BACK RIVER PROJECT

Final Environmental Impact Statement Supporting Volume 6: Freshwater Environment

Appendix V6-3D

Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas



Appendix V6-3D. Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas

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Appendix V6-3D. Back River Project: Bathymetric Surveys of Lakes in the Goose and George Property Areas

1.1 SUMMARY

Bathymetric surveys of lakes in the Project area were conducted from 2010 to 2013 during open-water and ice-covered seasons. Surveys were conducted on lakes closest to potential infrastructure and activities as well as lakes identified as potential water sources for Project domestic and industrial uses.

1.2 METHODS

The bathymetric surveys were conducted as part of the baseline sampling program, and detailed in the following reports:

- Back River Project: 2010 Lake Water and Sediment Quality Baseline Report (Rescan 2011;
 Appendix V6-3A);
- Back River Project: 2011 Freshwater Baseline Report (Rescan 2012; Appendix V6-3B);
- Back River Project: 2012 Freshwater Baseline Report (Rescan 2013a; Appendix V6-3C); and
- o Back River Project: 2013 Freshwater Baseline Report (Rescan 2013b).

Bathymetric surveys were also conducted on ice-covered lakes in 2013 using a ground-penetrating radar system (Appendix V6-3E).

Open-water bathymetric surveys from 2010 to 2013 consisted of two parts:

- 1. The collection of continuous depth measurements along perpendicular and perimeter transects on the lake and pond surfaces using a Differential Global Positioning System (DGPS) and a Garmin depth sounder; and
- 2. Establishing on-land benchmarks via DGPS surveys of the lake shorelines.

A Trimble PF Power DGPS was used for positioning during the depth survey, and a Garmin depth sounder and a Trimble TSC1 datalogger were used to collect and store the depth data in electronic files. The DGPS and sounder were mounted on the boat for surveys along the lake surfaces.

Depth surveys were carried out by navigating a course of regularly spaced transects across the width of each lake, followed by a longitudinal transect through the long axis of the lake (i.e., e-line). A hand-held GPS, pre-loaded with transect tracks, was used to maintain the correct course with the boat.

Bathymetric surveys conducted on ice-covered lakes in 2013 used a Ground-Penetrating RADAR (GPR) array. MALA's Ramac CUII was used with a 50 MHz rough-terrain antenna. Real-time positioning was attained using a Topcon HyperLite+GPS/Glonass unit. Positions were recorded at 1 Hz with a typical absolute horizontal accuracy of \pm 1 metre. The GPR survey was conducted at a speed of approximately 15 km/hr and data were acquired at a frequency of approximately 10 readings per second, giving an

average horizontal resolution of approximately one GPR trace per 42 cm along survey lines. Data were later corrected for ice thickness (Appendix V6-3E).

1.3 RESULTS

The bathymetry of 19 lakes in the Goose Property Area and 10 lakes in the George Property Area were surveyed between 2010 and 2013 (summarized in Table V6-3D-1). Smooth bathymetric contours were calculated using standard interpolation techniques and were used to create the bathymetric maps shown in Figures V6-3D-1 to V6-3D-27. For results of bathymetric surveys completed by EBA in winter on ice-covered lakes see Appendix V6-3E.

Table V6-3D-1. Summary of Bathymetry Data Collected in the George and Goose Property Areas, Back River Project, 2010 to 2013

Lake	Year Bathymetry Completed	Lake	Year Bathymetry Completed
George Property		Goose Property (cont'd)	
Lytle Lake	2012	Reference Lake B	2010
Occurrence Lake	2012	Goose Lake	2011
Sleigh Lake	2012	Round Pond ¹	2011
George Lake	2012	Pond NE of Round Pond ²	2011
Reference Lake C	2012	Del Lake	2012
Mosquito	2013	Big Lake	2012
Bob	2013	Fox Lake	2012
Komatic	2013	Rabbit Lake	2012
Reference Q	2013	Giraffe Lake	2012
McCoy	2013	Rascal	2013
Goose Property		Wasp	2013
Llama Lake	2010	Pond A	2013
Umwelt Lake	2010	Propeller ³	2013
Mam Lake	2010	Leaf ⁴	2013
Chair Lake	2010	Wolf ⁴	2013

