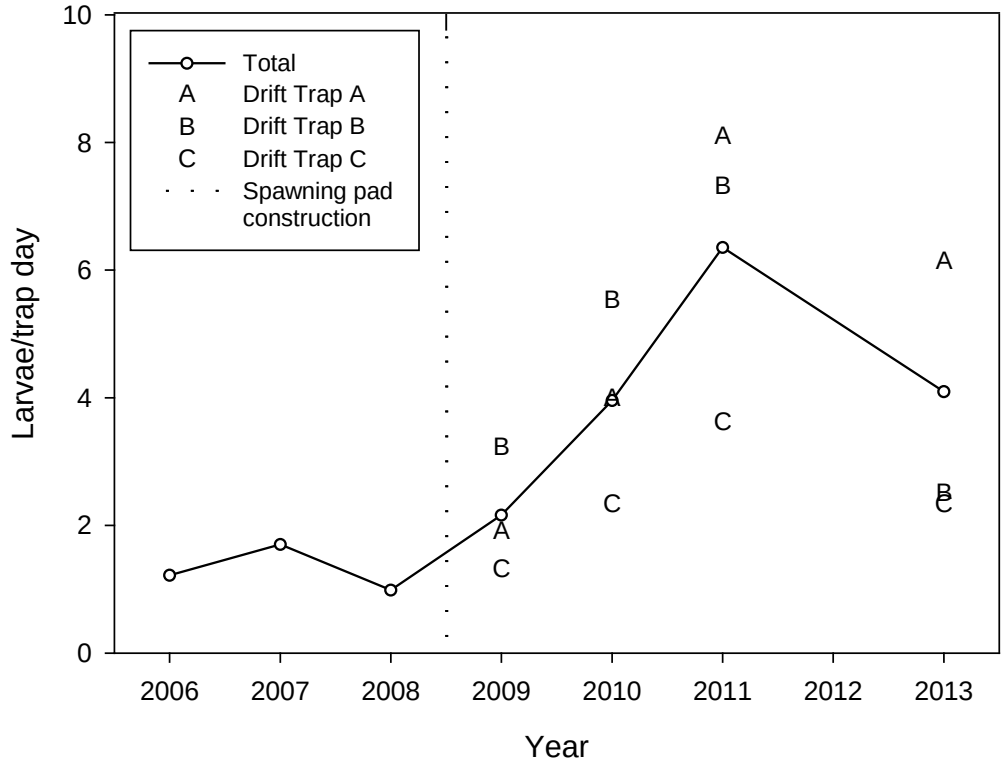

Figure 3. Total relative larval drift count (# larvae/trap day for the first 24 study days), and relative larval drift count upstream and downstream of the constructed spawning pad area at R02 from 2006 to 2013.

3.3 HOOP NETS

3.3.1 Total Catch

As in the past, the predominant species of adult fish collected in 2013 along the AWAR was Arctic grayling (*Thymallus arcticus*) (n = 160). Several round whitefish (*Prosopium cylindraceum)* and lake trout (*Salvelinus namaycush)* were caught, but these together were less than 10% of the total catch. A summary of the total number of adult fish collected is provided Table 5. Since Arctic grayling are the primary species of concern in this study, the majority of the data analysis includes only individuals of that species.

Table 5. Total number of fish collected by species.

Species	Total Catch
Arctic Grayling	160
Lake Trout	3
Round Whitefish	10
Total	173

By standardizing the catch to the number of nets or % stream coverage and number of days fished, a cursory comparison of inter-annual trends can be performed. It should be noted, however, that longer study periods involve a greater proportion of days on which fewer fish are migrating. If the study continues beyond the actual migration period, the total number of fish per unit effort is reduced when compared with shorter studies conducted only while migration is occurring. This potentially confounding factor is not taken into account here.

As previously discussed, the 2013 sampling period was short compared to 2009, 2010 and 2011, with only 122 net days (Table 6). However, overall effort was similar in 2007 and 2008.

Table 6. Summary of dates and number of nets (upstream and downstream) used at R02 from 2005 to 2013.

Hoop Nets	2005	2006	2007	2008	2009	2010	2011	2013
Date in	Jun 29	Jun 24	Jun 24	Jun 17	Jun 26	Jun 25	Jun 24	Jun 14
Date out	Jul 18	Jul 19	Jul 20	Jul 16	Aug 02	Aug 01	Jul 19	Jun 29
Max # nets	2	2	5	4	9	7	9	10
# net days	42	50	132	124	234	227	219	122

Since stream coverage in 2013 was substantially lower than previous years (see Table 2 and previous reports), it is most useful to compare the number of fish caught per unit of stream coverage. This value was calculated as the sum of the total % coverage on each study day. For example, if a study lasted 2 days, and coverage was 20% at location A for both days, and 50% at location B for day 2 only, total units of coverage would be 20+20+50 = 70. These calculations were performed for all dates for which % coverage data was available. As shown in Figure 4, the number of fish caught per unit of stream coverage was highest in 2013. In addition, the maximum number of fish caught in one day per unit stream coverage was substantially higher in 2013 (0.85 fish) compared to 2010 (0.25 fish) and 2011 (0.20 fish). This result may be solely due to the decreased catch efficiency associated with increased effort, increased migration through this reach, favourable migratory conditions in

general, well-timed monitoring (capture of the true peak and few days on which migration did not occur), or more likely, a combination of these.

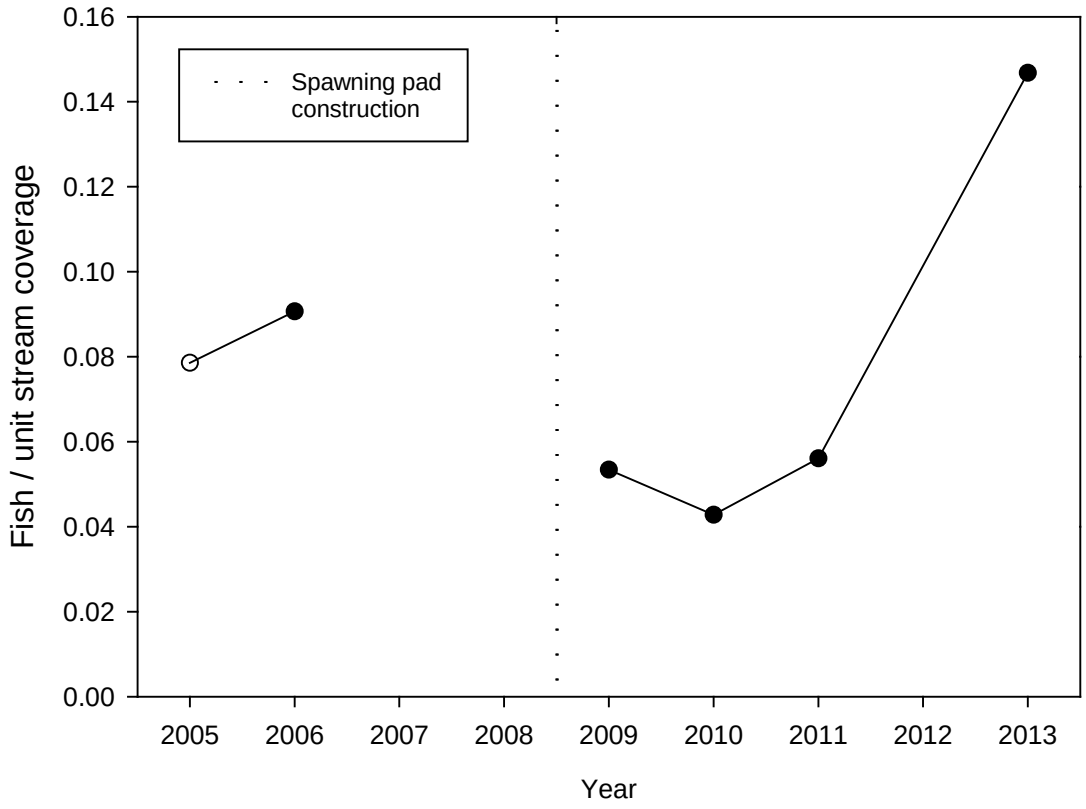

Figure 4. Number of fish captured per unit of stream coverage (% coverage x days) at R02 from 2005 to 2013.

