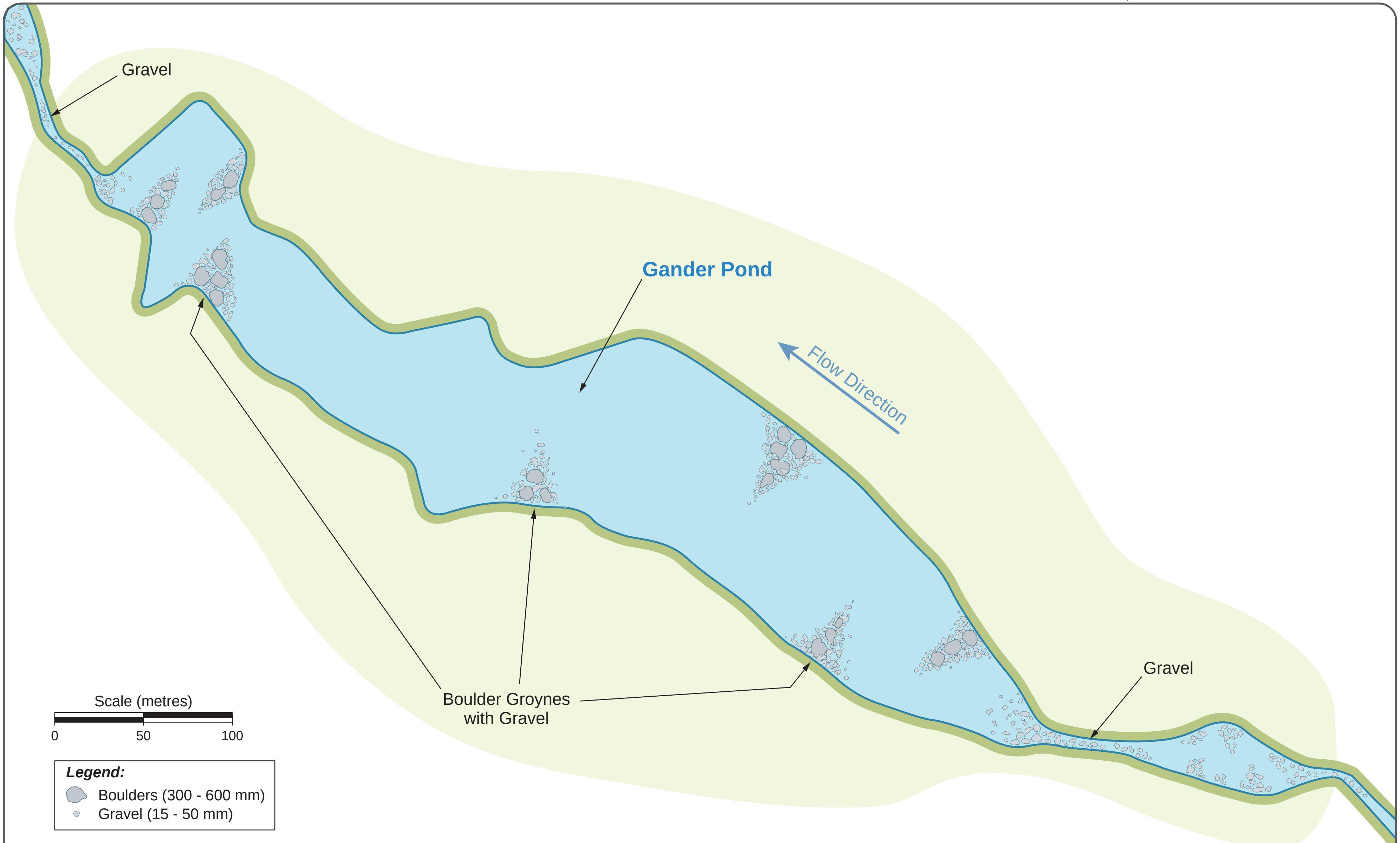
Note: Boulder and gravel enhancements are not to scale. See Appendix 5.3 for details.

Figure 5.1-2

Proposed Habitat Enhancements at Gosling Ponds 1 and 2



Note: Boulder and gravel enhancements are not to scale. See Appendix 5.3 for details.

Figure 5.1-3

Sabina GOLD & SILVER CORP.

Proposed Habitat Enhancement at Gander Pond

Rescan an ERM company

5.2.3 Mitigation for Erosion and Sedimentation

Experience with other Arctic diversion channels has shown that sediment can be mobilized from a new stream channel and/or from disturbed areas through thermal degradation, and transported downstream immediately after freshet flows begin in late May/early June.

During freshet of 2015, releases in sediment are expected to occur following the winter construction of berms and culverts and increased channel flows over the entire length of the re-realigned RSW. Increased suspended sediment will be mitigated naturally in the three ponds (Gander, Gosling 1 and 2) where low velocities (Figure 5.1-1) will cause a large portion of suspended solids to deposit without being carried farther downstream. The result will be a natural lowering of concentrations of suspended solids in the water between pond reaches, and most importantly, in the most downstream reach located just upstream of Goose Lake where Arctic Grayling will enter the re-aligned stream to spawn and migrate.

The boulder and gravel groynes placed in each pond to increase habitat heterogeneity and rearing cover will also serve to increase the surface area available to trap and remove suspended sediments from water transport. Moreover, the relatively flat topography over the length of the enhanced RSW should allow for additional settling onto the tundra should flows overtop existing banks.

In the event that particulates do not adequately settle prior to leaving Gander Pond, sediment curtains will be installed in Goose Lake at the mouth of the re-aligned RSW, to mitigate for the potential of sediments entering Goose Lake. Sediment curtains will be placed in an overlapping configuration, such that the majority of suspended particulates are captured, but also so fish may pass between curtains and migrate into the stream.

5.2.4 Construction Schedule and Environmental Mitigation Measures

5.2.4.1 Construction Period

The schedule for construction is presented in Table 4.1-1. Two rock berms (See Figure 4.1-1 for placement) will be constructed during April 2015 when the ground is still frozen. During the first winter season, heavy machinery can move freely around the site with limited damage to the tundra. Substrates used for construction of the berm will be composed of clean rock (i.e., non-potentially acid generating rock) and will be placed to impede natural flows from moving eastwards towards Goose Lake. As a result of proposed berm placements, it is expected that at freshet, water will be forced to flow towards the most western branch (i.e., Rascal Stream West), and northwards to Goose Lake passing first through Gosling Ponds 1 and 2, and eventually through Gander Pond. Gander Pond will act as the final natural sediment trap should any fine sediments be transported downstream from Gosling Ponds 2 and 1, and along lowland areas along the re-aligned course.

Gravel and boulder additions proposed for the three pond locations as depicted in schematic drawings will also be conducted in the winter to minimize damage to the tundra (Figures 5.1-2 and 5.1-3, Table 5.2-1). Clean substrates will be placed on the ice/snow-covered ponds using a two-step process consisting of initial placement of large boulders, followed by gravel additions. Gravel substrates will also be added to areas just upstream and downstream of these ponds. All of these substrate additions have the objective of enhancing existing fish habitat at RSW (Table 5.2-1) in addition to reducing transport of sediment released into Goose Lake (see section 5.2.2 for additional information).

Following detailed hydrological and fish habitat assessments conducted in 2015 (see Proposed Monitoring Program, Chapter 6 of this report) at both high (freshet) and low flows following berm construction, habitat enhancement works will be designed and adapted to conditions observed and will be implemented the following winter.

Table 5.2-1. Details of Proposed Fish Habitat Enhancement Activities to be Conducted within Re-aligned Rascal Stream and Associated Ponds during Year 1 of Post-Berm Construction

Enhancement	Description	Habitat Unit Created	Function	Effect	Proposed Location
Spawning gravel enhancement pads	Addition of gravel (15 - 50 mm) and boulders ~300 - 600 mm	Riffle	Arctic Grayling spawning and juvenile rearing/foraging habitat	Increase in available spawning habitat	• Upstream Gosling Pond 1 • Between Gosling Ponds 1 and 2 • Downstream Gosling Pond 2 • Upstream Gander Pond • Downstream Gander Pond
Boulder groynes	Addition of large boulders (300 - 600 mm) placed into single fingerlike projections	Pool, run, and shallow backwater	Arctic grayling rearing/foraging habitat, and cover	Fine sediment trapping upstream of projections	• Gosling Pond 1 • Gosling Pond 2 • Gander Pond
Addition of large boulders (clusters)/gravel	Boulders: 300 - 600 mm; Gravel ~15 - 50 mm	Pool and run	Cover; juvenile Arctic Grayling rearing/foraging; velocity refugia for fish and aquatic invertebrates	Increase in habitat complexity; boulders create cover; water flow is reflected and directed around boulders; depth created by scouring	• Gosling Pond 1 • Gosling Pond 2 • Gander Pond

5.2.4.2 Source of Substrate

Any natural boulder and cobble material dug up during construction anywhere at site will be separated from the rest of the boulder/cobble material and retained for use in the new re-aligned stream section. Larger substrates (i.e., boulders) will be retained for pond enhancement works. All substrate materials larger than sand will be washed (whenever feasible) prior to use to reduce the amount of small particles. Only clean (i.e., non-potentially acid generating substrates) will be used.

Substrates remaining in RSE but no longer within a wetted channel will also be retained for use as spawning gravel and cobble during habitat mitigation in year 2.

5.2.4.3 Culvert Mitigation

Placement of box culverts (sea cans) or circular culverts located at meter 96 between Goose Lake and Gander Pond will occur during the winter to minimize/eliminate to accommodate the construction of an all-weather road. Culverts will be installed following best practices (BC MFLNRO 2012, DFO 2007). Sizing of culverts to be placed was determined such that they did not present a velocity barrier to migrating Arctic Grayling.

Regular culvert maintenance will be performed on an ongoing basis in order to prevent culvert blockage and will generally follow the DFO Nunavut Operation Statement for Culvert Maintenance (DFO Nunavut Operation Statement: Culvert Maintenance, version 3.0 (2007)). Specifically, culverts will be blocked prior to winter to prevent snow from accumulating inside the culvert and blocking flows during freshet, which would have the potential of overflooding the area, possibly leading to sedimentation and erosion.

5.3 RESIDUAL EFFECTS

Residual effects are those effects predicted to remain after the application of mitigation and management measures.

Three potential effects to Arctic Grayling productivity were evaluated:

- Habitat losses in Rascal Stream East (RSE);
- Habitat gains in Rascal Stream West (RSW); and
- Sedimentation and erosion in Rascal Stream West (RSW).

There is no residual effect anticipated from the loss of fish habitat in RSE because of the proposed offsetting/habitat enhancement in RSW.

For the potential effect of sedimentation/erosion on Arctic Grayling, mitigation measures such as the timing of construction (winter) along with the use of silt curtains will eliminate or minimize this potential effect in downstream Goose Lake and in sections of RSW. However, silt curtains, when installed in an overlapping configuration with a gap between panels to allow fish passage may still create a barrier to Arctic Grayling being able to use portions of RSW. Hence, a potential adverse residual effect due to sedimentation/erosion on the Arctic Grayling population spawning in year one following stream re-alignment is evaluated below (Table 5.3-1).

Table 5.3-1. Summary of Potential Residual Effect and Significance Rating for Arctic Grayling

	Qualifier	Primary Criteria		Secondary Criteria			Qualifier	Significance Rating
Potential Residual Effect	**Direction (positive, neutral, negative)**	**Magnitude (low, moderate, high)**	**Reversibility (reversible, reversible with effort, irreversible)**	**Duration (short, medium, long)**	**Frequency (once, sporadic, continuous)**	**Geographic Extent (footprint, local, regional, beyond regional)**	**Probability (unlikely, moderate, likely)**	**(Not Significant (N), Significant (S))**
Sedimentation/Erosion potential effects. Mitigation measure will be in place (e.g. winter construction, local sediment controls); however, the placement of silt curtains would prevent Arctic Grayling from accessing the new RSW habitat. Consider the potential residual effect of sedimentation/erosion in order to allow access of Arctic Grayling to new RSW habitat. Decreased Arctic Grayling production caused by mobilization of fine particulate matter.	Negative	Low-moderate	Reversible	Medium	Sporadic	Local	Likely	N

In the absence of using silt curtains (in order to allow for Arctic Grayling passage through RSW), a residual effect arising from the suspension of fine particulate matter could result in decreased Arctic Grayling production through avoidance of turbid sections of stream, or by smothering eggs laid within spawning gravels in the channel. The geographical extent of the residual effect would be limited to the re-aligned RSW and confined to within the Rascal Lake to Goose Lake study area; therefore it would be considered *local*. The residual effect would be sporadic, with the majority of the sediment pulse occurring in year one following the re-alignment. However, subsequent, smaller pulses could occur during the placement of spawning gravels in year 2 and during culvert removal (possibly in years three to five). The potential increase in erosion and sedimentation would be of *medium* duration (primarily limited to the first year following construction) and thus, the potential adverse effect on Arctic Grayling would also be of *medium* duration. The potential residual effect would be *fully reversible* — spawning, rearing and migration should re-establish naturally with no intervention once freshet removes the suspended matter.