Notes:

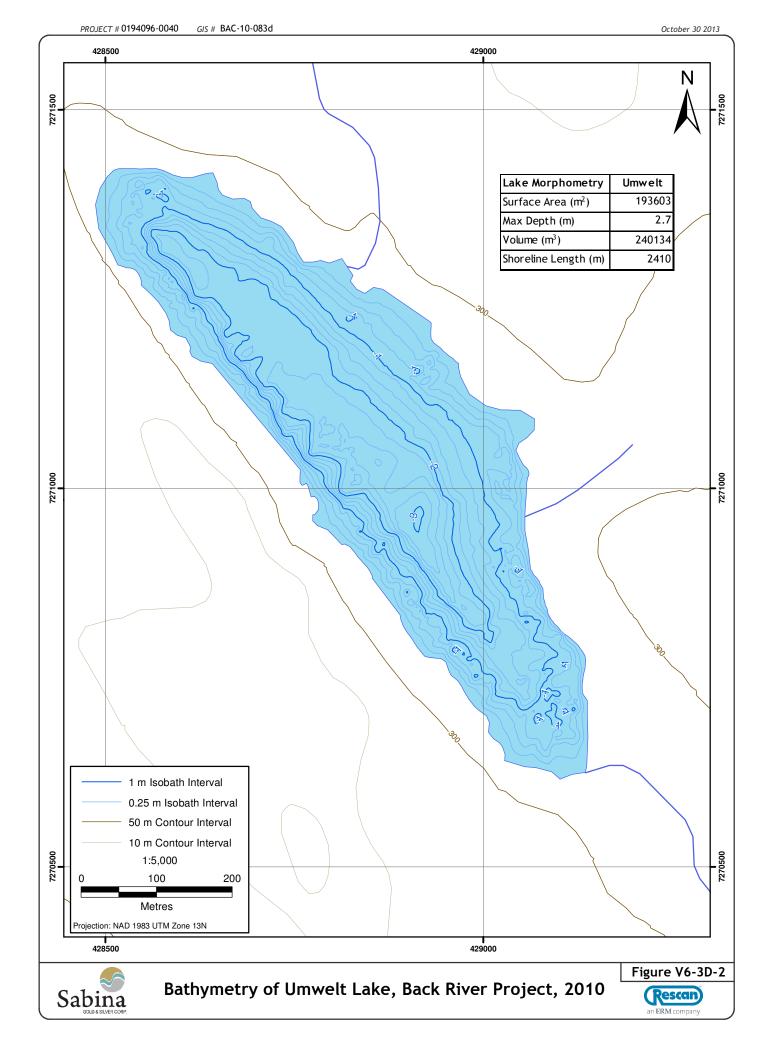
¹ Round Pond is also known as Pond 1.

² Pond NE of Round Pond is also known as Pond 2.

