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2023

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ONTARIO GEOLOGICAL SURVEY

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Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts

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P.M. Malegus, C.E. Kurcinka, E.G. Amyotte, K.E. Wiebe, S.A. Ferguson, T.K. Pettigrew and G. Dorland

2023

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ONTARIO GEOLOGICAL SURVEY

RESIDENT GEOLOGIST PROGRAM

REPORT OF ACTIVITIES—2022

RED LAKE
REGIONAL RESIDENT GEOLOGIST REPORT

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P.M. Malegus[1], C.E. Kurcinka[2], S.A. Ferguson[3], T.K. Pettigrew[4] and G. Dorland[5]

[1]Regional Resident Geologist, Red Lake, Resident Geologist Program, Ontario Geological Survey

[2]District Geologist (Acting, August to December 2022), Red Lake District, Resident Geologist Program, Ontario Geological Survey

[3]Regional Land Use Geologist – Northwest Region, Resident Geologist Program, Ontario Geological Survey

[4]Mineral Deposit Compilation Geoscientist – Northwestern Ontario, Resident Geologist Program, Ontario Geological Survey

[5]Geographic Information System Data Specialist – Northwestern Ontario, Resident Geologist Program, Ontario Geological Survey

INTRODUCTION

The Red Lake Resident Geologist District is a vast area in northwestern Ontario of approximately 100 000 km^2, connected to the rest of the provincial highway system by Highway 105. Across the district, it encompasses large lakes, such as its namesake Red Lake, Trout Lake and Lac Seul. Boundaries for the district extend east from the Manitoba border to Lac Seul, with the southern border just north of Perrault Falls and the northern border at latitude 55°N. Communities located within the district are as follows: Bearskin Lake First Nation (FN), Deer Lake FN, Township of Ear Falls, Keewaywin FN, Koocheching FN, McDowell Lake (Mishi Sakahiganiing FN), Muskrat Dam Lake FN, North Spirit Lake FN, Pikangikum FN, Poplar Hill FN, Sachigo Lake FN, Municipality of Red Lake, Sandy Lake FN and Wabauskang FN.

While there has been continued interest in critical minerals within the district, gold remains the only metallic mineral economically produced. All production within the district occurs within the Municipality of Red Lake from 2 operations: Evolution Mining Ltd.'s Red Lake operations and Pure Gold Mining Inc.'s PureGold Mine. However, the PureGold Mine operation entered into care and maintenance on October 24, 2022 (Pure Gold Mining Inc., news release, October 24, 2022). As a result, total gold production in the district was 154 467 ounces, with 132 776 ounces produced by Evolution Mining Ltd. and 21 691 ounces produced by Pure Gold Mining Inc. in 2022 (Figure 1; Table 1).

During the spring of 2022, there was substantial flooding in the region, which resulted in Highway 105 being washed out. This caused a significant hinderance to mining production and mineral exploration by creating difficulties for the industry moving equipment and people. The price of gold was less stable in 2022, beginning to trend upward for the first quarter, then a steady downward trend for the remainder of the year. Many factors impacted the price of gold in 2022, including the ongoing effects of the COVID-19 pandemic, increasing inflation and the Russia–Ukraine war. The average monthly price of gold per ounce was US$1800.09 in 2022 (Figures 2 and 3), increasing from the average price in 2021 by 8%. In 2022, lithium continued to be of particular interest in the Red Lake District. With the price of lithium hitting a high of US$85 000 per tonne in 2022, more companies than ever have been exploring for lithium-cesium-tantalum (LCT) pegmatites in the district (Desai 2022). The majority of claim registrations exploring for LCT pegmatites have been located around the Allison Lake batholith and along the Bear Head fault, near Frontier Lithium Inc.'s PAK and Spark deposits.

Table 1. Mine production and reserves in the Red Lake District in 2022.

Mine	Production in 2021 [1]		Production in 2022 [2]		Reserves [3] (Proven + Probable)
	Tonnage @ Grade	Total Commodity	Tonnage @ Grade	Total Commodity	
Evolution Mining Ltd. Red Lake Operations	748 000 tonnes @ 4.56 grams per tonne	109 592 ounces gold	903 000 tonnes @ 5.02 grams per ton	132 776 ounces gold	13 000 000 t @ 6.90 g/t Au = 2.878 million ounces gold
Pure Gold Mining Inc. PureGold Mine	208 874 tonnes @ 4.2 grams per tonne	26 899 ounces gold	162 354 tonnes @ 3.8 grams per tonne	21 691 ounces gold	3 512 000 t @ 8.97 g/t Au = 1.013 million ounces gold

Notes:

1) Red Lake Operations total production calculated from *Evolution Mining Ltd. March 2021, June 2021, September 2021 and December 2021 Quarterly Reports. PureGold Mine production* from *Pure Gold Mining Inc. (news release, March 30, 2022).*

2) Red Lake Operations total production calculated from *Evolution Mining Ltd. March 2022, June 2022, September 2022 and December 2022 Quarterly Reports. PureGold Mine production* from *Pure Gold Mining Inc. (news releases, May 16, August 15 and October 6, 2022).*

3) Red Lake Gold Mines reserves from *Evolution Mining Ltd. Annual Mineral Resources and Ore Reserves Statement (news release, February 16, 2023). PureGold Mine reserves* from *Pure Gold Feasibility Study (Makarenko et al. 2019).*

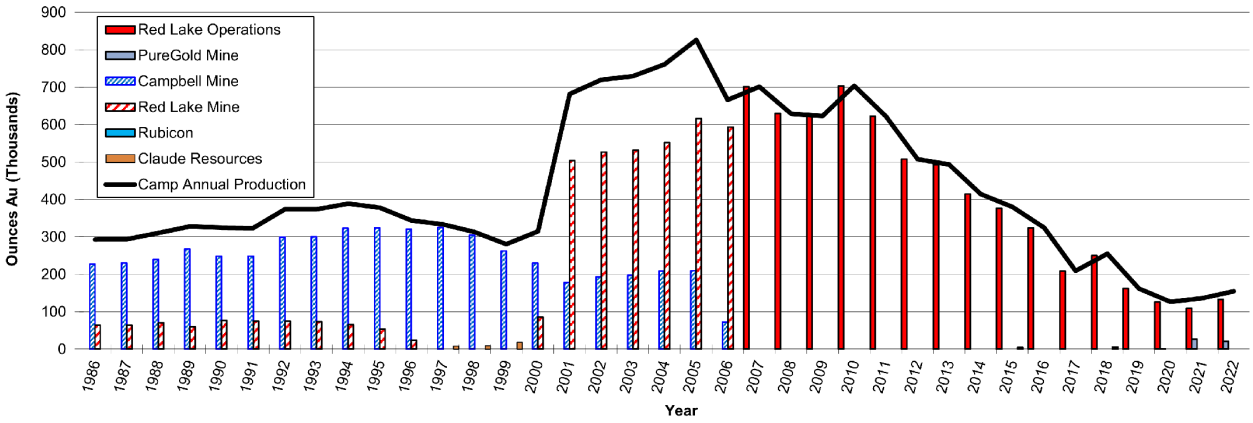


Figure 1. Annual gold production in the Red Lake greenstone belt, 1986–2022. (Note: There was no production at the Red Lake Mine between 1997 and 1999 because of a strike by unionized employees (*from* Resident Geologist Files, Red Lake District, Red Lake)).

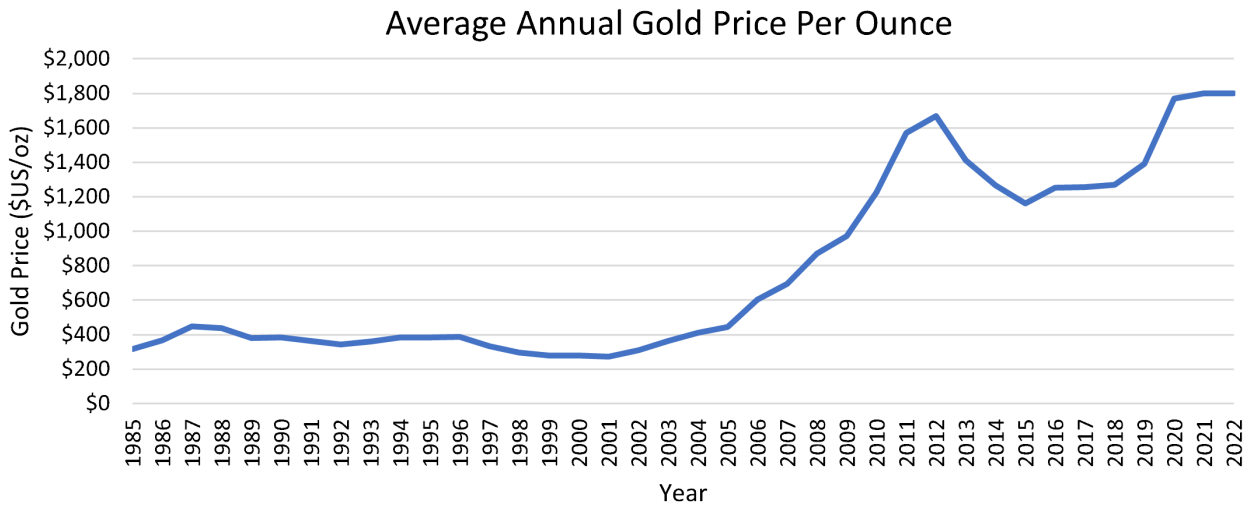


Figure 2. Average annual gold price per ounce from 1986 to 2022 (price information *from* www.kitco.com under Charts & Data | Historical Charts & Data | Gold, select "Yearly Gold Charts-1986 to 2022" [accessed January 17, 2023]).

Figure 3. Average monthly gold price per ounce in 2022 (price information *from* www.kitco.com under Charts & Data | Historical Charts & Data | Gold, select "Yearly Gold Charts-2022" [accessed January 17, 2023]).

Activities presented in Table 8, the Exploration Activity Table, are divided into 4 sections, each representing different stages of exploration and/or development activity.

With multiple years of exploration activity and positive results, projects moving onto the construction phase are included under the ***Mine Development Stage*** section of Table 8. Exploration will continue to progress during this stage as the project moves towards commercial production.

When a company begins an economic review of their project to determine if economic production is viable, the project is included under the ***Economic Analysis Stage*** section of Table 8. Economic studies that would allow a company to be included under this section include initiating a Preliminary Economic Assessment (PEA).

Projects working toward filing or upgrading a mineral resource estimate to the National Instrument (NI) 43-101 standard are included under the ***Resource Delineation Stage*** section of Table 8.

All other projects that do not fall under the categories mentioned above and are early exploration projects are included under the ***Exploration Stage*** section of Table 8.

Two companies within the district have projects in the Economic Analysis Stage: First Mining Gold Corp's Springpole project and Frontier Lithium Inc.'s PAK lithium project. In addition, 2 companies are currently in the Resource Delineation Stage: Kinross Gold Corporation's Great Bear project and Signature Resource Ltd.'s Lingman Lake project. Lastly, many exploration companies in the district are working on Exploration Stage projects. Table 8 and Figures 8a and 8b provide a list of companies working and their project locations in the district, respectively. Work completed and filed for assessment credit within the Red Lake District or otherwise provided is shown in Table 11.

The authors note that, unless otherwise noted: a) Web addresses were accessed on January 30, 2022; b) currency amounts are provided in Canadian dollars; and c) Universal Transverse Mercator (UTM) co-ordinates are reported using North America Datum 1983 (NAD83) in UTM Zone 15.

MINING ACTIVITY

Metal production in the Red Lake District continued entirely from gold mining at 2 mine sites. Gold production continued at Evolution Mining Ltd.'s Red Lake operations, including the following mining areas: Lower Red Lake, Upper Campbell and Cochenour. Access to these mining areas is from a portal or the #3, Reid and Cochenour shafts (Red Lake Operation Fact Sheet, https://evolutionmining.com.au/red-lake, select "Full Fact Sheet" button [accessed December 12, 2022]). Total mine production and reserves from both of these mine sites are located in Table 1.

Evolution Mining Ltd. – Gold Production

Evolution Mining Ltd. (https://evolutionmining.com.au; *see* Figure 8a, location 1) Red Lake operation is located within the Municipality of Red Lake, with mining operations specifically within Balmertown and Cochenour. The current workforce of the mine is approximately 900 people, with 79% of the employees residing locally in the area (Evolution Mining Ltd., Red Lake site presentation, September 15, 2022). With a current life of mine plan of 18 years at the mine site. Evolution has the most extensive land package within the Red Lake greenstone belt, totalling 709 km^2 (Red Lake Operation Fact Sheet, https://evolutionmining.com.au/red-lake, select "Full Fact Sheet" button [accessed December 12, 2022]). The areas mined in 2022 include Balmer, Lower Campbell, Cochenour and Upper Campbell. In addition, the McFinley deposit at the Bateman Gold project will be included in future production. Mining areas are typically hosted within the Balmer assemblage, consisting of tholeiitic basalt and basaltic komatiites.

Additionally, there are 3 mills at Evolution's operations, which include the Campbell, Red Lake and Bateman (currently on care and maintenance) facilities (Red Lake operation fact sheet, https://evolutionmining.com.au/red-lake, select "Full Fact Sheet" button [accessed December 12, 2022]). Gold production increased by 21% to a total of 132 776 ounces at an average grade of 5.02 g/t Au in 2022, compared to 2021 (*see* Table 3). Mineral reserve and resource estimates for the mine site are available in Table 2.

In 2022, Evolution Mining Ltd. in Red Lake continued work toward its long-term plan of producing 300 000 ounces of gold a year by 2027 (Evolution Mining Ltd., Red Lake site presentation, September 15, 2022). One of the significant milestones at the operation includes the beginning of remnant mining in the Upper Campbell area. Ore was first mined from Upper Campbell in September 2022, a result of the development of the Campbell Young Dickenson (CYD) decline. To reach Upper Campbell on schedule with the CYD decline, development rates of 1200 m per month were achieved (Figure 4) (Evolution Mining Ltd., news release, August 18, 2022). There are plans to increase development rates even further to 1500 m per month with the addition of new mining equipment to be used at Cochenour and Upper Campbell (Evolution Mining Ltd., Quarterly Report, January 24, 2023). Finally, the first stope ore from Upper Campbell produced 5400 tonnes at 7.91 g/t Au (Evolution Mining Ltd., Quarterly Report, October 20, 2022).

Table 2. Evolution Mining Ltd. Red Lake operations 2022 quarterly gold production results (Evolution Mining Ltd., Quarterly Reports, April 21, July 21, and October 20, 2022, and January 24, 2023).

Red Lake Operations Activity	March Quarter FY22	June Quarter FY22	September Quarter FY23	December Quarter FY23	Yearly Total 2022*
Underground ore mined (tonnes ×1000)	243	235	223	180	881
Total tonnes processed (tonnes ×1000)	239	258	209	197	903
Grade processed (g/t Au)	4.74	5.11	5.82	4.40	5.02
Gold recovery (%)	90.5	91.3	92.2	89.5	90.9
Gold production (ounces gold)	33 056	38 620	36 140	24 960	132 776
All-in sustaining cost (AISC) (AU$/sold ounces)**	2394	2161	2266	2761	2360

**Yearly total grade processed was calculated by the weighted average of each quarters grade processed and total tonnes processed. Additionally, yearly all-in sustaining cost was calculated by the weighted average of each quarters all-in sustaining cost and gold production.*

***Bank of Canada 2022 monthly exchange rates (AU$1 to C$): March = 0.9334; June = 0.8998; September = 0.8896; December = 0.9172.*

Table 3. Mineral Reserve and Resource estimate, in accordance with JORC Code 2012, combined for all deposits at the Evolution Mining Ltd. Red Lake operations as of December 31, 2022 (Evolution Mining Ltd., news release, February 16, 2023).

Category	Tonnes (Mt)	Grade (g/t Au)	Gold (ounces ×1000)
Reserve Probable	13.0	6.90	2878
Resource Indicated	35.7	6.66	7639
Resource Inferred	24.8	5.90	4702

Mineral resource cut-off grade varies from 2.5 g/t to 3.3 g/t Au, dependent on deposit and location from surface and processing plant. Mineral reserve cut-off grade is 4.0 g/t Au, except HG Young is 3.0 g/t Au and Upper Campbell is 2.5 g/t Au.

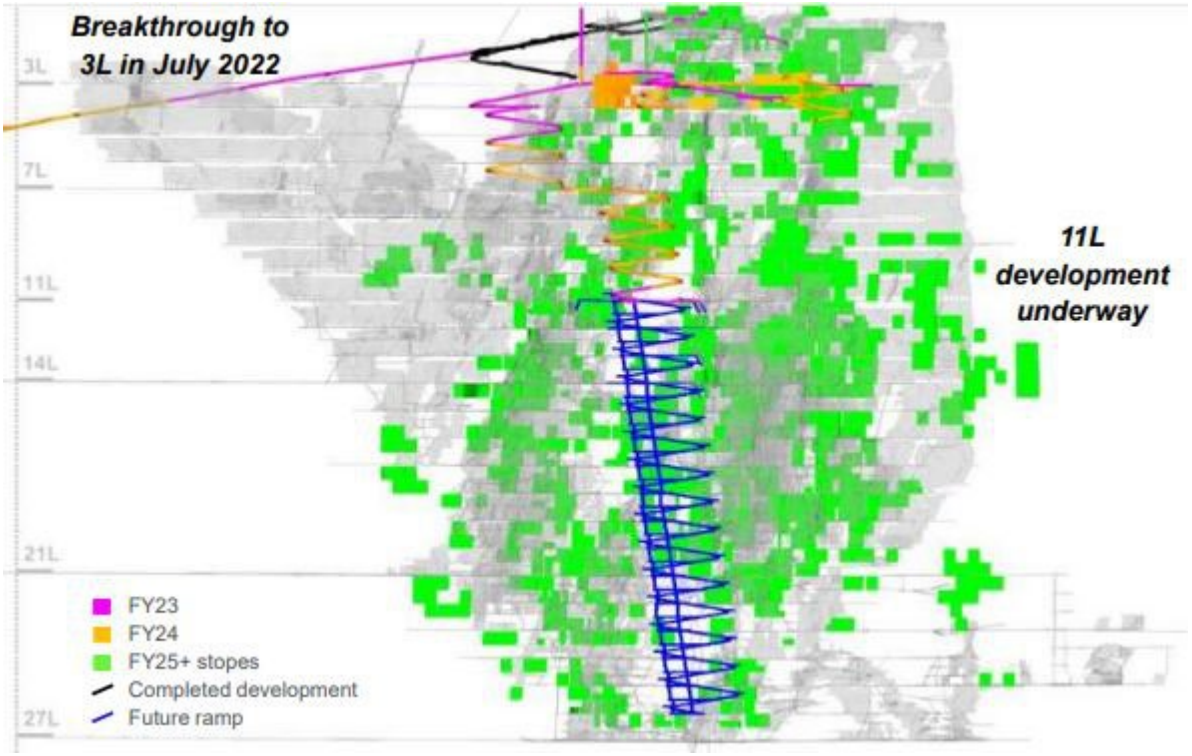


Figure 4. Location of Campbell Young Dickenson (CYD) decline relative to Upper Campbell stopes at the Evolution Mining Ltd. Red Lake operation (*from* Evolution Mining Ltd., Red Lake site presentation, September 15, 2022).

Reaching the Upper Campbell area was an important milestone, as it will increase tonnage in future years, representing up to 40% of annual tonnage by 2024. Increasing the tonnage to the mills was another milestone, as the mine site can now process up to 1.1 million tonnes of ore a year. There are plans to increase mill capacity to 1.8 million tonnes of ore a year, with the first steps to complete mill optimization studies. Mill production increases are possible with up to 2200 and 1100 tonnes per day at the Campbell and Red Lake mill, respectively, by increased optimization (Evolution Mining Ltd., Red Lake site presentation, September 15, 2022).

The company was actively upgrading the mineral resource at the mine site with 5 diamond-drill rigs, with a budget of AU$8 to 10 million, and with a focus on primarily upgrading the Upper Campbell area's mineral resource. The regional exploration program had a budget of AU$6 to 8 million, and includes 2 diamond-drill rigs exploring outside the historically productive Balmer assemblage. Additionally, Evolution undertook sonic drilling at the McFinley deposit as a trial to validate the technique for sampling gold-in-till from lakes. The program successfully validated the technique; Figure 5 shows increased gold in till counts near the McFinley deposit. The results from this program are important for Evolution to use in the future, as 28% of their property is underlain by lakes (Evolution Mining Ltd., Red Lake site presentation, September 15, 2022). Lastly, at the start of 2022, Evolution continued to follow up on drilling the Western R zone to extend the known mineralization. Highlights from the drilling included 51.99 g/t Au over 0.59 m at 857.30 m and 29.43 g/t Au over 2.10 m at 885.25 m in drill-hole D48069BW (Evolution Mining Ltd., Quarterly Report, April 21, 2022).

Evolution Mining's exploration and production diamond-drill statistics for 2022 (V. Smith, Evolution Mining Ltd., personal communication, January 5, 2023) are as follows.

Exploration Drilling	**Depth (m)**
Underground and Surface	~26 000
Resource Definition Drilling	**Depth (m)**
Underground	~31 000

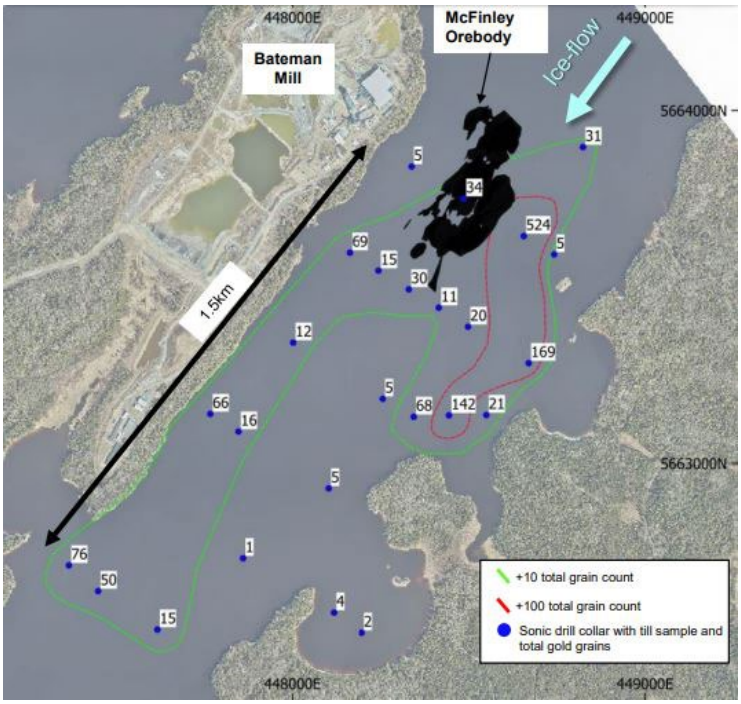


Figure 5. Gold grain in till results from sonic drilling of the Evolution Mining Ltd. McFinley deposit under the ice at East Bay (*from* Evolution Mining Ltd., Red Lake site presentation, September 15, 2022).