Arctic Grayling have a highly adaptable life history that allows for flexibility in its spawning, rearing and foraging locations which can occur in lakes, streams and rivers (Evans, Reist, and Minns 2002). In addition, Arctic Grayling are long lived, iteroparous spawners. This strategy is adaptive to overcome for the loss, or partial loss of yearly cohorts in unpredictable environments like the Arctic. Thus, the magnitude of the potential residual effect due to erosion/sedimentation on Arctic Grayling spawning and migration is anticipated to be *low to moderate*, with a temporary loss of production, largely taking place in year 1 of the re-alignment.

The probability of the potential residual effect occurring is dependent upon whether silt curtains are used to mitigate for sediment/erosion potential, or whether it is deemed preferable to allow access to the newly created RSW habitat. However, even if silt curtains are not used, it is predicted that the potential residual effect of sedimentation/erosion would be ***Not Significant*** due to the flexibility of Arctic Grayling life history and the predicted increase in spawning and rearing habitat provided by the design of the re-aligned RSW and mitigation measures. This significance rating is made with *moderate* certainty. However, there will be a robust monitoring program in place that will allow for adaptation should further sedimentation/erosion mitigation measures become necessary (e.g. placement of silt curtains).

6. Proposed Monitoring Program

6. Proposed Monitoring Program

6.1 OVERVIEW

A monitoring program will be implemented to determine if the proposed enhancement of RSW through re-alignment of RSE is functioning effectively, and to determine progressive enhancement strategies of RSW through the placement of gravel, cobble, and boulders after Year 1 of post-enhancement monitoring.

This Proposed Monitoring Program will commence during Year 1 synchronous with the expansion of the airstrip and construction of the temporary all-weather road. Results from Year 1 monitoring will be used to determine the placement of gravel, cobble and boulders during Year 2.

In order to determine whether the enhanced RSW has successfully replaced lost Arctic Grayling production in RSE, monitoring will occur annually during Years 1, 2, and 3, and again in Years 5 and 6 after the new habitat has had time to settle in and mature and after the removal of the temporary all-weather road culverts. If the all-weather road culverts are removed at a later date, then the Monitoring Program will be modified to include monitoring during and after the culvert removal.

The main objective of the Monitoring Program is to evaluate the effectiveness of compensatory habitat designed to offset losses in Arctic Grayling production in RSE.

6.2 MONITORING PROGRAM SCHEDULE AND DESIGN

Table 6.2-1 presents the proposed schedule for the Monitoring Program. The Monitoring Program will assess Arctic Grayling, fish habitat, and other environmental components of fish habitat for the first 3 years of the stream re-alignment and then again in years 5 and 6. Not all components are scheduled to be sampled in each monitoring year, but rather at intervals allowing for the stream community to establish over time, promoting a quantitative assessment of the offsetting program's effectiveness.

Little baseline information was collected prior to the scheduled construction timing of the re-alignment, partly due to low, intermittent flows and limited fish habitat present along the length of RSW. To address these limitations, it is proposed that the monitoring program include reference sampling sites (RS1 to RS3) located upstream of the junction where RSE will be re-aligned towards RSW (Figure 6.2-1). Monitoring sites (MS1 to MS6) located downstream of this junction will form part of the 'impacted' sites to which upstream, 'un-impacted' reference sites can be compared to.

Because few enhancement works are anticipated to be made during the re-alignment phase (other than gravel and boulder additions in ponds and immediate inflow and outflow sections), data collection conducted prior to the completion of all enhancement works (Year 1) will form part of the baseline collection year(s). Additional habitat enhancement designs (e.g., boulder structures, additional channelization, etc.) will be developed only after the first year of post- re-alignment data are collected such that the most suitable works may be selected and implemented the following winter. Only once these works are completed will the 'Post-habitat enhancement of RSW' begin (Year 2 in Table 6.2-1).

PROJECT # 0234411-0008 GIS # BAC-06-222 October 15 2014

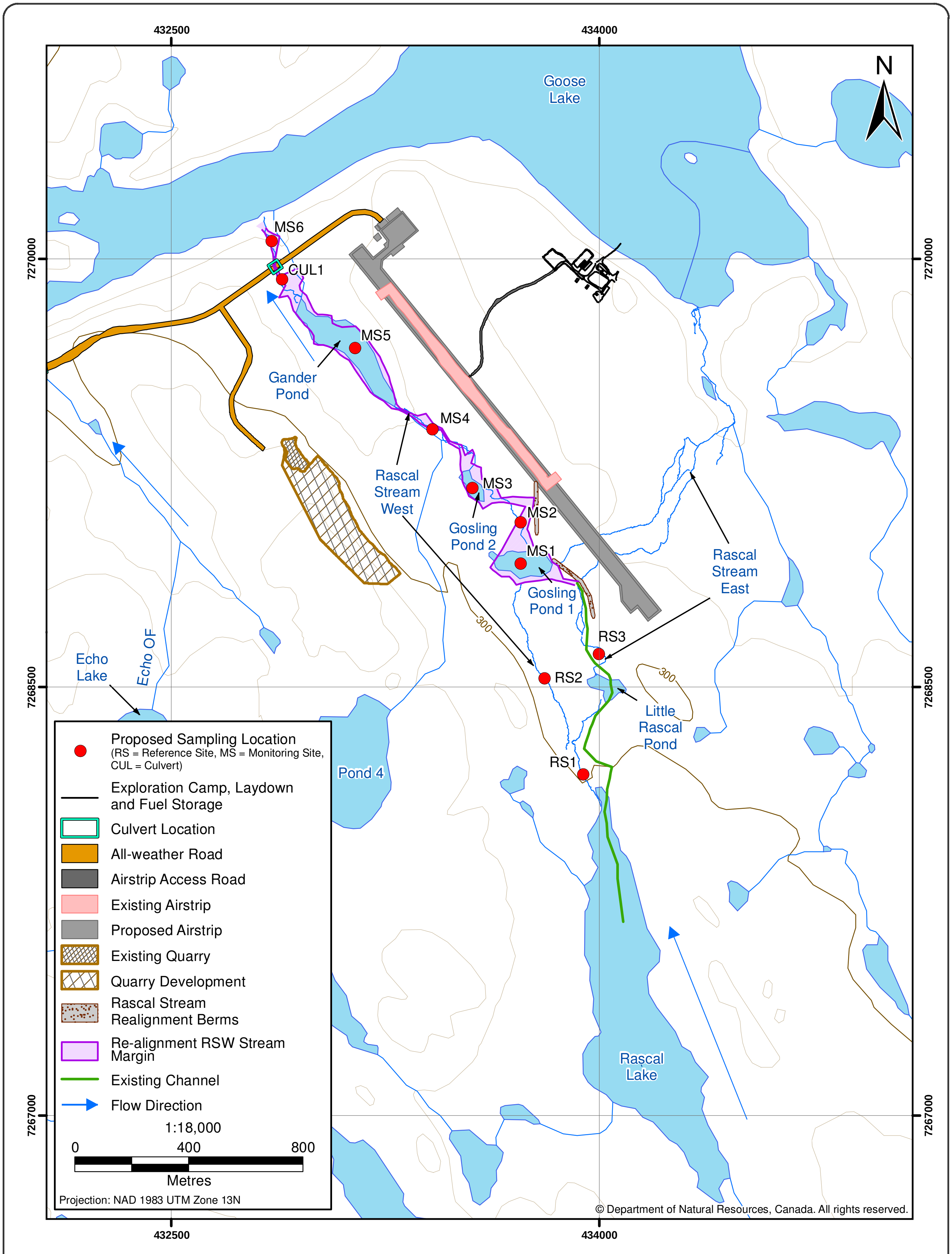


Figure 6.2-1

Proposed Monitoring Program Sampling Locations

Table 6.2-1. Monitoring Program Schedule and Design Summary

	Year 1 (likely 2015)	Year 2	Year 3	Year 5	Year 6
Monitoring Program Design Year:	**Baseline Post Re-alignment Year**	**Post-Habitat Enhancement of RSW Monitoring**			
Monitoring Component:					
Stream flow	X	X	X	X	X
Water quality[1]	X	X	X	X	X
Sediment quality	X	-	-	-	X
Periphyton	X	X	-	X	X
Benthic invertebrates	X	X	-	X	X
Fish habitat[1]	X	X	X		X
Number of Arctic Grayling spawners[1]	X	X	X	X	X
Visual counts of Arctic Grayling fry[1]	X	X	X	X	X
Number of outmigrant Arctic Grayling/other fish	X	X	X	X	X
Fish culvert passage assessment	-	X	-	-	-

Note: Monitoring of project construction is not included, but required during berm construction and culvert installation.
[1] Baseline pre- re-alignment data collected in 2013 for RSE and RSW.

6.3 DETAILED MONITORING METHODS

6.3.1 Stream Flow

Detailed hydrological assessments including stream velocity and channel profiles will be required to confirm predicted flows following re-alignment. Hydrological assessments will be taken at each month at 5 transects along each re-aligned RSW section (i.e., between ponds; Figure 5.1-1c) to ensure the flow conditions are within the range of values to support the Arctic Grayling life cycle. In addition, velocity measurements will be taken at the upstream and downstream ends of each culvert (and within each culvert) to ensure Arctic Grayling migration is not restricted by culvert velocities.

Following detailed monthly hydrological and fish habitat assessments conducted in Year 1 (2015), the location and extent of spawning gravel placement will be designed and adapted to conditions observed and will be implemented the following winter.

6.3.2 Water and Sediment Quality

To ensure water and sediments remain within Canadian Council of Ministers of the Environment (CCME) guidelines for aquatic life or at natural background concentrations, water and sediment quality will be monitored at three reference sites upstream of the re-aligned RSW and at six locations within the re-aligned RSW (Figure 6.2-1; Table 6.3-1). Water temperatures will be monitored with stationary data loggers installed at each water and sediment quality sampling station. Manual measurements will also be taken each time data are collected.

Table 6.3-1. Proposed Sampling Stations between Rascal and Goose Lakes

Location	Site	Approximate UTM Coordinates (Zone 13N)		Adult Fish Migration	Culvert Passage	Fry Outmigration	Fish Community	Water Quality	Sediment Quality	Periphyton	Benthic Invertebrates
		Easting	Northing								
Downstream of Rascal Lake	RS1	433964	7268146	X	-	X	X	X	X	X	X
RSW (upstream of Gosling Pond 1)	RS2	433785	7268534	-	-	-	X	X	X	X	X
RSE (upstream of Gosling Pond 1)	RS3	433999	7268616	-	-	-	X	X	X	X	X
Gosling Pond 1	MS1	433724	7268933	-	-	-	X	X	X	X	X
RSW (between Gosling ponds 1 and 2)	MS2	433741	7269108	-	-	-	X	X	X	X	X
Gosling Pond 2	MS3	433554	7269199	-	-	-	X	X	X	X	X
RSW (upstream of Gander Pond)	MS4	433390	7269367	-	-	X	X	X	X	X	X
Gander Pond	MS5	433143	7269688	-	-	-	X	X	X	X	X
Upstream of Culvert	CUL1	432886	7269929	-	X	-	-	-	-	-	-
RSW (upstream of Goose Lake)	MS6	432844	7270030	X	X	X	X	X	X	X	X

Note: RSW = Rascal Stream West, RSE = Rascal Stream East, RS= Reference Site, MS = Monitoring Site. Each site will encompass a 100m section of creek. The upstream and downstream limits of each site will be determined during Year 1 of the monitoring program.

6.3.3 Periphyton

Periphyton samples will be collected using a plate technique to determine the level of initial colonization of primary producers (using Chlorophyll *a*) and to evaluate whole community composition. Periphyton plates will be used at the same sites as water quality sampling sites (Figure 6.2-1; Table 6.3-1). Five samplers will be submerged at each location at the end of July and will be recovered in late August or early September for a total submerged time of approximately 30 days.

Appropriate metrics and indices will be used to evaluate periphyton data including: biomass, density, relative density (i.e., the proportion of each taxonomic group in the community) and several diversity metrics (e.g., Shannon-Weiner Diversity Index, Simpson's Diversity Index, genus richness, G, and maximum dominance).

6.3.4 Benthic Invertebrates

Benthic invertebrate community structure will be sampled at the same sites selected for periphyton sampling (Figure 6.2-1; Table 6.3-1). Benthic invertebrates will be collected using Hester-Dendy samplers to document invertebrate community structure. Samplers will be submerged at the end of July and recovered in late August or early September of each sampling year. Five replicate samples will be collected within 15 m of each designated location.

Metrics and indices used to evaluate benthic invertebrate data will include density, relative density (i.e., the proportion of each taxonomic group in the community), biomass, relative biomass, and several diversity metrics. Particular emphasis will be placed on comparing functional feeding groups between reference and monitored sites.

6.3.5 Fish Habitat

The fish habitat surveys will be conducted along the length of the re-aligned RSW using SHIM twice per year, once during high and once during low flows, following berm construction and culvert installation to compare as built habitat gains to modeled habitat gains (Appendix 5.3) following the re-alignment activities.