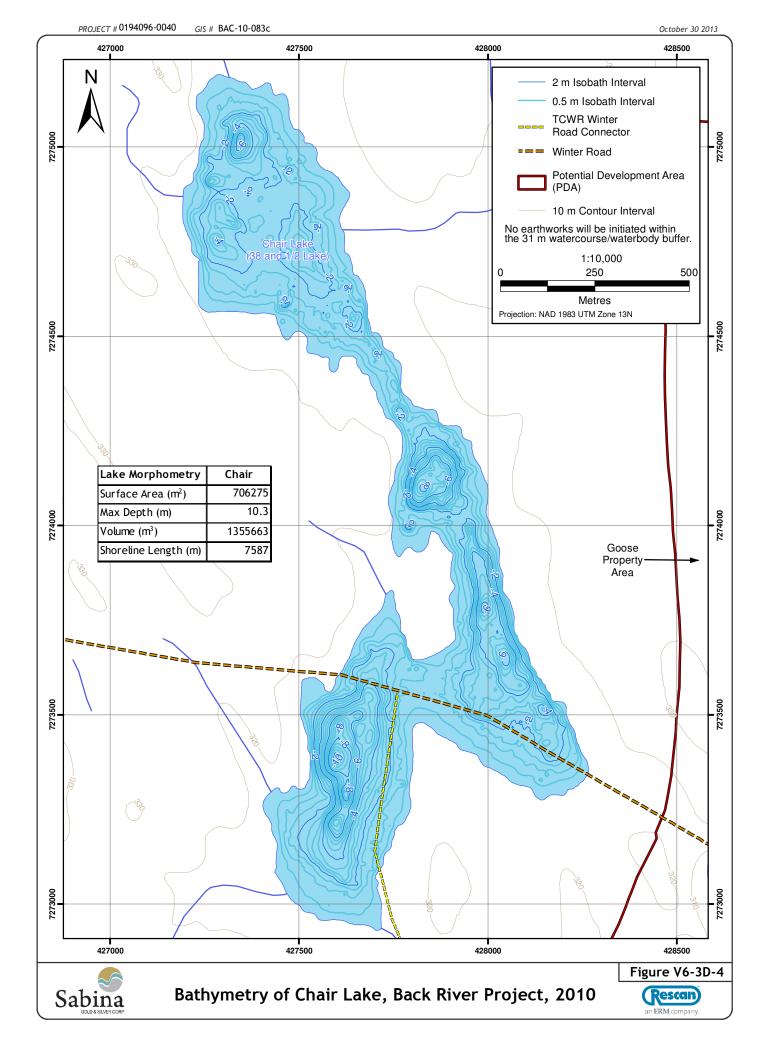
³ Bathymetry was conducted on Propeller Lake in the open-water season using the standard methods and by GPR (Rescan 2013b and Appendix V6-3E).

⁴ Under-ice bathymetry conducted using GPR (Appendix V6-3E).

PROJECT # 0194096-0040 GIS # BAC-10-083a October 30 2013 428500 429000 Lake Morphometry Llama 365933 Surface Area (m²) 13.6 Max Depth (m) 1130613 Volume (m3) Shoreline Length (m) 3205 WRSAA Llama Pit 2 m Isobath Interval 0.5m Isobath Interval Winter Road Haul and Access Road Proposed Infrastructure 10 m Contour Interval No earthworks will be initiated within the 31 m watercourse/waterbody buffer. 1:5,000 100 200 Metres Projection: NAD 1983 UTM Zone 13N 429000 428500 Figure V6-3D-1 Bathymetry of Llama Lake, Back River Project, 2010 Sabina