Pure Gold Mining Inc. – Gold Production

Pure Gold Mining Inc. (www.puregoldmining.ca; *see* Figure 8a, location 2) completed 3 quarters of production at the PureGold Mine before announcing, on October 24, 2022, that the mine would enter care and maintenance immediately and operations were suspended. The suspension was the result of the company's current cash balance and debt obligations (Pure Gold Mining Inc., news release, October 24, 2022). Further to the suspension of operations, the company announced an application for creditor protection and gained approval for a Sales and Investment Solicitation Process Order (Pure Gold Mining Inc., news releases, October 31 and November 10, 2022). Production at the PureGold Mine in 2022 was 21 691 ounces of gold at an average grade of 3.8 g/t Au, covering only the year's first 9 months (Table 4).

Pure Gold Mining Inc. released an updated mineral resource estimate for the mine site, with the combined indicated and inferred resources provided in Table 5. In addition, the resource was further broken down into each zone at the mine, including Madsen – Austin, Madsen – South Austin, Madsen – McVeigh, Madsen – 8 Zone, Fork, Russet and Wedge. The majority of the resource is located within the Madsen – Austin zone; the mineral resource estimate used a cut-off grade of 3.38 g/t Au and a gold price of US$1800 per ounce (Revering, Barnett and McLeod 2022). Finally, the updated resource shows that there continues to be high-grade gold material below the current ramp depth, where mining has ceased (Figure 6).

Although the company raised $31.1 million throughout the year to continue operations and fund other activities, the financial challenges at the mine site have paused updates to the mine's Life of Mine plan, updating the reserves and completing a Pre-Feasibility Study (PFS) (Pure Gold Mining, news releases, May 27 and October 24, 2022).

Table 4. 2022 Quarterly and annual production summary for the Pure Gold Mining Inc. PureGold Mine (Pure Gold Mining Inc., news releases, May 16, August 15 and October 6, 2022).

PureGold Mine Activity	Q1 2022	Q2 2022	Q3 2022	Yearly Total 2022
Tonnes processed (t)	50 892	45 420	66 042	162 354
Average Head grade (g/t Au)	4.3	2.4	4.5	3.8
Recovery (%)	95.2	93.2	95.1	94.6
Ounces produced (oz)	6653	5997	9041	21 691

Table 5. Mineral Reserve, in accordance with NI 43-101, combined for all deposits at the Pure Gold Mining Inc. PureGold Mine, as of July 5, 2019 (Makarenko et al. 2019), and Mineral Resource Estimate, as of December 31, 2021 (Revering, Barnett and McLeod 2022).

Category	Tonnes	Grade (g/t Au)	Gold (ounces)
Probable Reserve	3 512 000	8.97	1 013 000
Indicated Resource	6 909 900	7.4	1 653 000
Inferred Resource	1 819 300	6.3	366 200

Mineral resource cut-off grade is 3.38 g/t Au. Mineral reserve cut-off grade is 4.75 g/t Au, except McVeigh which is 4.0 g/t Au.

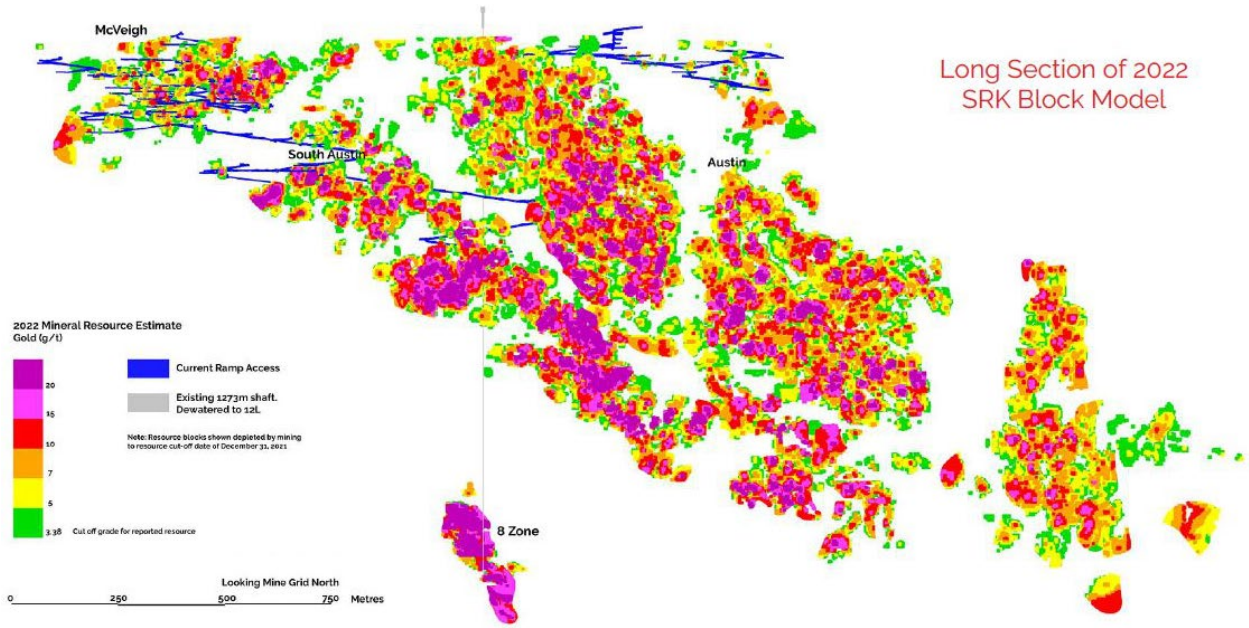


Figure 6. Long section depicting the Pure Gold Mining Inc. PureGold Mine mineral resource estimate and current underground development (*from* Pure Gold Mining Inc., corporate presentation, September 13, 2022).

Table 6. Historical gold production in the Red Lake District as of December 31, 2022.

Mine	Years of Production	Ore Milled (Tonnes)	Gold Produced			
			Grams	Troy Ounces	Ounces per Short Ton	Grams per Tonne (g/t)
Red Lake Operations	2006–present [1]	11 842 469	216 209 799	6 951 413	0.533	18.26
Campbell Mine	1949–2006 [2]	19 944 241	348 870 374	11 216 443	0.510	17.49
Goldcorp (Dickenson)	1948–2006 [3]	8 715 228	185 468 415	5 962 948	0.621 [4]	21.28
PureGold Mine	1938–1976, 1997 [5]–1999, 2020–2022	8 247 803	77 814 667	2 501 838	0.275	9.43
Cochenour–Willans	1939–1971	2 096 654	38 701 403	1 244 279	0.538 [7]	18.46
McKenzie Red Lake	1935–1966	2 135 361	20 253 215	651 156	0.277	9.48
Howey	1930–1941, 1957 [8]	4 200 972	13 112 977	421 592	0.091 [9]	3.12
Hasaga	1938–1952	1 374 641	6 787 182	218 213	0.144	4.94
Starratt–Olsen	1948–1956	823 554	5 100 659	163 990	0.181	6.19
Berens River	1939–1948	508 574	4 893 852	157 341	0.281	9.62
Uchi	1939–1943	686 806	3 560 321	114 467	0.151	5.18
Jason (Argosy)	1934–1952	250 903	3 168 666	101 875	0.368	12.63
H.G. Young	1960–1963	261 432	1 718 280	55 244	0.192	6.57
Sachigo River	1938–1941	42 145	1 634 798	52 560	1.131	38.79
McMarmac	1940–1948	138 779	1 407 307	45 246	0.296	10.14
Gold Eagle	1937–1941	163 379	1 250 484	40 204	0.223	7.65
Jackson Manion	1934–1940	95 578	842 210	27 142	0.258	8.83
Red Lake Gold Shore	1936–1938	78 320	656 283	21 100	0.244	8.38
Phoenix	2015, 2018	90 344	311 563	10 071	0.101	3.47
Hudson Patricia	1936–1937	10 186	57 759	1857	0.165	5.67
Buffalo	1981–1982	29 017	51 507	1656	0.052	1.78
Abino	1985–1986	2479	43 451	1397	0.511	17.53
Lake Rowan	1986–1988	11 814	40 372	1298	0.100	3.42
Kostynuk Brothers	1963–1966	577	35 022	1126	1.770	60.70
Mount Jamie	1976	882	11 726	377	0.388	13.30
Bobjo	1929	N/A	11 260	362 [10]	N/A	N/A
Bathurst	1927–1937	510	9 549	307	0.546	18.73
Red Summit	1935–1936	536	8 616	277	0.469	16.07
Sol d'Or	1933–1936	415	8025	258	0.563	19.31
TOTAL		**61 753 600**	**932 033 649**	**29 966 037**	**0.441**	**15.13**

Notes:

1) Includes total production from the Red Lake complex from January 1, 2006, and production from the Campbell complex subsequent to May 12, 2006, the date of acquisition. Includes production from April 1, 2019 to April 1, 2020 under Newmont Corp. Includes production from Evolution Mining Ltd. acquisition of Red Lake Operations on April 1, 2020.

2) Includes production figures under Placer Dome (CLA) Ltd., to May 12, 2006.

3) For 1997, 1998 and 1999, no production because of strike by unionized employees.

4) From 1970, includes production from Robin Red Lake.

5) Includes clean-up of ore and materials from the mine site.

6) Historical grade, actual grade for 1999 was 0.14 ounce per ton gold.

7) Includes production from Annco and Wilmar properties.

8) Continuous production 1930 to 1941; includes 268 ounces recovered from clean up in 1957.

9) The ore mined at Howey totalled 5 158 376 tons before sorting. The average production from run-of-mine ore was therefore 0.0817 ounce per ton gold.

10) Not included in total production figure.

N/A Data not available.

Historical production in short tons has been converted to metric tonnes.

EXPLORATION ACTIVITY

Throughout 2022, the registration of mining cell claims through the Mining Lands Administration System (MLAS) within the Red Lake District continued to increase. With the industry focussed on developing more lithium assets to support the green energy transition, claim registration has occurred outside the district's typical areas. Significant registration of mining cell claims occurred within the English River Subprovince, the Allison Lake batholith, and along strike and/or parallel to Frontier Lithium's PAK and Spark deposits. As a result, from January 4, 2022, to January 4, 2023, there was an increase in mining cell claims in the Red Lake district by 169 099 ha (15% increase). And the total area mining cell claims increased from 1 117 304 ha on January 4, 2022, to 1 286 403 ha on January 4, 2023 (Table 7; Figure 7). Figure 7 additionally shows newly acquired mining cell claims in the district in 2022. A summary of exploration activity within the Red Lake District is provided in Table 8.

Table 7. Summary of claim status in the Red Lake District.

Year	Active (Cells and Claim Units)	Total Area Covered (Hectares)
2022		1 286 403 [(1)]
2021		1 117 304 [(2)]
2020		808 419 [(3)]
2019	28345	676 218 [(4)]
2018	25281	516 996 [(5)]
2017	19350	
2016	20237	
2015	20523	
2014	22791	
2013	22803	
2012	26378	

Notes:

1) Total area covered by cells and claims [accessed January 4, 2023].
2) Total area covered by cells and claims [accessed January 4, 2022].
3) Total area covered by cells and claims [accessed January 4, 2021].
4) Total area covered by cells and claims [accessed January 6, 2020].
5) Total area covered by cells and claims [accessed January 9, 2019].

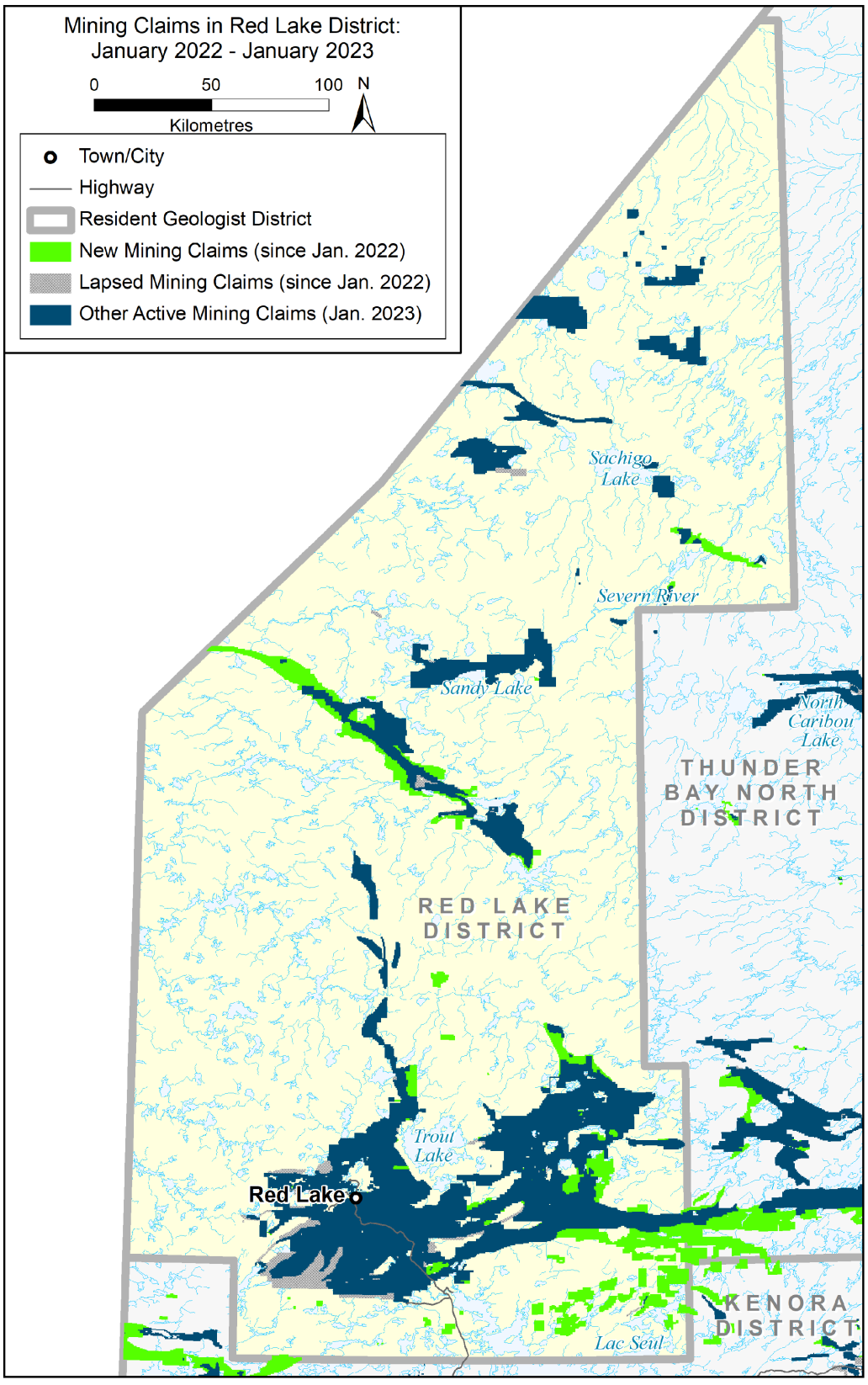


Figure 7. Location of the Red Lake District showing active mining claims, including lapsed mining claims and new mining claims staked during 2022.

Table 8. Exploration activity in the Red Lake District in 2022, keyed to Figures 8a and 8b.

Abbreviations

AM ..... Airborne magnetic survey
AQ ..... Acquisition (property/company)
ASD ..... Assay data
CC ..... Channel cutting
Comp ..... Compilation
DDH ..... Diamond-drill hole(s)
DDR ..... Diamond drill hole (engineering)
EA ..... Environmental assessment study
EIS ..... Environmental impact statement
ENV ..... Environmental study
GL ..... Geological/mapping survey
Interp ..... Interpretation
Lidar ..... Airborne light detection and ranging survey
MDA ..... Mine development activities
MET ..... Metallurgical testing
MRE ..... Mineral Resource Estimate (NI 43-101/JORC)
NR ..... News release
Pr ..... Prospecting
RC ..... Reverse-circulation drill hole(s)
REP ..... Technical report (NI 43-101)
Samp ..... Sampling (other than bulk)
SGH ..... Soil gas hydrocarbon analyses
Str ..... Stripping
TILL ..... Till/soil survey
UG ..... Underground exploration/development

No.	Company (Property Name)	Township/Area (Commodity)	Easting [1]	Northing [1]	NTS Area	Exploration Activity
	MINE ACTIVITY/DEVELOPMENT STAGE					
1	Evolution Mining Ltd. (*Red Lake operations)*	Balmer Township (Au)	447764	5657225	52N04SE/SW	UG, DDH, MRE, MDA
2	Pure Gold Mining Inc. *(PureGold Mine)*	Baird Township, Heyson Township, Dome Township, Fairlie Township (Au)	435536	5646384	52K13NW	DDH, UG, MDA, MRE, REP
	ECONOMIC ANALYSIS STAGE					
3	First Mining Gold Corp. *(Springpole gold project)*	Casummit Lake Area, Keigat Lake Area, Satterly Lake Area, Seagrave Lake Area (Au)	549269	5693714	52N08	EA, EIS
4	Frontier Lithium Inc. *(PAK Lithium project; includes Spark pegmatite)*	Pakeagama Lake Area (Li, Ta, REE)	474469	5827935	53C11SW	DDH, MRE, MET
	RESOURCE DELINEATION STAGE					
5	Kinross Gold Corporation *(Great Bear project)*	Dixie Lake Area, Bruce Lake Area, South of Byshe Area, Faulkenham Lake Area (Au)	456410	5633549	52K13SE/NE/NW, 52K14SW	AQ, DDH, DDR, RC, ENV
6	Signature Resources Ltd. *(Lingman Lake project)*	Lingman Lake Area, North of Lingman Lake Area, Seeber Lake Area, Vanderbrink Lake Area (Au)	507240	5968703	53F14NW/SE, 53F14NE/SE	Interp, Comp, Samp
	EXPLORATION STAGE					
7	Aben Resources Ltd. *(Pringle North project)*	Pringle Lake Area (Au)	460131	5711857	52N12SE	Interp, Comp
8	Angel Wing Metals Inc. *(formerly Huntington Exploration Inc., Quartz Lake project)*	Dent Township, Goodall Township, Honeywell Township, Agnew Township, Corless Township, Mitchell Township (Au)	522196	5670511	52N02NW/NE/SE	Lidar

Note:
1) Universal Transverse Mercator (UTM) easting and northing co-ordinates are the centroid of property.

Table 8, *continued*.

No.	Company (Property Name)	Township/Area (Commodity)	Easting[1]	Northing[1]	NTS Area	Exploration Activity
9	Angel Wing Metals Inc. *(formerly Huntington Exploration Inc., Winora project)*	Lingman Lake Area (Au)	509598	5968275	53F15W	DDH
10	Angold Resources Ltd. *(Uchi property)*	Agnew Township, Earngey Township Dent Township (Au, Cu, Zn, Ag)	527727	5665758	52N02NE/SE	GL, Pr, SGH, TILL
11	Argo Gold Inc. *(Uchi gold project)*	Earngey Township (Au)	528720	5654997	52N02SE	ASD
12	Big Tree Carbon Inc. *(formerly AurCrest Gold Inc., Trout Lake South property)*	Joyce River Area, Gerry Lake Area, South of Otter Lake Area, Knott Township (Au)	493126	5654582	52K14NW/NE, 52N03SE, 52N02SW	NR
13	Big Tree Carbon Inc. *(formerly AurCrest Gold Inc., Ranger Lake property)*	Ranger Township, Otter Lake Area (Au)	464467	5656672	52N04SE, 52N03SW	NR
14	Big Tree Carbon Inc. *(formerly AurCrest Gold Inc., Richardson Lake property)*	Casummit Lake Area, Brownstone Lake Area (Au)	545757	5704714	58N08NW	NR, SGH
15	Bounty Gold Corp. *(Gun Club (Wenasaga) property)*	Camping Lake Area Ear Falls Lake Area Bruce Lake Area Karas Lake Area (Li, Cs)	479563	5619396	52K11N	AQ, Pr
16	Bounty Gold Corp. / Last Resort Resources Ltd. *(McKenzie Bay pegmatite)*	Landings Lake Area, Clace Lake Area, Broad Lake Area, Maskerine Lake Area (Li)	537440	5595561	52K09SW, 52K08NW, 52K07NE, 52K010SE	AQ, Pr, Samp
17	Bounty Gold Corp. / Last Resort Resources Ltd. *(Wapesi North property)*	Wapesi Lake Area, Pilot Lake Area (Li)	552707	5613258	52K09N	AQ, Pr, Samp
18	BTU Metals Corp. *(Dixie Halo project)*	Dixie Lake Area Dedee Lake Area Longlegged Lake Area Bruce Lake Area South of Byshe Area (Au, Cu, Zn)	454977	5629180	52K12NW, 52K13SW/SE, 52K14SW	DDH, GL, ASD, SGH
19	Critical Resources Ltd. *(Plaid project)*	Pakeagama Lake Area, Kennedy Lake Area, (Li)	466841	5825534	53C11SW, 53C12SE	AQ
20	Critical Resources Ltd. *(Whiteloon project)*	Mechita Lake Area Pakeagama Lake Area Cellist Lake Area Pakwan Lake Area (Li)	480559	5831447	53C11SW/NW	AQ
21	Dixie Gold Inc. *(Red Lake gold project)*	Byshe Township, Willans Township, South of Byshe Area, South of Otter Lake Area, Bruce Lake Area Karas Lake Area Faulkenham Lake Area (Au)	464806	5638886	52K13NE, 52K14NW/SW	NR
22	Exiro Minerals Corp. *(North Spirit project)*	Hewitt Lake Area, Mattson Lake Area, Armstrong Lake Area, Margot Lake Area, Buckett Lake Area (Au, Cu, Li)	510112	5804946	53C07, 53C06NE, 53C10SW	AQ, AM