6.3.6 Arctic Grayling Spawner and Adult Spring Migrant Monitoring

Along with visual spawner counts conducted at the onset of spring melt, Arctic Grayling spawners and migrants will be enumerated as they move between Rascal and Goose lakes via the re-aligned RSW using fish boxes according to the schedule set out in Table 6.2-1. Two fish boxes will be installed in the spring to track migrations as soon as water begins to flow and boxes will be removed when spawner numbers decline to zero, typically occurring at the end of June. One fish box net will be located at the outlet of Rascal Lake (Site RS1), and another box will be located at the inflow to Goose Lake (MS6; Table 6.3-1). The ratio of visual-survey-fish-counts to box-trap-counts will also be calculated to examine for potential visual underestimation during the spring spawner surveys and it will be compared to baseline data from 2013.

The fish boxes will be serviced once each day during peak spawning migration and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. All Arctic Grayling ≥ 170 mm long will be tagged with a unique T-bar Floy Tag attached below the dorsal fin. Tagging of Arctic grayling will allow for evaluation of fish movement patterns and time spent in the re-aligned stream, in addition to fish passage through the stream and installed culverts, and it will also indicate the proportion of the population that overwinters in Rascal Lake and Goose Lake.

If barriers or seasonal restrictions to fish movement are identified in RSW during adult migrant monitoring (e.g. the cascade located in Reach 1 of RSW), those locations may need to be adaptively managed to improve egress.

6.3.7 Summer Fish Community Surveys

Summer fish community surveys will be conducted according to the schedule set out in Table 6.2-1. Newly-emerged Arctic Grayling fry will be enumerated in early to mid-July to help determine if the re-aligned RSW diversion is being used successfully for spawning. Fry will be counted using timed walking surveys of the entire length of stream habitat located between Rascal and Goose lakes, including the re-aligned RSW and the reference sections located upstream of where RSE is diverted to RSW. Subsequent dipnet/pole seine surveys conducted at specific sites will be used to determine fish community and fish-size-at-sampling-date (Table 6.3-1). These data will allow for the direct comparisons of fry health and growth between the re-aligned RSW and baseline measurements taken at RSE, in addition to reference sites located upstream of where RSE is diverted to RSW.

Electrofishing surveys will also be conducted to determine which fish species utilize the newly created habitat in the re-aligned RSW. These electrofishing surveys will take place in mid-August at the same locations as used for the dipnet/pole seine surveys, though additional fry length/weight measurements will be made during the electrofishing surveys.

6.3.8 Fry Outmigration

Juvenile fish movement through the re-aligned RSW prior to winter freeze-up will be monitored using bi-directional fyke nets. Three nets will be installed from early to mid July until freeze-up (~early October) at the same locations as the fish boxes: one at the outlet of Rascal Lake and one at the inflow to Goose Lake (Figure 6.2-1; Table 6.3-1). Each fyke net will be serviced once a day during peak outmigration, and once every two days after peak migration. During each visit, all fish will be counted, identified to species, sub-sampled for length and weight, and released in the direction they were swimming. Fyke nets will allow for the determination of stream residence time of fry and juvenile fish, as well as the total growth of fry during their stream residence. It will also provide information as to lake preferences for overwintering habitat.

6.3.9 Culvert Passage Assessment

An assessment of upstream passage through the culvert will be completed to ensure that the culvert does not restrict egress for fish. A box trap will be installed immediately upstream of the culvert in Year 2 to assess fish movement. Catch at this trap will be compared to the catch at the fish box net located at the outlet of Rascal Lake (Site RS1; Section 6.3.6), downstream of the culvert.

6.3.10 Evaluating Success of the Stream Re-alignment

To evaluate the offsetting plan's success for no net loss of fisheries productivity, primary production (as Chl *a*), periphyton community composition, invertebrate community composition and fish use parameters will be compared to baseline conditions using a Before-After/Control-Impact (BACI) design when data is available, otherwise data collected within the RSW will be compared to those collected in reference areas (i.e., upstream of where RSE is diverted to RSW). For this analysis, control sites will be chosen within the unmodified upstream eastern and western sections of the re-aligned RSW (Figure 6.2-1), impact sites located within the re-aligned RSW (Figure 6.2-1). Temporal trends in measured parameters will also be examined in the final two years of the sampling program.

The re-alignment of the streams and offsetting of RSE habitat will be considered successful if parameters measured in the re-aligned RSW are found to be: 1) greater than that found during baseline conditions in the re-aligned sections of RSW for which data is available (before-after), 2) indistinguishable to that found during baseline conditions in the unmodified upstream eastern and western sections of the re-aligned RSW (control-impact), and 3) improve over successive sampling intervals post-construction (trends through time).

References

References

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

1985. *Fisheries Act*, RS. C. F-14.

B.C. Ministry of Forests, Lands and Natural Resource Operations, B.C. Ministry of Environment, and Fisheries and Oceans Canada. 2012. Fish-stream crossing guidebook. Rev. ed. For. Prac. Invest. Br. Victoria, B.C.

BHP Billiton. 2002. *EKATI Diamond Mine: Sable, Pigeon and Beartooth No Net Loss Plan*. Prepared for BHP Billiton Diamonds Inc. by Dillon Consulting Ltd.

De Beers. 2002. *Aquatic organisms and habitat section of the De Beers Snap Lake Diamond Project – Environmental Assessment*. Prepared for De Beers Canada Mining Inc by Golder Associates Ltd.

DFO. 2007. DFO Nunavut Operational Statement: Culvert Maintenance. Version 3.0, DFO/2007-1329.

DFO. 2013. *Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting*. Department of Fisheries and Oceans: Ottawa, ON.

Diavik. 1998. *"No Net Loss" plan*. Prepared for De Beers Canada Inc. by Golder Associates Ltd.

Evans, C.L., J.D. Reist, and C.K. Minns. 2002. Life History Characteristics of Freshwater Fishes Occurring in the Northwest Territories and Nunavut, with Major Emphasis on Riverine Habitat Requirements. Can. Manu. Rep. Fish. Aquat. Sci. 2614.

Golder. 2007. *Doris North Project "No Net Loss" Plan – Revision 6 Final Report*. Prepared for Miramar Hope Bay Ltd. by Golder Associates Ltd.: Edmonton, AB.

Golder. 2012. *Gahcho Kué Fish Habitat Compensation Plan - Update*. Prepared for De Beers Canada Inc. by Golder Associates Ltd.: Saskatoon, SK.

Hubert, W.A., R.S. Helzner, L.A. Lee and P.C. Nelson. 1985. Habitat suitability index models and instream flow suitability curves: Arctic grayling riverine populations. *U.S. Fish and Wildlife Service Biological Report* 82(10.110), U.S. Department of the Interior, Washington, D.C., USA.

Rescan. 2005. *Twin Lakes Diversion Project conceptual no net loss fish habitat compensation plan*. Prepared for BHP Billiton Base Metals by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2007. *Galore Creek Project: Fish Habitat Compensation Plan*. Prepared for Novagold Canada Inc. by Rescan Environmental Services Ltd.

Rescan. 2010. *EKATI Diamond Mine Pigeon Stream Diversion Fish Habitat Compensation and Monitoring Plan*. Prepared for BHP Billiton Diamond Inc. by Rescan Environmental Services: Vancouver, B.C.

Rescan. 2012a. *Back River Project: 2011 Hydrology Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012b. *Back River Project: 2012 Hydrology Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd. : Vancouver, BC.

Rescan. 2012c. *Back River Project: 2011 Fish And Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012d. *Back River Project: 2012 Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2012e. *Back River Project: 2012 Freshwater Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd.: Vancouver, BC.

Rescan. 2013. *Back River Project: Draft Environmental Impact Statement*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company.

Rescan. 2014a. *Back River Project: 2013 Fish and Fish Habitat Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.

Rescan. 2014b. *Back River Project: 2013 Hydrology Baseline Report*. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM company.

RL&L/Golder. 2003. *Doris North Project no net loss plan*. Prepared for Miramar Hope Bay Ltd. by RL&L Environmental Services Ltd./Golder Associates Ltd.: Edmonton, AB.

Scott, W. B., and E. J. Crossman. 1973. *Freshwater Fishes of Canada*. Oakville, ON: Galt House Publications Ltd.

Stewart, D.B., N.J. Mochnacz, J.D. Reist, T.J. Carmichael, and C.D. Sawatsky. 2007. Fish life history and habitat use in the Northwest Territories: Arctic Grayling (Thymallus arcticus). Can. Manu. Rep. Fish. Aquat. Sci. 2797.

US Fish and Wildlife Service (USFWS). 1980. Habitat evaluation procedures (HEP) ESM 102. US Department of Interior: Washington, DC.

Appendix 2.1

Rascal Realignment Hydraulic Model

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2

T: +1.604.681.4196
F: +1.604.687.5532

vancouver@srk.com
www.srk.com

Memo

To:	Max Brownhill	**Client:**	Sabina Gold & Silver Corp
From:	Samantha Barnes John Duncan	**Project No:**	1CS020.006
Cc:	Kerry Marchinko, ERM Rescan	**Date:**	October 7, 2014
Subject:	Rascal Realignment Hydraulic Model		

1 Introduction

Sabina Gold & Silver Corp. (Sabina) intends to extend the existing airstrip servicing the Goose Lake camp. In order to construct this extension, a stream realignment is required. The work will require that Sabina place a berm on the Rascal Stream East (RSE), realigning it to augment flows along the Rascal Stream West (RSW) watercourse. With the construction of a series of berms, RSE will be realigned towards an existing smaller catchment flowing into Gander Pond. The realigned RSW will generate increased flows into Gander Pond and create new fish habitat to mitigate the loss of habitat from RSE.

A hydraulic model was prepared to analyze velocities and flow depths in the realigned RSW. A temporary access road will be constructed across the realigned stream, which will require culverts to convey the flow and allow for fish passage. One location was identified as a feasible culvert crossing location, where the sizing was governed by conveyance and fish passage design criterion. The diversion berms were incorporated into the model in order to characterize the realigned stream and confirm that water will not pond along the airstrip.

There are stream velocity constraints that exist for the culverts and along the entire stream length to allow fish passage. The goal of the realignment is to create a fish habitat that matches or exceeds the quality of habitat that will be lost from these proposed works.

2 Supporting Information

2.1 Hydrology

RSE currently flows northeast and bypasses the existing airstrip, eventually discharging to Goose Lake. With the airstrip expansion, RSE will lose its upstream flow contributions. The realignment will route 100% of the RSE flow northwest towards Gander Pond, discharging into a nearby location in Goose Lake.

The connection of the Gander Pond and Rascal Lake catchment will significantly increase the flows in Gander Pond since the Rascal catchment is significantly larger than the Gander Pond catchment. Figure 1 shows the catchment areas contributing to each system. The resulting catchment through Gander Pond is equal to 34.3 km^2, whereas the current catchment is 1.8 km^2.

Flows were estimated based on a regional hydrometric analysis. This analysis generated unit peak flows for various regional stations, and compared the flows based on average elevation, and lake cover percentage. A unit peak flow was developed for the Back River Project, and will be described in the SRK Hydrology Report.

Two flow conditions were modelled to assess fish habitat potential. These flows included the monthly average flow in June, which represents the spring snowmelt, and the monthly average flows between July and October denoted as the average fall flow.

The 2-year and 20-year flow events were also modelled to verify the extent of flooding and capacity of the culvert, and the 100-year flow event was modelled to evaluate the freeboard along the berms.

2.2 Topography

Topographical data was provided by Sabina in the form of 1 m LiDAR contours across the complete Goose Property, as well as 25 cm LiDAR in the vicinity of the airstrip.