3.3.2 Movements

A total of 114 Arctic grayling were captured moving upstream and 46 moving downstream. Fish were caught on the first sampling day (June 15), when temperatures were 5°C. The lowest water temperature observed was 3°C (June 19). The bi-modal distribution of captures over time observed in previous years was not as distinct in 2013 (Figure 5). As discussed above, the second peak may have just been beginning when sampling concluded. However, it appears that the first peak was better captured in 2013 than previously, likely because nets were set earlier than ever before.

Peak larval drift (Section 3.1) occurred four days after the observed peak adult migration (June 22), indicating that although large mature fish were still moving upstream during the collection period, migration and spawning also occurred prior to the study initiation (likely under the ice or immediately at ice-off).

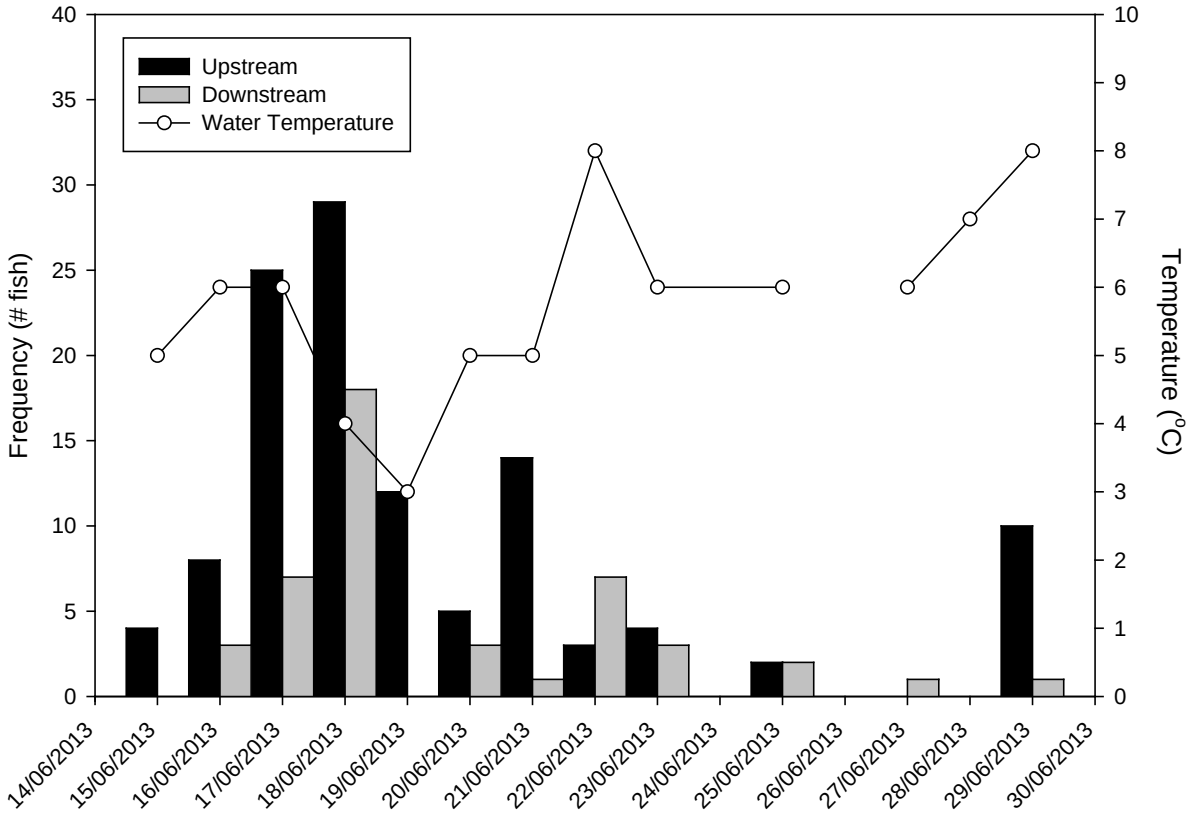

Figure 5. Upstream and downstream movements of Arctic grayling at R02 in 2013.

The R02 nets were set in two locations - just upstream (R02A) and downstream of the habitat compensation area (R02B). As in 2011, more fish (122) were collected at R02A than R02B (38) – see Table 7. However, the total stream coverage was higher at R02A (46%) compared to R02B (27%), as in 2011 (75% and 25%, respectively), so it is possible that fish were more easily able to avoid capture at this location.

Table 7. Upstream and downstream movements of Arctic grayling by net location since 2010.

R02 Hoopnet ID	Fish Movement	2010	2011	2013
A	US	61	175	81
	DS	58	13	41
B	US	103	25	33
	DS	8	16	5
C	US	3	1	
	DS	11	25	
Total	US	167	201	114
	DS	77	54	46

3.3.3 Condition Factor

Table 8 provides a summary of the average, maximum and minimum length and weight, and the average condition factor of Arctic grayling collected. The largest fish that was collected moving upstream at R02 was 410 mm in length and 710 g in weight. Many smaller fish were also collected (minimum 209 mm length and 120 g weight). The average condition factor (K) was greater than 1.00, which demonstrates a healthy population.

Table 8. Average, maximum and minimum Arctic grayling length, weight and average condition factor (K).

	Length (mm)			Weight (g)			K*
n	AVG	MAX	MIN	AVG	MAX	MIN	AVG
160	296	410	209	306	710	114	1.16

* $K = (weight/((length/10)^3)) \times 100$

Condition factors for years 2006 – 2013 are shown in Figure 6. Variability in 2013 compared to 2011 may have been reduced because the second run of smaller younger fish was not fully captured.