No.	Company (Property Name)	Township/Area (Commodity)	Easting[1]	Northing[1]	NTS Area	Exploration Activity
23	First Mining Gold Corp. *(Birch-Uchi Greenstone Belt project; includes: Birch, Horseshoe, Horseshoe East, Satterly, Stargazer, Shabumeni, Swain, Swain Post, Vixen North, Vixen West and Vixen South properties)*	Satterly Lake Area, Casummit Lake Area, Keigat Lake Area, Shabumeni Lake Area, Little Shabumeni Lake Area, Goodall Township, Honeywell Township, McNaughton Township, Dent Township (Au)	537345	5689157	52N08NW/NE/SW, 52N07SE/NE, 52N02NE	Samp, TILL, AM, DDH, ASD
24	Golden Goliath Resources Ltd. *(Kwai project)*	Dixie Lake Area, Cabin Bay Area, Longlegged Lake Area (Au, Cu)	452866	5622063	52K13SE, 52K12NE/NW	NR
25	GoldON Resources Ltd. (*McDonough property)*	McDonough Township (Au)	441520	5668167	52N04NW	NR
26	GoldON Resources Ltd. (*Springpole East property)*	Keigat Lake Area, Seagrave Lake Area, Zionz Lake Area, Gull Lake Area (Au, Ag)	565488	5692728	52N08NE, 52O05NW	AM, GL, Pr, Samp, Interp, ASD
27	Green Technology Metals Ltd. (*Allison Lithium project)*	Latreille Lake Area, McNaughton Township, Costello Township, Jubilee Lake Area (Li)	539193	5667811	52N01NW/SW	AQ, AM, Pr
28	Green Technology Metals Ltd. (*Pennock Lake)*	Setting Net Lake Area, Setting Net Creek Area (Li)	458425	5845467	53C13SE, 53C12NE	AQ
29	Kenorland Minerals Ltd. *(South Uchi project)*	Avis Lake Area, Slate Lake Area, Bluffy Lake Area, Whitemud Lake Area, Fredart Lake Area, Curie Lake Area, Wesley Lake Area, Otatakan Lake Area, Roadhouse River Area (Au)	539219	5642193	52K15, 52K16NW/NE/SW, 52J13SW/NW	TILL, GL
30	Last Resort Resources Ltd. *(Jack Elliot property)*	Heyson Township, Dome Township, (Au)	437847	5652237	52N04SW	Pr, Samp
31	Lithium One Metals Inc. *(Allison South)*	Jubilee Lake Area, Avis Lake Area (Li)	549649	5650141	52N01SW, 52K12NE	AQ
32	Lithium One Metals Inc. *(Sharp)*	Wesley Lake Area (Li)	561429	5631416	52K16SE	AQ
33	Lithium One Metals Inc. *(Dagny)*	Flash Lake Area, Dagny Lake Area (Au)	587615	5601410	52J12SW/SE	AQ
34	Madi Minerals Ltd. *(Morrison River)*	Morrison River Area (Li)	586394	5932602	53G12SE	AQ, NR
35	Midex Resources Ltd. *(Allison Lake project)*	Birkett Township (Li)	540832	5658243	52N01SW	AQ
36	Midex Resources Ltd. *(Berens North project)*	South of Favourable Lake Area, Favourable Lake Area, Borland Lake Area, Setting Net Creek Area (Li)	438020	5857945	53C13NW/SW, 53D16NE, 53C12NE	AQ, Pr, Samp
37	Midex Resources Ltd. *(Berens South project)*	Pakwan Lake Area, Margot Lake Area, (Li)	493925	5815775	53C11SE, 53C06NE	AQ

No.	Company (Property Name)	Township/Area (Commodity)	Easting[1]	Northing[1]	NTS Area	Exploration Activity
38	MetalCorp Ltd. *(Black Bear)*	Blackbear Lake Area, Shaver Township, (Au)	460113	5672748	52N04NE	ASD
39	Musk Metals Corp. *(Allison Lake East)*	Jubilee Lake Area (Li)	547077	5657784	52N01SE	AQ, AM, Interp
40	Newrange Gold Corp. *(Argosy gold mine)*	Casummit Lake Area (Au)	544893	5703467	52N08NW	NR, Comp
41	Newrange Gold Corp. *(North Birch gold project)*	Casummit Lake Area, Brownstone Lake Area, Wavell Lake Area, Little Shabumeni Lake Area (Au)	537208	5705315	52N10SE, 52N09SW, 52N07NE, 52N08NW	DDH, ASD
42	Nexus Metals Corp. *(formerly Nexus Gold Corp., McKenzie project)*	Dome Township (Au)	438436	5656388	52N04SW	ASD, NR
43	Pacton Gold Inc. *(Red Lake gold project)*	Ranger Township, Byshe Township, Heyson Township, Faulkenham Lake Area, South of Byshe Area, Medicine Stone Lake Area (Au)	443217	5643937	52K13NW/NE, 52L16NE, 52K13NW	DDH, ASD, GL, Pr
44	Pacton Gold Inc. *(Swain)*	Shabumeni Lake Area (Au)	529211	5681682	52N07SE	Comp
45	Platinex Inc. *(Muskrat Dam Critical Mineral project; includes Axe Lake, Munekun Lake, Fox Bay, Rottenfish and Windigo A properties)*	Severn River Area, Muskrat Dam Lake Area, Morrison River Area, Misquamaebin Lake Area, Namaybin Lake Area, Kippen Lake Area, North of Rottenfish River Area, Rottenfish River Area (Li, Ni, Cu, PGE, Au)	603526	5923862	53G06NW/NE, 53G05NE/SW, 53G12SE, 53F01NE, 53F08NW/SW	AQ
46	Portofino Resources Inc. *(Allison Lake North property)*	Costello Township, Latreille Lake Area, Birkett Township, Jubilee Lake Area (Li, REE)	542582	5663175	52N01NW/SW	AQ, CC, Samp, ASD, AM
47	Prosper Gold Corp. *(Golden Sidewalk property)*	Knott Township, Corless Township, Dent Township, Goodall Township, Shabu Lake Area, Skinner Township (Au)	511146	5672503	52N07SW, 52N02NW	AQ, ASD, DDH, CC, Str
48	Red Lake Gold Inc. *(Whirlwind Jack gold project)*	Faulkenham Lake Area, Medicine Stone Lake Area, Dedee Lake Area, Rainfall Lake Area (Au)	436607	5638168	52K13NW/SW, 52L16NE/SE	NR
49	Rockland Resources Ltd. *(Cole gold mine)*	Ball Township (Au)	413785	5658575	52M01SE	ASD, NR
50	Silver Dollar Resources Inc. *(Pakwash Lake property)*	Cabin Bay Area, Dixie Lake Area Camping Lake Area (Au)	463191	5618395	52K12NE, 52K13SE, 52K11NW	AM
51	Solstice Gold Corp. *(New Frontier property)*	Kavanagh Lake Area (Au)	454000	5727357	52N12NE	AQ
52	Solstice Gold Corp. *(RLX project)*	Nungesser Lake Area, Hanton Lake Area Storey Lake Area (Au)	465032	5698791	52N05SE, 52N06NW, 52N11SW	DDH, ASD, Interp

No.	Company (Property Name)	Township/Area (Commodity)	Easting[1]	Northing[1]	NTS Area	Exploration Activity
53	StraightUp Resources Inc. *(Belanger property)*	Knott Township, Mitchell Township, Belanger Township, Bowerman Township (Au, Cu, Ag, Zn)	513273	5651507	52N02SW	NR
54	StraightUp Resources Inc. *(RLX property)*	Otter Lake Area, South of Otter Lake Area, Willans Township (Au, Cu, Ag)	475390	5651000	52N03SW, 52K14NW, 52K13NE	NR, AQ
55	Taura Gold Inc. *(Shabu project)*	Shabu Lake Area (Au)	514744	5683304	52N07SW	AQ, Pr, GL, Samp
56	Tearlach Resources Ltd. *(Harth Lithium project)*	Perky Lake Area, Wesley Lake Area (Li)	552361	5632503	52L16SW/SE	AQ
57	Tearlach Resources Ltd. *(Margot Lake Lithium project)*	Margot Lake Area (Li)	492730	5812938	53C06NE	AQ
58	Tearlach Resources Ltd. *(Pakwan Lithium project)*	Pakwan Lake Area, Pakeagama Lake Area (Li)	484776	5825426	53C11SE/SW	AQ
59	Tearlach Resources Ltd. *(Wesley Lake Lithium project)*	Wesley Lake Area, Otatakan Lake Area (Li)	568926	5633840	52K16SE, 52J13SW	AQ, Pr, GL, Samp
60	Trillium Gold Mines Inc. *(Birch-Uchi properties, including Satterly Lake and Swain Lake)*	Satterly Lake Area, McNaughton Township, Shabumeni Lake Area, Casummit Lake Area (Au, Ag)	539692	5682453	52N08SW/NW	AQ
61	Trillium Gold Mines Inc. *(Confederation Belt properties; includes Uchi Gold, Copperlode West, Fly Lake, Eastern Vision, Garnet Lake, Gerry Lake, Karas Lake, Leg Lake, Lost Bay, Moose, Caribou Creek; Panama Lake acquired from Benton Resources Inc.; Wenasaga Gold acquired from Bounty Gold Corp.)*	Fredart Lake Area, Gerry Lake Area, South of Otter Lake Area, Karas Lake Area, Belanger Township Bowerman Township, Mitchell Township, Earngey Township, Birkett Township, Agnew Township, Dent Township, Bluffy Lake Area, Slate Lake Area, (Au, Cu, Zn, Ag)	504700	5644479	52K14, 52K15NW/NE/SW, 52N02SE/SW/NE	AQ, Samp, Comp, TILL, ASD, Pr, DDH
62	Trillium Gold Mines Inc. *(Gold Centre property)*	Balmer Township (Au)	451046	5653357	52N04SE	DDH, ASD, Interp
63	Trillium Gold Mines Inc. *(Newman Todd project; includes Rivard and Willis property)*	Todd Township (Au)	420241	5656152	52M01SE	ASD, DDH, Interp
64	Westmount Minerals Corp. *(Otatakan Lithium property)*	Otatakan Lake Area (Li)	578290	5624481	52J13SW	AQ
65	Westmount Minerals Corp. *(Pilot East Lithium property)*	Pilot Lake Area (Li)	568299	5615625	52K09NE	AQ
66	West Red Lake Gold Mines Ltd. *(formerly West Red Lake Gold Mines Inc. West Red Lake Gold project; includes Rowan Mine and Mount Jamie properties; Rowan Mine JV between West Red Lake Gold Ltd.: 69%, Evolution Mining Ltd.: 31%)*	Todd Township (Au)	421587	5657772	52M01SE	CC, DDH, REP, NR
67	Xplore Resources Corp. *(Upper Red Lake project)*	East of Trout Lake Area, Shabu Lake Area, Skinner Township (Au)	503834	5676504	52N07SW, 52N02NW	ASD

[1] *Universal Transverse Mercator (UTM) easting and northing co-ordinates are the centroid of property.*

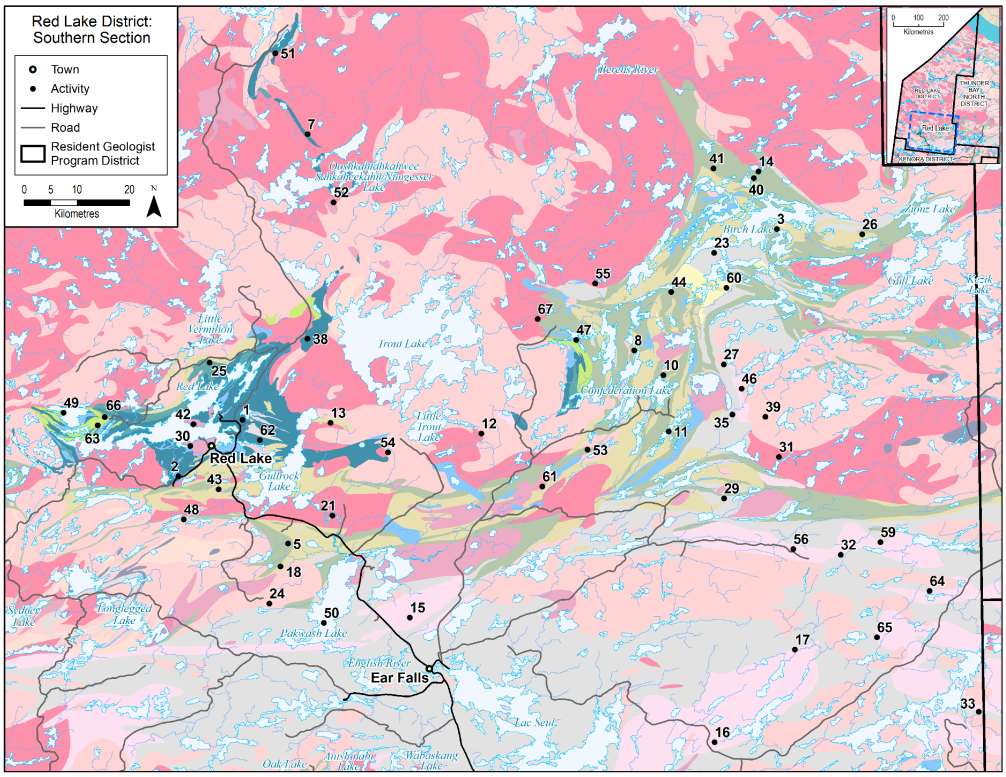


Figure 8a. Location of exploration and mining activity conducted in the southern Red Lake District in 2022 (numbers keyed to Table 11). Bedrock geology *from* Ontario Geological Survey (2011).

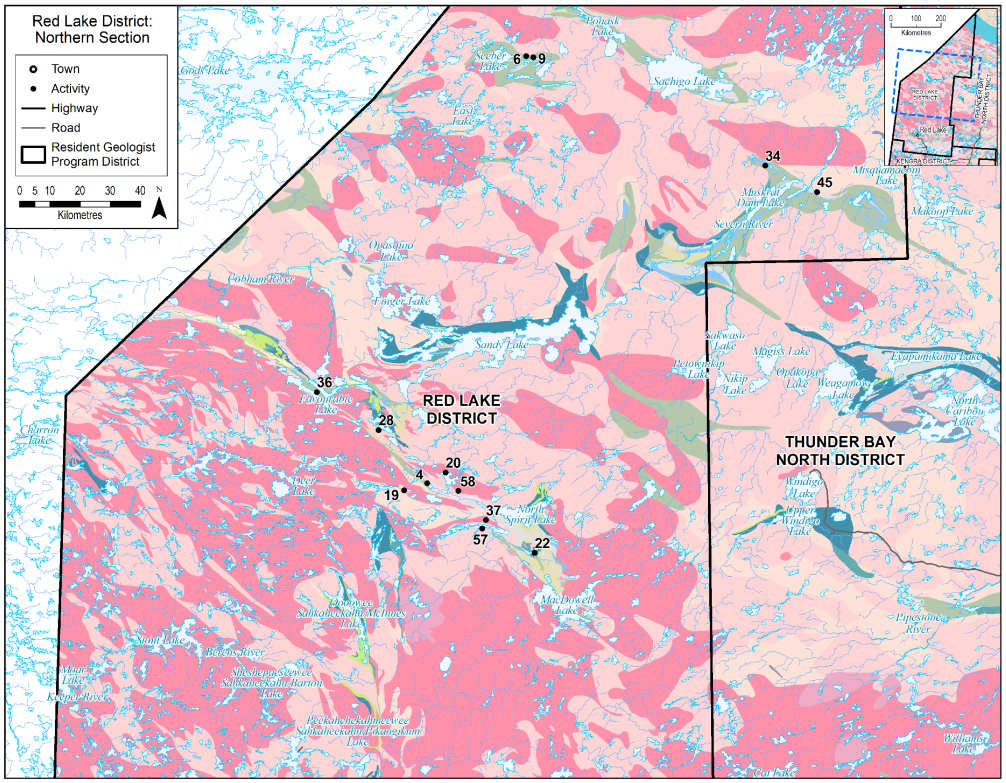


Figure 8b. Location of exploration and mining activity conducted in the northern Red Lake District in 2022 (numbers keyed to Table 11). Bedrock geology *from* Ontario Geological Survey (2011).

Plans and Permits

Since April 1, 2013, certain prescribed early mineral exploration activities have required an Exploration Plan or Permit issued by the Ministry of Mines under the *Mining Act.*

> Exploration Plans must be filed for geophysical surveys requiring a power generator; line cutting where the line widths are less than 1.5 m; drilling with a drill rig lighter than 150 kg; mechanized stripping where the total surface area stripped does not exceed 100 m^2 within a 200 m radius; and test pitting and trenching of bedrock where the volume extracted is between 1 and 3 m^3 within a 200 m radius (www.ontario.ca/page/exploration-plans).
>
> Exploration Permits must be obtained for line cutting where the line widths exceed 1.5 m; drilling with drill rigs heavier than 150 kg; mechanized stripping where the total surface area stripped exceeds 100 m^2 within a 200 m radius; and test pitting and trenching of bedrock where the total volume extracted exceeds 3 m^3 within a 200 m radius (www.ontario.ca/page/exploration-permits).

Plan submissions and Permit applications for properties located in the Red Lake District are processed by Northwest Regional Mineral Development and Lands Branch office of the Ministry of Mines in Thunder Bay. There was 1 active Exploration Plan and 92 active Exploration Permits for properties in the Red Lake District as of December 31, 2022 (Tables 9 and 10).

Table 9. Active exploration plans ("PL-") in the Red Lake District as of December 31, 2022.

Plan Number	Plan Holder	Property Name	Activities	Effective Date (dd/mm/yy)
PL-21-000016	Whitefish Exploration Inc.	Swain Lake project	Geophysical Surveys	11/04/21

Table 10. Active exploration permits ("PR-") in the Red Lake District as of December 31, 2022.

Permit Number	Plan Holder	Property Name	Activities	Effective Date (dd-mmm-yy)
PR-19-000227	Great Bear Resources Ltd.	Dixie project	Mechanized Drilling	27-Nov-19
PR-19-000302	Silver Dollar Resources Inc.	Pakwash Lake	Mechanized Drilling, Mechanized Stripping, Line Cutting	06-Jan-20
PR-19-000306	BTU Metals Corp.	Dixie Halo property	Mechanized Drilling, Mechanized Stripping	16-Jan-20
PR-19-000316	BTU Metals Corp.	Dixie Halo	Mechanized Drilling	16-Jan-20
PR-19-000322	Pacton Gold Inc.	Roger	Mechanized Drilling	17-Jan-20
PR-19-000342	GoldON Resources Ltd.	Bruce Lake	Mechanized Drilling, Mechanized Stripping, Line Cutting	12-Feb-20
PR-20-000040	Bounty Gold Corp.	Laird Lake gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	11-Aug-20
PR-20-000041	GoldON Resources Ltd.	Madsen–Medicine Stone gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	04-Aug-20
PR-20-000042	Bounty Gold Corp., GoldON Resources Ltd.	Flat Lake gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	03-Jul-20
PR-20-000043	Bounty Gold Corp.	RLX North gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	30-Jun-20
PR-20-000044	Bounty Gold Corp.	RLX South gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	30-Jun-20
PR-20-000045	Newrange Gold Corp.	North Birch gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	08-Sep-20

Permit Number	Plan Holder	Property Name	Activities	Effective Date (dd-mmm-yy)
PR-20-000046	Newrange Gold Corp.	Joneston gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	08-Sep-20
PR-20-000047	Copper Road Resources Inc.	Mount Jamie North gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	30-Jun-20
PR-20-000060	GoldON Resources Ltd.	West Madsen	Mechanized Drilling	17-Apr-20
PR-20-000061	Nexus Metals Corp.	McKenzie project	Mechanized Drilling	17-Apr-20
PR-20-000102	Pacton Gold Inc.	Roger	Line Cutting	20-May-20
PR-20-000116	EMX Properties (Canada) Inc.	South of Otter gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	23-Jul-20
PR-20-000133	Bounty Gold Corp.	Belanger gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	30-Jun-20
PR-20-000134	GoldON Resources Ltd.	Pipestone Bay	Mechanized Drilling	30-Jun-20
PR-20-000178	Great Bear Resources Ltd.	Dixie project	Mechanized Stripping	16-Jul-20
PR-20-000194	Gold Canyon Resources Inc.	Springpole project	Mechanized Drilling	09-Nov-20
PR-20-000195	Gold Canyon Resources Inc.	Springpole project	Mechanized Drilling	09-Nov-20
PR-20-000196	Gold Canyon Resources Inc.	Springpole project	Mechanized Drilling	09-Nov-20
PR-20-000197	Gold Canyon Resources Inc.	Springpole project	Mechanized Drilling	09-Nov-20
PR-20-000198	Pacton Gold Inc.	Red Lake Project, 2020 seismic survey	Mechanized Drilling, Line Cutting	28-Jul-20
PR-20-000213	Newrange Gold Corp.	2020 North Birch 1 (NRG)	Airborne Geophysical Survey, Ground Geophysical Survey, Line Cutting	25-Sep-20
PR-20-000219	EMX Properties (Canada) Inc.	Kwai	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	21-Aug-20
PR-20-000222	GoldON Resources Ltd.	McDonough	Mechanized Drilling	12-Aug-20
PR-20-000243	Evolution Mining Gold Operations Ltd., Pacton Gold Inc.	Sidace	Mechanized Drilling	14-Sep-20
PR-20-000249	Metalcorp Limited	Blackbear	Mechanized Drilling, Mechanized Stripping	20-Oct-20
PR-20-000258	Pacton Gold Inc.	Red Lake South	Mechanized Drilling	29-Sep-20
PR-20-000276	Great Bear Resources Ltd.	GBR Dixie	Mechanized Stripping	13-Oct-20
PR-20-000291	Argo Gold Inc.	Uchi Lake	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock, Line Cutting	30-Oct-20
PR-20-000327	Evolution Mining Gold Operations Ltd.	DMC_McCuaig	Mechanized Drilling	18-Dec-20
PR-20-000334	Evolution Mining Gold Operations Ltd.	South East Bay	Mechanized Drilling	22-Dec-20
PR-20-000335	D.D. Rivard, J.O. Rivard, P.R. Rivard, O.O. Yauch, J.C. Petticrew, Trillium Gold Mines Inc., L. Rivard, N.L. Stewart	Rivard project	Mechanized Drilling	18-Dec-20
PR-20-000349	Pacton Gold Inc.	Carricona East	Mechanized Drilling	22-Jan-21
PR-20-000350	BTU Metals Corp.	Dixie Halo	Mechanized Drilling, Mechanized Stripping	26-May-21
PR-20-000354	Frontline Gold Corporation, Pegasus Resources Inc.	Garnet Lake	Mechanized Drilling	03-Feb-21
PR-20-000355	Trillium Red Lake Gold Ontario Inc., Pegasus Resources Inc.	Fredart Lake	Mechanized Drilling	10-Feb-21
PR-20-000357	EMX Properties (Canada) Inc.	Kwai	Mechanized Drilling	02-Feb-21