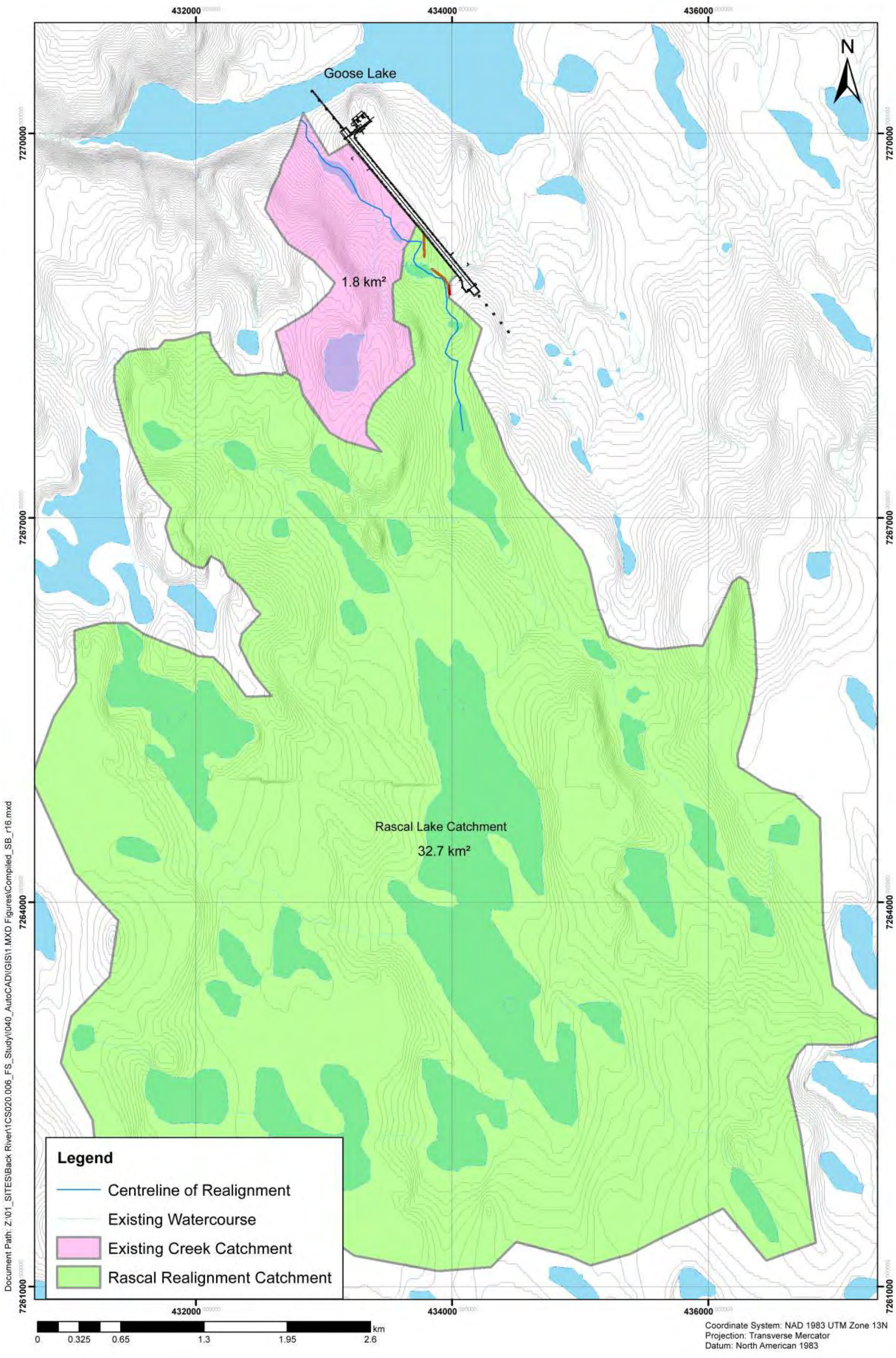


Figure 1: Catchments for Rascal Lake and Gander Pond

3 Design Criteria

The hydrotechnical design criteria that were used for the Rascal realignment design are defined from a compilation of civil engineering best management practices, SRK professional judgment working in the north and ERM Rescan prescribing the fish passage criterion (Table 1).

Table 1: Hydrotechnical Design Criteria

Item	Value	Unit	Source/Comments
Channel Design			
Average fall flow	0.27	m^3/s	*Specified by SRK*
Average June flow	1.22	m^3/s	*Specified by SRK*
2-year peak flow	2.4	m^3/s	*Specified by SRK*
Manning's roughness for channel	0.029	n/a	*Based on substrate material and riprap. Assumed D_{50}= 10 cm.*
Preferred velocity range	0.05 – 0.80	m/s	*Based on fish habitat requirements*
Berm Design			
100-year peak flow	5.1	m^3/s	*Specified by SRK*
Side slopes	1.5:1 (H:V)	m	*Specified by SRK*
Minimum freeboard	0.3	m	*(U.S. Bureau of Reclamation [USBOR], 1978)*
Minimum height	2.3	m	*Specified by SRK*
Minimum top width	6	m	*Specified by SRK*
Culvert Design			
20 year-peak flow	4.2	m^3/s	*Specified by SRK*
Manning's roughness for bottom of culvert	0.040	n/a	*For gravel, cobbles and few small boulders (Chow V. T., 1994)*
Maximum velocity over short length	1	m/s	*Based on fish passage requirements supplied by ERM Rescan*

Due to the presence of permafrost across the realignment area, excavation into the existing ground is to be minimized. Long-term ponding in the area adjacent to the works should also be minimized to prevent differential thawing in the permafrost beneath the airstrip.

4 Hydraulic Model

4.1 Hydraulic Model

The hydraulic model used for this project was HEC-RAS. HEC-RAS is a one-dimensional computer program developed by the US Army Corps of Engineers and is typically used to estimate hydraulic parameters for flow through natural rivers and other channels.

The realigned RSW hydraulic model was prepared as a steady state model, with fixed flows established for each specified event, including the average fall flow, the average June flow, and the peak 2-year, 20-year, and 100-year return period events.

A TIN model was prepared using the 25 cm LiDAR topography which was extended using the 1 m LiDAR data. The TIN was defined to include the floodplain and channel extents along the 3 km reach of the realignment. The hydraulic model included the proposed berm structures adjacent to the airstrip, as well as the culvert crossing beneath a proposed access road. A total of 48 cross-sections were generated in ARCGIS with the application ARC-GeoRAS and transformed into geometric data for HEC-RAS. Cross-sections were then interpolated at a minimum of 20 m spacing within HEC-RAS. Figure 6 illustrates a plan view of the HEC-RAS model showing the realignment, cross-sections and 100-year flood extents.

The stream reach analyzed had a longitudinal slope that varies between zero and 0.03 m/m and consists of several ponds and meandering sections. The model provides a representation of the water levels and hydraulic parameters expected during the different flow events.

4.2 Alternative Analysis

4.2.1 Berm Alignment

The historical alignment of RSE routes water immediately south of the existing airstrip to Goose Lake. The lower reach of the channel north of the airstrip is in conflict with other mining infrastructure and it was therefore decided to realign RSE towards the RSW watercourse, through Gander Pond to Goose Lake. The realignment is accomplished with minimal excavation by constructing the south berm illustrated on Figure 2. There is a low point situated adjacent to the proposed extension downstream of the south berm along the new alignment, and the proposed north berm will restrict water from ponding along the airstrip. For each flow event, HEC-RAS produced an aerial view of the ponding extents within each cross-section. Based on available topography and HEC-RAS model results, the berms were generated in an iterative process to minimize the length of berm, while ensuring that no water shall impinge on the airstrip during the design events.

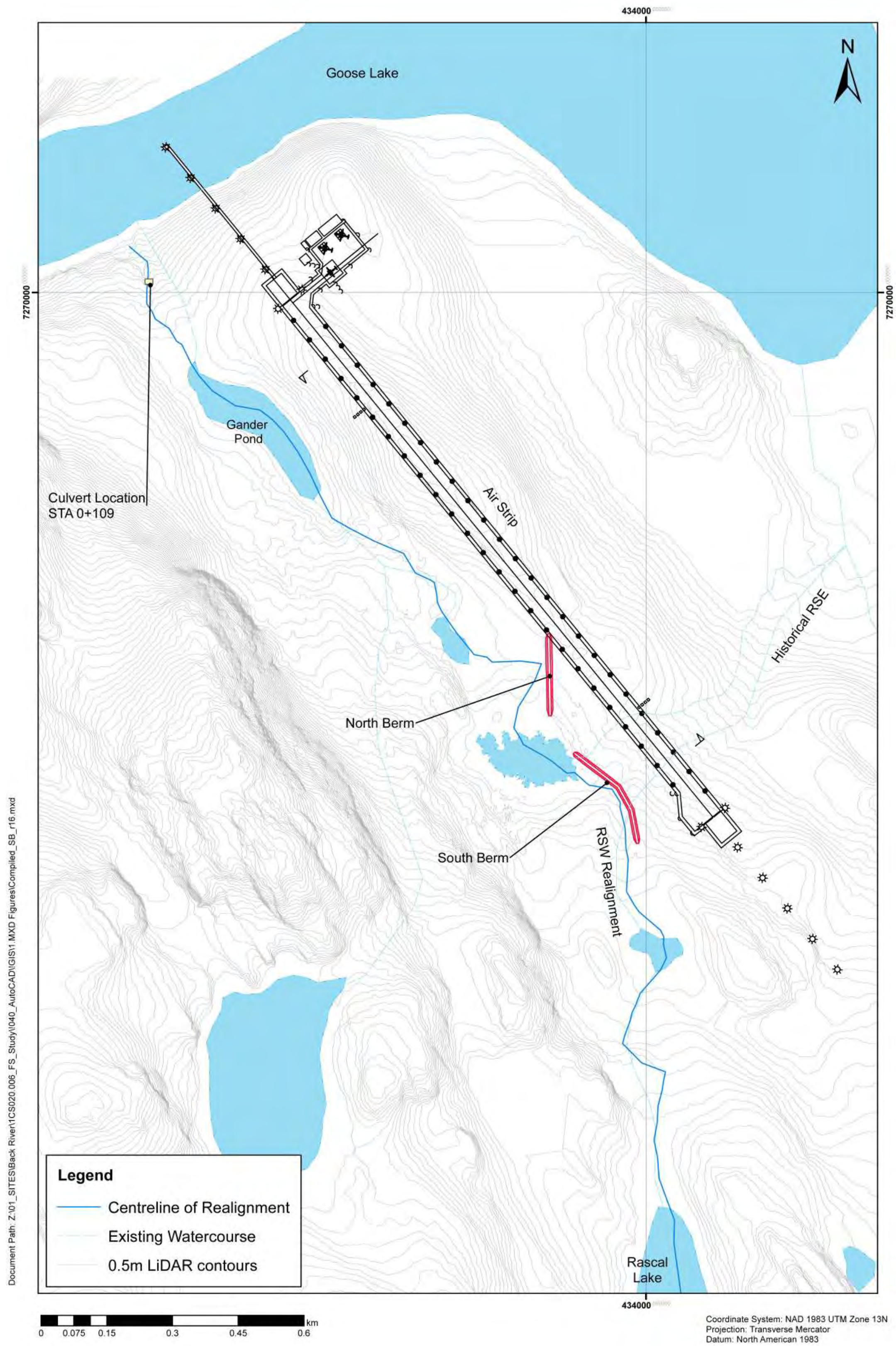


Figure 2: Rascal Realignment

4.2.2 Culvert Location and Sizing

The culvert location was selected based on stream slope and cross-sectional topography to minimize the fill required for the road crossing. The crossing location is identified in Figure 2, at Station 0+109. The longitudinal slope in this section is 3.6% along the base of the culvert.

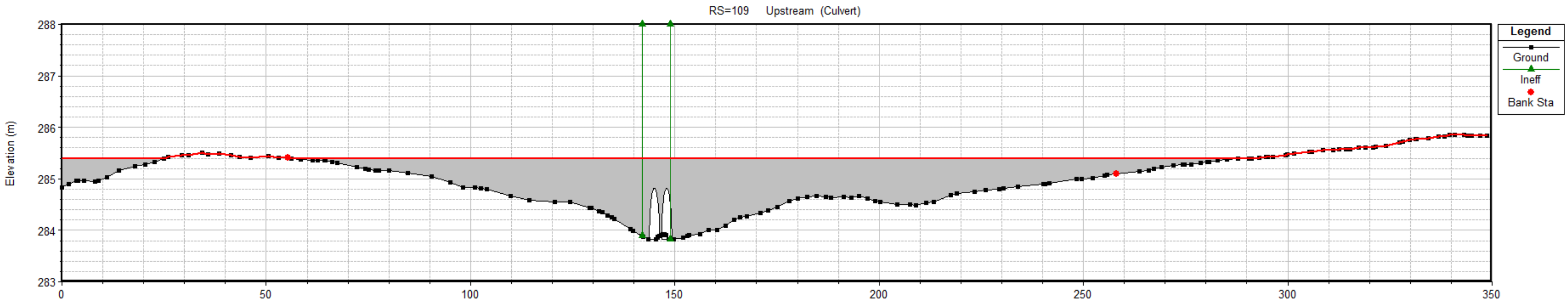
Two culvert alternatives were assessed;

- 2 x 2.5 m box culverts
- 2 x 2.5 m Corrugated Steel Pipe (CSP) culverts

The culverts will be filled with subgrade and large boulders or baffles to facilitate fish passage and increase the roughness in the pipe. The cross-section at the culvert location is provided in Figure 3, for the box and CSP culverts.

The box culverts will be embedded below existing ground by approximately 15 cm in order to place the substrate layer. Several boulders with a minimum diameter of 0.4 m will also be placed within the culverts to reduce velocities during high flow events.

The CSP culverts will need to be filled with substrate to a depth equal to 40% of the culvert diameter. This will require an excavation below existing ground of 1 m.



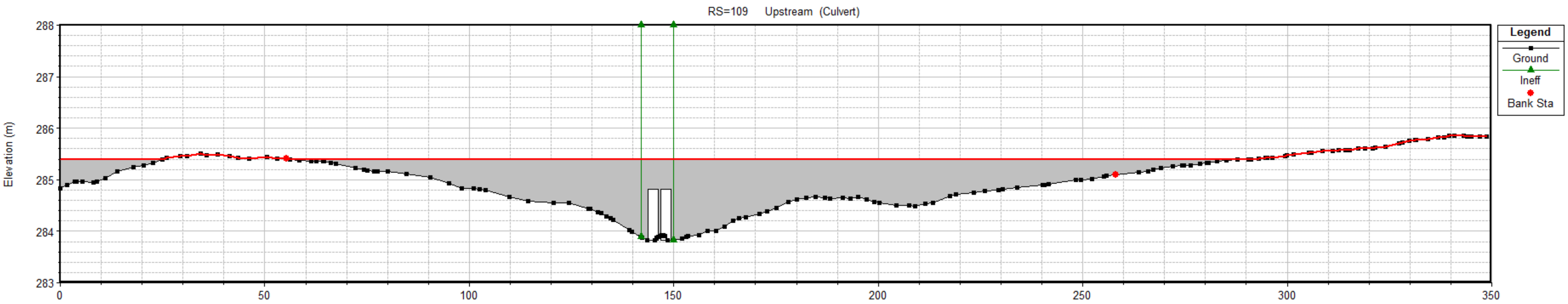


Figure 3: Cross-section along Proposed Culvert, for Box and CSP culverts

5 Results

The results of the HEC-RAS model are presented in terms of the channel, berms, and culverts.