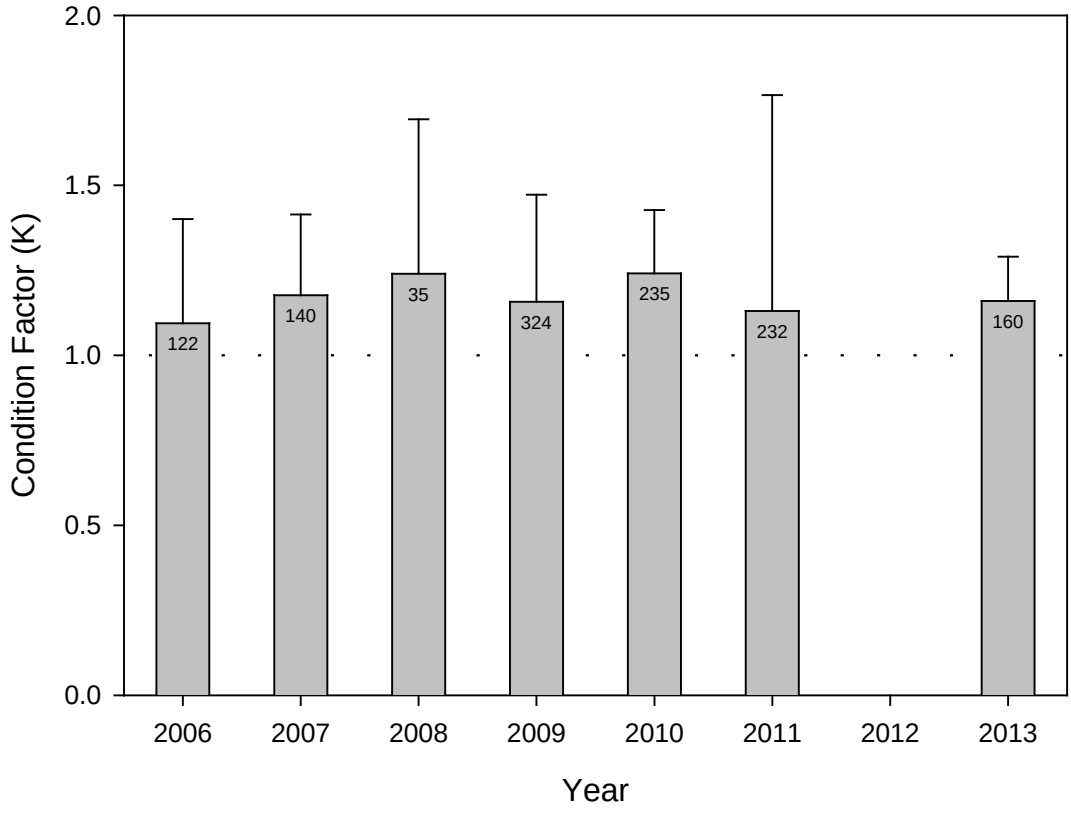

Figure 6. Average condition factor of Arctic grayling captured at R02. Error bars indicate standard deviation. Values indicate total number of fish.

3.3.4 Size Distribution and Maturity

As in the past, the length-frequency distribution (Figure 7) of fish collected at R02 is approximately normally distributed with the largest number of fish collected in the 280-299 mm size class (45 fish). This data demonstrates that recruitment is occurring as would be expected.

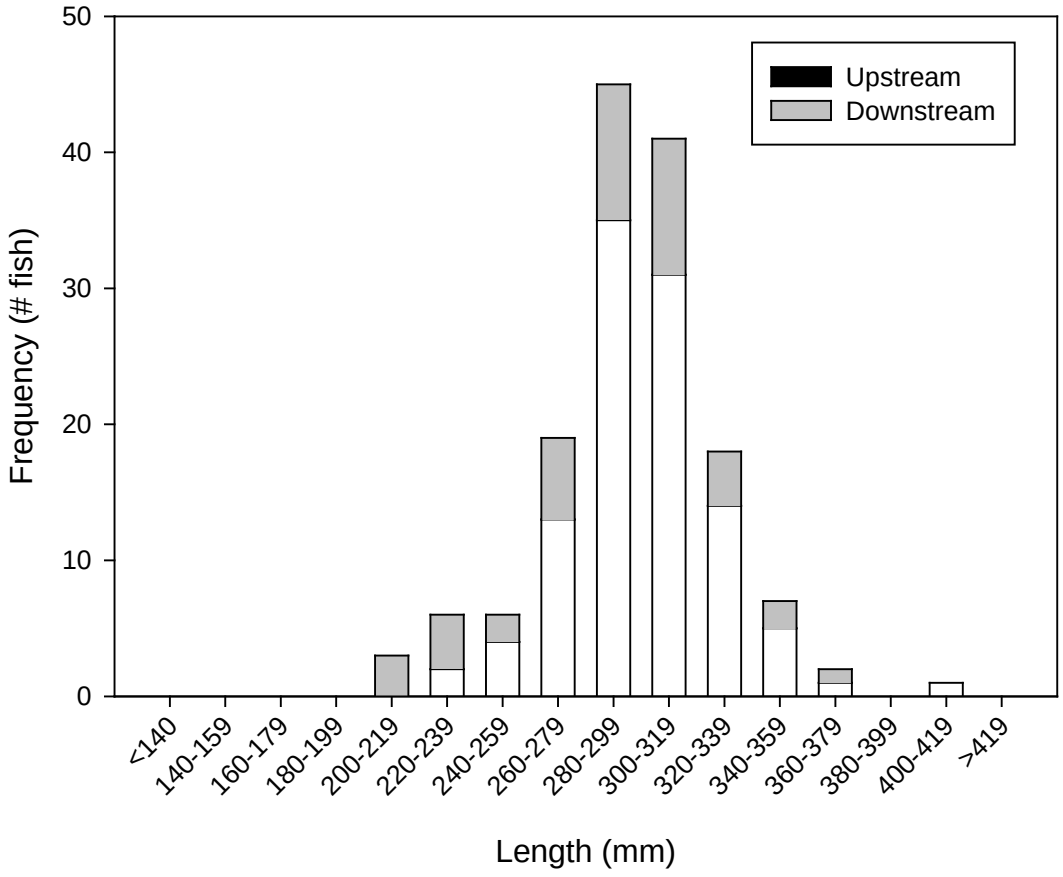

Figure 7. Length-frequency distribution of Arctic grayling captured at R02 in 2013.

The total numbers of male and female fish captured by spawning classification are shown in Table 9. More than twice as many males were caught as females, which is consistent with catches in 2011 at water temperatures < 7 °C (first run).

Table 9. Number of fish by spawning classification caught at R02 in 2013.

Classification	Catch
Female	*Total = 43*
Immature	3
Ready	14
Waiting	18
Spent	4
Unknown	4
Male	*Total = 104*
Immature	9
Ready	83
Waiting	8
Spent	0
Unknown	4

3.3.5 Current Year Recaptures

Floy tags are commonly used to provide population density measurements, but they are also very useful in tracking the activities of migrating fish. Table 10 provides the results of the current year tagging program, or “recaptures” at each crossing. In 2013, 11 fish were re-captured at R02. The majority of these fish were ready to spawn males, consistent with the captured population in general.

Table 10. Arctic grayling captured and re-captured in the current year at R02.

Fish	Date Collected	Net	US/DS	Tag #	Length	Weight	Sex	Maturity
1	17-Jun-13	R02A	US	101155	306	320	M	Ready
	18-Jun-13	R02A	DS					
2	17-Jun-13	R02A	US	101160	302	325	F	Spent
	29-Jun-13	R02B	US					
3	17-Jun-13	R02A	US	101163	340	445	M	Ready
	18-Jun-13	R02A	DS					
4	17-Jun-13	R02A	US	101166	303	340	F	Waiting
	20-Jun-13	R02B	US					
5	17-Jun-13	R02A	US	101173	315	310	M	Ready
	18-Jun-13	R02A	US					
6	21-Jun-13	R02B	US	101179	299	280	M	Ready
	25-Jun-13	R02A	US					
7	16-Jun-13	R02A	DS	101280	274	240	M	Ready
	17-Jun-13	R02A	US					
8	16-Jun-13	R02A	US	101289	294	310	M	Ready
	18-Jun-13	R02B	US					
9	18-Jun-13	R02A	DS	102301	315	400	M	Ready
	21-Jun-13	R02A	US					
10	18-Jun-13	R02B	US	102330	294	295	M	Ready
	21-Jun-13	R02A	US					
11	18-Jun-13	R02B	US	102338	335	410	M	Ready
	21-Jun-13	R02B	US					

3.3.6 Previous Year Recaptures

As in 2011, a total of 5 fish caught at R02 in 2013 were previous year recaptures (Table 11). This data indicates that Arctic grayling are generally returning to the stream to spawn. All re-captures were first caught in 2011, and were caught at an earlier date in 2013. This may have been because water temperatures were warmer earlier in 2013 or because as the fish age and grow, they are better able to navigate swifter currents. All fish have increased length and weight in 2013, an indication of improved health of the fish population over time.