Permit Number	Plan Holder	Property Name	Activities	Effective Date (dd-mmm-yy)
PR-20-000364	ALX Resources Corp.	Vixen North 2021 permit	Mechanized Drilling	29-Jun-21
PR-20-000365	GoldON Resources Ltd.	McDonough A	Mechanized Stripping, Line Cutting	03-Feb-21
PR-20-000366	Trillium Gold Ontario Inc., Rupert Resources Ltd.	Gold Centre	Mechanized Drilling	03-Feb-21
PR-20-000368	G. Smith	Cole gold project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	04-Mar-21
PR-20-000371	Evolution Mining Gold Operations Ltd.	East Bay	Mechanized Drilling	03-Feb-21
PR-21-000004	Trillium Red Lake Gold Ontario Inc., Trillium Gold Mines Inc.	Confederation Lake South	Mechanized Drilling	18-Feb-21
PR-21-000005	EMX Properties (Canada) Inc., Trillium Red Lake Gold Ontario Inc.	Confederation Lake North	Mechanized Drilling	18-Feb-21
PR-21-000013	Bounty Gold Corp.	RLX North gold project	Line Cutting	11-Mar-21
PR-21-000015	Bounty Gold Corp.	RLX South gold project	Line Cutting	29-Apr-21
PR-21-000021	Pacton Gold Inc.	Faulkenham (Red Lake project)	Line Cutting	03-Mar-21
PR-21-000031	Prosper Gold Corp.	Golden Sidewalk	Ground Geophysics, Line Cutting	01-Mar-21
PR-21-000032	Prosper Gold Corp.	Golden Sidewalk	Ground Geophysics, Line Cutting	10-Mar-21
PR-21-000039	AurCrest Gold Inc.	AGO Ranger/Ranger East 2021–22	Mechanized Drilling	25-Mar-21
PR-21-000044	Prosper Gold Corp.	GS - Skinner N	Mechanized Drilling, Mechanized Stripping	25-Mar-21
PR-21-000045	Prosper Gold Corp.	GS - Golden Corridor	Mechanized Drilling	15-Mar-21
PR-21-000046	Prosper Gold Corp., Sabina Gold & Silver Corp.	GS - Bathurst Area	Mechanized Drilling	25-Mar-21
PR-21-000058	Solstice Gold Corp.	Red Lake Extension project	Line Cutting	25-Mar-21
PR-21-000077	Newrange Gold Corp.	North Birch 2021	Mechanized Drilling, Pitting and Trenching of Bedrock, Line Cutting	09-Jun-21
PR-21-000081	L. Rivard, J.O. Rivard, O.O. Yauch, J.C. Petticrew, N.L. Steward, Trillium Gold Mines Inc., D.D. Rivard, P.R. Rivard	Rivard project	Mechanized Drilling, Mechanized Stripping	03-May-21
PR-21-000117	Solstice Gold Corp.	Red Lake North	Mechanized Drilling, Line Cutting	11-Jun-21
PR-21-000132	EMX Properties (Canada) Inc.	South of Otter	Mechanized Drilling, Mechanized Stripping	13-Jul-21
PR-21-000146	Pacton Gold Inc.	Claremont	Mechanized Stripping	21-Jun-21
PR-21-000190	Great Bear Resources Ltd.	Dixie project 2021	Mechanized Stripping	13-Jul-21
PR-21-000212	Frontier Lithium Inc.	PAK project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	07-Nov-22
PR-21-000215	Prosper Gold Corp.	Golden Sidewalk - Golden Corridor Extension	Mechanized Drilling	08-Sep-21
PR-21-000217	Evolution Mining Gold Operations Ltd.	F2 HGYG East Bay	Mechanized Drilling	31-Aug-21
PR-21-000232	Prosper Gold Corp.	GS - Golden Corridor Southeast	Mechanized Drilling	08-Sep-21
PR-21-000258	Great Bear Resources Ltd.	Dixie	Mechanized Stripping	08-Oct-21
PR-21-000261	Bounty Gold Corp.	RLX North 2021A	Mechanized Drilling	22-Nov-21
PR-21-000266	Evolution Mining Gold Operations Ltd.	Golden Pike BN	Mechanized Drilling	22-Nov-21
PR-21-000267	Evolution Mining Gold Operations Ltd.	Golden Pike EVN	Mechanized Drilling	22-Nov-21
PR-21-000301	Frontier Lithium Inc.	Spark lithium project	Mechanized Drilling, Mechanized Stripping, Pitting and Trenching of Bedrock	25-Feb-22

Permit Number	Plan Holder	Property Name	Activities	Effective Date (dd-mmm-yy)
PR-21-000317	Evolution Mining Gold Operations Ltd.	Chevron	Mechanized Drilling	18-Jan-22
PR-21-000374	Pacton Gold Inc.	Claremont East	Mechanized Drilling	16-May-22
PR-22-000005	Huntington Exploration Inc.	Keyhole	Mechanized Drilling, Mechanized Stripping, Line Cutting	15-Mar-22
PR-22-000011	Solstice Gold Corp.	RLX	Mechanized Drilling	10-Mar-22
PR-22-000117	Solstice Gold Corp.	RLX 2022	Mechanized Drilling	05-Aug-22
PR-22-000126	Trillium Gold Mines Inc	Confederation Belt East	Mechanized Drilling	28-Jun-22
PR-22-000135	Kenorland Minerals North America Ltd.	South Uchi - project 1	Mechanized Drilling	14-Jul-22
PR-22-000136	Kenorland Minerals North America Ltd.	South Uchi - project 2	Mechanized Drilling	14-Jul-22
PR-22-000137	Kenorland Minerals North America Ltd.	South Uchi - project 3	Mechanized Drilling	14-Jul-22
PR-22-000138	Kenorland Minerals North America Ltd.	South Uchi - project 4	Mechanized Drilling	14-Jul-22
PR-22-000139	Kenorland Minerals North America Ltd.	South Uchi - project 5	Mechanized Drilling	14-Jul-22
PR-22-000188	Prosper Gold Corp.	GS - Skinner South	Mechanized Drilling	11-Aug-22
PR-22-000189	Prosper Gold Corp.	GS - Ruff Lake	Mechanized Drilling	11-Aug-22
PR-22-000190	Prosper Gold Corp.	GS - Skinner NW	Mechanized Drilling	11-Aug-22
PR-22-000205	Evolution Mining Gold Operations Ltd.	Adams Lake - Gullrock	Mechanized Drilling	11-Aug-22
PR-22-000206	Evolution Mining Gold Operations Ltd.	McMarmac	Mechanized Drilling, Mechanized Stripping	11-Aug-22
PR-22-000215	Trillium Gold Mines Inc, Trillium Red Lake Gold Ontario Inc., Solstice Gold Corp., EMX Properties (Canada) Inc.	Confederation Belt	Mechanized Drilling	27-Oct-22
PR-22-000216	Trillium Red Lake Gold Ontario Inc., EMX Properties (Canada) Inc., Trillium Gold Mines Inc	Confederation Belt	Mechanized Drilling	27-Oct-22

Table 11. Assessment files received in the Red Lake District in 2022.

Abbreviations

ABCON ..... Aboriginal consultation
ACOMP ..... Airborne geophysics – compilation and interpretation
AEM ..... Airborne electromagnetic survey
AGR ..... Airborne resistivity
AMAG ..... Airborne magnetic survey
ARAD ..... Airborne radiometric
ASSAY ..... Assaying and analyses
AVLF ..... Airborne very low frequency electromagnetic survey
BEEP ..... Beep Mat
CHNL ..... Channel sampling
GEOL ..... Geological survey/mapping
GLCOMP ..... Geology – compilation and interpretation
GR ..... Ground resistivity
IP ..... Induced polarization
LC ..... Line cutting
LIDAR ..... Airborne light detection and ranging survey
PCOMP ..... Compilation and interpretation – Diamond drilling
PDRILL ..... Diamond drilling
PHOTO ..... Air photo and remote imagery interpretations
PROSP ..... Prospecting
ROCK ..... Rock sampling
SOIL ..... Soil sampling

File ID	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File Identifier
20000019919	Casummit Lake Area, Honeywell, Little Shabumeni Lake Area	ALX Resources Corp.	Vixen property	2019	ASSAY, GEOL, PROSP, ROCK, SOIL	$95,701	4099, 73472
20000019937	Casummit Lake Area, Brownstone Lake Area	AurCrest Gold Inc, Newrange Gold Corp.	Birch Lake property	2021	IP	$153,066	4234, 75112
20000019950	Faulkenham Lake Area, Baird, Heyson	Pacton Gold Inc.	Madsen-Dixie fault zone, Red Lake gold project	2020	GR, IP, LC	$183,999	4254, 75397
20000019952	Belanger	Frontline Gold Corp.	Copperlode property	2021	ASSAY, PROSP, ROCK	$19,854	4265, 75524
20000019958	Cabin Bay Area	EMX Properties (Canada) Inc.	SLF property, Sydney Lake fault property	2019–2021	GEOL, PROSP	$14,577	4138, 73972
20000019964	Dome, Heyson	Nexus Gold Corp.	McKenzie project	2020–2021	ASSAY, PDRILL	$861,636	4255, 75427
20000019999	Avis Lake Area, Bluffy Lake Area, Curie Lake Area, Fredart Lake Area, Otatakan Lake Area, Roadhouse River Area, Root Lake Area, Slate Lake Area, Wesley Lake Area, Whitemud Lake Area	Kenorland Minerals North America Ltd.	South Uchi property	2021	ARAD, GEOL, PHOTO	$78,276	4276, 4277, 4278, 4279, 4280, 4281, 4282, 4283, 4284, 4285, 4286, 4287, 4288, 4289, 4290, 4291, 4292, 4293, 4294, 4295, 4296, 4297, 75659, 75667, 75669, 75672, 75692, 75693, 75694, 75695, 75696, 75698, 75699, 75700, 75701, 75702, 75703, 75704, 75705, 75706, 75707, 75709, 75711, 75713
20000020019	Camping Lake Area	P. Pomialowski	Camping Lake property	2021	PROSP, ROCK	$5,568	4308, 75892
20000020038	Casummit Lake Area, Goodall, Honeywell, Little Shabumeni Lake Area, McNaughton	ALX Resources Corp.	Vixen property	2020	ASSAY, BEEP, GEOL, ROCK	$124,788	4327, 76138
20000020054	Brownstone Lake Area, Casummit Lake Area	Newrange Gold Corp.	North Birch project	2021	IP	$45,211	4387, 76772
20000020060	Otter Lake Area, Ranger, South Of Otter Lake Area, Willans	Great Bear Resources Ltd.	Sobel property	2020	GEOL, PROSP, ROCK, SOIL	$69,565	4393, 76881
20000020085	Nungesser Lake Area, Hanton Lake Area, Pringle Lake Area, Storey Lake Area	Solstice Gold Corp.	RLX property	2021	AMAG	$65,802	4376, 76694

File ID	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File Identifier
20000020094	Ball	Rockland Resources Ltd.	Cole gold project	2021	ASSAY, CHNL, PCOMP, PDRILL, ROCK	$499,372	4429, 77259
20000020118	Little Shabumeni Lake Area	Wild Gooseberry Exploration Ltd.	Red Lake project	2021	AEM, AMAG	$42,000	4357, 76553
20000020137	Slate Lake Area, Avis Lake Area	St Anthony Gold Corp.	Panama Lake property	2019	ASSAY, PROSP, ROCK	$21,699	4488, 78185
20000020162	Heyson, Baird, Faulkenham Lake Area	Pacton Gold Inc.	Red Lake gold project main block	2019–2021	ABCON, ASSAY, LC, PDRILL, SOIL	$4,031,777	4508, 78586
20000020223	Heyson, Baird, Byshe, Cabin Bay Area, Camping Lake Area, Faulkenham Lake Area, Hanton Lake Area, Longlegged Lake Area, Medicine Stone Lake Area, Nungesser Lake Area, Ranger, Sobeski Lake Area, South Of Byshe Area, Willans	Pacton Gold Inc.	Red Lake gold project	2020	AGR, AMAG, AVLF	$147,197	4559, 4560, 4561, 4562, 4563, 4564, 4565, 4566, 4567, 4568, 4569, 79375, 79376, 79377, 79378, 79379, 79380, 79381, 79382, 79383, 79384, 79385
20000020226	Casummit Lake Area, Keigat Lake Area, Satterly Lake Area, Seagrave Lake Area	First Mining Gold Corp.	Springpole gold project, Springpole property	2020	ASSAY, PDRILL	$1,582,886	4577, 4597, 79483, 79878
20000020235	Otter Lake Area, Ranger, South Of Otter Lake Area, Willans	Great Bear Resources Ltd.	Sobel property	2021–2022	ASSAY, GEOL, PROSP, ROCK	$69,115	4593, 79840
20000020237	Shabu Lake Area, Goodall, Shabumeni Lake Area, Skinner	Great Bear Resources Ltd.	Red Lake North property	2021	ASSAY, PROSP, ROCK	$111,138	4598, 79879
20000020238	Casummit Lake Area, Little Shabumeni Lake Area	ALX Resources Corp.	Vixen North property	2020	AGR, AMAG, ARAD, AVLF	$84,420	4599, 79881
20000020249	Bruce Lake Area	LP Gold Corp.	LP Gold project	2021	ASSAY, GEOL, PROSP, ROCK	$16,809	4623, 4624, 80423, 80425
20000020262	South Of Byshe Area, Bruce Lake Area, Byshe, Faulkenham Lake Area, Karas Lake Area, South Of Otter Lake Area	Dixie Gold Inc.	Red Lake gold project	2021	ASSAY, GEOL, PROSP, ROCK	$124,489	4625, 80428
20000020268	Shabumeni Lake Area, Satterly Lake Area	Huntington Exploration Inc.	Quartz Lake properties	2022	LIDAR	$5,361	4650, 80720
20000020271	Ball, Indian House Lake Area	GoldON Resources Ltd.	Pipestone Bay property	2020–2022	AMAG, GLCOMP	$42,274	4657, 80840
20000020277	Cabin Bay Area, Camping Lake Area, Dixie Lake Area	Silver Dollar Resources Inc.	Pakwash Lake property	2022	AMAG	$69,387	4666, 81078
20000020289	Fredart Lake Area, Belanger, Gerry Lake Area	Imagine Lithium Corp.	Fredart property	2021	AMAG	$17,783	4687, 4688, 81424, 81425

File ID	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File Identifier
20000020290	Belanger, Bowerman	Imagine Lithium Corp.	Garnet Lake property	2021	ACOMP, AMAG	$28,365	4689, 81431
20000020314	Gerry Lake Area, South Of Otter Lake Area	Imagine Lithium Corp.	Confederation North property	2022	PDRILL	$243,967	4706, 81757
20000020320	Shabu Lake Area, Skinner	Cross River Ventures Corp.	Shabu project	2021	ASSAY, PROSP, ROCK	$86,591	4714, 81838
20000020343	Casummit Lake Area	Argo Gold Inc.	Angela Lake property	2021	PROSP	$4,930	4077, 72442
20000020352	Coli Lake Area	Pacton Gold Inc.	Sidace Lake project	2020–2021	ASSAY, PDRILL	$1,789,835	4201, 74675
20000020354	South Of Otter Lake Area, Gerry Lake Area, Karas Lake Area	Portofino Resources Inc.	South of Otter property	2020–2021	AMAG, ASSAY, ROCK, SOIL	$136,472	4218, 4219, 74804, 74809
20000020359	Camping Lake Area, Bruce Lake Area	Great Bear Resources Ltd.	Pakwash property	2020–2021	ASSAY, PROSP, ROCK, SOIL	$67,171	4267, 75558
20000020369	Baird, Killala	GoldON Resources Ltd.	West Madsen property	2020–2021	ASSAY, PDRILL	$2,025,538	4440, 77440
20000020381	Costello, Birkett, Jubilee Lake Area, Latreille Lake Area	Portofino Resources Inc.	Allison Lake North project	2021	ASSAY, CHNL, ROCK	$45,718	4516, 78757
20000020386	Ferdinand Lake Area, Hailstone Lake Area	StraightUp Resources Inc.	Ferdinand gold project	2021	ACOMP, AMAG	$135,062	4534, 79018
20000020387	Ferdinand Lake Area	StraightUp Resources Inc.	Ferdinand gold project	2021	ASSAY, PROSP, ROCK	$56,197	4535, 79019
20000020396	Cabin Bay Area, Dixie Lake Area	Golden Goliath Resources Ltd.	Kwai property	2020	AGR, AVLF	$13,162	4587, 79736
20000020404	Fredart Lake Area	Infinite Ore Corp.	Fredart property	2020	ASSAY, PDRILL	$434,941	4614, 80251
20000020415	Camping Lake Area, Bruce Lake Area	Great Bear Resources Ltd.	Pakwash property	2022	ASSAY, PROSP, ROCK	$99,575	4659, 80864
20000020419	South Of Otter Lake Area	Imagine Lithium Inc.	Confederation North property	2021	ASSAY, PDRILL	$452,830	4704, 4705, 81752, 81755
20000020423	Rainfall Lake Area, Bruce Lake Area, Byshe, Dedee Lake Area, Faulkenham Lake Area, Karas Lake Area, Medicine Stone Lake Area, South Of Byshe Area, South Of Otter Lake Area, Willans	Barrick Gold Inc.	Chukuni project	2021	LIDAR	$74,700	4726, 4728, 4729, 4730, 4731, 4732, 4733, 4734, 4736, 4737, 4738, 4739, 4741, 4746, 4747, 4748, 4749, 4750, 82031, 82033, 82044, 82050, 82058, 82061, 82063, 82064, 82066, 82068, 82071, 82074, 82080, 82106, 82110, 82120, 82132, 82147
20000020452	Avis Lake Area	Cross River Ventures Corp.	McVicar Lake project	2021	ASSAY, PROSP, ROCK	$56,429	4785, 82843
20000020457	Blackbear Lake Area, Shaver	Metalcorp Ltd.	Black Bear property	2021	ASSAY, PDRILL	$413,103	4802, 82961
20000020488	Skinner, Corless, Dent, East Of Trout Lake Area, Goodall, Knott, Shabu Lake Area	Prosper Gold Corp.	Golden Sidewalk project	2021	AMAG, ASSAY, IP, LIDAR, PDRILL, SOIL	$5,274,288	4837, 4839, 4840, 4846, 4847, 4852, 83679, 83689, 83691, 83739, 83740, 83783

File ID	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File Identifier
20000020499	Hanton Lake Area, Nungesser Lake Area, Pringle Lake Area, Sobeski Lake Area, Storey Lake Area	Solstice Gold Corp.	RLX property	2021	AEM, AMAG	$301,027	4859, 83955
20000020539	Satterly Lake Area, McNaughton, Shabumeni Lake Area	Trillium Gold Mines Inc.	Satterly Lake property	2021	AMAG	$50,676	4997, 85814

Economic Analysis Stage

First Mining Gold Corp. (www.firstmininggold.com; *see* Figure 8a, location 3) continued work at the Springpole gold project, located approximately 100 km northeast of the Municipality of Red Lake hosted within the Birch–Uchi greenstone belt.

In January 2022, the company announced that additional work was required to advance toward a Feasibility Study. This work would include a more detailed metallurgical program, analysis of greenhouse gas emissions, renewable power generation at the project and continued environmental data collection (First Mining Gold Corp., news release, January 11, 2022). With the additional work documented, the company expects to complete a Feasibility Study by 2023. Lastly, the company released a draft of its Environmental Assessment and Environmental Impact Statement in 2022, with the final versions to be submitted by 2024 (First Mining Gold Corp., Corporate Presentation, November 2022).

While First Mining has continued technical and environmental work on the project, the company continued to perform regional exploration work across the company's extensive land holding in the Birch–Uchi greenstone belt. Work across the properties included analyzing historical data, mapping, prospecting, soil and rock sampling. This work was to narrow down future exploration drilling targets to find satellite deposits nearby Springpole (First Mining Gold Corp., Corporate Presentation, November 2022). The exploration activity section highlights First Mining's regional exploration work.

Frontier Lithium Inc. (www.frontierlithium.com; *see* Figure 8b, location 4) has extensive land positions along the Bear Head fault exploring for lithium-cesium-tantalum (LCT) pegmatites. The PAK lithium project is located within the North Spirit Lake greenstone belt approximately 160 km north of the Municipality of Red Lake. In 2022, the company completed exploration work on the PAK lithium project, including the PAK and Spark deposits and the Bolt pegmatite. The final known pegmatite on Frontier's land package is the Pennock pegmatite in the northern portion of the property.

In 2022, exploration activities in the project area were primarily conducted at the Spark deposit. The company released an updated mineral resource estimate on the Spark deposit in March. A large portion of the previously inferred mineral resource has been upgraded to indicated containing 14.4 million tonnes of 1.40% Li_2O (Table 12) (Frontier Lithium Inc., news release, March 1, 2022). Additionally, Frontier announced the successful trial of a mineral processing pilot plant to produce 500 kg of spodumene concentrate from a 7800 kg sample of Spark and PAK blended material. The blend of material was made up of a ratio of 89% Spark and 11% PAK (Frontier Lithium Inc., news release, March 30, 2022). All other exploration activities in 2022 supported the project's Pre-Feasibility Study (PFS). The company is taking a phased approach to their PFS which will include 2 phases: Phase 1 including the mine and mill development to produce spodumene concentrate; and Phase 2 consisting of increasing mine and mill capacity to produce battery-grade lithium chemicals. The expected completion date for the PFS is Q1 2023 (Frontier Lithium Inc., news release, October 11, 2022).

Table 12. Mineral resource estimate of the Frontier Lithium Inc. Spark pegmatite (0.7% Li_2O cut-off) (Frontier Lithium Inc., news release, March 1, 2022).

Category	Tonnes Total (Mt)	Li_2O Grade (%)	Ta_2O_5 Grade (ppm)
Indicated	14.414	1.40	114
Inferred	18.118	1.37	105

Table 13. Highlights of drilling results from Phases X, XI and XII at the Frontier Lithium Inc. Spark pegmatite (Frontier Lithium Inc., news releases, February 1, June 7, July 25, August 17 and December 14, 2022).