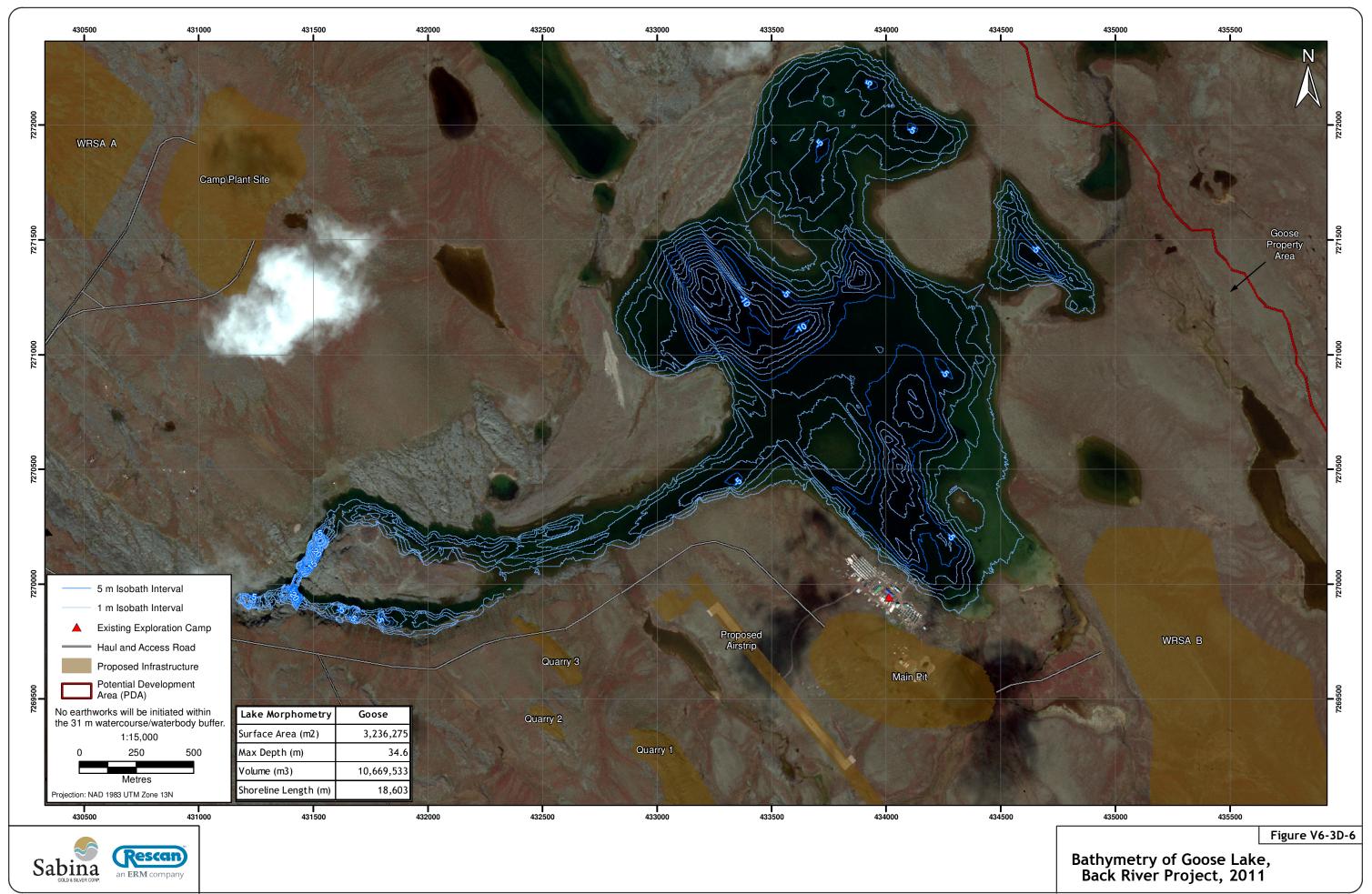


PROJECT #0194096-0040 GIS # BAC-10-083b October 30 2013 428000 427800 **TCWR Winter** Road Connector 1 m Isobath Interval 0.25 m Isobath Interval 10 m Contour Interval No earthworks will be initiated within the 31 m watercourse/waterbody buffer. Lake Morphometry Mam Surface Area (m²) 76928 1:2,500 3.8 Max Depth (m) 100 Volume (m³) 60936 Metres Shoreline Length (m) 1383 Projection: NAD 1983 UTM Zone 13N 428000 427800 Figure V6-3D-3 Bathymetry of Mam Lake, Back River Project, 2010 Sabina (Rescan)

