APPENDIX 15-S
KSM PROJECT: 2012 FISH BEARING STATUS ASSESSMENT MEMORANDUM

Memorandum

DATE:	December 17, 2012
TO:	Elizabeth Miller – Seabridge Gold Inc.
FROM:	Kyla Warren – Rescan Environmental Services Ltd.
CC:	Sean Cullen, Christopher Burns - Rescan Environmental Services Ltd.
SUBJECT:	KSM Project: 2012 Fish Bearing Status Assessment

Refer to File No.: N:\868 Seabridge\868-017 KSM 2012 Fieldwork\868-017-19 Fisheries - Treaty Access Road\Word Processing\Memo\A.1 MEMORANDUM - Fish Bearing Status.docx

1. Introduction

The objective of the assessment was to determine fish presence/absence, fish bearing status, and fish community composition in the following waterbodies:

- Sulphurets Creek and its tributaries (i.e., Mitchell and Ted Morris creeks) upstream of the cascade fish migration barrier;
- A small lake, named Treaty Saddle Lake, near the proposed Camp 6 location in the Treaty Creek Saddle Area; and
- Two lakes, named Unuk Camp Lakes, in the Unuk River watershed, adjacent to the proposed Camp 8 location.

All sampled sites were of unknown fish-bearing status. The sampled waterbodies are shown in Figure 1-1.

Sulphurets Creek and its tributaries (i.e., Mitchell and Ted Morris creeks) are glacially fed streams. Glacial streams can be highly turbid during summer due to the glacial flour runoff. Although substantial electrofishing effort over two summers did not capture any fish above a cascade fish migration barrier located approximately 500 m above the confluence with the Unuk River (KSM 2009, 2010), additional sampling was scheduled for early winter when water clarity improves.

Treaty Saddle Lake is located upstream of a gradient fish migration barrier in excess of 30% slope, which is sufficient to prevent fish passage (MOF 1998). However, headwater lakes above fish barriers have been known to support resident populations of fish, especially Dolly Varden (*Salvelinus malma malma*; McPhail 2007). No previous sampling had been conducted in the lake and its fish-bearing status was unknown.

The Unuk Camp Lakes are located near the Unuk River, connected to the river by a short stream. No previous sampling had been conducted in either lake and their fish-bearing status were unknown.

This memo summarizes the methods and results of the fish habitat and distribution surveys conducted in November 2012.