Drill-Hole ID	From (m)	To (m)	Width (m)	Li_2O (%)	Cs_2O (%)	Ta_2O_5 (ppm)
PL-GDH-08-21	1.0	95.5	94.5	1.71	0.03	172
PL-054-22	2.6	97.6	95.0	1.13	0.02	132
PL-057-22	0.1	110.8	110.7	1.76	0.02	124
PL-057-22	142.6	172.5	29.9	1.68	0.99	780
including	149.5	159.5	10.0	3.14	2.54	211
including	157.5	172.5	15.0	1.02	0.30	1355
PL-068-22	0.9	47.3	46.4	1.98	0.04	71
including	42.0	46.7	4.7	1.10	0.05	213
PL-077-22	56.9	183.7	126.8	1.31	0.02	85
PL-077-22	260.2	271.3	11.1	1.79	0.31	459

Throughout 2022, Frontier has been active with diamond drilling on the Spark pegmatite (Figure 9) and continued to release results from Phase X drilling in 2021. Phase X drilling was required for the PFS with results such as 1.52% Li_2O from 0 to 154.7 m in drill-hole PL-050-21 (Frontier Lithium Inc., news release, February 16, 2022). By the end of March, the company had completed the Phase XI diamond-drill program, which totalled 1343 m over 5 drill holes. Phase XI diamond drilling was primarily drilled from low areas of terrain that are best to drill during the winter months to infill and expand the known Spark pegmatite for the PFS. Significant intercepts in Phase XI drilling include 1.13% Li_2O from 2.6 to 97.6 m in drill-hole PL-065-22 (Frontier Lithium Inc., news release, June 7, 2022). By October 2022, the company had completed the Phase XII diamond-drill program, which totalled 14 641 m from 45 drill holes. Initially, the main goal of Phase XII drilling was to upgrade the inferred resource in the middle of the Spark deposit at depth. Later in the drill program, drill holes will be used for geotechnical work, pit designs and delineating the western and eastern sections of the Spark pegmatite (Frontier Lithium Inc., news release, December 14, 2022). Significant intercepts in Phase XII drilling include 1.76% Li_2O from 0.1 to 110.8 m, 1.68% Li_2O, 0.99% Cs_2O and Ta_2O_5 from 142.6 to 172.5 m, including 3.14% Li_2O and 2.54% Cs_2O from 149.5 to 159.5 m in drill-hole PL-057-022 (Frontier Lithium Inc., news release, July 25, 2022). Table 13 includes select significant assay results from Phase X, XI and XII diamond drilling at the Spark pegmatite.

Lastly, the company completed channel sampling on the more recently discovered Bolt pegmatite. The Bolt area was mapped as pegmatite with aplite during the channel sampling process. Assay results from the channel sampling include 1.14% Li_2O over 49 m from CH-49 and 1.56% Li_2O over 31.4 m from CH-47 (Frontier Lithium Inc., news release, May 2, 2022).

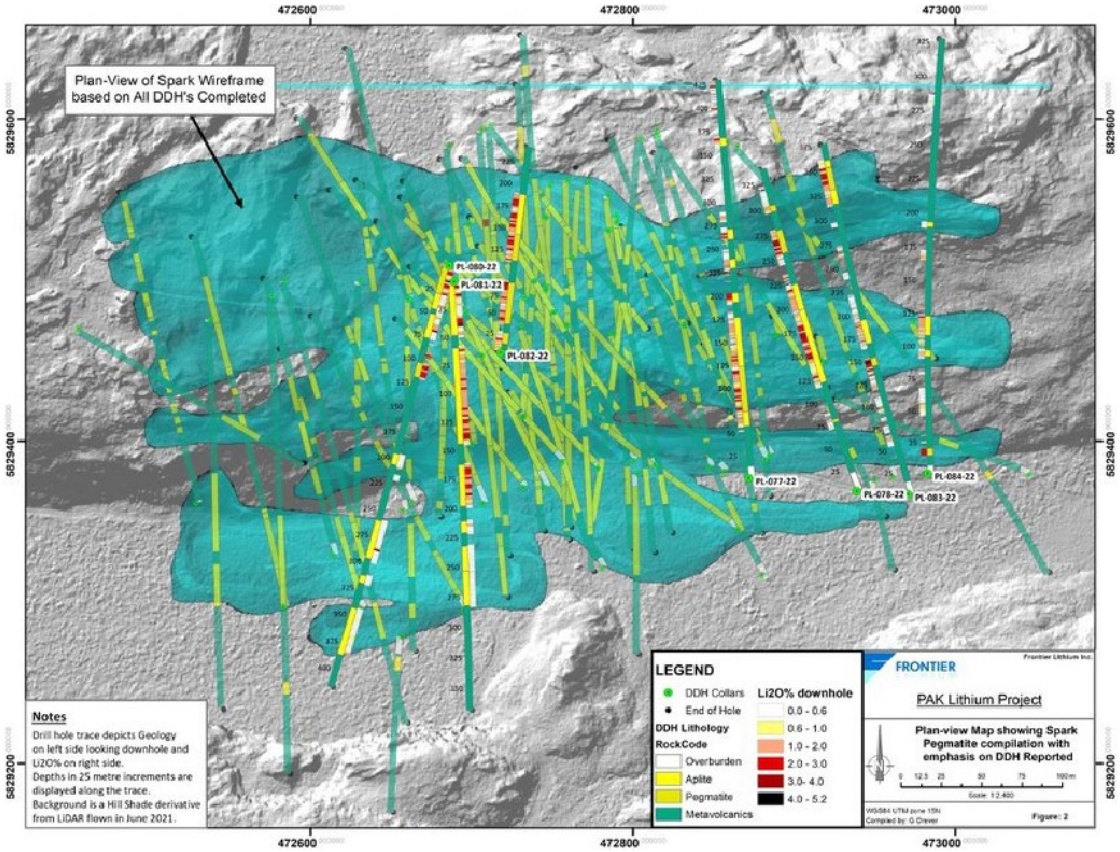


Figure 9. Plan view of the Frontier Lithium Inc. Spark pegmatite 3-D model overlain by 2022 diamond-drill hole traces (*from* Frontier Lithium Inc., news release, December 14, 2022).

Resource Delineation Stage

Kinross Gold Corporation (www.kinross.com; *see* Figure 8a, location 5) began 2022 with its formal entry into the Red Lake District by completing the acquisition of Great Bear Resources Ltd.'s Great Bear project on February 24, 2022, formerly the Dixie Lake project. The Great Bear project is located approximately 15 km southeast of the Municipality of Red Lake. Financing for the acquisition included a cash price of $29.00 or 3.8654 Kinross shares for each Great Bear Resources Ltd. share. Additionally, the total cash price or Kinross shares could equal a maximum of $1.4 billion or 80 773 353 shares (Kinross Gold Corporation, news release, February 24, 2022). With the acquisition complete, Kinross spent 2022 ramping up work on the project toward the 2029 target for production. Work includes diamond drilling, reverse circulation drilling, baseline studies for permits and engagement with Wabuaskang and Lac Seul First Nations (Kinross Gold Corporation, news release, June 28, 2022).

For 2022, Kinross planned a 225 000 m diamond drill and a 35 000 m reverse circulation grade-control program. These drill programs are required for the initial mineral resource and technical report, expected to be released in early 2023 (Kinross Gold Corporation, news release, February 9, 2023). The diamond-drill program was focussed primarily on infill and expansion drilling of the LP Fault zone for the initial mineral resource estimate while also following up on exploration targets (Figure 10) (Kinross Gold Corporation, news release, June 28, 2022). Diamond drilling at the LP Fault zone has continued to confirm high-grade gold mineralization at the expected widths. However, the company also believes the high-grade gold mineralization will continue below a depth of 500 m, where the initial mineral resource estimate based on current diamond drilling will end (Figure 11) (Kinross Gold Corporation, Third Quarter

Results 2022, November 9, 2022). Additionally, the reverse circulation drill program at the LP Fault zone is expected to aid in modelling high-grade areas, determining an outlier strategy for moderate-grade areas and developing grade-control procedures before production starts (Kinross Gold Corporation, news release, June 28, 2022). Selected diamond-drill hole results are provided in Table 14.

With gold mineralization continuing at deeper depths, Kinross is looking at additional ways to diamond drill the deposit effectively at depth. One way to accomplish this is by examining the potential for an underground decline that would allow diamond drilling to occur closer to zones, including the LP Fault, Hinge and Limb zones (Kinross Gold Corporation, Third Quarter Results 2022, November 9, 2022). Kinross intends to begin the potential exploration decline in 2024, with the first underground diamond drilling to commence in 2025 (Kinross Gold Corporation, Third Quarter Results Presentation, November 10, 2022).

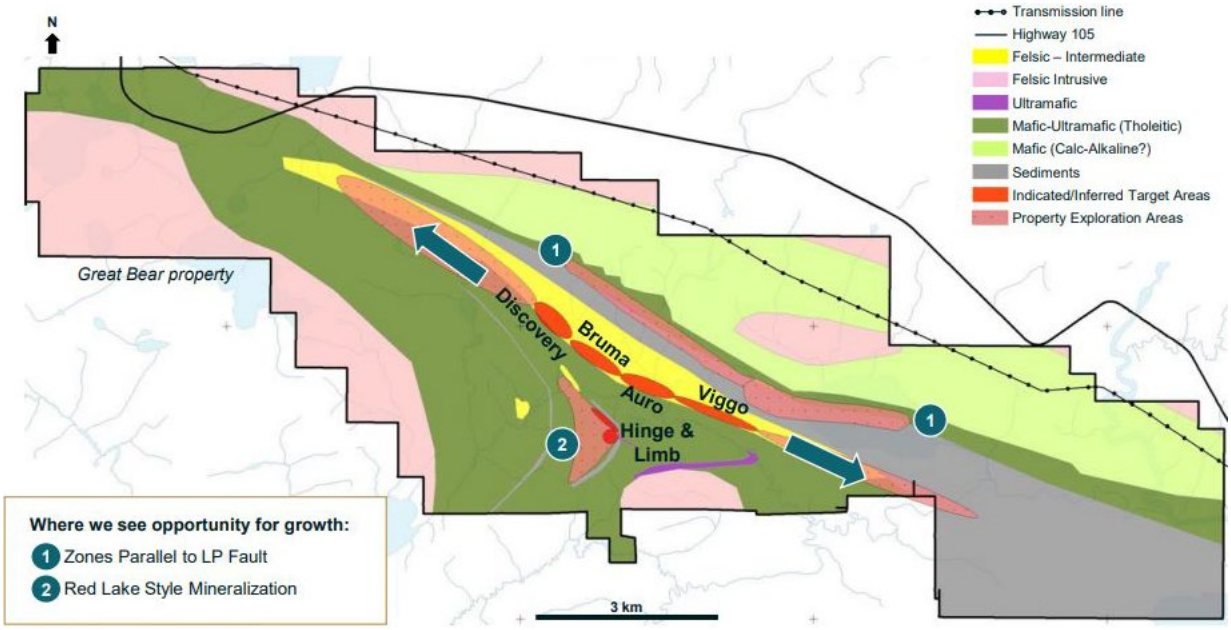


Figure 10. Property geology with mineralized zones at the Kinross Gold Corporation Great Bear project and regional exploration target areas (*from* Kinross Gold Corporation, Third Quarter Results 2022 presentation, November 10, 2022).

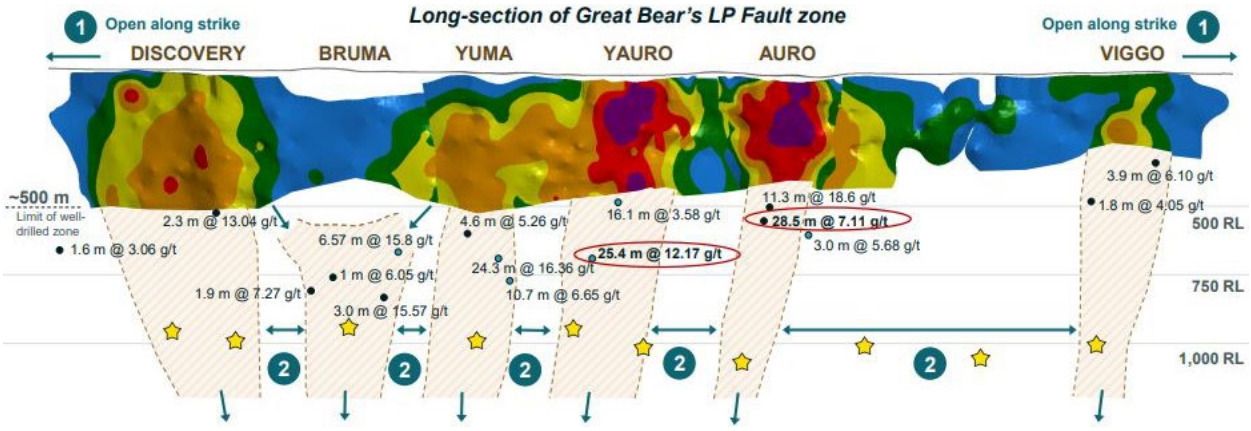


Figure 11. Long section of Kinross Gold Corporation Great Bear project LP Fault zone showing high-grade zones and recent diamond-drilling results below current model (*from* Kinross Gold Corporation, Third Quarter Results 2022 presentation, November 10, 2022).

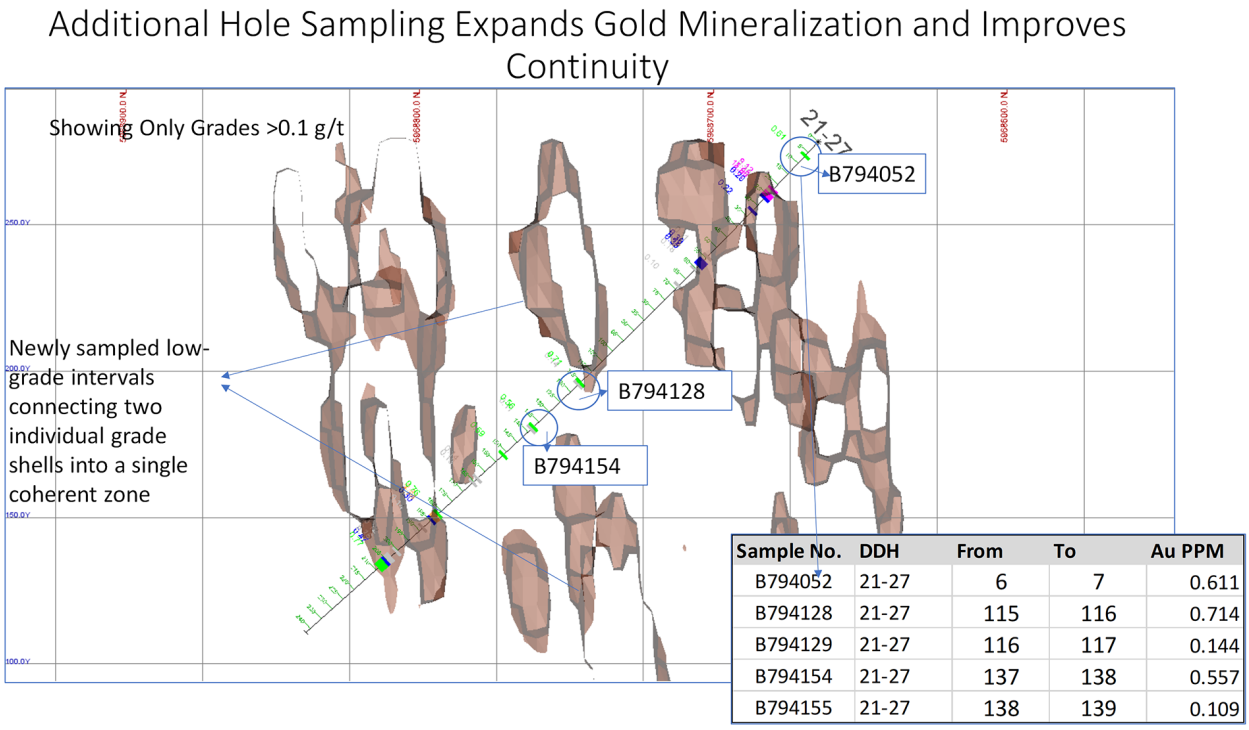
Table 14. Highlights of drilling results in 2022 at the Kinross Gold Corporation Great Bear project (Kinross Gold Corporation, news releases, April 7 and June 28, 2022; First Quarter Results 2022, May 10, 2022; Second Quarter Results 2022, June 30, 2022; Third Quarter Results 2022, November 9, 2022).

Drill-Hole ID	From (m)	To (m)	True Width (m)	Gold Grade (g/t)	Zone
BR-481	461.50	471.75	10.10	15.10	NA
including	470.60	471.75	1.00	65.83	NA
BR-503	18.70	30.10	11.20	10.80	NA
including	18.70	22.45	3.60	25.72	NA
BR-470	140.25	143.25	2.90	8.82	Discovery
BR-553	514.15	517.75	3.40	2.61	Yauro
BR-553	758.00	758.65	0.60	24.70	Yauro
BR-565	175.05	196.50	20.10	7.50	Viggo
including	176.50	180.00	3.30	37.69	Viggo
BR-537	756.0	814.0	40.0	2.2	Yuma
including	780.6	786.4	3.6	18.6	Yuma
BR-541	283.0	358.3	50.0	2.1	Yauro
including	294.0	300.7	4.8	13.4	Yauro
BR-571	968.2	983.95	13.0	1.2	Gap
including	970.45	975.9	4.5	2.6	Gap
BR-601	30.0	77.25	28.5	2.2	Yuma
including	37.8	38.4	0.4	143.0	Yuma
BR-559	234.8	251.0	14.0	0.58	Auro
BR-559	325.8	348.9	21.5	1.97	Auro
BR-559	364.6	367.5	2.6	121.57	Aurgo
BR-605	99.0	119.0	17.0	0.89	Yauro
BR-605	146.0	194.0	40.8	3.83	Yauro
including	150.0	155.5	4.6	8.00	Yauro
including	188.0	193.0	4.5	12.17	Yauro
BR-596	687.1	694.5	6.6	3.73	Yuma
including	687.1	691.0	3.7	6.85	Yuma
BR-576	703.0	711.1	7.1	11.83	Yuma
including	704.0	707.0	2.8	29.54	Yuma
BR-621	330.0	374.9	43.1	2.27	Auro
including	347.0	365.8	16.5	3.16	Auro
including	372.0	373.0	1.0	26.50	Auro

Signature Resources Ltd. (www.signatureresources.ca; *see* Figure 8b, location 6) holds most of the Lingman Lake greenstone belt, located approximately 325 km north of the Municipality of Red Lake. With the entire land package covering 21 113 ha, there is a lot of prospective ground at the Lingman Lake gold project (Signature Resources Ltd., corporation presentation, August, 2022). Geology at the property includes mafic metavolcanic and felsic metavolcanic rocks with interbedded metasedimentary rocks all crosscut by various intrusive rocks. Mineralization is controlled by multiple subparallel shear zones hosted in mafic metavolcanic rocks (Siriunas and Hanych 2020). The project includes the historical Lingman Lake gold mine, which has a non-compliant NI 43-101 mineral resource estimate from 1989, which included a possible and probable resource of 1 172 753 tons with a grade of 0.20 ounces per tonne gold; when converted to metric, it is 1 063 903 tonnes with a grade of 6.25 g/t Au (McPhee 1989).

In 2022, the main goal of Signature Resources was to advance work to produce an NI 43-101 compliant mineral resource estimate for the project. Completed work includes compiling a drill and assay database, updating the geological model and determining gaps in the database. In addition, examining historical assays at the property determined that not all of the drill holes comply with current standards which led Signature Resources to complete further assaying of historical samples (Signature Resources Ltd., news release, June 29, 2022). Through this process, the company has identified additional areas of low-grade mineralization in the historical drill holes. Additionally, the sampling of historical drill holes has

expanded previously modelled mineralized zones (Figure 12), in some cases, even merging 2 zones into 1 zone (Signature Resources Ltd., news release, August 30, 2022). Lastly, Signature will need to re-drill specific historical diamond-drill holes through high-grade zones to be incorporated into the updated mineral resource estimate (Signature Resources Ltd., news release, November 15, 2022).



Sample No.	DDH	From	To	Au PPM
B794052	21-27	6	7	0.611
B794128	21-27	115	116	0.714
B794129	21-27	116	117	0.144
B794154	21-27	137	138	0.557
B794155	21-27	138	139	0.109

Figure 12. Cross section of the current 3-D model at the Signature Resources Ltd. Lingman Lake gold project, indicating grade in previously unsampled historical core, which has expanded known mineralized zones (*from* Signature Resources Ltd., news release, August 20, 2022).

Exploration Stage

Aben Resources Ltd. (https://abenresources.com; *see* Figure 8a, location 7) announced that the company has continued to compile and interpret geological and geophysical data from the Pringle North project, 60 km north of Red Lake. The company has also noted numerous structural features from the project's fall 2021 high-resolution airborne magnetic survey. The structural features mentioned are potential sources for fluids responsible for gold mineralization. However, the company was not able to start exploration activities when planned because of poor weather and no subsequent details regarding exploration programs have been released (Aben Resources Ltd., news releases, January 27, and April 19, 2022).

Angel Wing Metals Inc. (https://angelwingmetals.com; *see* Figure 8a, location 8; Figure 8b, location 9) *formerly* Huntington Exploration Inc., with the name change effective as of May 19, 2022 (Angel Wing Metals Inc., news release, May 17, 2022). The company commenced its 1800 m drill program on the Winora gold project, located adjacent to the east side of the historic Lingman Lake gold mine. Drilling targets will determine the potential extension of the gold-bearing quartz veins from Signature Resources Ltd.'s property. The company plans to complete a ground magnetic and induced polarization study after drilling is completed (Angel Wing Metals Inc., news release, March 1, 2022).

Angold Resources Ltd. (www.angoldresources.com; *see* Figure 8a, location 10) has commenced its first field season at the Uchi project, located along strike with the past-producing copper-zinc-silver South Bay Mine. Field work will focus on the southeastern part of the property and will include mapping, prospecting, rock and soil sampling, and a spatiotemporal geochemical hydrocarbon (SGH) survey. Additional prospecting and sampling are expected around the Mimi Point and Crab Point mineral occurrences (OMI points) and some targets identified from a recent VTEM survey in the north and western portions of the property (Angold Resources Ltd., news release, September 13, 2022).

Argo Gold Inc. (https://argogold.com; *see* Figure 8a, location 11) announced results from their 2021 program at the Uchi Lake gold project. Drilling, overburden stripping and channel sampling were completed south of the Raingold area (Figure 13), with 62 channel samples taken. Results up to 15.4 g/t Au over 0.9 m were returned, extending the region of gold mineralization to the south. In addition, gold was present in quartz veins and veinlets, iron formation, and pyrite or ankerite alteration (Argo Gold Inc., news release, April 25, 2022).