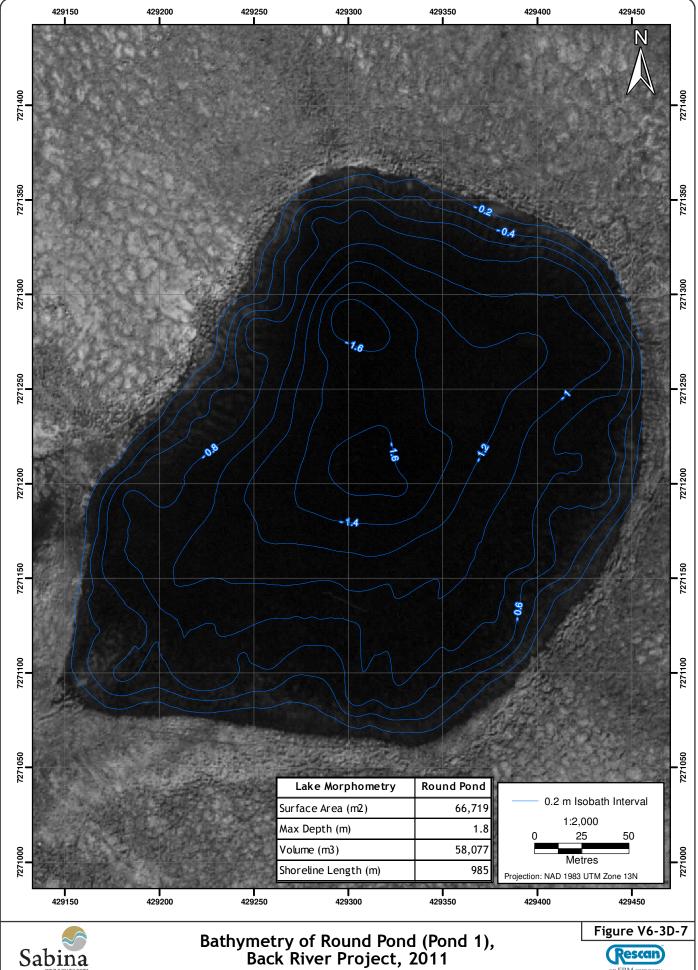


PROJECT #0194096-0040 GIS # BAC-10-083e October 30 2013 442000 Lake Morphometry Reference B Lake 322402 Surface Area (m²) 5.1 Max Depth (m) Volume (m³) 862148 2980 Shoreline Length (m) 1 m Isobath Interval 0.25 m Isobath Interval 1:5,000 100 200 Metres Projection: NAD 1983 UTM Zone 13N 442000 Figure V6-3D-5 Bathymetry of Reference B Lake, Back River Project, 2010 Rescan Sabina