PROJECT # 868-017-19 GIS No. KSM-06-160 December 13, 2012

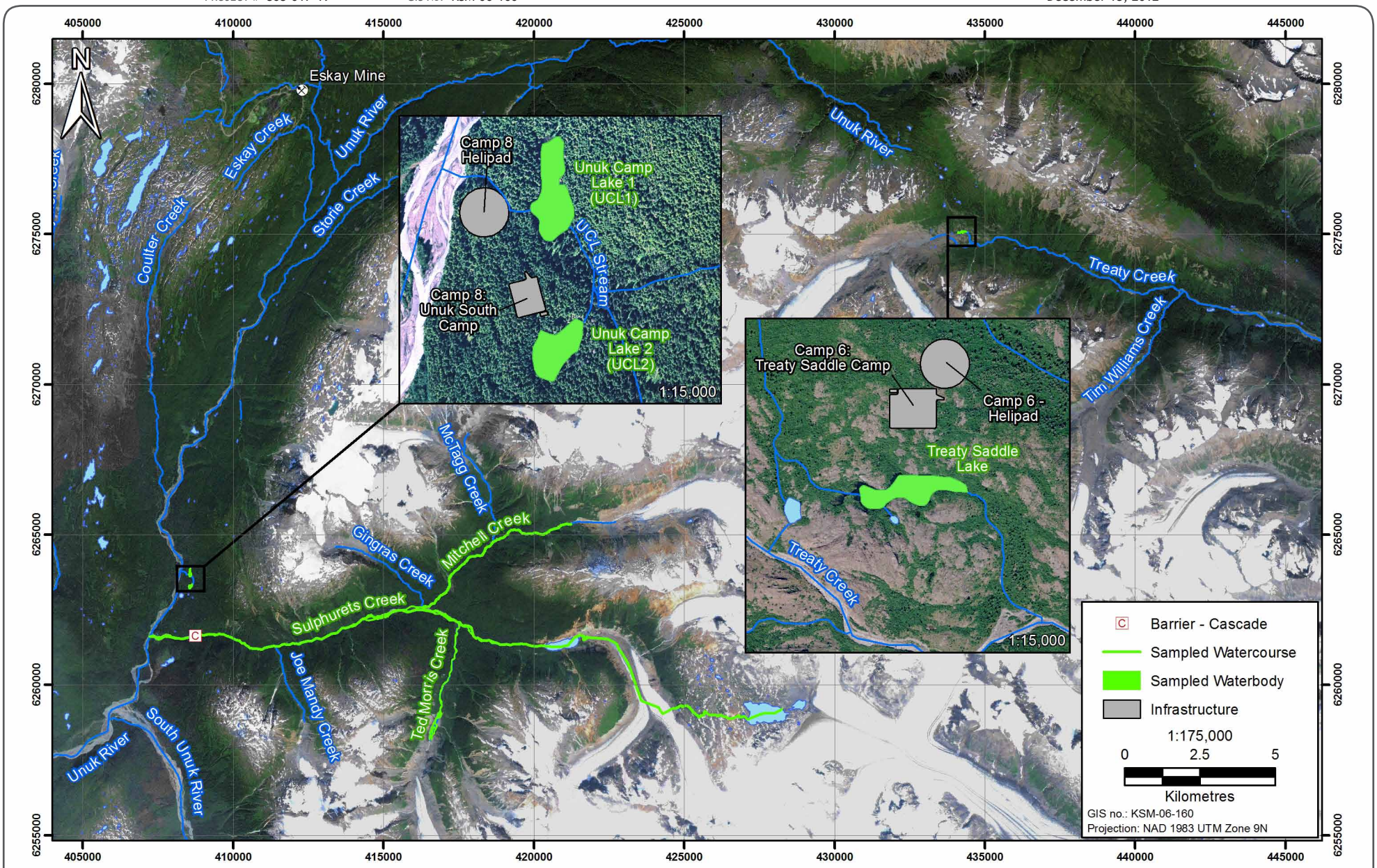

Figure 1-1

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Sampled Waterbodies, KSM Project, 2012

Figure 1-1

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2. Methods

All sampling was completed from November 21 to November 24, 2012. Low water temperatures precluded the use of electrofishing equipment, which is unsuitable for use in cold water (i.e., <5°C). Sampling using pole seines nets was prevented by solid ice cover on the lakes and by the formation of frazil ice in the streams. Minnow traps were determined to be the most suitable sampling gear for all waterbodies.

Minnow traps were baited with commercial shrimp and prawn bait and set in the shallow littoral zones of lakes, and slow water, low velocity areas in streams. The minnow traps consisted of two cylinders of 6.3 mm galvanized metal mesh measuring 42 cm long and 23 cm in diameter with a 2 cm diameter opening. The cylinders were locked together using a clip attached to a rope and buoy. Minnow traps were set and left overnight or longer.

Fish captured during sampling were moved to a recovery bucket, identified by species, and measured for fork length (to the nearest 1 mm). Catch per unit effort (CPUE) for each trap was calculated as:

*CPUE = number of fish caught per trap * (24 (h) / set time (h))*

3. Results

3.1 Sulphurets Creek and Tributaries

Minnow traps were set in sections of Sulphurets Creek, Ted Morris Creek, and Mitchell Creek (Figure 3.1-1). Minnow trap set locations were restricted to creek areas where suitable depth and velocity were present so that traps did not move. Furthermore, minnow traps were located in creek areas that were ice free and avalanche risks were low to negligible. A total of 913 hours of minnow trapping effort was completed in the Sulphurets Creek watershed (Appendix A). No fish were captured in any of the minnow traps.

3.2 Treaty Saddle Lake

Eight minnow traps were set in the lake between November 22 and November 24 for a total of 268 hours of minnow trapping effort (Appendix B). No fish were captured. Although small, the lake was determined to be deep (>5 m, as determined by a weighted line). The shoreline dropped off steeply, resulting in a narrow littoral zone.

3.3 Unuk Camp Lakes

Ten minnow traps were set in the Unuk Camp Lakes area (Appendix C). Five were set in Unuk Camp Lake 1 (UCL1, downstream of the other Unuk Camp Lake), one trap set in Unuk Camp Lake Stream (UCL Stream) between the two lakes, and four traps set in Unuk Camp Lake 2 (UCL2, upstream of both UCL1 and UCL Stream; Figure 3.3-1). A total of 242 hours of minnow trapping effort was completed in the Unuk Camp Lakes area.