5.1 Channel Results

Velocity and water depth profile results are presented for the channel along the realigned centreline. The velocities in each cross-section allow for the selection of an appropriate substrate material based on the fish habitat classification. Velocity profiles for each alternative are presented in Figure 4, for average fall flow and average June flow. The water depth profile ensures that there is sufficient depth for fish passage, and is presented in Figure 5 during the average fall flow and average June flow.

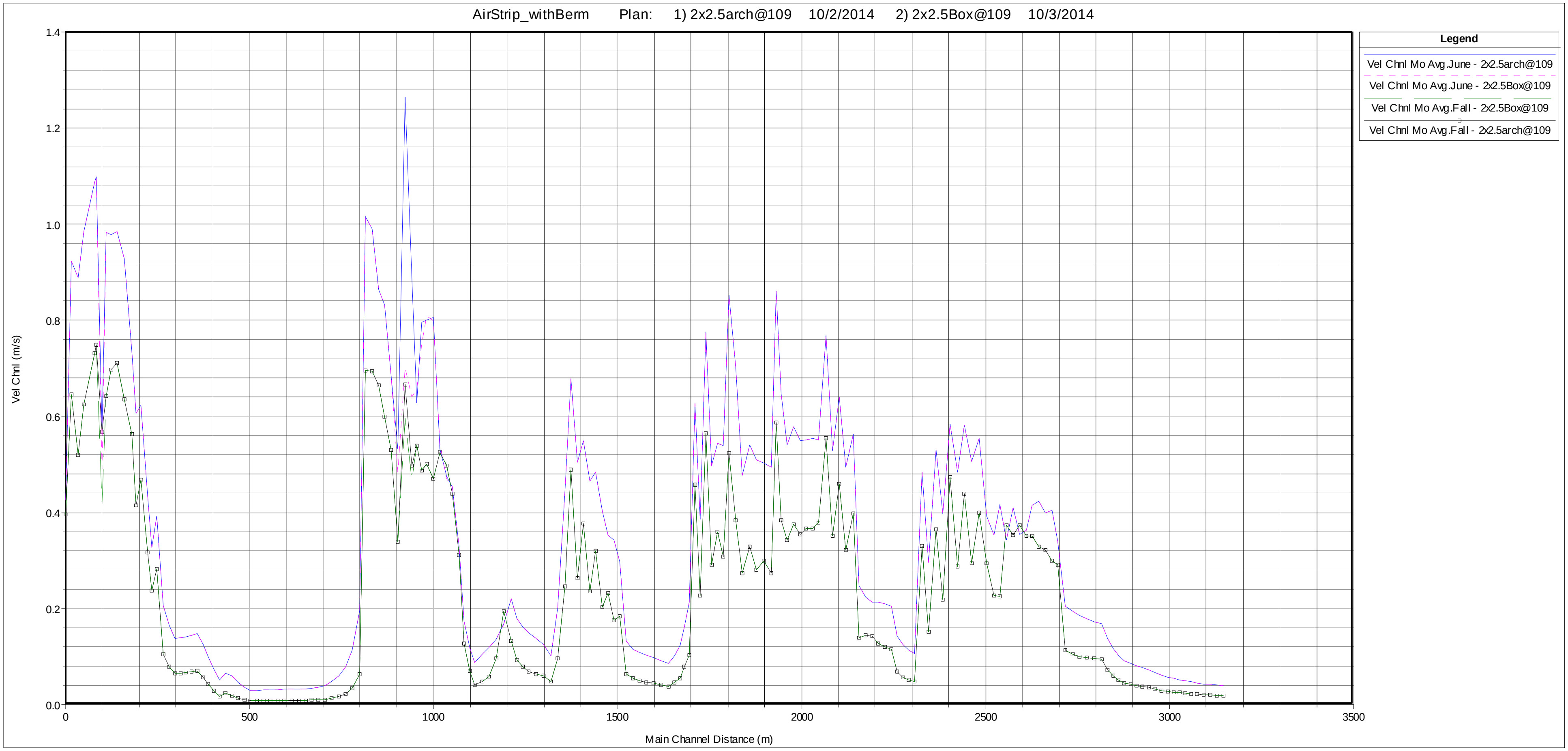


Figure 4: Velocity Profile for Average Fall Flow and Average June Flow

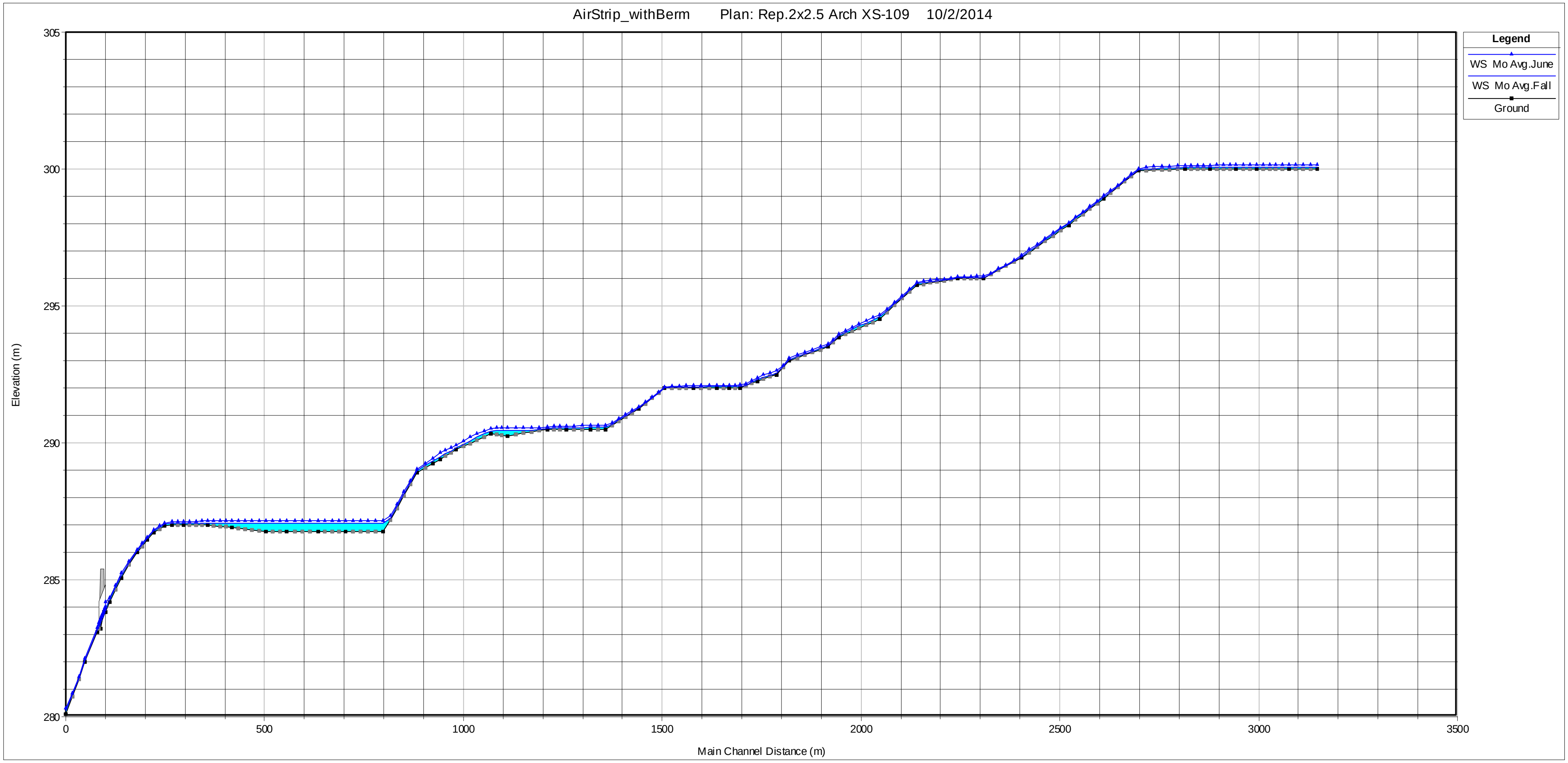


Figure 5: Water depth profile with culvert at location, for Average Fall Flow and Average June Flow

5.2 Berm Selection

The flooding extents show the limit of potential ponding during each flow event. The berm alignments were selected based on the results of the 100-year and 20-year return period flood events. The 100-year return flood event with the culverts in place is illustrated in Figure 6. Two berms were necessary to ensure that no water would pool adjacent to the airstrip for both the 20 and 100-year events. Based on the flood extents, the downstream and upstream berm were designed with a length of 180 m and 270 m respectively. Berm alignments are shown in Figure 2. The berm heights were governed by the minimum height criterion used to bring the permafrost line to the bottom of the berm section. The haul road and culverts are expected to be in place for only a few years during the project early works. Upon removal of the haul road and culverts, adequate freeboard exists on the berms during the 100-year design event.

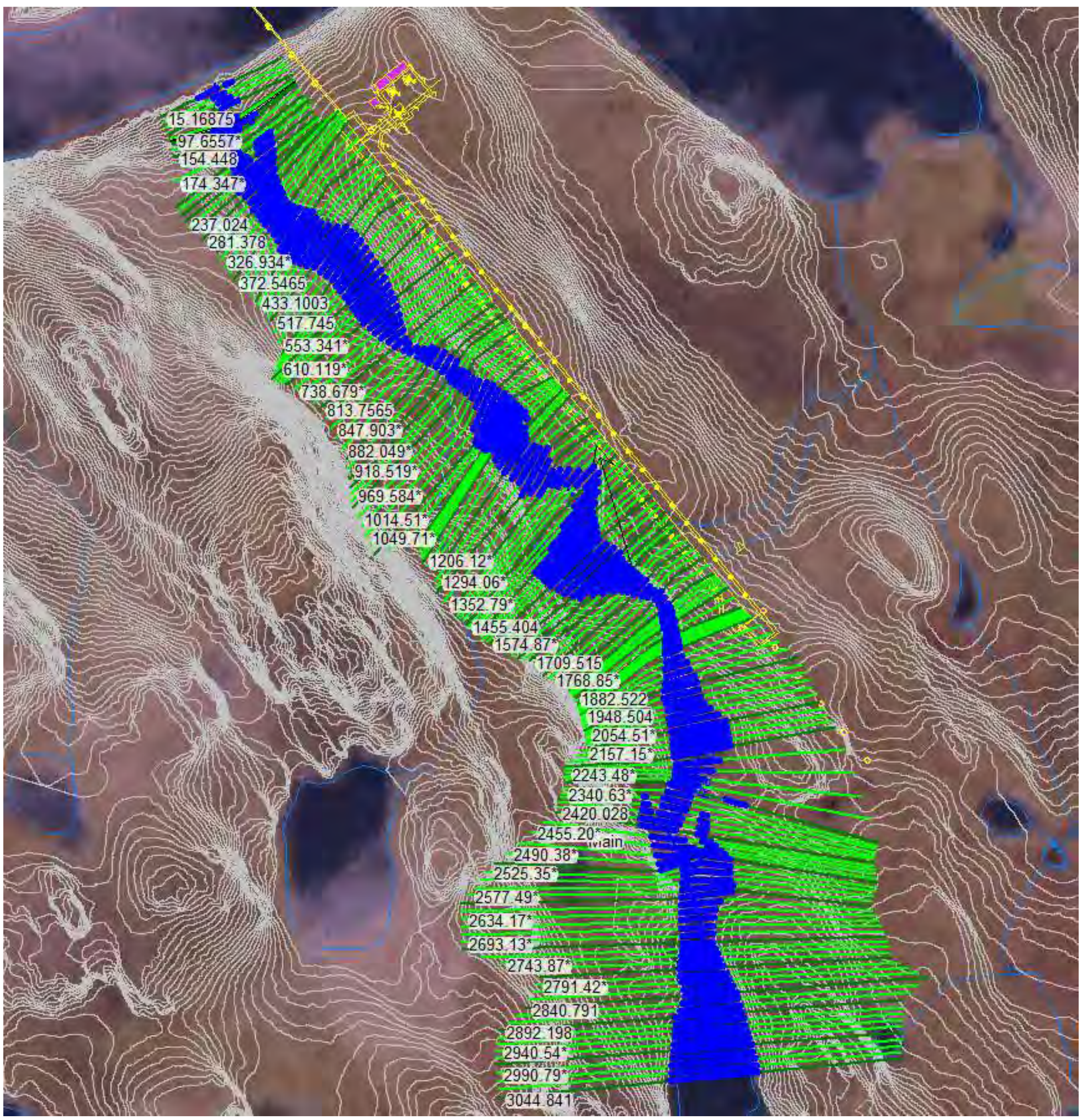


Figure 6: HEC-RAS Model Plan View with 100 year flooding extents

5.3 Culvert Results

The maximum recommended current velocity for sustained swimming in Arctic Grayling is 1.5 m/s. This velocity became the limiting factor in the culvert sizing, and was set as the maximum velocity for the culvert during June average flows, which coincides with the timing of fish swimming upstream. Velocities higher than 1.5 m/s during the month of June will require boulder placement or baffles throughout the culvert in order to provide areas of reduced velocities.