Table 11. Arctic grayling captured in previous years and re-captured in 2013 at R02.

Fish	Date	Crossing	US/DS	Tag #	Length	Weight	Sex	Maturity
1	25-Jun-11	R02A	US	90225	285	280	M	Ready
	15-Jun-13	R02A	US		300	390	M	Ready
2	25-Jun-11	R02A	US	90232	349	500	F	Spent
	18-Jun-13	R02A	DS		360	550	F	Ready
3	02-Jul-11	R02A	US	90745	255	180	M	Ready
	18-Jun-13	R02A	DS		280	260	M	Ready
4	25-Jun-11	R02A	US	90218	315	450	F	Spent
	18-Jun-13	R02A	US		331	450	F	Ready
5	30-Jun-11	R02A	US	90566	246	150	F	Immature
	18-Jun-13	R02B	US		287	245	M*	Ready*

**Likely misidentified in 2011*

SECTION 4 • CONCLUSIONS AND RECOMMENDATIONS

The intention of the constructed spawning pad feature was to decrease flow rates and water depths, and provide suitable substrate for Arctic grayling spawning. Stability of the feature was visually confirmed, with minor shifting of material as anticipated at construction.

Despite a reduced sampling period, data collected in 2013 indicate that fish migrating at R02 continue to have a well distributed population structure (greatest number of fish in the middle size class) and are generally a good body weight ($K > 1$). Sex and maturity distribution is also similar to previous years for comparable water temperatures. The number of fish caught per unit effort (% stream coverage) was higher than previous years, which may have been a result of increased efficiency, increased stream usage and/or well-timed monitoring. These data confirm continued use of the R02 reach by Arctic grayling.

Although the successful utilization of the spawning pads is difficult to quantify, the larval drift data collected in 2013 continues to provide evidence of increased Arctic grayling spawning in this reach since construction occurred. Comparing equal catch per unit effort, the number of larvae caught throughout the R02 reach has increased since 2009. Overall, the constructed spawning pads have not only increased the quantity of high-value habitat, but appear to be effectively increasing production rates in the local population.

For future AWAR habitat compensation monitoring, it is recommended that length of hoop net sets and larval drift trap sets are consistent with previous monitoring programs. Nets and traps should be set as early as possible (as in 2013) and kept in the stream for no less than 4 weeks. This will ensure that Arctic grayling are captured through the end of the upstream migration and nearly all of the downstream migration, and will provide the best possible inter-annual comparison of data. Furthermore, it is recommended that additional drift traps should be purchased to maintain a consistent larval drift count effort in each area.

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APPENDIX A

Habitat Compensation Monitoring Plan (2013) Schedule of Monitoring Events

Table 1A. Summary of monitoring methods, analytical parameters, sampling frequency and number of samples for dike faces and finger dikes. *Dike as-built designs were incorporated into the 2012 NNLP. Flooding is estimated to be completed in 2023.

Compensation Feature	Component	Reason	Method	Parameters	Completed Sampling	Number of Samples	Next Sampling
East Dike	Interstitial water	Possible metals leaching	Tube sampler	TSS Total and dissolved metals	2009 2011	2 locations (exterior)	2015
	Periphyton	Base of food chain	Periphyton sampler	Biomass	2009 2011	2 locations (exterior)	2015 2020 2025
	Fish use	Confirm use by fish	Angling Underwater motion camera	CPUE, physical characteristics	2009 2011	2 locations (exterior)	2015 2020
	Structure	Design intent met	As-built designs	Area, substrate, depth zone	2012*	-	-
		Stability	Underwater camera	Qualitative observations	2009 2011	Vertical transects at 5 locations	-
Bay Goose Dike	Interstitial water	Possible metals leaching	Tube sampler	TSS Total and dissolved metals	2011	3 locations (exterior)	2015 2020
	Periphyton	Base of food chain	Periphyton sampler	Biomass	2011	3 locations (exterior)	2015 2020
	Fish use	Confirm use by fishing	Angling Underwater motion	CPUE Physical	2011	3 locations (exterior)	2015 2020

Compensation Feature	Component	Reason	Method	Parameters	Completed Sampling	Number of Samples	Next Sampling
			camera	characteristics			
	Structure	Design intent met	As-built designs	Area, substrate, depth zone	2012*	-	-
		Stability	Underwater camera	Qualitative observations	2011	Vertical transects at 10 locations	-
Finger Dikes	Interstitial water	Possible metals leaching	Tube sampler	TSS Total and dissolved metals	-	2 locations	2015 2020 2025
	Structure	Design intent met	Photos Field survey	Area, substrate, depth zone	-	-	2015
		Stability	Underwater camera	Qualitative observations	-	One vertical transect of each dike	2015
Central Dike	Interstitial water	Possible metals leaching	Tube sampler	TSS Total and dissolved metals	-	2 locations	2025 2030
	Structure	Design intent met	As-built designs	Area, substrate, depth zone	-	-	2016
		Stability	Underwater camera	Qualitative observations	-	Vertical transects at 5 locations	2025

Table 2A. Summary of monitoring methods, analytical parameters, sampling frequency and number of samples for compensation features constructed in the Portage basin. Year of re-flooding completion est. 2023 (F). Year of dike breach est. 2025.

Compensation Feature	Component	Reason	Method	Parameters	Number of Samples	Next Sampling
Basin	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2016 (prior to flooding)
	Open basin water quality*	Possible metals leaching, anoxia	Tube sampler Grab samples Depth profiles	Conventional parameters Anions Nutrients Organic parameters Total and dissolved metals	1 per pit area	3 x yr from F until closure
	Fish use	Confirm use (re-flooded basin and at dike breach)	Angling Underwater motion camera Hoopnets	CPUE Physical characteristics	TBD by field staff	2025 2030
Roads	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2016 (prior to flooding)
		Stability	Underwater camera	Qualitative observations	Representative transects TBD by field staff	2025

Compensation Feature	Component	Reason	Method	Parameters	Number of Samples	Next Sampling
Pits	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2016 (prior to flooding)
Boulder garden	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2016 (prior to flooding)
		Stability	Underwater camera	Qualitative observations	Representative transects TBD by field staff	2025

*Monitoring and sampling protocols will be developed and conducted in-line with CREMP sampling

Table 3A. Summary of monitoring methods, analytical parameters, sampling frequency and number of samples for compensation features constructed in the Vault and Phaser basins. Year of re-flooding completion est. 2023 (F). Year of dike breach est. 2025.

Compensation Feature	Component	Reason	Method	Parameters	Number of Samples	Next Sampling
Basin	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2017 (prior to flooding)
	Open basin water quality*	Possible metals leaching, anoxia	Tube sampler Grab samples Depth profiles	Conventional parameters Anions Nutrients Organic parameters Total and	1 per basin	3x yr from F until closure

Compensation Feature	Component	Reason	Method	Parameters	Number of Samples	Next Sampling
				dissolved metals		
	Fish use	Confirm use (re-flooded basin and at dike breach)	Angling Underwater motion camera Hoopnets	CPUE Physical characteristics	TBD by field staff	2020 2025 2030
Roads	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2017 (prior to flooding)
		Stability	Underwater camera	Qualitative observations	Representative transect TBD by field staff	2025
Pits	Structure	Design intent met	Air photos Field survey	Area, substrate, depth zone	-	2017 (prior to flooding)

*Monitoring and sampling protocols will be developed and conducted in-line with CREMP sampling

Table 4A. Summary of monitoring methods, analytical parameters, sampling frequency and number of samples for access enhancement compensation features. C – year of construction

Compensation Feature	Component	Reason	Method	Parameters	Number of Samples	Next Sampling
Dogleg Ponds	Structure	Design intent met (monitor water levels, especially access to Dogleg North)	Bathymetric survey	Area of ponds, depth of access channels	All three ponds and connecting channels	2015 2020 2025
	Fish use	Confirm use by fish	Angling Underwater motion camera	CPUE Physical characteristics	TBD by field staff	2015 2020 2025
W3 Access	Structure	Design intent met (W3 passage constructed as intended)	Bathymetric survey	Width, depth of excavation	-	C (yr of dike breach, est. 2025)
	Fish use	Confirm use by Arctic char in Wally Lake	Hoopnets at channel	CPUE Physical characteristics	TBD by field staff	2020 2025 2030

Table 5A. Summary of monitoring methods, analytical parameters, sampling frequency and number of samples for All Weather Private Access Road R02 (bridge 1) habitat compensation features.