Fish were captured in four of the five UCL1 traps and in the UCL Stream trap. All captured fish were identified as Dolly Varden (Appendix D). No fish were captured in UCL2 traps. A beaver dam approximately 1 m in height was identified at the outlet of UCL2, separating it from UCL1 and UCL Stream.

PROJECT # 868-017-09 GIS No. KSM-06-161 December 12, 2012

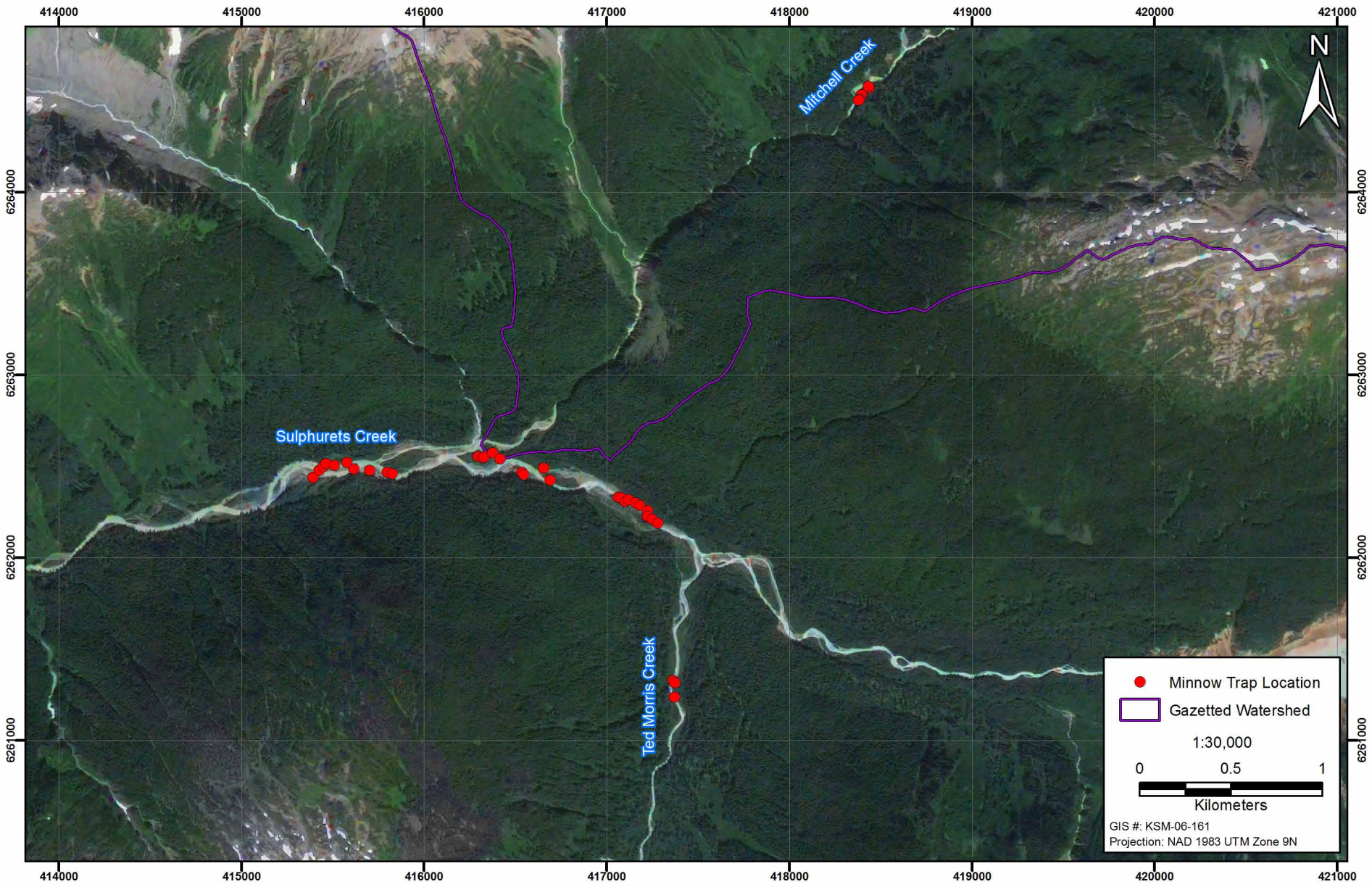

Figure 3.1-1

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Sulphurets Watershed Sampling Locations, KSM Project, 2012