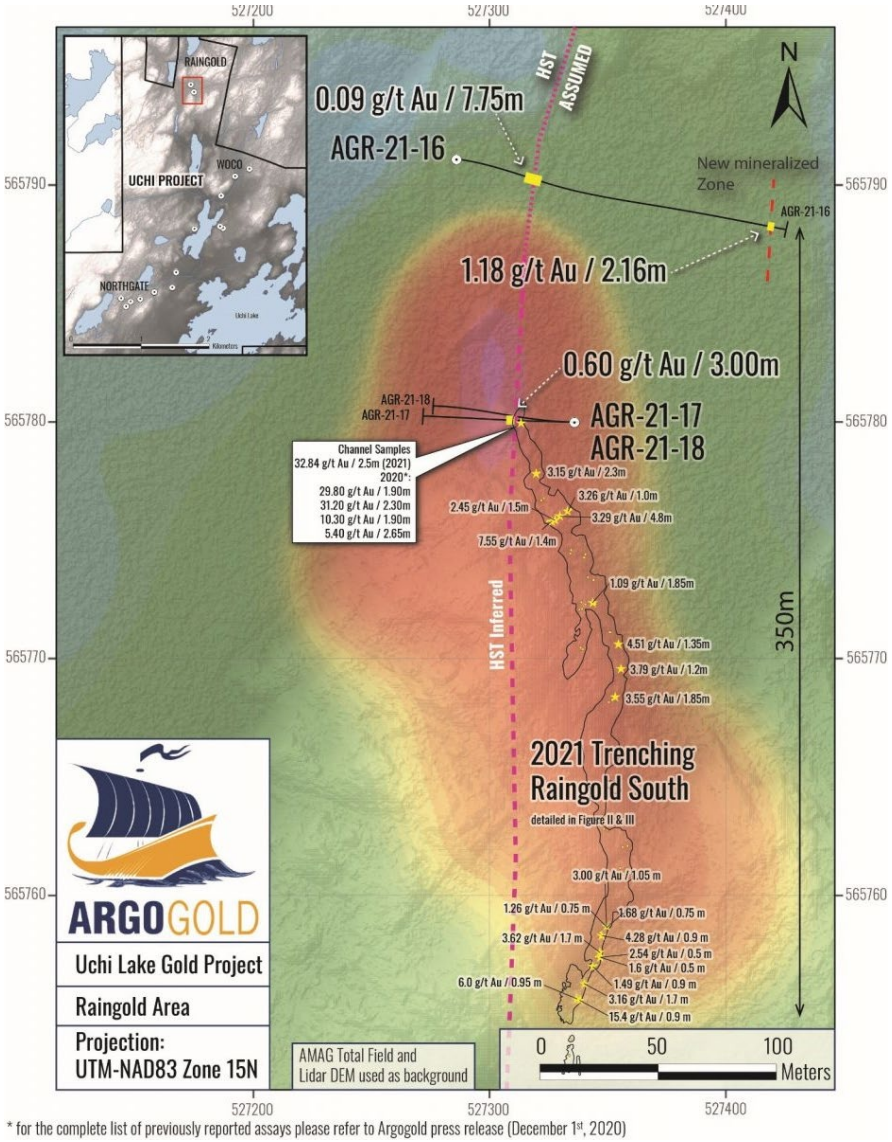


Figure 13. Locations and results from the 2021 exploration program at the Argo Gold Inc. Uchi Lake gold project (*from* Argo Gold Inc., news release, April 25, 2022).

Big Tree Carbon Inc. (https://aurcrest.ca; *see* Figure 8a, locations 12, 13 and 14), *formerly* AurCrest Gold Inc., completed a name change on April 27, 2022. The name change is intended to show the company's interest and opportunities for carbon sequestration (Big Tree Carbon Inc., news releases, March 17, and April 27, 2022). Big Tree Carbon completed a lake bottom sediment SGH sampling program on western Richardson Lake, but results have yet to be received. In addition, grassroots prospecting has been ongoing at the Trout Lake South gold property (formerly Dancing Man property) (Big Tree Carbon Inc., Management's Discussion and Analysis, filed November 24, 2022 with SEDAR®).

BTU Metals Corp. (www.btumetals.com; *see* Figure 8a, location 18) began drilling at both its Pakwash North target and the Tooth area of the Dixie Halo project (Figure 14), located immediately south of the Kinross Gold Corporation Great Bear project (BTU Metals Corp., news releases, February 9, and April 6, 2022).

Four holes were drilled on the ice of Pakwash Lake in February to test geophysical anomalies. The program is exploring for copper, zinc, gold and silver with targets chosen from geophysical surveys, including a previously completed induced polarization survey that identified a significant chargeability target. The Ontario Junior Exploration Program (OJEP) partially funded the drill program.

The Tooth area target is untested over a 2 km strike length. Four additional holes were drilled in the Tooth area, with numerous shear zones and many quartz, quartz-carbonate and calcite veins were intersected (up to 25% in stockwork veined areas), as well as multiple styles of alteration. Mineralization noted in the cores was primarily pyrite, with lesser amounts of chalcopyrite and arsenopyrite (BTU Metals Corp., news release, May 10, 2022). Results from 10 holes drilled in 2021 were received for the Rose Lake and Hiewall Lake targets and the Tooth area. Highlights include 682 ppb Au from 41.3 to 41.8 m in drill-hole BTU-21-76. In addition, selected results from the 2022 winter drill program were also received from the area west of Dixie Creek. Assays of note from drill-hole BTU-22-79 include an assay value of 343 ppb Au, and cores from several other holes contain geochemically anomalous results (BTU Metals Corp., news release, May 10, November 29, 2022).

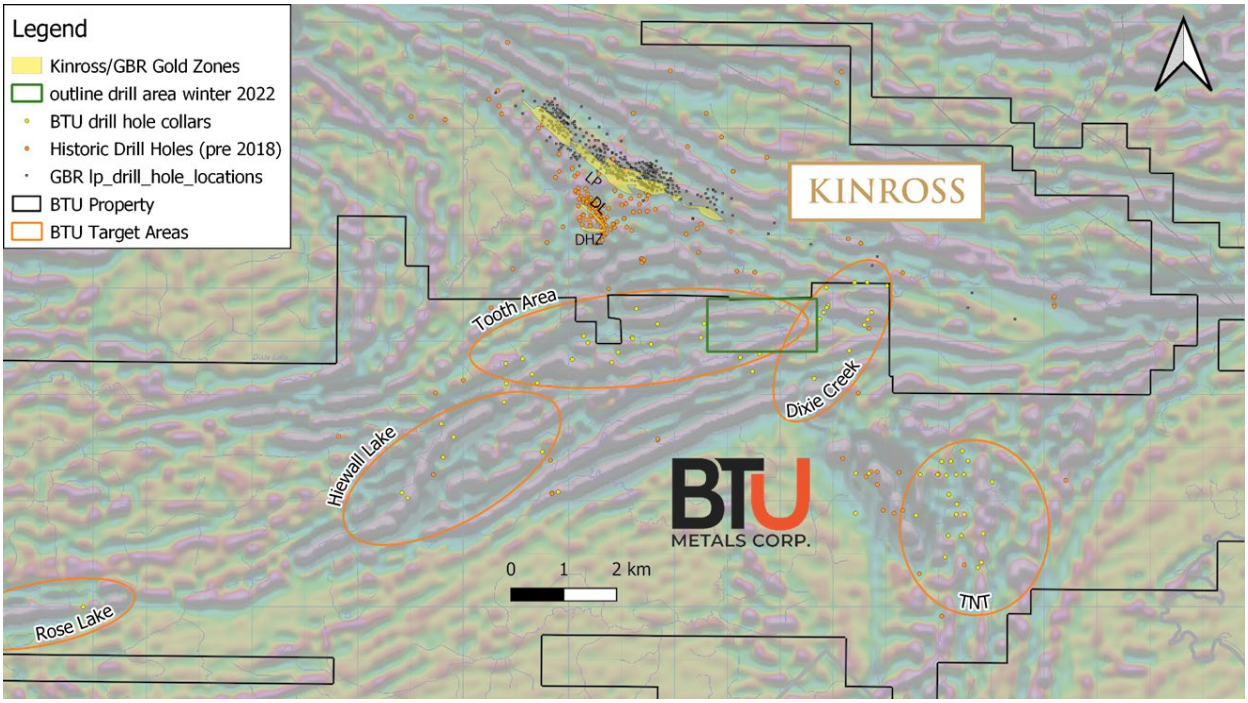


Figure 14. General locations of exploration programs underway or previously completed by BTU Metals Corp. Kinross Gold Corporation Dixie Halo project is located north of the Tooth area (*from* BTU Metals Corp., news release, April 6, 2022).

Previous work in the TNT area tested a geophysical anomaly, including drill-hole BTU-19-13 that yielded 1.14% Cu equivalent over 44.3 m. In October, the company collected 678 samples on 50 m centres for SGH analysis near drill-hole BTU-19-13. The samples will be analyzed for copper and gold (BTU Metals Corp., news release, November 29, 2022).

The company has also worked with Windfall Geotech to update its artificial intelligence model using new information released from the Kinross Gold Corporation Great Bear project. This resulted in the generation of new targets on the BTU Dixie Halo project and a new target approximately 1 km in length between Hiewall Lake and the Tooth area (BTU Metals Corp., news releases, July 13, and November 29, 2022).

Critical Resources Ltd. (www.criticalresources.com.au; *see* Figure 8b, locations 19 and 20) has staked an additional 1200 ha of land surrounding the Plaid project. The Plaid and Whiteloon projects are located approximately 185 km north of the Municipality of Red Lake at the boundary between the Berens River and Sachigo subprovinces. Exploration permitting is underway and the company expects to complete airborne surveys, surface mapping, channel sampling and a drill program on the properties (Critical Resources Ltd., news release, April 12, 2022).

First Mining Gold Corp. (www.firstmininggold.com; *see* Figure 8a, location 23) expanded exploration activity by exploring targets in proximity to the Springpole gold project across the Birch–Uchi greenstone belt project. The project combines all the contiguous properties that First Mining acquired throughout 2021, covering over 70 000 ha (Figure 15). Exploring across the region could potentially increase the mineral resource in the area, alongside Springpoles current probable reserve of 3 800 000 ounces of gold at 0.97 g/t Au and indicated resource of 4 600 000 ounces of gold at 0.94 g/t Au (First Mining Gold Corp., news release, January 17, 2023).

Throughout 2022, the company completed geochemical and geological surveys and diamond drilling over priority targets across the project. Priority targets include Swain–Sol D'Or, Horseshoe, Sirius and Canamer, with selected assay results provided in Table 15. Grab samples were collected from Springpole, Birch, Horseshoe, Horseshoe East, Satterly, Stargazer, Swain, Swain Post, Vixen West and Vixen South properties. Additionally, across the Birch, Swain, Swain Post and Vixen West properties, over 700 soil samples were collected from B-horizon till. Diamond drilling occurred on the Swain property, including a total of 1560 m drilled from 5 diamond-drill holes. Initial results from diamond drilling encountered rock units, zones with wide widths and mineralization associated with favourable structures. Assay data from the drilling are still pending, with results expected in early 2023 (First Mining Gold Corp., news release, January 17, 2023).

Table 15. Select highlights of the 2022 exploration program at the First Mining Gold Corp. Birch–Uchi greenstone belt project (First Mining Gold Corp., news release, January 17, 2023).

Sample ID	Gold Grade (g/t Au)	Target Area	Property
B1055002	42.4	Sirius	Springpole
B1055352	34.7	Sol D'Or	Sol D'Or
B1055423	15.4	Bronco	Horseshoe
B1055078	15.3	Canamer	Birch
B1055051	9.3	Bullseye	Swain

Lastly, the company completed an airborne geophysical survey, totalling 3843 line-kilometres, across the project. The survey complements previous geophysical surveys flown in the area. This most recent survey was flown in 2022 over Springpole, Birch, Horseshoe, Horseshoe East, Satterly, Stargazer, Shabumeni and Swain properties (First Mining Gold Corp., news release, January 17, 2023).

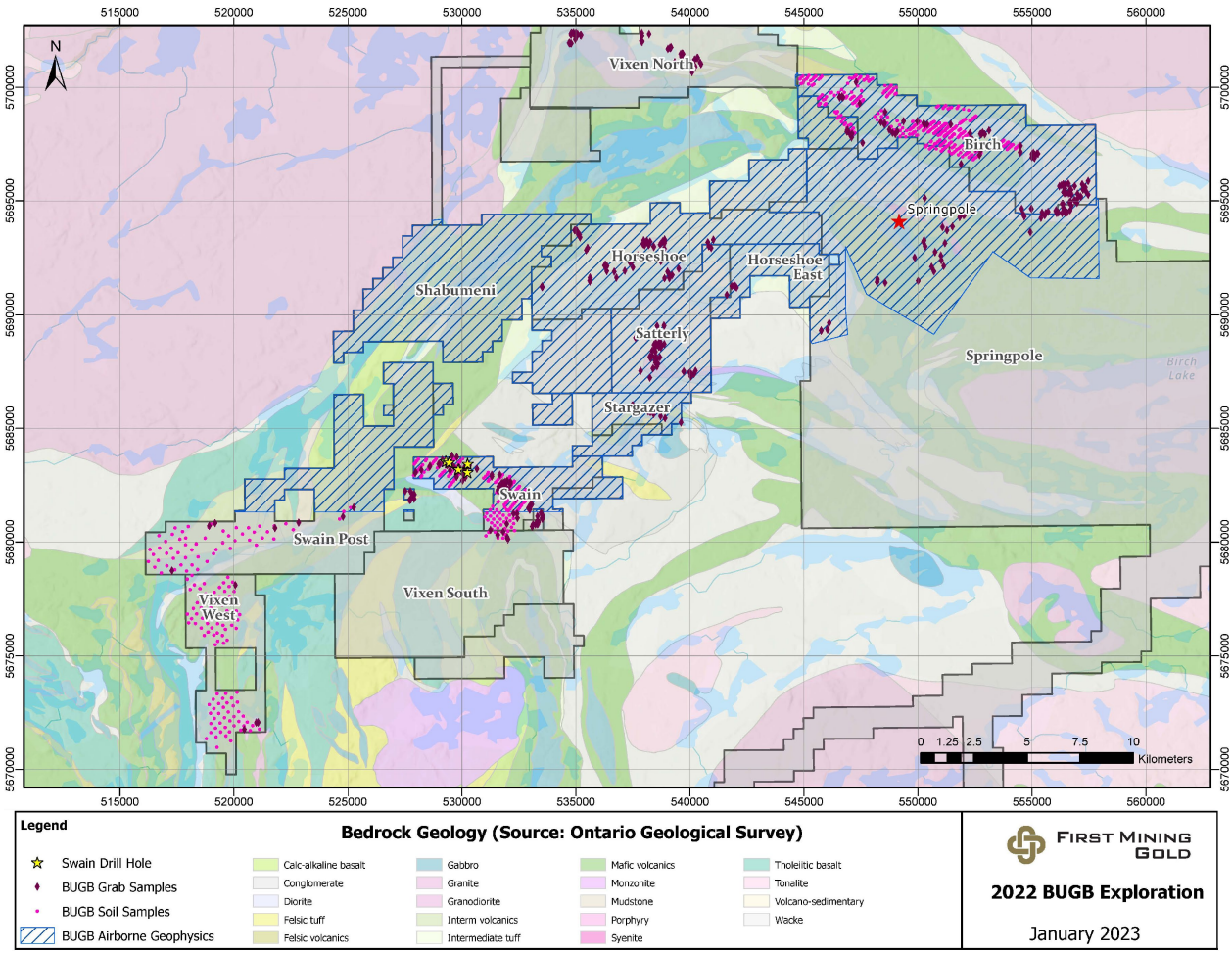


Figure 15. Location of the First Mining Gold Corp. Birch–Uchi greenstone belt project in relation to the Springpole gold project (*from* First Mining Gold Corp., news release, January 7, 2023).

GoldOn Resources Ltd. (https://goldonresources.com; *see* Figure 8a, locations 25 and 26) has completed its high-resolution, 1390 line-kilometres magnetometer survey at the Springpole East property. The property is located in the Birch–Uchi greenstone belt and is interpreted to comprise mafic volcanic sequences interspersed with sedimentary and banded iron formations. Interpretations of the magnetometer survey highlighted multiple structural features across the property, including shear and/or deformation zones and fold axes (GoldON Resources Ltd., news releases, April 6, and June 7, 2022). GoldON has also completed Phases I and II of their exploration program. Phase I involved prospecting, mapping and sampling with a total of 109 grab and 31 lake sediment samples collected. Phase II followed up on those results, with 34 grab samples collected from 3 target areas. Additionally, Phase II helped uncover east-trending anomalous gold values (Figure 16) in altered foliated granite with quartz-feldspar veining and 1 to 2% coarse pyrite. Grab sample results have yielded gold values from 191 ppb Au to 1.27 g/t Au (= 1270 ppb Au) (GoldON Resources Ltd., news releases, July 26, October 24, and November 9, 2022).

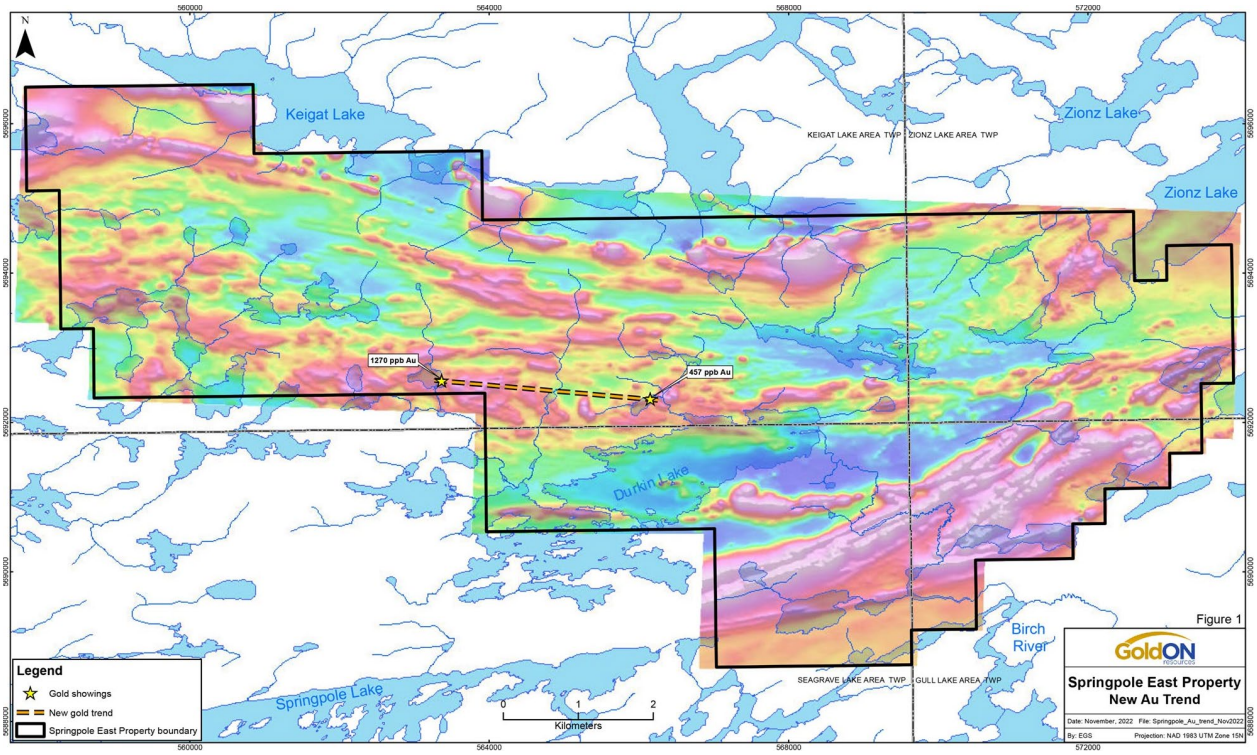


Figure 16. Location of the new gold trend identified on the GoldON Resources Ltd. Springpole East property (*from* GoldON Resources Ltd., news release, November 9, 2022).

Green Technology Metals Ltd. (www.greentm.com.au; *see* Figure 8a, location 27; *see* Figure 8b, location 28) announced 2 binding option agreements for claim packages at the Allison Lake batholith. The company also entered into an option agreement with Solstice Gold Corp. to acquire the Pennock Lake project, located adjacent to Frontier Lithium's PAK lithium project. In addition, the company commenced a helicopter magnetic survey at its Allison Lake and Allison Lake North projects to determine structural controls in areas with potential lithium mineralization (Green Technology Metals, news releases, January 24, and May 26, 2022).

Kenorland Minerals Ltd. (https://kenorlandminerals.com; *see* Figure 8a, location 29) announced results from its South Uchi project, a project held under an earn-in option to joint venture agreement with **Barrick Gold Corp**. (www.barrick.com). In addition, the company announced on January 19, 2023, that the agreement between the 2 companies was terminated by Barrick (Kenorland Minerals Ltd., news release, January 19, 2023).

The project area is located along the Sydney Lake–Lake St. Joseph Fault at the boundary between the Confederation assemblage volcanic rocks and the metasedimentary-dominated English River Subprovince. During the fall of 2021, a glacial till geochemical survey was completed across the project. The survey collected 1874 samples on a 1000 m by 200 m spaced grid. The survey highlighted multiple anomalous arsenic and antimony values of over a 20 km long east-trending structure. In 2022, Barrick Gold Corp. approved an infill till sampling program within the anomalous area. The program collected 459 overburden and 1069 rock samples and completed detailed mapping across the property (Kenorland Minerals Ltd., news release, January 19, 2023). Results from the till sampling program returned anomalous values of nickel, copper, lithium and cesium, with up to 674 ppm Ni and 306 ppm Cu (*see* Figures 17 and 18) (Kenorland Minerals Ltd., news release, January 19, 2023).