Feature	Component	Reason	Method	Parameters	Completed Sampling	Next Sampling
Spawning pads	Structure	Design intent met	As-built report	Area, substrate	2009	-
		Stability	Visual observation Underwater camera	Qualitative observations	2010 2011 2013	2015 2020 2025 2030
	Fish use	Confirm use by Arctic grayling	Hoopnets set downstream and upstream Larvae traps	CPUE Physical characteristics	2009 2010 2011 2013	2015 2020 2025 2030

APPENDIX B

2013 Fisheries Data

AWR Fisheries Evaluation Field Sheets

Field Crew:

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
14-Jun-13	13:30	5	0.6	US	R02B	-	-	-	-	-	-	3 US Hoop Nets Set. Drift Traps set
14-Jun-13	12:00			US	R02A	-	-	-	-	-	-	1 US Hoop Net Set. Drift Traps set.
15-Jun-13	15:58	5	0.6	US	R02A	2	90225	300	390	M7	PYRC	-
15-Jun-13	15:58	5	0.6	US	R02A	1	101291	290	340	F3	-	-
15-Jun-13	15:58	5	0.6	US	R02A	3	-	-	-	-	-	Lost in Transfer
15-Jun-13	15:30	6	0.56	US	R02B	-	-	-	-	-	-	No Fish
16-Jun-13	14:00	6	0.55	DS	R02A	13	101280	274	240	M7	-	-
16-Jun-13	14:00	6	0.55	DS	R02A	12	101281	290	335	F3	-	-
16-Jun-13	13:21	6	0.55	US	R02A	11	101282	293	290	M8	-	-
16-Jun-13	13:21	6	0.55	US	R02A	9	101283	288	280	M7	-	-
16-Jun-13	13:21	6	0.55	US	R02A	8	101284	240	220	F1	-	-
16-Jun-13	13:21	6	0.55	US	R02A	7	101285	318	360	M7	-	-
16-Jun-13	13:21	6	0.55	US	R02A	6	101286	320	370	M7	-	-
16-Jun-13	13:21	6	0.55	US	R02A	5	101289	294	310	M7	-	-
16-Jun-13	13:21	6	0.55	US	R02A	4	101290	315	325	M7	-	-
16-Jun-13	13:21	6	0.55	US	R02A	10	-	-	-	-	-	Lost in Transfer
16-Jun-13	14:00	6	0.55	DS	R02A	14	-	219	114	F1	-	Too Weak to Tag