Figure 3.1-1

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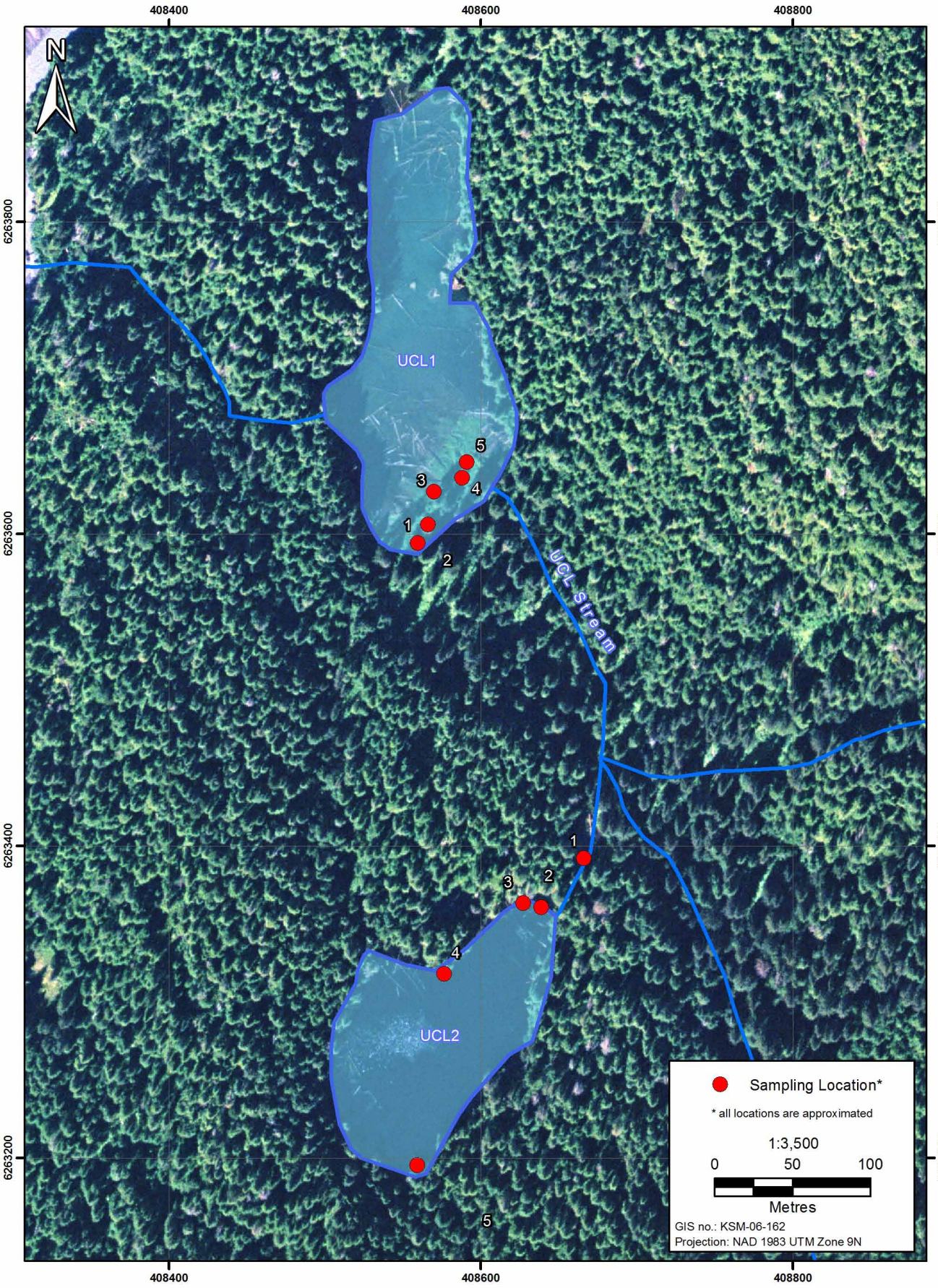

Figure 3.3-1

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Sampling Locations in the Unuk Camp Lakes, KSM Project, 2012

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4. Conclusions and Recommendations

In 2008, Sulphurets Creek and its tributaries (McTagg, Mitchell, and Ted Morris creeks) were sampled. No fish were caught above the cascade despite 6,698 s of electrofishing effort. A total of nine sites were sampled in August 2008 (Rescan 2009). Sulphurets Lake was sampled in September and no fish were caught despite a total of 118 h of gillnetting and 297 h of minnow trapping effort.