PROJECT # **0194096-0040** GIS # **BAC-10-083f**

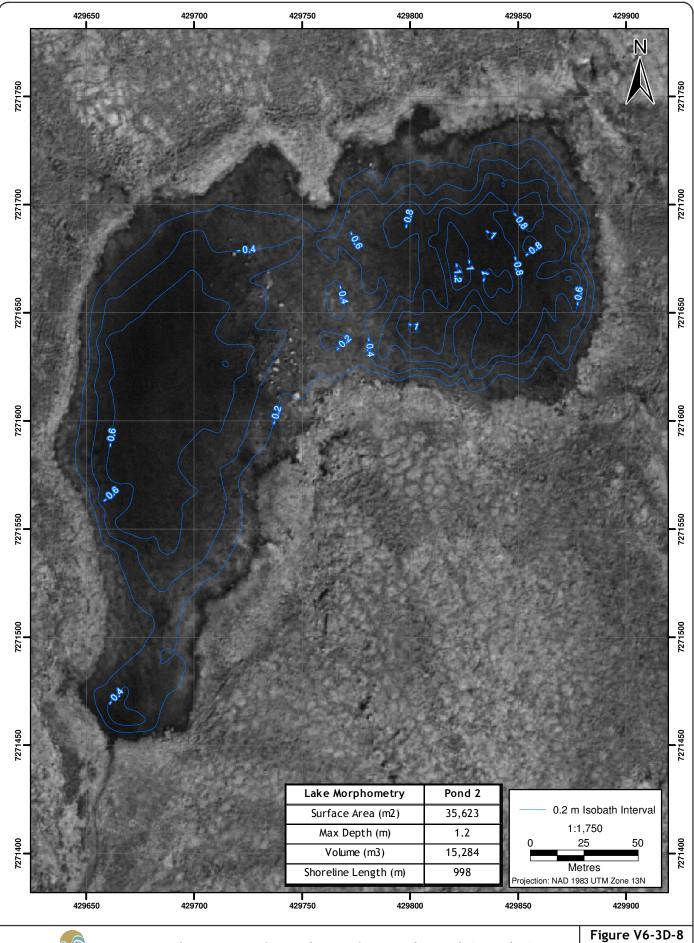


October 28 2013 PROJECT # 0194096-0040 GIS #BAC-10-083g





PROJECT # 0194096-0040 GIS #BAC-10-083h October 28 2013

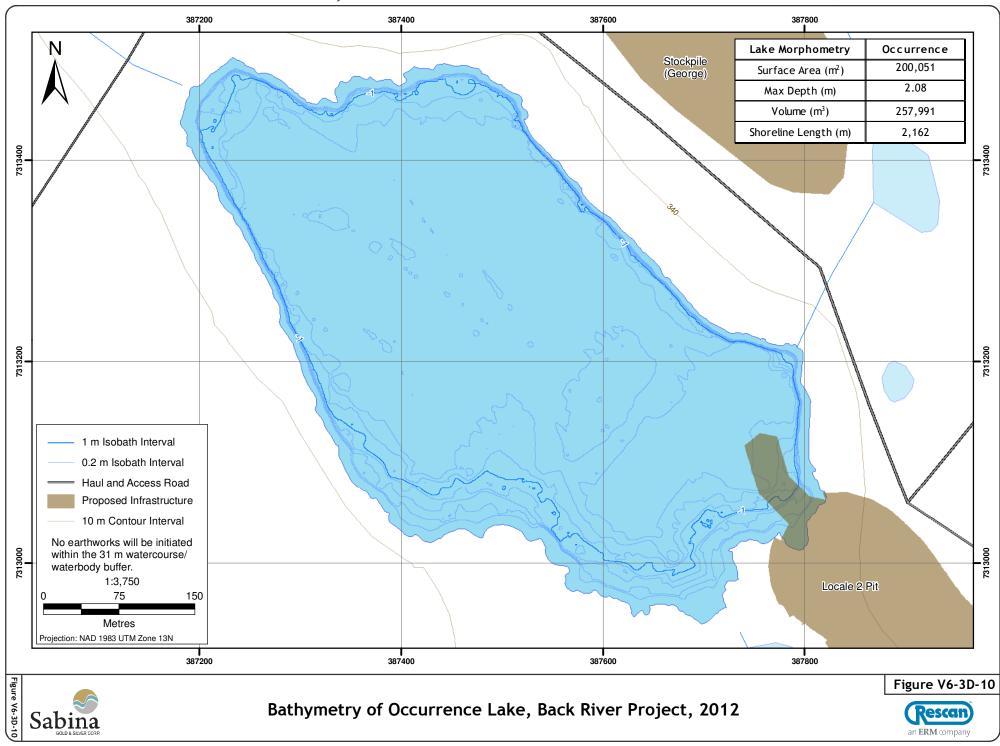


Bathymetry of Pond NE of Round Pond (Pond 2), Back River Project, 2011



PROJECT #0194096-0040 GIS # BAC-10-083i October 28 2013 386800 387000 Lytle Lake Morphometry 77,020 Surface Area (m²) 1.82 Max Depth (m) 78,380 Volume (m³) 1,517 Shoreline Length (m) Locale 1 Pit 7313800 1 m Isobath Interval 0.25 m Isobath Interval Proposed Infrastructure 50 m Contour Interval 10 m Contour Interval No earthworks will be initiated within the 31 m watercourse/waterbody buffer. 1:2,750 50 100 Metres Projection: NAD 1983 UTM Zone 13N 386800 387000 Figure V6-3D-9 Bathymetry of Lytle Lake, Back River Project, 2012 Sabina

PROJECT # 0194096-0040 GIS # BAC-10-083j October 30, 2013



PROJECT # 0194096-0040 GIS # BAC-10-083k October 30 2013 388000 387800 Lake Morphometry Sleigh 7313000 86,433 Surface Area (m2) 1.46 Max Depth (m) 73,160 Volume (m³) Shoreline Length (m) 1,833 Locale 2 Pit 0.5 m Isobath Interval 0.1 m Isobath Interval Haul and Access Proposed Infrastructure 50 m Contour Interval 10 m Contour Interval No earthworks will be initiated within the 31 m watercourse/waterbody buffer. 1:3,000 50 100 Metres Projection: NAD 1983 UTM Zone 13N 387800 388000 Figure V6-3D-11 Bathymetry of Sleigh Lake, Back River Project, 2012 Sabina