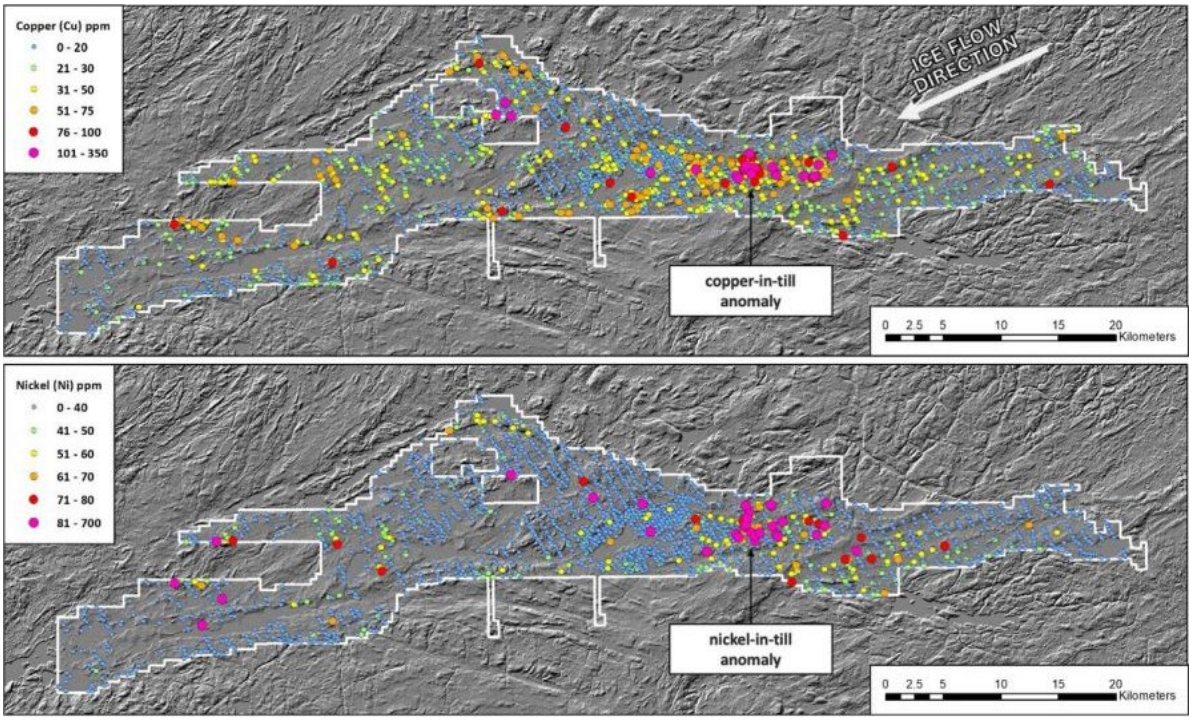


Figure 17. Till sampling copper (top) and nickel (bottom) anomalies across the Kenorland Minerals Ltd. South Uchi project (*from* Kenorland Minerals Ltd., news release, January 19, 2023).

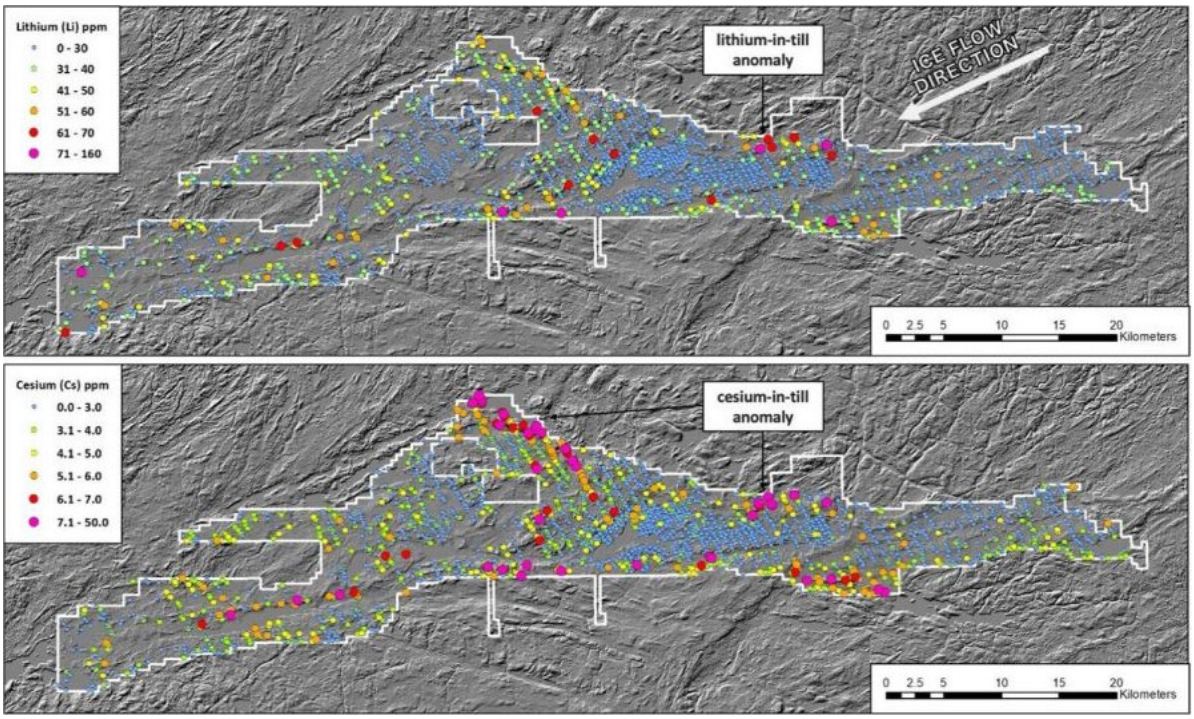


Figure 18. Till sampling lithium (top) and cesium (bottom) anomalies across the Kenorland Minerals Ltd. South Uchi project (*from* Kenorland Minerals Ltd., news release, January 19, 2023).

MetalCorp Inc. (www.metalcorp.ca; *see* Figure 8a, location 38) has announced drill results from its Black Bear property, located within the East Bay deformation zone. The company drilled 6 holes, totalling 1800 m, 2 of which exhibited gold mineralization. Highlights include 1.66 g/t Au over 2 m in drill-hole BB21-22. A follow-up campaign will focus on areas near drill-holes BB21-22 and BB21-24 (MetalCorp Inc., news release, March 16 and May 4, 2022).

Musk Metals Corp. (https://muskmetals.ca; *see* Figure 8a, location 39) acquired 100% interest in the Allison Lake East lithium property. The property covers approximately 1500 ha and is near previously mapped pegmatites along the LCT Goldilocks zone. A high-resolution heliborne magnetic survey was completed and preliminary results show a regional magnetic gradient increasing in intensity toward the north and east (Figure 19). This survey will be used to delineate targets for future field work and drilling (Musk Metals Corp., news releases, February 1, and June 27, 2022).

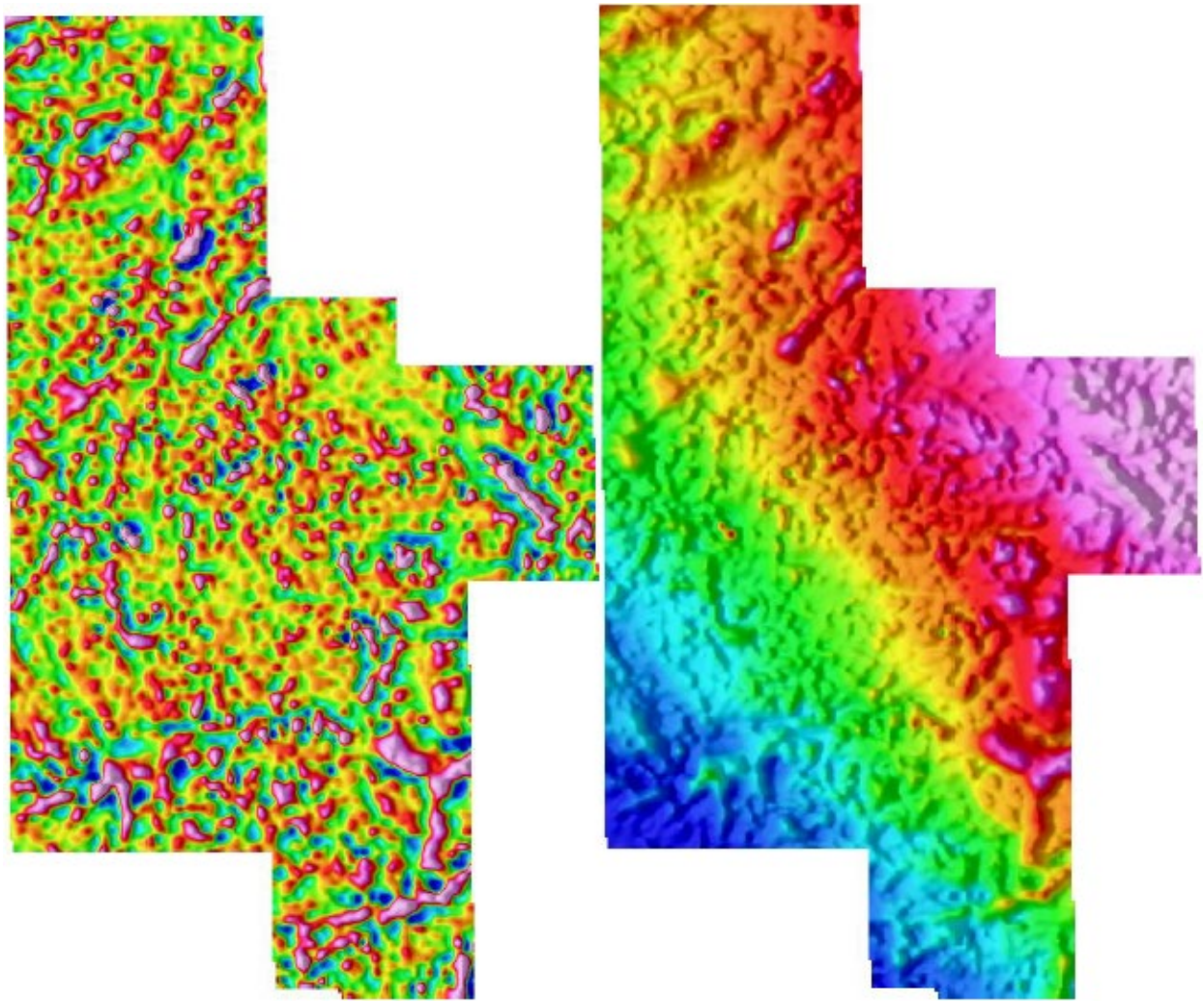


Figure 19. Preliminary first vertical derivative (left) and total magnetic intensity (right) images from Musk Metals Corp. airborne survey over the Allison Lake East lithium property (*from* Musk Metals Corp., news release, June 27, 2022).

Newrange Gold Corp. (https://newrangegold.com; *see* Figure 8a, locations 40 and 41) began their winter drill program at the North Birch property, located in the Birch–Uchi greenstone belt 110 km northeast of the Municipality of Red Lake. The target is a 3 km sheared limb of a folded iron formation, highlighted in a magnetic and lidar survey and had not been drilled previously (Figure 20). The overall geologic setting is interpreted to be potentially similar to Newmont's Musselwhite Mine. Only 2 holes were completed during the 2022 drill program because of weather issues that caused the program to end early. Drill-hole NB22001 confirmed the lithostructural interpretation of a deformation zone comprising basalt and iron formation. Assay values increased in parallel with shearing intensity, with results of 0.25 g/t Au and 363 ppm Cu. Drill-hole NB22002 did not intersect the iron formation or intense shearing present in the first hole, but did contain a zone of biotite alteration and anomalous geochemical results. Follow-up drilling is expected in the future (Newrange Gold Corp., news releases, January 24, February 17, March 9, and May 17, 2022).

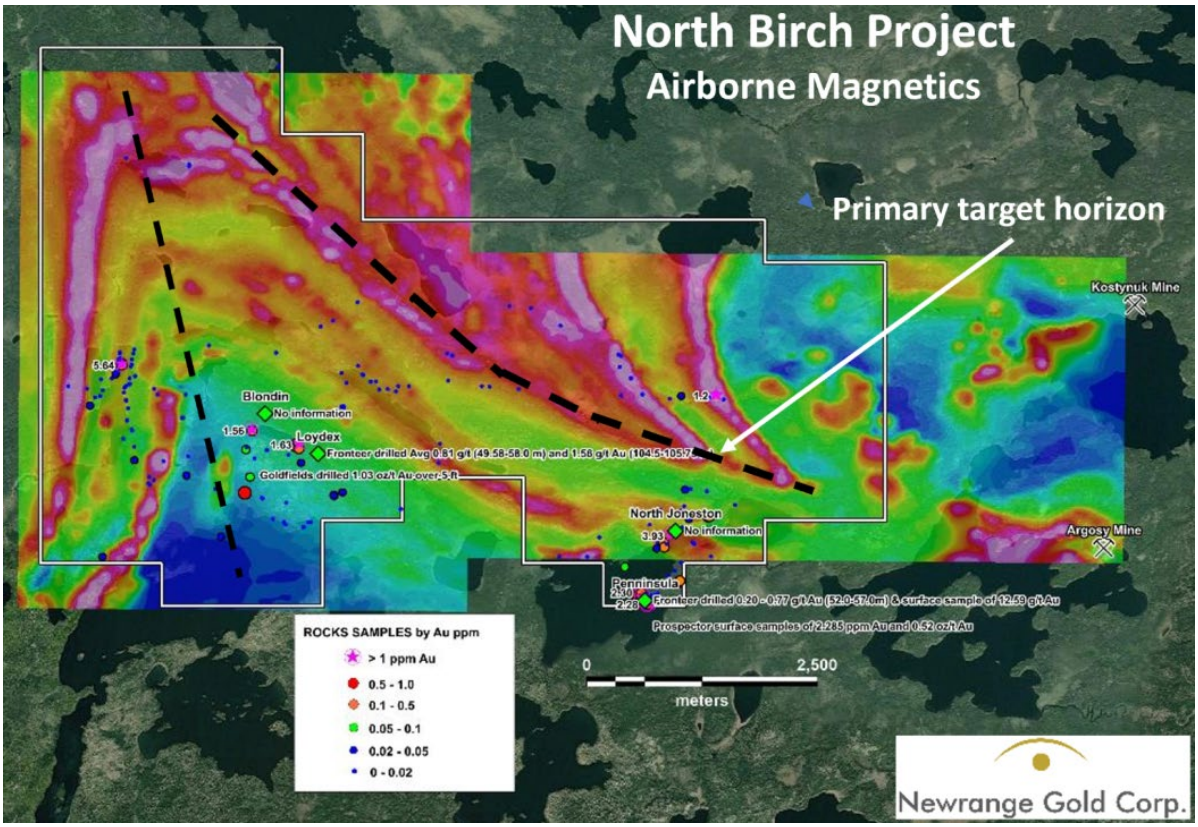


Figure 20. Map of magnetic survey results over the Newrange Gold Corp. North Birch property, which highlights the property's large-scale fold, and also shows the target location for 2022 drilling (*from* Newrange Gold Corp., news release, February 17, 2022).

Nexus Metals Corp. (https://nexusmetals.ca; *see* Figure 8a, location 42) was announced as the new name for the spinout company of Nexus Gold Corp. The new company, Nexus Metals Corp., contains all the Canadian projects from the Nexus Gold Corp. portfolio, including the McKenzie gold project (Nexus Metals Corp., news releases, June 28, August 10, September 8, October 5, and October 12, 2022).

The company has released results from round two of its 2021 drill program designed to test the strike extension of previously identified mineralization at the McKenzie gold project. Four holes were drilled, for a total of 2000 m, entirely through the Dome stock. Zones of potassic, silica and sericite alteration, as well as sulphide mineralization and quartz-carbonate stringers, were noted in the drill core. Significant gold assays include drill-hole MK-21-028 grading 0.65 g/t over 74 m from 203 to 276 m and drill-hole MK 21-025 grading 10.21 g/t over 2 m from 66 to 68m (Figure 21) (Nexus Gold Corp., news release, February 15).

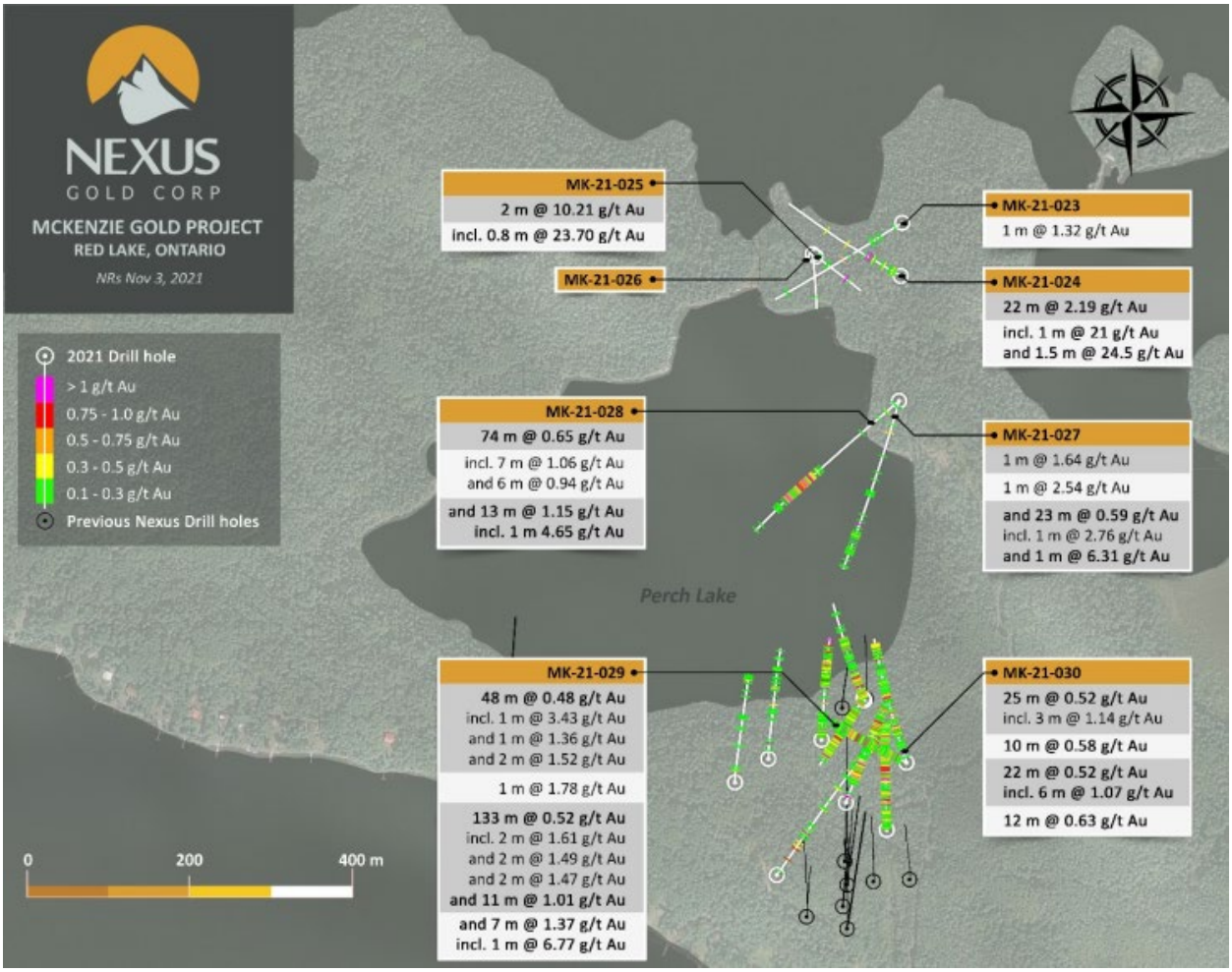


Figure 21. Location and results from holes drilled in 2021 by Nexus Gold Corp on the McKenzie gold project property (*from* Nexus Gold Corp., news release, February 15, 2022).

Pacton Gold Inc. (www.pactongold.com; *see* Figure 8a, locations 43 and 44) continued its exploration work on the 28 000 ha Red Lake project, which covers a large swath of land from the west to the east end of the Municipality of Red Lake. The project is adjacent to properties held by Evolution Mining Ltd., Pure Gold Mining Inc. and Kinross Gold Corporation.

The company released the results from its summer 2021 soil sampling program across the Red Lake and Gullrock properties. A total of 7200 assays were taken with multiple anomalous gold trends found in the Keg, Claremont, Carricona and Boyden West areas (Figure 22). These areas were subsequently the focus of the 2022 drill program (Pacton Gold Inc., news release, February 3, 2022).

The 2022 drill program focussed on Boyden West and East, Carricona East and Claremont West. Fifteen holes were drilled, for a total of 5698 m. Results from Boyden returned anomalous values along a trend with a strike length of 2 km. Assay highlights include 0.5 g/t Au over 0.5 m from 126.5 to 127 m in drill-hole PAC-22-065 and 0.3 g/t Au over 2.0 m from 77.0 to 79.0 in drill-hole PAC-22-068. Gold mineralization at Boyden occurs in pinch-and-swell quartz veins found in mafic volcanic rocks, but is not continuous throughout because of the presence of intrusive units. The company plans to continue exploration at this project through drilling, mapping and outcrop stripping (Figure 23; Pacton Gold Inc., news release, September 6, 2022).

Pacton Gold Inc. has recently completed a database, including compiling historical data and a high-resolution magnetic survey for the Swain property, located in the Birch–Uchi greenstone belt 80 km east-northeast of the Municipality of Red Lake. Lastly, the company collected samples during a prospecting campaign and will release results as they become available.

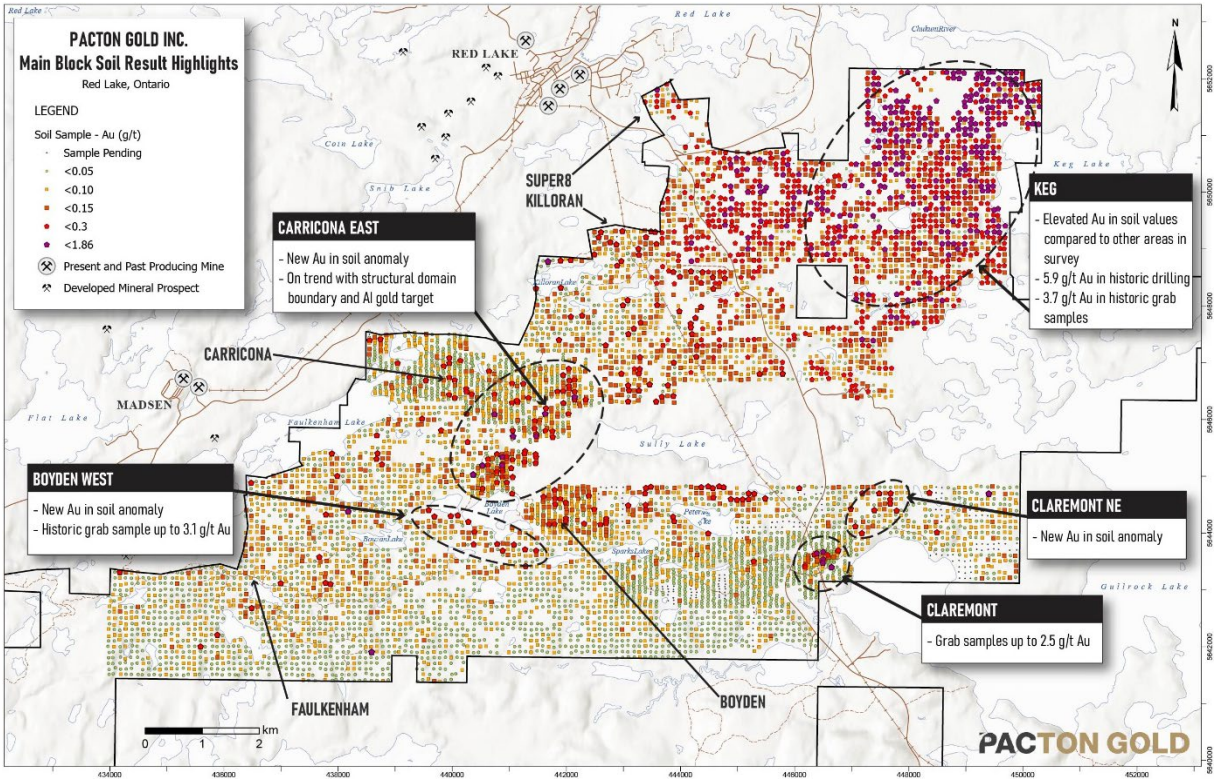


Figure 22. Map showing highlights of soil sampling from the numerous targets of the Pacton Gold Inc. Red Lake project (*from* Pacton Gold Inc., news release, February 15, 2022).