In 2009, a total of 3,046 s of electrofishing effort was exerted above the cascade at three sites in Sulphurets and Mitchell creeks. Sampling occurred in August and September 2009 and no fish were caught (Rescan 2010). Sulphurets Lake was sampled in July and no fish were caught after a total of 45 h of gillnetting and 235 h of minnow trapping effort.

The 2012 minnow trapping in Sulphurets Creek and tributaries complements the electrofishing, gillnetting, and minnow trapping effort previously undertaken upstream of the Sulphurets Creek cascade fish migration barrier. With this additional sampling and during a different season, resulting in no fish caught, there is sufficient evidence to confirm the watershed upstream of the Sulphurets Creek cascade barrier is non-fish bearing.

The effort expended in the Treaty Saddle Lake is not on its own sufficient to determine fish-bearing status. However, the lake is small (approximately 300 m in diameter across the longest axis), with gradient barriers immediately upstream and downstream of in the lake inflow and outflow and a narrow littoral zone. Spawning habitat for resident fish populations is likely to be limited, resulting in marginal overall fish habitat and potential to support only a small fish population, as supported by the observed CPUE. Therefore, the Treaty Saddle Lake was determined to be fish bearing based upon the amount of sampling effort.

The Unuk Camp Lakes provide good overwintering and rearing habitat as shown by the high CPUE in UCL1. Although no fish were captured in UCL2, the beaver dam separating the two lakes is a temporary barrier, and both lakes were classified as fish bearing (MOF 1998).

References

Rescan. 2009. *KSM Project: 2008 Fish and Fish Habitat Baseline Report*. Vancouver, BC. Prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd.

Rescan. 2010. *KSM Project: 2009 Fish and Fish Habitat Baseline Report*. Vancouver, BC. Prepared for Seabridge Gold Inc. by Rescan Environmental Services Ltd.

McPhail, J.D. 2007. *The Freshwater Fishes of British Columbia*. Edmonton, AB: The University of Alberta Press.

Ministry of Forests (MOF). 1998. *Fish-stream identification guidebook*. Second Edition. Forest Practices Code Guidebook. B.C. Ministry of Forests. Victoria, B.C.

- Appendix A -
Sulphurets Creek and Tributary Minnow Trap Effort and Catch, KSM Project, 2012

Appendix A. Sulphurets Creek and Tributary Minnow Trap Effort and Catch, KSM Project, 2012