Based on this velocity constraint, two culvert options were proposed. These alternatives include two adjacent 2.5 m diameter box culverts, versus two adjacent 2.5 m diameter CSP culverts. The upstream and downstream velocities for the 2 culvert alternatives are presented in Table 2. The minimum water depths are also presented for the average fall flows to illustrate the minimum depth expected in the culvert during open water season other than the snowmelt period. Both culvert options were also found to have enough capacity to convey the 20-year flood event.

Table 2: Culvert Design Summary

Culvert Station	Culvert Description	Upstream Culvert Velocity in June (m/s)	Downstream Culvert Velocity in June (m/s)	Minimum Water Depth in Culvert in fall (m)
0+109	2 x 2.5m submerged CSP	1.35	1.39	0.07
0+109	2 x 2.5m box	1.35	1.38	0.07

6 Recommendation

Based on the results presented in Table 2, both culvert alternatives will provide similar hydraulic results. The velocities presented could be mitigated by placing boulders in the culverts to create low velocity resting areas for fish. It is recommended that either two 2.5 m box culverts or two 2.5 m CSP culverts be installed. The bottom of the culverts will contain substrate material as well as large boulders to facilitate the fish passage.

The CSP culverts will require an excavation depth of approximately 1 m through permafrost in order to properly place the substrate material and achieve the hydraulic results presented in the HEC-RAS model. It is best practice to avoid excavating through permafrost and as such, the preference would be to install box culverts over CSP culverts.

SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2

T: +1.604.681.4196
F: +1.604.687.5532

vancouver@srk.com
www.srk.com

Memo

To:	Max Brownhill	**Client:**	Sabina Gold & Silver Corp.
From:	Iozsef Miskolczi	**Project No:**	1CS020.006
Cc:	John Duncan, SRK	**Date:**	October 8, 2014
Subject:	Rascal Stream East Realignment		

1 Introduction

Sabina Gold & Silver Corp. plans to extend the existing airstrip servicing the Goose Lake camp. This work will require placing a berm on the Rascal Stream East that will realign it to augment flows along Rascal Stream West watercourse. A second berm is required along the watercourse to avoid water from ponding along the airstrip. Figure 1 shows the location of the stream realignment and berms in relation to the airstrip.

The hydraulic design of the realignment was completed by SRK as documented in the October 3, 2014, memo. This memo documents design criteria and parameters for the berms.

2 Description of Berms

Ponding water around the Goose Lake camp airstrip could cause permafrost degradation in the area and failure of the airstrip embankment. The berms will direct flows to the Rascal Stream West watercourse to keep ponding water away from the airstrip.

The South Berm will redirect water from Rascal Stream East towards a natural pond further west of the airstrip. Water in the pond will overflow through an existing ephemeral channel and flow towards Gander Pond to the north. The North Berm was designed to prevent water from overtopping the ephemeral channel and ponding in a low spot against the airstrip.

3 Design Criteria and Parameters

The berms were designed to divert water during normal and high flows (freshet) and to provide protection from a 1 in 100 year flood event. The berms must be resistant to erosion and not susceptible to freeze-thaw damage.

The berms' geometries are shown in Figure 1. The cross section shows the berms are 2.3 m high with a crest widths of 6 m and side-slope grades of 1.5H:1V. The 6 m crest width was specified for constructability. The berms will be terminated at the same 1.5H:1V grades.

The material quantities required for construction are provided in Table 1. The liner quantities do not include overlap and wastage.

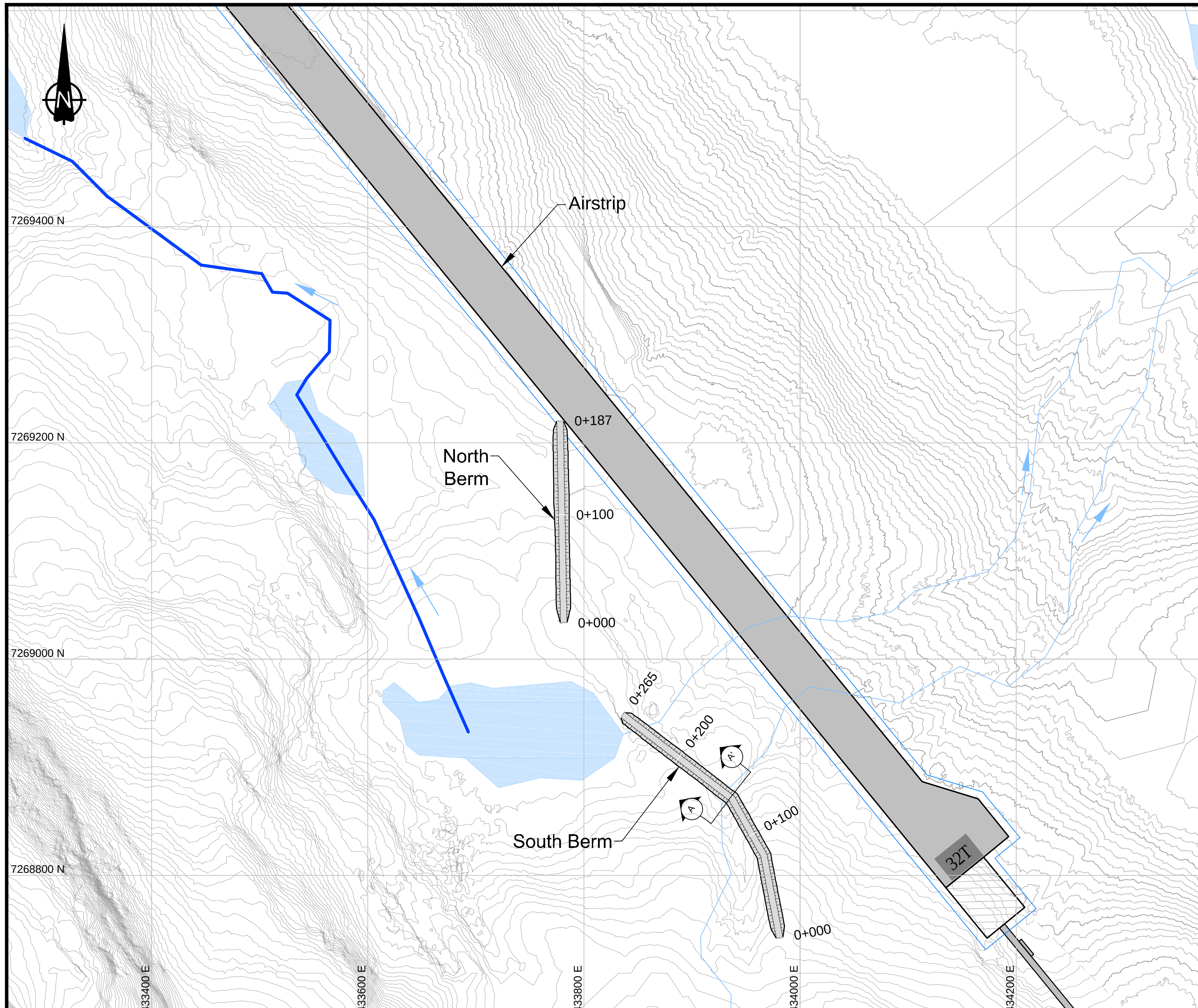
Table 1: Material Quantities Summary

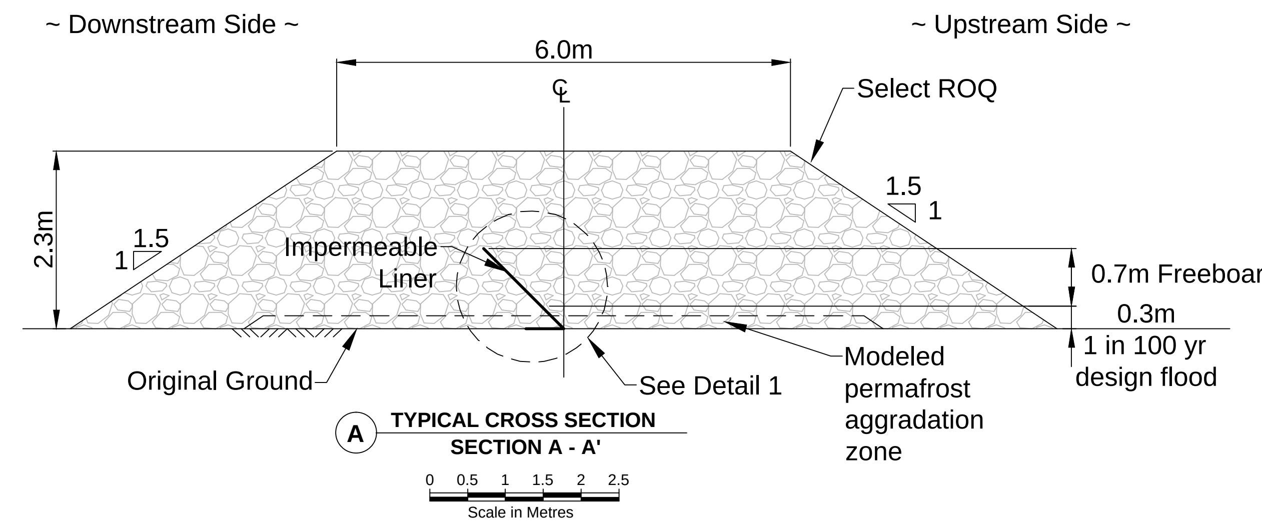
	North Berm	South Berm
Length (m)	187	265
Fill Volume (m^3)	4,100	5,800
Liner Quantity (m^2)	374	530

The berms will be constructed of select waste rock or run-of-quarry material. The fill shall be well graded, containing sufficient quantities of gravel, sand, and silt sized particles. The maximum boulder size shall not exceed 1,000 mm in any direction.

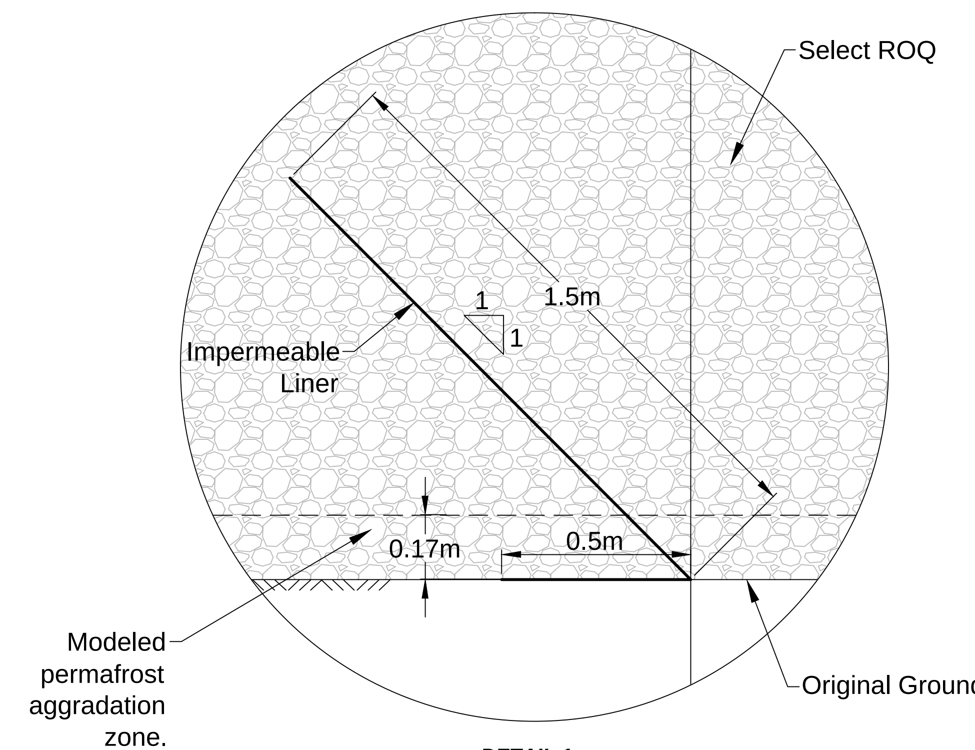
To provide the required stream realignment, an impermeable liner shall be installed within the fill, near the centerline of the berm. The design drawing includes installation details. Ground preparation for liner installation should include clearing vegetation in the contact area between the original ground surface and liner. The installation should be performed ideally in the winter, and the disturbance should be kept to minimum to protect the permafrost.

Based on the thermal modelling completed by SRK for the Back River project, the 2.3 m height of the rock fill will result in permafrost aggradation of about 17 cm above the original ground level. This would ensure adequate water-tightness of the structure, with the liner being well keyed-in to the permafrost.