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
17-Jun-13	12:30	6	0.525	DS	R02A	19	101151	300	310	M7	-	-
17-Jun-13	12:30	6	0.525	DS	R02A	20	101152	290	280	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	22	101154	307	290	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	23	101155	306	320	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	24	101156	353	520	F4	-	-
17-Jun-13	13:00	6	0.525	US	R02A	25	101157	260	215	M6	-	-
17-Jun-13	13:00	6	0.525	US	R02A	26	101158	274	235	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	27	101159	322	360	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	28	101160	302	325	F4	-	-
17-Jun-13	13:00	6	0.525	US	R02A	29	101161	299	270	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	30	101162	301	330	F4	-	-
17-Jun-13	13:00	6	0.525	US	R02A	31	101163	340	445	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	32	101164	344	490	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	33	101165	323	355	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	34	101166	303	340	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	35	101167	311	345	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	36	101168	336	425	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	37	101169	309	345	M7	-	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
17-Jun-13	13:00	6	0.525	US	R02A	38	101170	262	230	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	39	101171	298	310	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	40	101172	370	309	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	41	101173	315	310	M7	-	-
17-Jun-13	13:00	6	0.525	US	R02A	42	101174	280	295	F3	-	-
17-Jun-13	13:00	6	0.525	US	R02A	43	101175	285	280	M7	-	-
17-Jun-13	12:30	6	0.525	DS	R02A	18	101276	329	350	M7	-	-
17-Jun-13	12:30	6	0.525	DS	R02A	17	101277	278	250	M7	-	-
17-Jun-13	12:30	6	0.525	DS	R02A	16	101278	299	300	M7	-	-
17-Jun-13	12:30	6	0.525	DS	R02A	15	101279	230	170	M6	-	-
17-Jun-13	13:00	6	0.525	US	R02A	45	101280	274	240	M7	CYRC	-
17-Jun-13	12:30	6	0.525	DS	R02A	21	-	-	-	-	-	Lost in Transfer, Fish had tag
17-Jun-13	13:00	6	0.525	US	R02A	44	-	236	180	F1	-	-
17-Jun-13	11:30	6	0.525	US	R02B	-	-	-	-	-	-	1 Additional Hoop Net Set on North Side of Stream
18-Jun-13	17:00	4	0.55	US	R02A	71	90218	331	450	F2	PYRC	-
18-Jun-13	16:25	4	0.55	DS	R02A	46	90232	360	550	F2	PYRC	-
18-Jun-13	17:42	4	0.55	US	R02B	82	90566	287	245	M7	PYRC	-
18-Jun-13	16:25	4	0.55	DS	R02A	61	90745	280	260	M7	PYRC	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
18-Jun-13	16:25	4	0.55	DS	R02A	47	101155	306	320	M7	CYRC	-
18-Jun-13	16:25	4	0.55	DS	R02A	59	101163	340	445	M7	CYRC	-
18-Jun-13	17:00	4	0.55	US	R02A	66	101173	315	310	M7	CYRC	-
18-Jun-13	17:42	4	0.55	US	R02B	90	101289	294	310	M7	CYRC	-
18-Jun-13	16:25	4	0.55	DS	R02A	48	102301	315	400	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	49	102302	280	220	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	50	102304	335	360	F2	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	51	102306	280	260	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	52	102308	275	215	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	53	102310	320	480	F2	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	54	102311	310	350	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	55	102312	290	270	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	57	102313	340	410	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	58	102316	320	380	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	60	102317	305	350	F2	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	62	102318	285	290	F2	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	63	102319	255	200	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	64	102320	334	520	F2	-	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
18-Jun-13	17:00	4	0.55	US	R02A	65	102321	307	260	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	67	102322	288	260	F3	-	-
18-Jun-13	17:00	4	0.55	US	R02A	68	102324	339	410	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	69	102325	305	360	F2	-	-
18-Jun-13	17:42	4	0.55	US	R02B	92	102330	294	295	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	91	102331	323	300	F3	-	-
18-Jun-13	17:42	4	0.55	US	R02B	89	102332	330	345	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	88	102334	295	245	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	87	102335	279	200	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	86	102336	319	360	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	85	102337	280	240	F2	-	-
18-Jun-13	17:42	4	0.55	US	R02B	84	102338	335	410	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	83	102339	267	210	M8	-	-
18-Jun-13	17:42	4	0.55	US	R02B	81	102340	283	250	F2	-	-
18-Jun-13	17:42	4	0.55	US	R02B	80	102341	311	360	M7	-	-
18-Jun-13	17:42	4	0.55	US	R02B	79	102342	286	295	M8	-	-
18-Jun-13	17:42	4	0.55	US	R02B	78	102343	324	410	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	77	102344	280	270	M8	-	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
18-Jun-13	17:00	4	0.55	US	R02A	76	102345	305	360	F2	-	-
18-Jun-13	17:00	4	0.55	US	R02A	75	102346	294	290	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	74	102347	318	345	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	73	102348	308	310	F3	-	-
18-Jun-13	17:00	4	0.55	US	R02A	72	102349	285	240	M7	-	-
18-Jun-13	17:00	4	0.55	US	R02A	70	102350	307	310	M7	-	-
18-Jun-13	16:25	4	0.55	DS	R02A	56	-	235	115	M6	DEAD	-
19-Jun-13	9:00	3	0.515	US	R02A	94	101290	315	325	M7	-	-
19-Jun-13	9:00	3	0.515	US	R02A	103	102322	288	260	F3	-	-
19-Jun-13	9:00	3	0.515	US	R02A	95	102326	300	310	F3	-	-
19-Jun-13	9:00	3	0.515	US	R02A	93	102328	334	420	F2	-	-
19-Jun-13	9:00	3	0.515	US	R02A	96	102751	290	290	M8	-	-
19-Jun-13	9:00	3	0.515	US	R02A	97	102752	309	350	M7	-	-
19-Jun-13	9:00	3	0.515	US	R02A	98	102753	294	295	M7	-	-
19-Jun-13	9:00	3	0.515	US	R02A	99	102754	285	315	F2	-	-
19-Jun-13	9:00	3	0.515	US	R02A	100	102755	266	200	M7	-	-
19-Jun-13	9:00	3	0.515	US	R02A	101	102756	284	270	M8	-	-
19-Jun-13	9:00	3	0.515	US	R02A	102	102757	258	190	M8	-	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
19-Jun-13	9:00	3	0.515	US	R02A	105	102758	560	1850	-	-	Lake Trout
19-Jun-13	9:00	3	0.515	US	R02A	104	-	-	-	-	-	Lost in Transfer
20-Jun-13	17:00	5	0.48	US	R02B	112	101166	303	340	F3	CYRC	-
20-Jun-13	17:00	5	0.48	US	R02B	110	102759	270	230	M7	-	-
20-Jun-13	17:00	5	0.48	US	R02B	111	102761	298	345	M7	-	-
20-Jun-13	17:00	5	0.48	US	R02B	113	102764	350	490	M7	-	-
20-Jun-13	17:00	5	0.48	US	R02A	106	-	330	360	-	-	Whitefish
20-Jun-13	17:00	5	0.48	DS	R02A	107	-	-	-	-	-	Lost in Transfer
20-Jun-13	17:00	5	0.48	DS	R02A	108	-	-	-	-	-	-
20-Jun-13	17:00	5	0.48	DS	R02A	109	-	-	-	-	-	-
20-Jun-13	17:00	5	0.48	US	R02B	114	-	-	-	-	-	Lost in Transfer
21-Jun-13	8:47	5	0.48	US	R02A	124	101177	275	210	M10	-	-
21-Jun-13	8:47	5	0.48	DS	R02A	125	101178	280	260	M10	-	-
21-Jun-13	9:22	5	0.48	US	R02B	127	101179	299	280	M7	-	-
21-Jun-13	9:22	5	0.48	US	R02B	128	101180	285	300	M7	-	-
21-Jun-13	9:22	5	0.48	US	R02B	129	101183	260	210	F5	-	-
21-Jun-13	8:47	5	0.48	US	R02A	116	102301	315	400	M7	CYRC	-
21-Jun-13	8:47	5	0.48	US	R02A	115	102330	294	295	M7	CYRC	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
21-Jun-13	9:22	5	0.48	US	R02B	126	102338	335	410	M7	CYRC	-
21-Jun-13	8:47	5	0.48	US	R02A	117	102765	295	305	F3	-	-
21-Jun-13	8:47	5	0.48	US	R02A	118	102767	273	260	M8	-	-
21-Jun-13	8:47	5	0.48	US	R02A	119	102768	290	290	F2	-	-
21-Jun-13	8:47	5	0.48	US	R02A	120	102769	287	255	M7	-	-
21-Jun-13	8:47	5	0.48	US	R02A	121	102771	257	205	M6	-	-
21-Jun-13	8:47	5	0.48	US	R02A	122	102772	328	365	M7	-	-
21-Jun-13	8:47	5	0.48	US	R02A	123	102774	309	355	F5	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	131	101184	309	305	M7	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	132	101185	265	275	M7	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	133	101186	280	255	M7	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	134	101190	252	200	M7	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	135	101191	317	360	M7	-	-
22-Jun-13	16:30	8	0.474	US	R02A	136	101192	265	210	M7	-	-
22-Jun-13	16:30	8	0.474	US	R02A	137	101193	317	350	M10	-	-
22-Jun-13	16:30	8	0.474	US	R02B	138	101194	271	255	M7	-	-
22-Jun-13	16:30	8	0.474	DS	R02B	139	101195	269	230	F3	-	-
22-Jun-13	16:30	8	0.474	DS	R02A	130	101285	318	360	M7	-	-

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
23-Jun-13	8:24	6	0.44	DS	R02A	140	101196	309	315	M7	-	-
23-Jun-13	8:24	6	0.44	DS	R02A	141	101197	307	325	M7	-	-
23-Jun-13	8:24	6	0.44	DS	R02A	142	101199	274	240	M7	-	-
23-Jun-13	8:24	6	0.44	US	R02A	144	101200	238	165	M6	-	-
23-Jun-13	8:24	6	0.44	US	R02A	145	102279	410	710	M7	-	-
23-Jun-13	17:03	7	0.44	US	R02B	148	102280	300	310	M7	-	-
23-Jun-13	17:03	7	0.44	US	R02B	149	102281	312	360	M7	-	-
23-Jun-13	8:24	6	0.44	DS	R02A	143	-	275	255	-	-	Whitefish
23-Jun-13	16:35	7	0.44	US	R02A	146	-	254	180	-	-	Whitefish
23-Jun-13	16:35	7	0.44	US	R02A	147	-	248	160	-	-	Whitefish
25-Jun-13	8:02	6	0.43	US	R02A	150	101179	299	280	M7	CYRC	-
25-Jun-13	8:30	6	0.43	DS	R02B	153	102282	234	150	M6	-	-
25-Jun-13	8:30	6	0.43	DS	R02B	154	102283	237	150	M6	-	-
25-Jun-13	8:30	6	0.43	US	R02B	155	102284	287	275	M10	-	-
25-Jun-13	8:02	6	0.43	US	R02A	151	-	337	430	-	-	Whitefish
25-Jun-13	8:02	6	0.43	US	R02A	152	-	435	900	-	-	Lake Trout
26-Jun-13	-	-	-	-	R02A	-	-	-	-	-	-	No personnel on site
26-Jun-13	-	-	-	-	R02B	-	-	-	-	-	-	No personnel on site