			UTM Zone 9		Set		Removal					
Stream	Site	Set	Easting	Northing	Date (mm/dd/yy)	Time (24 hr Clock)	Date (mm/dd/yy)	Time (24 hr Clock)	Soak Time (h)	Depth (m)	Catch (No.)	CPUE (fish/24 h)
Sulphurets Creek	1	1	415393	6262439	11/21/12	9:00	11/22/12	9:10	24.2	0.4	0	0.00
Sulphurets Creek	1	2	415424	6262477	11/21/12	9:10	11/22/12	9:12	24.0	0.3	0	0.00
Sulphurets Creek	1	3	415447	6262499	11/21/12	9:25	11/22/12	9:10	23.8	0.3	0	0.00
Sulphurets Creek	1	4	415462	6262516	11/21/12	9:35	11/22/12	9:15	23.7	0.4	0	0.00
Sulphurets Creek	1	5	415509	6262506	11/21/12	9:40	11/22/12	9:22	23.7	0.3	0	0.00
Sulphurets Creek	1	6	415576	6262521	11/21/12	9:41	11/22/12	9:28	23.8	0.3	0	0.00
Sulphurets Creek	1	7	415616	6262485	11/21/12	9:50	11/22/12	9:35	23.8	0.4	0	0.00
Sulphurets Creek	1	8	415702	6262479	11/21/12	10:00	11/22/12	9:42	23.7	0.4	0	0.00
Sulphurets Creek	1	9	415797	6262469	11/21/12	10:10	11/22/12	9:55	23.8	0.5	0	0.00
Sulphurets Creek	1	10	415827	6262460	11/21/12	10:28	11/22/12	10:15	23.8	0.3	0	0.00
Sulphurets Creek	2	11	416295	6262555	11/21/12	10:50	11/22/12	10:20	23.5	0.4	0	0.00
Sulphurets Creek	2	12	416320	6262546	11/21/12	11:00	11/22/12	10:22	23.4	0.4	0	0.00
Sulphurets Creek	2	13	416329	6262552	11/21/12	11:07	11/22/12	10:26	23.3	0.4	0	0.00
Sulphurets Creek	2	14	416374	6262575	11/21/12	11:15	11/22/12	10:35	23.3	0.4	0	0.00
Sulphurets Creek	2	15	416415	6262542	11/21/12	11:22	11/22/12	10:38	23.3	0.3	0	0.00
Sulphurets Creek	2	16	416467	62624981	11/21/12	11:30	11/22/12	10:44	23.2	0.3	0	0.00
Sulphurets Creek	2	17	416534	6262468	11/21/12	11:35	11/22/12	10:49	23.2	0.3	0	0.00
Sulphurets Creek	2	18	416546	6262456	11/21/12	11:48	11/22/12	10:58	23.2	0.3	0	0.00
Sulphurets Creek	2	19	416655	6262491	11/21/12	11:55	11/22/12	11:03	23.1	0.3	0	0.00
Sulphurets Creek	2	20	416689	6262425	11/21/12	12:05	11/22/12	11:11	23.1	0.4	0	0.00
Sulphurets Creek	3	21	417063	6262332	11/21/12	12:15	11/22/12	11:20	23.1	0.3	0	0.00
Sulphurets Creek	3	22	417078	6262329	11/21/12	12:17	11/22/12	11:21	23.1	0.4	0	0.00
Sulphurets Creek	3	23	417100	6262307	11/21/12	12:20	11/22/12	11:25	23.1	0.4	0	0.00
Sulphurets Creek	3	24	417119	6262318	11/21/12	12:22	11/22/12	11:28	23.1	0.3	0	0.00
Sulphurets Creek	3	25	417158	6262300	11/21/12	12:30	11/22/12	11:30	23.0	0.3	0	0.00
Sulphurets Creek	3	26	417181	6262289	11/21/12	12:35	11/22/12	11:35	23.0	0.5	0	0.00
Sulphurets Creek	3	27	417222	6262258	11/21/12	12:42	11/22/12	11:40	23.0	0.4	0	0.00
Sulphurets Creek	3	28	417223	6262226	11/21/12	12:50	11/22/12	11:46	22.9	0.3	0	0.00
Sulphurets Creek	3	29	417249	6262212	11/21/12	12:55	11/22/12	11:49	22.9	0.3	0	0.00
Sulphurets Creek	3	30	417278	6262189	11/21/12	13:00	11/22/12	11:53	22.9	0.3	0	0.00
Ted Morris Creek	1	1	417370	6261237	11/23/12	13:15	11/24/12	10:02	20.8	0.5	0	0.00
Ted Morris Creek	1	2	617357	6261279	11/23/12	13:20	11/24/12	10:05	20.8	0.3	0	0.00
Ted Morris Creek	1	3	NA	NA	11/23/12	13:25	11/24/12	10:07	20.7	0.4	0	0.00
Ted Morris Creek	1	4	417363	6261328	11/23/12	13:25	11/24/12	10:07	20.7	0.4	0	0.00
Ted Morris Creek	1	5	417374	6261314	11/23/12	13:30	11/24/12	10:08	20.6	0.5	0	0.00
Mitchell Creek	1	1	418437	6264575	11/23/12	13:40	11/24/12	10:22	20.7	0.4	0	0.00
Mitchell Creek	1	2	418431	6264582	11/23/12	13:45	11/24/12	10:30	20.8	0.3	0	0.00
Mitchell Creek	1	3	418394	6264535	11/23/12	13:50	11/24/12	10:35	20.8	0.5	0	0.00
Mitchell Creek	1	4	418383	6264509	11/23/12	13:57	11/24/12	10:39	20.7	0.5	0	0.00
Mitchell Creek	1	5	418379	6264504	11/23/12	14:10	11/24/12	10:42	20.5	0.4	0	0.00