A **TYPICAL CROSS SECTION**
SECTION A - A'



DETAIL 1
1 **TIE-IN OF IMPERMEABLE LINER**

LEGEND

- Existing Flow Path
- Major Contour (5m)
- Minor Contour (1m)
- Rascal West Flow Augmentation
- Centerline of Creek
- Design Crest
- Design Toe
- Riprap
- Pond Area

NOTES

1. Liner welding is not required. Minimum overlap of 0.5m.
2. Select Run of Quarry (ROQ) material shall be well-graded, containing sufficient quantities of gravel, sand and silt sized materials; the maximum boulder size shall not exceed 1000mm in any direction. Basic screening or manual selection may be used to achieve the desired gradation.

srk consulting	Sabina GOLD & SILVER CORP	Rascal West Realignment Berm
		Plan and Details
SRK JOB NO.: – FILE NAME: Sabina Goose Overview – Sept 17.dwg	Sabina Gold and Silver Corp.	DATE: October 2014 APPROVED: JD FIGURE: 1

Appendix 2.2
Habitat Suitability Indices

Appendix 2.2. Habitat Suitability Indices

Habitat Suitability Indices and Descriptions	
HSI Value	**Habitat Description**
1.00	Optimal
0.75	Above Average
0.50	Average
0.25	Below Average
0.00	**Unsuitable**

Note: HSI = Habitat Suitability Index

Lake Habitat Suitability Indices by Habitat Type					
Species	**Habitat Type**	**Spawning/Nursery**	**Rearing**	**Foraging**	**Overwintering**
Arctic Grayling	Nearshore with fine sediment (< 2.5 m)	0.00	0.00	0.25	0.00
	Nearshore with large substrate (< 4 m)	0.00	0.50	0.50	0.25
	Deepwater (> 4 m) plus > 2.5 m with fine sediment	0.00	0.00	0.25	0.75

Stream Habitat Suitability Indices by Habitat Type					
Species	**Habitat Type**	**Spawning**	**Nursing**	**Rearing**	**Foraging (adult)**
Arctic Grayling	Organics	0.00	0.25	0.00	0.00
	Fines	0.00	1.00	0.00	0.00
	Gravel	1.00	0.50	0.25	0.25
	Cobble	0.00	0.50	1.00	1.00
	Boulder	0.00	0.25	0.75	0.75
	Bedrock	0.00	0.00	0.00	0.00

Source: Diavik 1998; Debeers 2002; Stewart et al. 2007; Golder 2013; Mainstream Aquatics 2004; Evans et al. 2002

Appendix 3.1

Rascal Stream East Reach Characteristics and Site Photos

Appendix 3.1. Rascal Stream East Reach Characteristics and Site Photos

Table A3.1-1. Characteristics of RSE Reaches, 2013

		Rascal-Goose Stream						
Attribute	**Units**	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Site number	n/a	300	301	302	305	306	307	308
Morphology	n/a	Run	Run	Riffle	Riffle	Run	Riffle	Boulder Garden
Secondary Habitat	n/a	Braided	OCH	OCH	Braided	-	-	Braided
Reach Length	m	385.9	257.6	536.9	806.0	545.0	313.7	740.6
Mean Gradient	%	1.0	0.0	1.0	1.0	0.0	4.0	1.0
Mean Bankfull Width	m	1.5	18.0	2.5	3.7	7.1	8.0	17.0
Mean Wetted Width	m	2.0	20.0	2.5	5.1	13.5	10.0	17.4
Mean Bankfull Depth	m	0.35	0.35	0.20	0.25	0.32	0.20	0.19
Mean Wetted Depth	m	0.35	0.60	0.20	0.30	0.35	0.25	0.19
Bankfull area	m^2	579	4,637	1,342	2,982	3,870	2,510	12,590
Spawning	n/a	Good	None	Poor	Fair	None	None	Fair
Overwintering	n/a	None	None	None	None	None	None	None
Rearing	n/a	Good	Fair	Fair	Fair	Poor	Fair	Good
Overall	n/a	Important	Important	Important	Important	Marginal	Important	Important

Braided = braided channel morphology
OCH = off-channel habitat
n/a = not applicable
Dashes indicate data not available

Table A3.1-2. Weighted Mean Habitat Characteristics of RSE Reaches, 2013

		Rascal-Goose Stream						
Attribute	**Units**	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Site number	n/a	300	301	302	305	306	307	308
Organics	%	5	98	0	0	0	4	0
Fine	%	0	0	0	0	60	0	0
Gravel	%	30	2	0	10	10	0	0
Cobble	%	40	0	75	60	20	3	20
Boulder	%	25	0	25	30	10	82	80
Bedrock	%	0	0	0	0	0	11	0
Compaction	n/a	Medium	Medium	Low	Medium	Medium	High	Medium
Bank Stability	n/a	Unstable	Unstable	Unstable	Unstable	Unstable	Stable	Unstable
Bank Substrate	n/a	Fines	Fines	Fines	Fines	Fines	Boulder	Fines

Table A3.1-2. Weighted Mean Habitat Characteristics of RSE Reaches, 2013

		Rascal-Goose Stream						
Attribute	**Units**	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Pool	%	2	0	0	0	0	3	0
Boulder	%	0	3	2	2	1	7	20
Instream Vegetation	%	2	0	1	1	1	0	0
Overhead Vegetation	%	0	0	0	0	0	0	0
Undercut Bank	%	1	2	3	0	0	0	0
Total Cover	%	5	5	6	2	2	9	20
Number of Pools	no.	0	0	0	0	0	1	0
Mean Maximum Pool Depth	m	-	-	-	-	-	1.0	-
Mean Crest Depth	m	-	-	-	-	-	0.3	-
Residual Pool Depth	m	-	-	-	-	-	0.7	-
Riffle	no.	0	0	1	1	0	1	0
Pool	no.	0	0	0	0	0	1	0
Run	no.	1	1	0	0	1	1	0
Cascade	no.	0	0	0	0	0	0	0
Boulder Garden	no.	0	0	0	0	0	0	1
Other	no.	0	0	0	0	0	0	0

n/a = not applicable
Dashes indicate data not available
No. = number

Plate A3.1-1. Braided channels with mixed cobble, gravel, and boulder substrate at Reach 1 of RSE, June 16, 2013.

Plate A3.1-2. Off-channel habitat was present in wetted areas outside the bankfull width at Reach 2 of RSE, June 16, 2013.

Plate A3.1-3. Ephemeral fish habitat at a flooded area west of Reach 2 of RSE, June 16, 2013.

Plate A3.1-4. Upstream view of riffle habitat at Reach 3 of RSE, June 16, 2013.

Plate A3.1-5. Braiding at Reach 4 of RSE, June 16, 2013.

Plate A3.1-6. Low gradient channel at Reach 5 of RSE, June 16, 2013.

Plate A3.1-7. Riffle and pool habitat at Reach 6 of RSE, June 16, 2013.

Plate A3.1-8. Boulder-dominated substrate at Reach 7 of RSE, June 16, 2013.

Appendix 3.2
Rascal Stream West Reach Characteristics and Site Photos

Appendix 3.2. Rascal Stream West Reach Characteristics and Site Photos

Table A3.2-1. Characteristics of RSW (Gander Pond) Stream Reaches, 2013

		Gander Pond Stream Reach		
Attribute	**Units**	**1**	**2**	**3**
Site	n/a	101	804	-
Morphology	n/a	Run	Run	NCD
Secondary Habitat	n/a	Braided	Intermittent Channelization	-
Reach Length	m	473	385	254
Mean Gradient	%	2	1	-
Mean Bankfull Width	m	0.7	1.2	-
Mean Wetted Width	m	1.1	4.5	-
Mean Bankfull Depth	m	0.15	0.15	-
Mean Wetted Depth	m	0.20	0.31	-
Bankfull area	m^2	331	462	-
Spawning	n/a	Fair	Poor	None
Overwintering	n/a	None	None	None
Rearing	n/a	Good	Fair	None
Overall	n/a	Important	Marginal	None

NCD = non-classified drainage
Dashes indicate data not available
n/a = not applicable

Table A3.2-2. Weighted Mean Habitat Characteristics of Gander Pond Stream Reaches, 2013

		Gander Pond Stream Reach		
Attribute	**Units**	**1**	**2**	**3**
Organics	%	40	0	-
Fine	%	2	70	-
Gravel	%	16	5	-
Cobble	%	25	20	-
Boulder	%	17	25	-
Bedrock	%	0	0	-
Compaction	n/a	Medium	Medium	-
Bank Stability	n/a	Stable	Stable	-
Bank Substrate	n/a	Cobble	Fines	-
Number of Pools	no.	3	0	-
Mean Maximum Pool Depth	m	0.53	-	-
Mean Crest Depth	m	0.18	-	-
Mean Residual Depth	m	0.35	-	-
Pool	%	16	0	-

Table A3.2-2. Weighted Mean Habitat Characteristics of Gander Pond Stream Reaches, 2013

Attribute	Units	Gander Pond Stream Reach		
		1	2	3
Boulder	%	8	2	-
Instream Vegetation	%	3	5	-
Overhanging Vegetation	%	1	0	-
Undercut Bank	%	1	1	-
Total Cover	%	29	8	-
Riffle	no.	1	0	-
Pool	no.	3	0	-
Run	no.	2	1	-
Cascade	no.	1	0	-
Boulder Garden	no.	0	0	-
Other	no.	0	0	-

No. = number; Dashes indicate data not available; n/a = not applicable

Plate A3.2-1. View of intermittent channelization at Reach 2 of Gander Pond Stream, facing north-west towards Gander Pond, June 22, 2013.

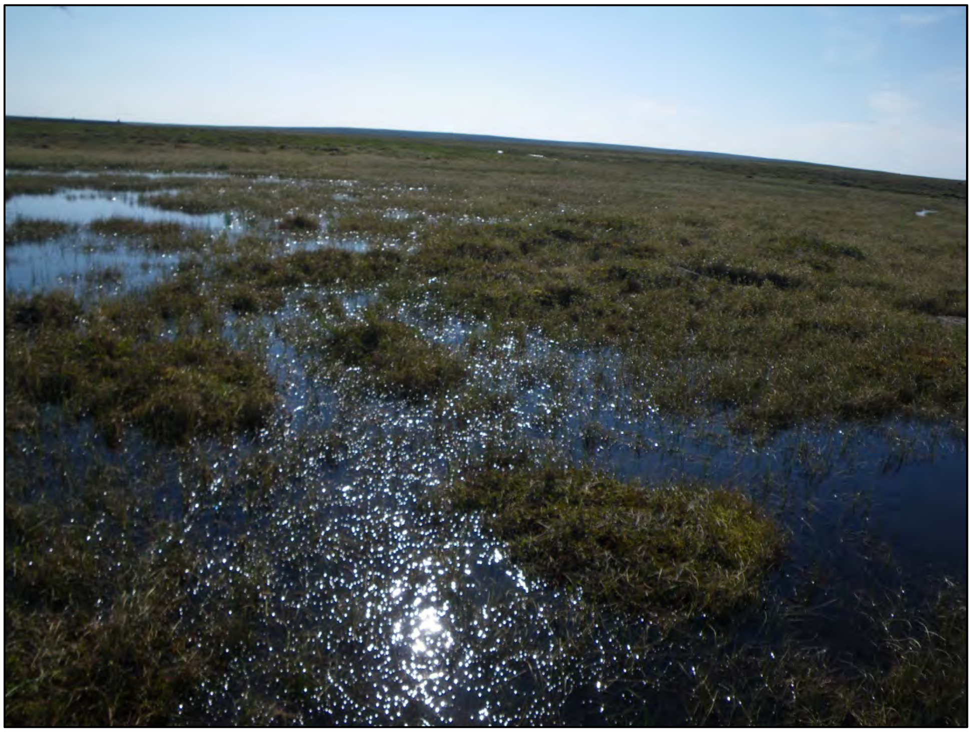


Plate A3.2-2. Non-channelized ephemeral wetted areas at Reach 3 of Gander Pond Stream, June 22, 2013.