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
27-Jun-13	16:15	7	0.42	DS	R02B	156	-	209	120	-	-	Death
27-Jun-13	16:15	7	0.42	DS	R02B	157	-	218	135	-	-	Whitefish
27-Jun-13	16:15	7	0.42	DS	R02B	158	-	220	135	-	-	Whitefish
27-Jun-13	16:15	7	0.42	DS	R02B	159	-	280	255	-	-	Whitefish
27-Jun-13	16:15	7	0.42	DS	R02B	160	-	239	150	-	-	Whitefish
27-Jun-13	16:15	7	0.42	US	R02B	161	-	550	1750	-	-	Lake Trout
27-Jun-13	-	-	-	-	R02A	-	-	-	-	-	-	No fish
28-Jun-13	-	-	-	-	R02A	-	-	-	-	-	-	No personnel on site
28-Jun-13	-	-	-	-	R02B	-	-	-	-	-	-	No personnel on site
29-Jun-13	13:00	8	0.415	US	R02B	164	101160	302	325	F4	CYRC	-
29-Jun-13	13:00	8	0.415	US	R02B	165	102286	240	180	M6	-	-
29-Jun-13	13:00	8	0.415	DS	R02B	163	102288	215	145	M6	-	-
29-Jun-13	13:00	8	0.415	US	R02B	166	102289	345	500	M7	-	-
29-Jun-13	13:00	8	0.415	US	R02B	167	102290	310	385	F5	-	-
29-Jun-13	13:00	8	0.415	US	R02B	168	102291	290	310	F5	-	-
29-Jun-13	13:40	8	0.415	US	R02A	169	102292	290	240	M7	-	-
29-Jun-13	13:00	8	0.415	DS	R02B	162	-	245	210		-	Whitefish
29-Jun-13	13:40	8	0.415	US	R02A	170	-	-	-	-	-	Lost in Transfer

Date	Time	Water Temp	Staff Gauge	Direction (US or DS)	Net ID	Fish #	Tag #	Fork Length (mm)	Weight (g)	Sex/ Maturity	PYRC/ CYRC	Comments
29-Jun-13	13:40	8	0.415	US	R02A	171	-	-	-	-	-	Lost in Transfer
29-Jun-13	13:40	8	0.415	US	R02A	172	-	-	-	-	-	Lost in Transfer
29-Jun-13	13:40	8	0.415	US	R02A	173	-	-	-	-	-	Lost in Transfer

F1 - Female Immature, F2 - Female Ripe, F3 - Female Waiting, F4 - Female Spent, F5 - Female Unknown
M6 - Male Immature, M7 - Male Ripe, M8 - Male Waiting, M9 - Male Spent, M10 - Male Unknown

R02 Larval Drift Monitoring Data

Date	# Arctic grayling larvae								
	A1	A2	A3	A4	B1	B2	B3	C1	C2
15-Jun-13	0	0	19	14	1	0	0	0	0
16-Jun-13	0	4	2	0	0	1	1	0	0
17-Jun-13	0	0	0	0	0	0	0	0	0
18-Jun-13	0	0	1	2	9	0	1	3	5
19-Jun-13	1	7	11	17	0	1	5	3	2
20-Jun-13	4	31	14	8	14	2	2	3	9
21-Jun-13	3	5	26	15	4	0	1	1	1
22-Jun-13	5	11	38	21	17	0	1	6	6
23-Jun-13	3	7	17	11	9	3	7	4	3
24-Jun-13	0	1	4	7	0	4	2	1	3
25-Jun-13	0	0	0	0	0	1	2	0	0
26-Jun-13									
27-Jun-13	0	4	0	0	0	6	3	6	4
28-Jun-13									
29-Jun-13	0	0	4	3	0	1	0	1	0

APPENDIX C

2013 DFO Authorizations and Animal Care Committee Letter of Approval

Fisheries and Oceans Canada | Pêches et Océans Canada

Licence #: S-13/14-1010-NU

Ryan VanEngen
Agnico-Eagle Mines Ltd. P.O. Box 540
Baker Lake, NU, CA X0C 0A0

Dear Ryan VanEngen,

Enclosed is your Licence to Fish for Scientific Purposes issued pursuant to Section 52 of the Fishery (General) Regulations.

Failure to comply with any of the conditions specified on the attached licence may result in a contravention of the Fishery (General) Regulations.

Please be advised that this licence only permits those activities stated on your licence. Any other activity may require approval under the Fisheries Act or other legislation. It is the Project Authority's responsibility to obtain any other approvals.

Please ensure that you include the licence number and project title in any future correspondence and that you complete the Summary Harvest Report upon completion of activities under this licence.

Yours truly,

for Chris Lewis
Fisheries Management Biologist
Eastern Arctic Area
Central and Arctic Region
Fisheries and Oceans Canada

July 12, 2013
Date

Enclosure

LICENCE TO FISH FOR SCIENTIFIC PURPOSES

S-13/14-1010-NU

Pursuant to Section 52 of the Fishery (General) Regulations, the Minister of Fisheries and Oceans hereby authorizes the individual(s) listed below to fish for scientific purposes, subject to the conditions specified.

Project Authority: Ryan VanEngen
Agnico-Eagle Mines Ltd. P.O. Box 540
Baker Lake, NU, CA X0C 0A0

Other Personnel: Tom Thomson
Martin Theriault
Jamie Kataluk
Leilan Baxter

Objectives: Agnico-Eagle Mines Ltd. has received a NIRB Project Certificate (No. 004) for its Meadowbank gold project, located 70km north of Baker Lake, Nunavut. Environmental monitoring has been ongoing at this site since 1999. The purpose of the fisheries monitoring program is to avoid or mitigate negative impacts from mine activities, and to meet the condition and commitments of the NIRB Project Certificate (condition 53) and DFO Authorization (NU-03-0109, NU-03-0191.3 and NU-03-0191.4) for the all-weather road and project lake area. Specific objectives of the aquatic sampling program are to:
- monitor fish utilization of habitat structures (within project lakes and along AWPAR)
- evaluate productivity in habitat compensation along the AWPAR with a focus on arctic grayling.

monitor bridge and culvert installations along the all-weather road to avoid increased sedimentation that may directly or indirectly affect fish or fish habitat

CONDITIONS

Specified Conditions:

See Appendix A for clarification.
Note: short gill net sets will be limited to 2-3 hours.

Waters:

Water Body: Waterbodies Listed - See Conditions
Point A: 0° 0' N, 0° 0' W

Species: Arctic Charr (SR OR LL)
Arctic Grayling
Burbot
Sculpin, Slimy
Stickleback, Ninespine
Trout, Lake
Whitefish, Round

Gear: 10 MM Mesh Gillnets and Larger
Angling
Electroshocker
Minnow Trap
Plankton Net
See Conditions

Total Weight	Weight Live	Weight Dead	Number Alive	Number Dead	Number Tows	Number Sets	Hours	Minutes

Fishing Period: June 15, 2013 to October 31, 2013

A copy of this licence must be available at the study site and produced at the request of a fishery officer.

Live fish may not be retained unless specified in the conditions of this licence.

The licence holder shall immediately cease fishing when the total fish killed or live sampled reaches any of the maximums set for any of the species listed.

Transportation:

Other approvals/permits may be necessary to collect or transport certain species, such as Marine Mammal Transportation Permits. For marine mammal parts, products and derivatives a Marine Mammal Transportation Licence is required for domestic transport and, for international transport a Canadian CITES Export Permit is also required.

Disposal of Fish Caught:

Fish not required for the purpose of dead sampling and/or retention MUST be returned to the water at the site of capture. Retained fish may be made available to the nearest settlement for domestic consumption or sold commercially within the Territory. Any dead fish for commercial sale beyond the Territory in which it was caught requires authorization under the Fish Inspection Regulations. Disposal of any fish remains must be in accordance with local land use regulations.