CPUE = catch per unit effort

NA = not available

- Appendix B -
Treaty Saddle Lake Minnow Trap Effort and Catch, KSM Project, 2012

Appendix B. Treaty Saddle Lake Minnow Trap Effort and Catch, KSM Project, 2012

		UTM Zone 9		Set		Removal					
Lake	Set	Easting	Northing	Date (mm/dd/yy)	Time (24 hr Clock)	Date (mm/dd/yy)	Time (24 hr Clock)	Soak Time (h)	Depth (m)	Catch (No.)	CPUE (fish/24 h)
Treaty Saddle Lake	1	434395	6275055	11/22/12	12:30	11/24/12	11:00	46.5	0.5	0	0.00
Treaty Saddle Lake	2	434396	6275060	11/22/12	12:38	11/24/12	11:02	46.4	1.0	0	0.00
Treaty Saddle Lake	3	434390	6275063	11/22/12	12:39	11/24/12	11:02	46.4	0.8	0	0.00
Treaty Saddle Lake	4	434343	6275056	11/23/12	9:06	11/24/12	11:06	26.0	2.0	0	0.00
Treaty Saddle Lake	5	434322	6275066	11/23/12	6:37	11/24/12	11:11	28.6	3.5	0	0.00
Treaty Saddle Lake	6	434303	6275067	11/23/12	10:15	11/24/12	11:16	25.0	3.0	0	0.00
Treaty Saddle Lake	7	434293	6275059	11/23/12	10:29	11/24/12	11:25	24.9	3.0	0	0.00
Treaty Saddle Lake	8	434285	6275052	11/23/12	11:00	11/24/12	11:30	24.5	1.5	0	0.00

CPUE = catch per unit effort

- Appendix C -
Unuk Camp Lakes Minnow Trap Effort and Catch, KSM Project, 2012

Appendix C. Unuk Camp Lakes Minnow Trap Effort and Catch, KSM Project, 2012

		UTM Zone 9		Set		Removal					
Lake	Set	Easting	Northing	Date (mm/dd/yy)	Time (24 hr Clock)	Date (mm/dd/yy)	Time (24 hr Clock)	Soak Time (h)	Depth (m)	Catch (No.)	CPUE (fish/24 h)
UCL1	1	408566	6263606	11/23/12	11:30	11/24/12	11:58	24.5	0.4	0	0.00
UCL1	2	408568	6263592	11/23/12	11:39	11/24/12	12:05	24.4	0.4	2	1.96
UCL1	3	408570	6263627	11/23/12	11:50	11/24/12	12:08	24.3	0.5	4	3.95
UCL1	4	408588	6263636	11/23/12	11:55	11/24/12	12:11	24.3	0.3	1	0.99
UCL1	5	408591	6263646	11/23/12	12:00	11/24/12	12:15	24.3	0.4	1	0.99
UCL Stream	1	408666	6263392	11/23/12	12:15	11/24/12	12:32	24.3	0.3	1	0.99
UCL2	2	408643	6263369	11/23/12	12:28	11/24/12	12:41	24.2	0.3	0	0.00
UCL2	3	408627	6263367	11/23/12	12:29	11/24/12	12:41	24.2	0.3	0	0.00
UCL2	4	408575	6263321	11/23/12	12:48	11/24/12	12:46	24.0	1.5	0	0.00
UCL2	5	408595	6263149	11/23/12	12:55	11/24/12	12:53	24.0	0.7	0	0.00

UCL = Unuk Camp Lake

CPUE = catch per unit effort

- Appendix D -
Biological Characteristics of Fish Captured in Minnow Traps, KSM Project, 2012

Appendix D. Biological Characteristics of Fish Captured in Minnow Traps, KSM Project, 2012

Lake	Set	Species	Fork Length (mm)
UCL1	2	Dolly Varden	95
UCL1	2	Dolly Varden	100
UCL1	3	Dolly Varden	85
UCL1	3	Dolly Varden	142
UCL1	3	Dolly Varden	83
UCL1	3	Dolly Varden	121
UCL1	4	Dolly Varden	89
UCL1	5	Dolly Varden	83
UCL Stream	1	Dolly Varden	63

UCL = Unuk Camp Lake