Appendix 5.1

Habitat Loss Calculations for Rascal Stream East

Appendix 5.1. Habitat Loss Calculations for Rascal Stream East

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Main Goose Pit Stream — Reach 1	Arctic Grayling	Organics	16.35	0.00	0.0000	0.25	4.0875	0.00	0.0000	0.00	0.0000	4.0875
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	0.00	1.00	0.0000	0.50	0.0000	0.25	0.0000	0.25	0.0000	0.0000
		Cobble	0.00	0.00	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.0000
		Boulder	0.00	0.00	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.0000
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		16.35		0.0000		4.0875		0.0000		0.0000	
	Total HU											4.09

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Main Goose Pit Stream — Reach 2	Arctic Grayling	Organics	0.00	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	116.66	1.00	116.6622	0.50	58.3311	0.25	29.1656	0.25	29.1656	233.3244
		Cobble	816.64	0.00	0.0000	0.50	408.3177	1.00	816.6355	1.00	816.6355	2041.5887
		Boulder	233.32	0.00	0.0000	0.25	58.3311	0.75	174.9933	0.75	174.9933	408.3177
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		1166.62		116.6622		524.9799		1020.7943		1020.7943	
	Total HU											2683.23

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Main Goose Pit Stream — Reach 3	Arctic Grayling	Organics	0.00	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	173.80	1.00	173.8037	0.50	86.9019	0.25	43.4509	0.25	43.4509	347.6075
		Cobble	1738.04	0.00	0.0000	0.50	869.0186	1.00	1738.0373	1.00	1738.0373	4345.0932
		Boulder	1564.23	0.00	0.0000	0.25	391.0584	0.75	1173.1752	0.75	1173.1752	2737.4087
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		3476.07		173.8037		1346.9789		2954.6633		2954.6633	
	Total HU											7430.11

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Appendix 5.1. Habitat Loss Calculations for Rascal Stream East

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Main Goose Pit Stream — Reach 4	Arctic Grayling	Organics	21.76	0.00	0.0000	0.25	5.4406	0.00	0.0000	0.00	0.0000	5.4406
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	0.00	1.00	0.0000	0.50	0.0000	0.25	0.0000	0.25	0.0000	0.0000
		Cobble	0.00	0.00	0.0000	0.50	0.0000	1.00	0.0000	1.00	0.0000	0.0000
		Boulder	0.00	0.00	0.0000	0.25	0.0000	0.75	0.0000	0.75	0.0000	0.0000
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		21.76		0.0000		5.4406		0.0000		0.0000	
	Total HU											5.44

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Rascal to Goose Stream — Reach 1	Arctic Grayling	Organics	19.29	0.00	0.0000	0.25	4.8233	0.00	0.0000	0.00	0.0000	4.8233
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	115.76	1.00	115.7600	0.50	57.8800	0.25	28.9400	0.25	28.9400	231.5199
		Cobble	154.35	0.00	0.0000	0.50	77.1733	1.00	154.3466	1.00	154.3466	385.8666
		Boulder	96.47	0.00	0.0000	0.25	24.1167	0.75	72.3500	0.75	72.3500	168.8166
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		385.87		115.7600		163.9933		255.6366		255.6366	
	Total HU											791.03

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Rascal to Goose Stream — Reach 2	Arctic Grayling	Organics	908.74	0.00	0.0000	0.25	227.1855	0.00	0.0000	0.00	0.0000	227.1855
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	69.90	1.00	69.9032	0.50	34.9516	0.25	17.4758	0.25	17.4758	139.8064
		Cobble	279.61	0.00	0.0000	0.50	139.8064	1.00	279.6129	1.00	279.6129	699.0322
		Boulder	139.81	0.00	0.0000	0.25	34.9516	0.75	104.8548	0.75	104.8548	244.6613
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		1398.06		69.9032		436.8951		401.9435		401.9435	
	Total HU											1310.69

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Appendix 5.1. Habitat Loss Calculations for Rascal Stream East

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	Species	Habitat Type	Area (m^2)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Rascal to Goose Stream — Reach 4	Arctic Grayling	Organics	0.00	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Fines	0.00	0.00	0.0000	1.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Gravel	223.79	1.00	223.7852	0.50	111.8926	0.25	55.9463	0.25	55.9463	447.5704
		Cobble	1342.71	0.00	0.0000	0.50	671.3557	1.00	1342.7113	1.00	1342.7113	3356.7783
		Boulder	671.36	0.00	0.0000	0.25	167.8389	0.75	503.5167	0.75	503.5167	1174.8724
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		2237.85		298.3803		1268.1162		2536.2325		2536.2325	
	Total HU											4979.22

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Conversion of Stream Naming Conventions between this Report and Previous Baselines

2013 Report Name	2014 Report Name
Main Goose Pit Stream — Reach 1	Main Goose Pit Stream — Reach 1
Main Goose Pit Stream — Reach 2	Main Goose Pit Stream — Reach 2
Main Goose Pit Stream — Reach 3	Main Goose Pit Stream — Reach 3
Main Goose Pit Stream — Reach 4	Main Goose Pit Stream — Reach 7
Rascal to Goose Stream — Reach 1	Rascal Stream East Reach 1
Rascal to Goose Stream — Reach 2	Rascal Stream East Reach 2
Rascal to Goose Stream — Reach 4	Rascal Stream East Reach 4

Appendix 5.2

Habitat Loss Calculations for Rascal Stream West

an ERM company

Appendix 5.2. Baseline Habitat Calculations for Rascal Stream West

A. Stream Reaches

Stream Reach	Species	Habitat Type	Habitat Area (m^2)	Spawning		Nursery		Rearing		Foraging		Total
				HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Gander Stream Reach 1*	Arctic Grayling	Organics	0.00	0.00	0.0000	0.25	0.0000	0.00	0.0000	0.00	0.0000	0.0000
		Fines	230.98	0.00	0.0000	1.00	230.9840	0.00	0.0000	0.00	0.0000	230.9840
		Gravel	23.10	1.00	23.0984	0.50	11.5492	0.25	5.7746	0.25	5.7746	46.1968
		Cobble	92.39	0.00	0.0000	0.50	46.1968	1.00	92.3936	1.00	92.3936	230.9840
		Boulder	115.49	0.00	0.0000	0.25	28.8730	0.75	86.6190	0.75	86.6190	202.1110
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		461.97		23.0984		317.6030		184.7872		184.7872	
	Total HU											710.28

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

** Rescan. 2014a. Back River Project: 2013 Fish and Fish Habitat Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.*

Stream Reach	Species	Habitat Type	Habitat Area (m^2)	Spawning		Nursery		Rearing		Foraging		Total
				HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
2013 Report Name: Gander Stream Reach 2*	Arctic Grayling	Organics	82.88	0.00	0.0000	0.25	20.7204	0.00	0.0000	0.00	0.0000	20.7204
		Fines	16.58	0.00	0.0000	1.00	16.5763	0.00	0.0000	0.00	0.0000	16.5763
		Gravel	33.15	1.00	33.1526	0.50	16.5763	0.25	8.2881	0.25	8.2881	66.3052
		Cobble	132.61	0.00	0.0000	0.50	66.3052	1.00	132.6104	1.00	132.6104	331.5260
		Boulder	66.31	0.00	0.0000	0.25	16.5763	0.75	49.7289	0.75	49.7289	116.0341
		Bedrock	0.00	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000
	Total Area		331.53		33.1526		136.7545		190.6274		190.6274	
	Total HU											551.16

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

** Rescan. 2014a. Back River Project: 2013 Fish and Fish Habitat Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.*

Appendix 5.2. Baseline Habitat Calculations for Rascal Stream West

B. Ponds

Habitat Type	Habitat Area (m²)	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
		HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gander Pond										
Nearshore with fines (< 2.5 m)	33446.00	0.00	0.0	0.00	0.0	0.25	8361.5	0.00	0.0	8361.5
Nearshore with large substr. (< 4 m)	0.00	0.00	0.0	0.50	0.0	0.50	0.0	0.25	0.0	0.0
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	33446.00		0.0		0.0		8361.5		0.0	8361.5

Habitat Type	Habitat Area (m²)	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
		HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gosling Pond 2										
Nearshore with fines (< 2.5 m)	4477.00	0.00	0.0	0.00	0.0	0.25	1119.3	0.00	0.0	1119.3
Nearshore with large substr. (< 4 m)	0.00	0.00	0.0	0.50	0.0	0.50	0.0	0.25	0.0	0.0
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	4477.00		0.0		0.0		1119.3		0.0	1119.3

Habitat Type	Habitat Area (m²)	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
		HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gosling Pond 1										
Nearshore with fines (< 2.5 m)	14427.00	0.00	0.0	0.00	0.0	0.25	3606.8	0.00	0.0	3606.8
Nearshore with large substr. (< 4 m)	0.00	0.00	0.0	0.50	0.0	0.50	0.0	0.25	0.0	0.0
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	14427.00		0.0		0.0		3606.8		0.0	3606.8

Note: Overwintering WSA was set to zero to reflect the high liklihood that ponds will freeze to bottom in winter.

Conversion of Stream Naming Conventions between this Report and Previous Baselines

2013 Report Name	2014 Report Name
Gander Stream Reach 1	Rascal Stream West Reach 1
Gander Stream Reach 2	Rascal Stream West Reach 2

Appendix 5.3

Habitat Gain Calculations for Rascal Stream West

Rescan™
an ERM company

Appendix 5.3. Habitat Gain Calculations for Rascal Stream West

A. Stream Reaches

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	**Species**	**Habitat Type**	**Area (m²)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Gander Stream Reach 1*	Arctic Grayling	Organics	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
		Fines	2695.0	0.0	0.0	1.0	2695.0	0.0	0.0	0.0	0.0	2695.0
		Gravel	269.5	1.0	269.5	0.5	134.7	0.3	67.4	0.3	67.4	539.0
		Cobble	1078.0	0.0	0.0	0.5	539.0	1.0	1078.0	1.0	1078.0	2695.0
		Boulder	1347.5	0.0	0.0	0.3	336.9	0.8	1010.6	0.8	1010.6	2358.1
		Bedrock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Area		5390.0		269.5		3705.6		2156.0		2156.0	
	Total HU											8287.0

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Culvert loss accounted for by removing proportion stream occupied by culverts (22 m = 7.8%)

Rescan. 2014a. Back River Project: 2013 Fish and Fish Habitat Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	**Species**	**Habitat Type**	**Area (m²)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Gander Stream Reach 2*	Arctic Grayling	Organics	1274.2	0.0	0.0	0.3	318.6	0.0	0.0	0.0	0.0	318.6
		Fines	254.8	0.0	0.0	1.0	254.8	0.0	0.0	0.0	0.0	254.8
		Gravel	509.7	1.0	509.7	0.5	254.8	0.3	127.4	0.3	127.4	1019.4
		Cobble	2038.8	0.0	0.0	0.5	1019.4	1.0	2038.8	1.0	2038.8	5096.9
		Boulder	1019.4	0.0	0.0	0.3	254.8	0.8	764.5	0.8	764.5	1783.9
		Bedrock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Area		5096.9		509.7		2102.5		2930.7		2930.7	
	Total HU											8473.6

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Rescan. 2014a. Back River Project: 2013 Fish and Fish Habitat Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.

			Habitat	Spawning		Nursery		Rearing		Foraging		Total
Stream Reach	**Species**	**Habitat Type**	**Area (m²)**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**HSI**	**WSA**	**WSA**
Gander Stream Reach 3*	Arctic Grayling	Organics	1864.5	0.0	0.0	0.3	466.1	0.0	0.0	0.0	0.0	466.1
		Fines	372.9	0.0	0.0	1.0	372.9	0.0	0.0	0.0	0.0	372.9
		Gravel	745.8	1.0	745.8	0.5	372.9	0.3	186.5	0.3	186.5	1491.6
		Cobble	2983.3	0.0	0.0	0.5	1491.6	1.0	2983.3	1.0	2983.3	7458.2
		Boulder	1491.6	0.0	0.0	0.3	372.9	0.8	1118.7	0.8	1118.7	2610.4
		Bedrock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Area		7458.2		745.8		3076.5		4288.4		4288.4	
	Total HU											12399.2

Notes: HSI = Habitat Suitability Index, WSA = Weighted Suitable Area

Rescan. 2014a. Back River Project: 2013 Fish and Fish Habitat Baseline Report. Prepared for Sabina Gold & Silver Corp. by Rescan Environmental Services Ltd., an ERM Company: Vancouver, BC.

Appendix 5.3. Habitat Gain Calculations for Rascal Stream West

B. Ponds

Gain of Habitat Units Calculated for Arctic Grayling in Rascal Lake to Goose Lake Stream Realignment Option											
	Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
Habitat Type	Area (m²)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gander Pond										
Nearshore with fines (< 2.5 m)	36340.01	0.00	0.0	0.00	0.0	0.25	9085.0	0.00	0.0	9085.0
Nearshore with large substr. (< 4 m)	2137.65	0.00	0.0	0.50	1068.8	0.50	1068.8	0.25	534.4	2672.1
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	42752.95		0.0		1068.8		10153.8		534.4	11757.1

Gain of Habitat Units Calculated for Arctic Grayling in Rascal Lake to Goose Lake Stream Realignment Option										
	Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
Habitat Type	Area (m²)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gosling Pond 2										
Nearshore with fines (< 2.5 m)	12279.06	0.00	0.0	0.00	0.0	0.25	3069.8	0.00	0.0	3069.8
Nearshore with large substr. (< 4 m)	341.08	0.00	0.0	0.50	170.5	0.50	170.5	0.25	85.3	426.4
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	13643.40		0.0		170.5		3240.3		85.3	3496.1

Gain of Habitat Units Calculated for Arctic Grayling in Rascal Lake to Goose Lake Stream Realignment Option										
	Habitat	Spawning/Nursery		Rearing		Foraging		Overwintering		Total
Habitat Type	Area (m²)	HSI	WSA	HSI	WSA	HSI	WSA	HSI	WSA	WSA
Gosling Pond 1										
Nearshore with fines (< 2.5 m)	26591.78	0.00	0.0	0.00	0.0	0.25	6647.9	0.00	0.0	6647.9
Nearshore with large substr. (< 4 m)	738.66	0.00	0.0	0.50	369.3	0.50	369.3	0.25	184.7	923.3
Deepwater (> 4 m) plus > 2.5 with fines	0.00	0.00	0.0	0.00	0.0	0.25	0.0	0.75	0.0	0.0
Total HU	29546.42		0.0		369.3		7017.3		184.7	7571.3

Note: Overwintering WSA was set to zero to reflect the high liklihood that ponds will freeze to bottom in winter.

Conversion of Stream Naming Conventions between this Report and Previous Baselines

2013 Report Name	2014 Report Name
Gander Stream Reach 1	Rascal Stream West Reach 1
Gander Stream Reach 2	Rascal Stream West Reach 2
Gander Stream Reach 3	Rascal Stream West Reach 3