Retention & Disposal of Fish Caught:

Fish not required for the purpose of dead sampling and/or retention MUST be returned to the water at the site of capture. Retained fish may be made available to the nearest settlement for domestic consumption or sold commercially within the Territory. Any dead fish for commercial sale beyond the Territory in which it was caught requires authorization under the Fish Inspection Regulations. Disposal of any fish remains must be in accordance with local land use regulations.

Report on Activities:

The Project Authority will submit to the Area Licensing Coordinator, Department of Fisheries and Oceans, within one month of the expiry date, a report stating:

i) whether or not the field work was conducted; and if conducted

ii) waterbody location, fishing coordinates, gear types used at each coordinate, numbers or amount of fish (by species) collected and/or marked and the date or period of collection.

A Summary Harvest Report template is provided by the Licensing Coordinator at time of issuance of this licence.

The Project Authority also will provide a copy of any published or public access documents which result from the project. Information supplied will be used for population management purposes by the Department of Fisheries and Oceans and becomes part of the public record.

All documents should be sent to:

Area Licensing Administrator
Fisheries and Oceans Canada
P.O. Box 358
Iqaluit, NU X0A 0H0
Email: XCNA-NT-NUpermit@dfo-mpo.gc.ca

Notification of Commencement:

Prior to the commencement of fishing the Project Authority will contact:

Area Licencing Administrator
Fisheries and Oceans Canada
Box 358
Iqaluit, NU X0A 0H0
email: XCNA-NT-NUpermit@dfo-mpo.gc.ca

for Larry Dow
Director, Northern Operations
Central and Arctic Region
Fisheries and Oceans Canada

July 12, 2013
Date

For the Minister of Fisheries and Oceans.
Pursuant to Section 52 of the Fishery (General) Regulations.

Legal Name (if applicable): NA			
Local Name (if applicable): Portage Lake system – Sampling in Third Portage Lake near the Bay Goose Dike, Second Portage Lake near the East Dike and in Dogleg Ponds			
Latitude (degrees, minutes): 65°00'51"N		**Longitude (degrees, minutes):** 96°05'33"W	
Species:	**Estimated Sample Size: 250** (Number or estimated Weight in kg)		**Sampling Methods / Gear Types:** (include duration and number of tows / sets if applicable)
	Live Sample	**Dead Sample**	
Based on previous work, the adult, small bodied or YOY species include: Lake trout Round whitefish Arctic char Slimy sculpin Burbot	~200	50	Angling Underwater motion sensor cameras and if deemed necessary, Short set gill netting to establish a CPUE (catch-per-unit-effort) using 126, 102, 76, 51, 38 and 25 mm stretch mesh gangs (nets) consistent with previous studies.

Legal Name (if applicable): NA			
Local Name (if applicable): Wally Lake			
Latitude (degrees, minutes): 65°06'05"N		**Longitude (degrees, minutes):** 95°57'19"W	
Species:	**Estimated Sample Size: 125** (Number or estimated Weight in kg)		**Sampling Methods / Gear Types:** (include duration and number of tows / sets if applicable)
	Live Sample	**Dead Sample**	
Based on previous work, the adult, small bodied or YOY species include: Lake trout Round whitefish Arctic char Slimy sculpin Burbot	~100	25	Angling Underwater motion sensor cameras and if deemed necessary, Short set gill netting to establish a CPUE (catch-per-unit-effort) using 126, 102, 76, 51, 38 and 25 mm stretch mesh gangs (nets) consistent with previous studies.

Legal Name (if applicable): NA			
Local Name (if applicable): Vault Lake			
Latitude (degrees, minutes): 65°04'18"		**Longitude (degrees, minutes): 95°59'20"**	
Species:	**Estimated Sample Size: 125** (Number or estimated Weight in kg)		**Sampling Methods / Gear Types:** (include duration and number of tows / sets if applicable)
	Live Sample	**Dead Sample**	
Based on previous work, the adult, small bodied or YOY species include: Lake trout Round whitefish Arctic char Slimy sculpin Burbot	~100	25	Angling, Underwater motion sensor cameras and if deemed necessary, Short set gill netting to establish a CPUE (catch-per-unit-effort) using 126, 102, 76, 51, 38 and 25 mm stretch mesh gangs (nets) consistent with previous studies.

Legal Name (if applicable):			
Local Name (if applicable): Meadowbank All-Weather Private Access Road (AWPAR) HADD Crossings R02 (see attached AWPAR map sheets)			
Latitude (degrees, minutes): 64°18'42"N		**Longitude (degrees, minutes):** 96°00'04"W	
Species:	**Estimated Sample Size: 800** (Number or estimated Weight in kg)		**Sampling Methods / Gear Types:** (Include duration and number of tows / sets if applicable)
	Live Sample	**Dead Sample**	
Based on previous work, the following adult species and YOY are anticipated: Arctic grayling Round whitefish Lake trout Arctic char Slimy sculpin	~400 (mostly ARGR)	20 (Near-Zero mortality)	Hoop nets and angling to record fish presence
Based on previous work, the following larval species are expected: Arctic grayling Slimy sculpin Ninespine Stickleback		Est 400 Est 50 Est 50	Larval drift traps electrofishing

Canada

Date: June 11, 2013

To: Ryan VanEngen MSc
Agnico-Eagle Mines Ltd.
Baker Lake
Nunavut, X0C 0A0

Subject: Animal Use Protocol - Letter of Approval

Dear Ryan,

Your 2012 Animal Use Protocol (AUP), number FWI-ACC-2013-033 entitled "Meadowbank Mine: Fisheries Habitat Compensation Monitoring (All-Weather Access Road (AWAR) and Mine Site Authorization Monitoring)", has been reviewed and approved by the Freshwater Institute Animal Care Committee. This AUP will expire on November 01, 2013.

Keep this signed letter of approval as well as the signed AUP approval form for your records. Please be advised that should there be a need to revise the protocol you are requested to contact the Freshwater Institute Animal Care Committee and obtain approval prior to proceeding.

In addition, you are required to submit a brief report within 30 days of completion of the project outlining the unexpected changes to the protocol, the number of animals used and any unanticipated results or mortalities. The report form is attached in your approval email.

Feel free to contact me if you have any questions or concerns.

Sincerely,

Kerri Pleskach *FWISL-ACC Acting Chairperson*

Freshwater Institute Science Laboratories Animal Care Committee
Arctic Aquatic Research
Central & Arctic / Région du Centre et de l'Arctique
Fisheries and Oceans Canada / Pêches et Océans Canada
501 University Crescent
Winnipeg, Manitoba R3T 2N6
Phone:204 984-2532
Fax:204 984-2403

Enclosure

APPROVAL BY ANIMAL CARE COMMITTEE MEMBERS

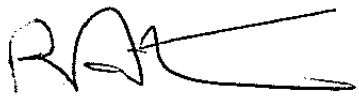
AUP#: ACC-2013-033 Date: June 11, 2013

Signatures of ACC Members

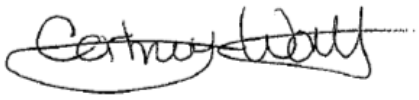
Kerri Pleskach, Chair

Theresa Carmichael

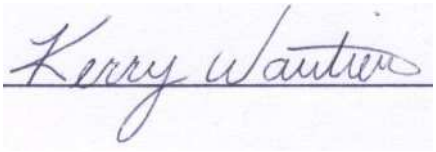
Dr. Ericka Anseeuw D.V.M.



Bob Artes



Cortney Watt



Kerry Wautier

Interim Approval ☐ **Final Approval** ☒

APPROVAL BY THE FWI ANIMAL CARE COMMITTEE IS FOR THE PERIOD STATED ON YOUR ANIMAL USE PROTOCOL.