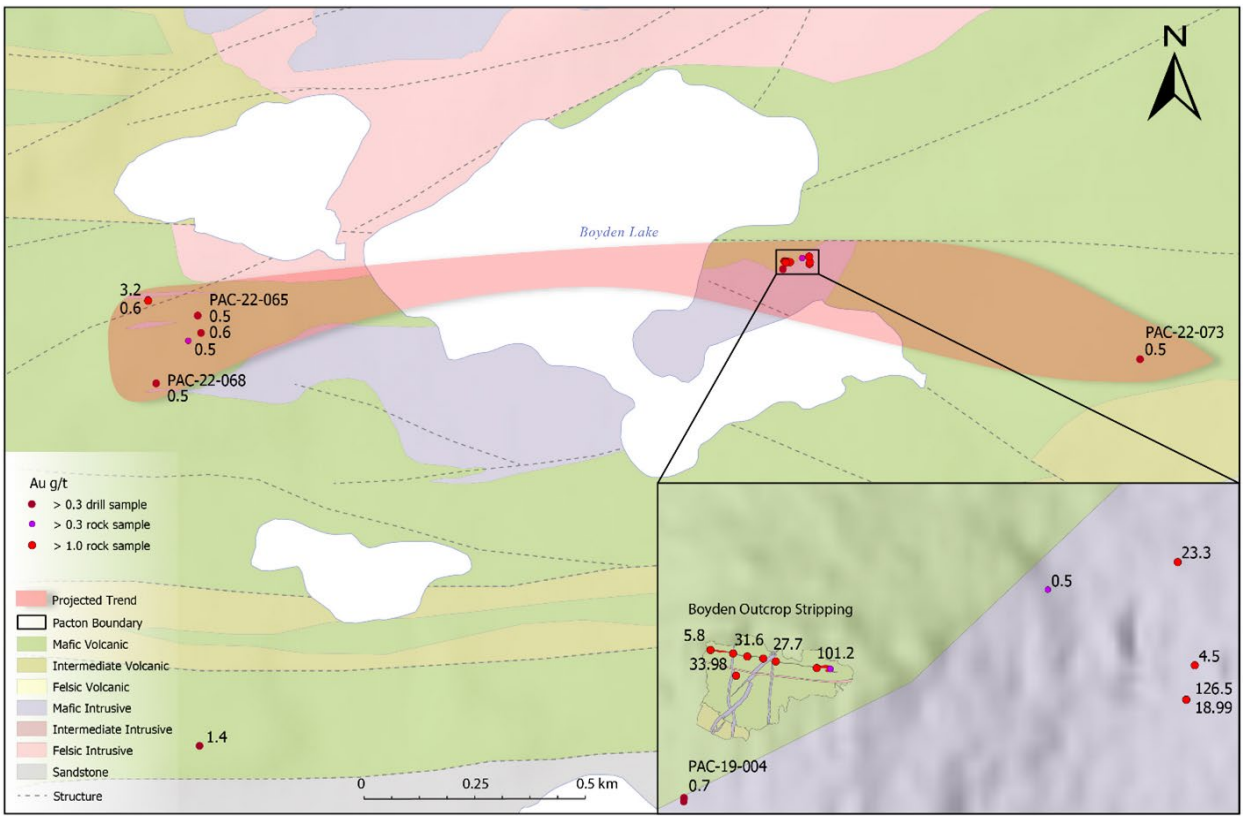


Figure 23. Locations drilling and stripping conducted by Pacton Gold Inc. in 2022 on the Boyden target areas (*from* Pacton Gold Inc., news release, September 6, 2022).

Platinex Inc. (https://platinex.com; *see* Figure 8b, location 45) acquired multiple properties exploring for critical minerals in the Muskrat Dam greenstone belt and Rottenfish assemblage, creating the Muskrat Dam Critical Minerals project. The project covers an area of 12 934 ha, composed of the Axe Lake, Munekun Lake, Windigo A & B, Fox Bay and Rottenfish properties. Platinex plans to explore for lithium at the Axe Lake and Munekun Lake properties along the Misquamaebin Lake batholith and the northwest-trending Axe Lake deformation zone, as labelled by the company. In addition, Platinex will be exploring for gold at both the Windigo A & B and Rottenfish properties. Finally, historical copper-nickel-platinum group element and chromite occurrences are found at the Fox Bay property along east-trending mafic and ultramafic sills (Platinex Inc., news releases, December 14, and December 29, 2022, and January 16, 2023).

Portofino Resources Inc. (https://portofinoresources.com; *see* Figure 8a, location 46) has released results from their Allison Lake North property located 100 km east of the Municipality of Red Lake. The property is located along the western edge of the Allison Lake batholith and was expanded in May to include 3 additional contiguous claims to the west (Portofino Resources Inc., news release, May 10, 2022).

Previous work by the Ontario Geological Survey (Breaks, Selway and Tindle 2003) determined the Alison Lake batholith to be one of the largest known fertile, peraluminous granites in northwestern Ontario, with the potential for lithium and rare earth element (REE) pegmatites. The company completed a 406 line-kilometres magnetic survey that showed increasing intensity toward the eastern part of the property (Figure 24), which is interpreted to potentially show increasing fractionation westward (Portofino Resources Inc., news release, September 15, 2022). In addition, the company released results from its September 2021 channel sampling program (35 channel samples), including results of 412 ppm Li

and 857 ppm Rb (Portofino Resources Inc., news release, January 14, 2022). A follow-up field program was initiated in 2022 with a focus on the outer edge of the batholith. In total, 28 grab and 23 channel samples were collected in the fall of 2022 (Figure 25). Values of up to 230 ppm Li were found in metasedimentary rocks adjacent to pegmatite dikes and 622 ppm Rb within the pegmatite. In addition, indicator minerals of garnet and tourmaline have been found, which are typical of LCT pegmatites (Portofino Resources Inc., news releases, October 3, and December 8, 2022).

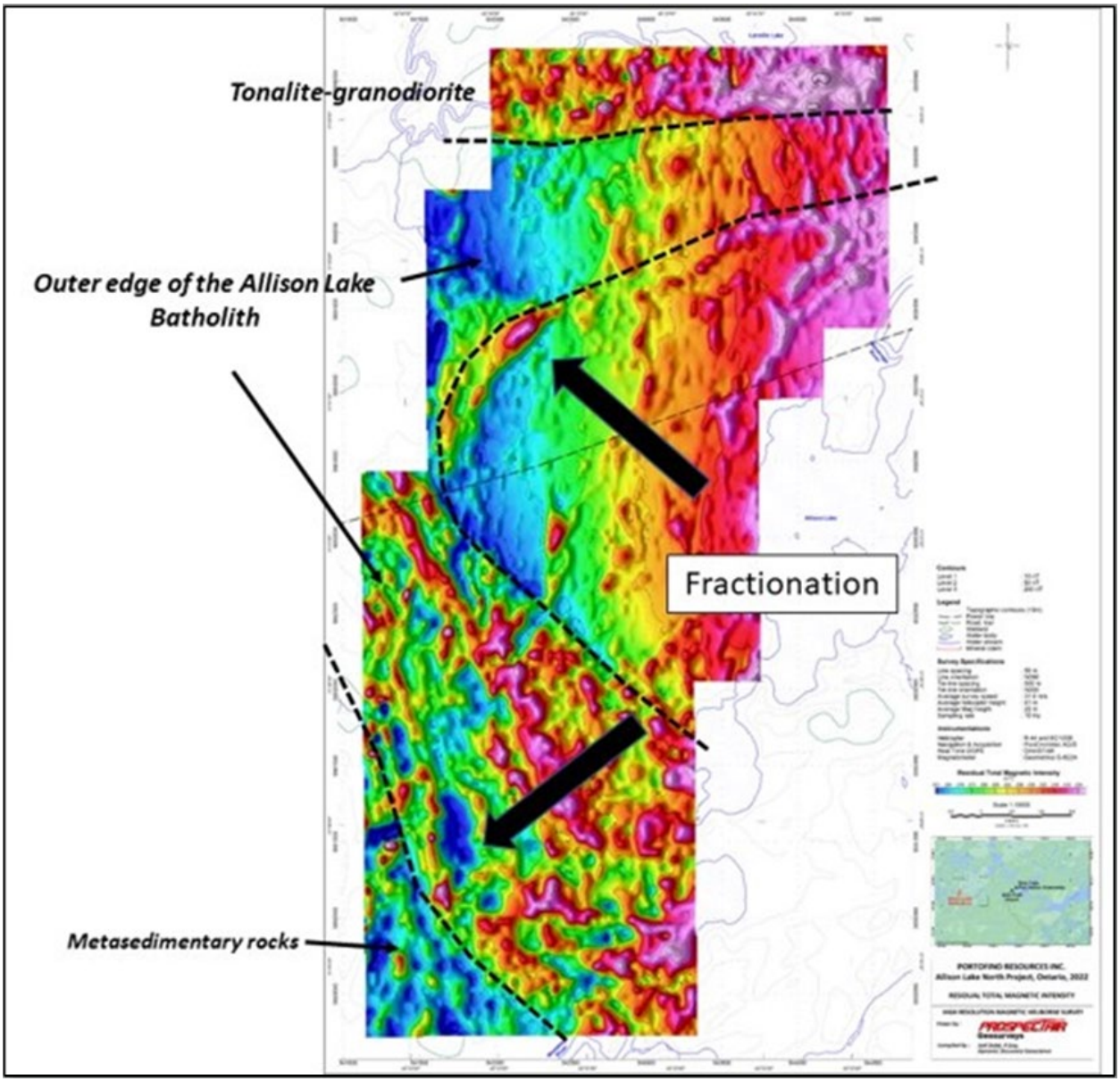


Figure 24. Magnetic survey results flown over the Portofino Resources Inc. Allison Lake North property showing increasing fractionation toward the east (*from* Portofino Resources Inc., news release, September 15, 2022).

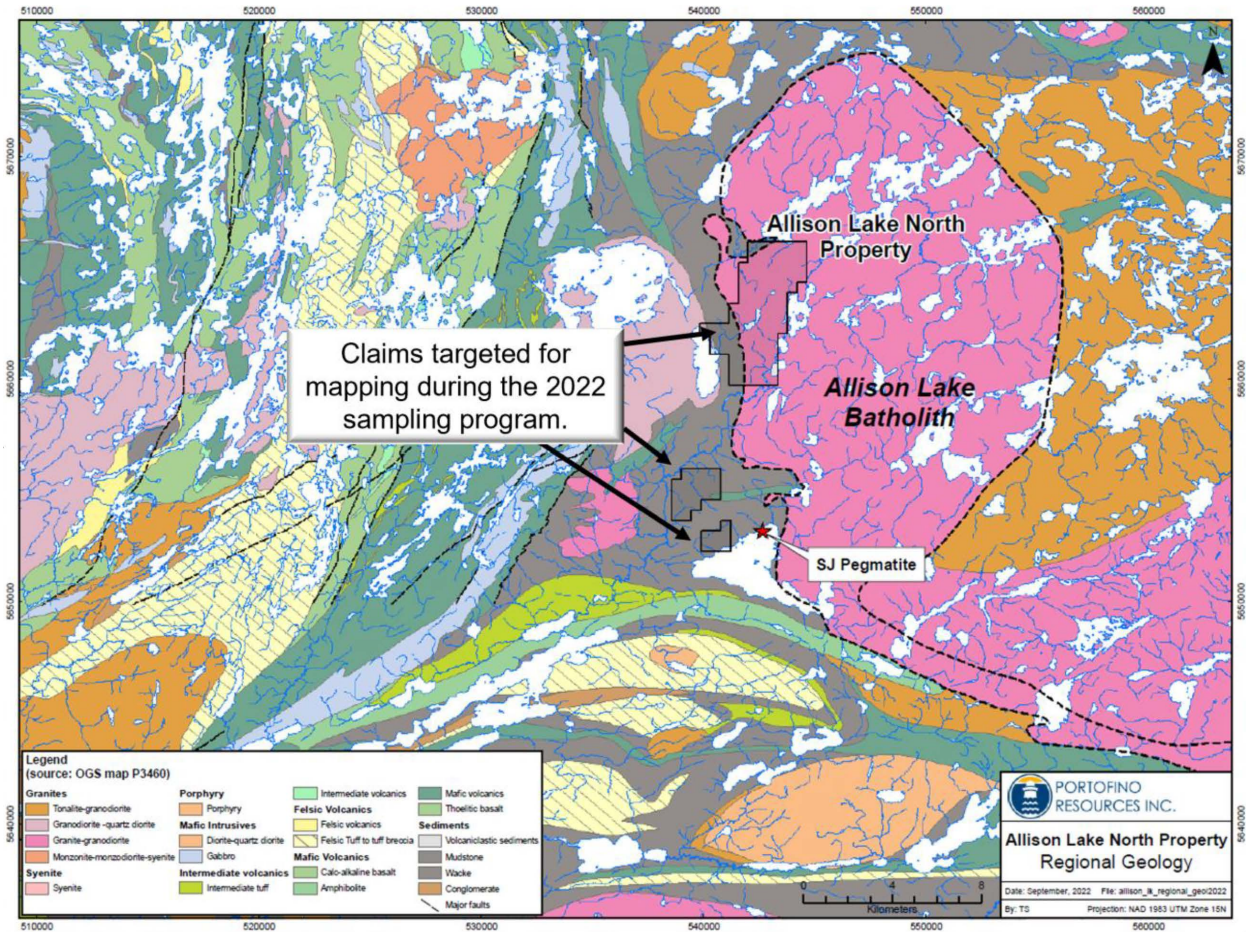


Figure 25. Geological map of the Allison Lake batholith area highlighting the location of the Portofino Resources Inc. Allison Lake North property where channel sampling was completed in 2022 (*from* Portofino Resources Inc., news release, December 8, 2022).

Prosper Gold Corp. (https://prospergoldcorp.com; *see* Figure 8a, location 47) announced results from its Golden Sidewalk project, located 60 km east of the Municipality of Red Lake. Reconnaissance drilling completed 66 diamond-drill holes, for a total of 21 103 m. Highlights from drilling include a 2.8 km mineralized structural corridor that is parallel and proximal to a regional unconformity. Mineralization occurs within quartz-ankerite veins, consisting of pyrite, arsenopyrite and visible gold. Significant assay results from drill-hole DD21GC039 include 22.7 g/t Au over 0.55 m (Prosper Gold Corp., news release, January 17, 2022). The winter program (Figure 26) drilled an additional 21 drill holes, totalling 6741 m, with significant assays including 3.13 g/t Au over 5.88 m from drill-hole DD22GC068 and 14.20 g/t Au over 0.50 m from drill-hole DD22GC084. Lastly, Prosper Gold completed a fall drill program consisting of 8 drill holes, totalling 1252 m, at the Skinner area. Significant assays from the drilling include 3.08 g/t Au over 2.35 m from drill-hole DD22SK002 (Prosper Gold Corp., news release, January 9, 2023). Table 16 provides drill highlights from the 2022 drill programs by Prosper Gold.

Table 16. Results of 2022 drilling in the Golden Corridor area of the Prosper Gold Corp. Golden Sidewalk project and Skinner area (Prosper Gold Corp., news releases, May 17, 2022, and January 9, 2023).

Drill-Hole ID	Location	Gold Grade (g/t Au)	Width (m)
DD22GC068	Golden Corridor	3.13	5.88
DD22GC068	Golden Corridor	1.86	1.50
DD22GC070	Golden Corridor	1.85	0.50
DD22GC070	Golden Corridor	12.50	0.59
DD22GC072	Golden Corridor	8.52	1.00
DD22GC084	Golden Corridor	14.20	1.00
DD22SK001	Skinner North	0.49	19.5
DD22SK002	Skinner North	3.08	2.35
DD22SK004	Skinner North	1.15	7.35

Prosper Gold Corp. has also completed a stripping and channel sampling program at the Skinner area. Because of limited outcrop, the company exposed a 25 by 50 m area that unearthed an iron-carbonate ± silica ± biotite altered shear zone with mineralized quartz-carbonate veins. Sulphide mineralization is present in the veins and wall rock (Prosper Gold Corp., news release, May 17, 2022). Highlights of the channel sampling program include 3 m of 9.69 g/t Au (including 1.5 m of 15.5 g/t Au) in sample TR22SK001-14 and 1.8 m of 13.3 g/t Au (including 0.7m of 25.9 g/t) in sample TR22SK001-11. The company completed a ground magnetic survey of the Skinner area to identify intersecting fault structures that can potentially host gold (Prosper Gold Corp., news release, September 7, 2022).

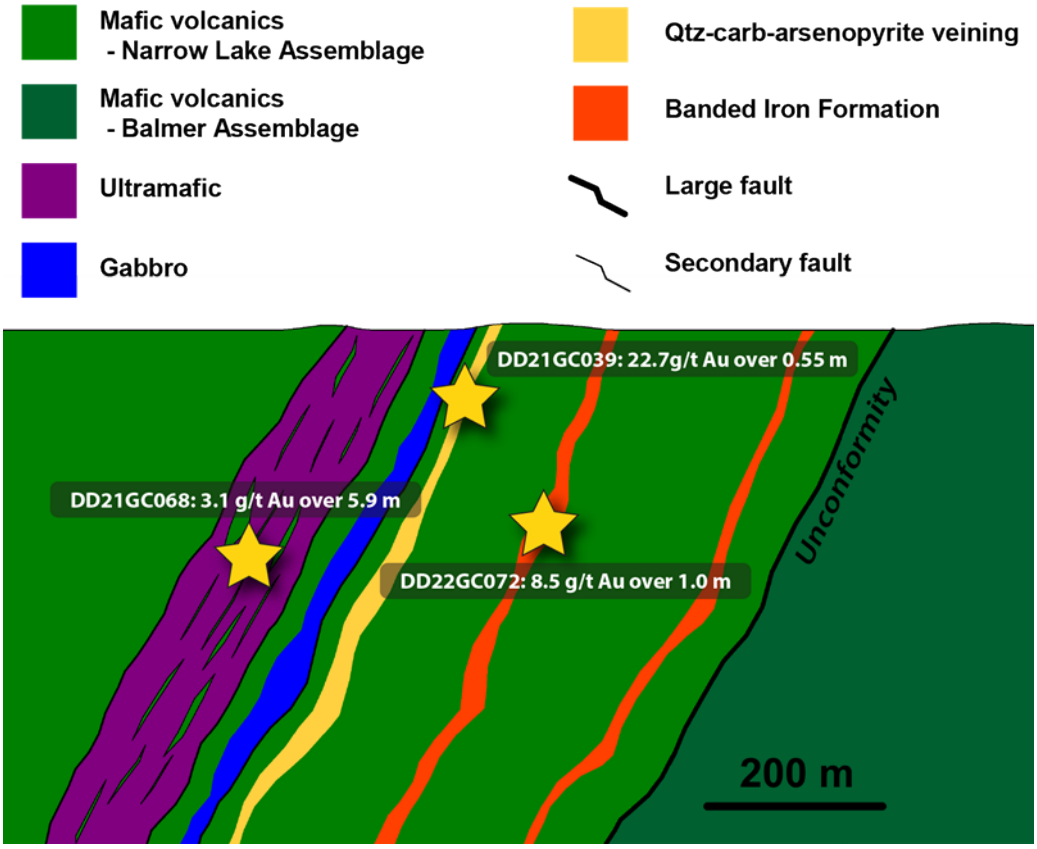


Figure 26. Schematic of a geological cross section showing lithological and structural settings associated with gold mineralization at the Golden Corridor of the Prosper Gold Corp. Golden Sidewalk project (*from* Prosper Gold Corp., news release, May 17, 2022).

Finally, the company exercised its option with Sabina Gold & Silver Corp. to acquire a 100% interest in the Golden Sidewalk and Skinner properties. Additionally, Prosper Gold entered into a royalty purchase agreement with P. English to purchase 100% of his 2% net smelter royalty on the Skinner Gold property (Prosper Gold Corp., news releases, November 22, and November 28, 2022).

Solstice Gold Corp. (https://solsticegold.com; *see* Figure 8a, location 51 and 52) began 2022 by acquiring the New Frontier project, a 23 km^2 land package associated with a deep-tapping regional structure documented by Lewis (2021) in OGS *Recommendations for Exploration* publication (Figure 27). This new property lies approximately 20 km northwest of their main RLX gold project. Data compilation was completed on the New Frontier project, with gold in float found in historic tills. Plans for the property include mapping, prospecting and soil sampling throughout the summer. Because of the lack of outcrop across the property, soil sampling will be undertaken, which should provide valuable data (Solstice Gold Corp., news releases, January 10 and April 26, 2022).

The RLX property was expanded from 5.5 km^2 to 11 km^2 in March and again by 13.6 km^2 in November with the acquisition of the Pringle property, contiguous to the north of the RLX property. Solstice released results from the 2021 electromagnetic (EM) survey and soil studies on the RLX property. From the EM survey, regionally extensive conductors over a 16 km strike length were noted, trending adjacent to the Nungessor shear zone. Additionally, several northeast-trending faults were noted throughout the RLX property, which are also in the vicinity of soil samples elevated in gold. The northeast-trending faults are interpreted to be a possible indication of features associated with a major crustal fault or deep tapping structure (Solstice Gold Corp., news releases, March 14, and November 14, 2022).

The Phase 1 diamond-drill program, testing mainly the central region of the RLX property, resulted in 11 drill holes, totalling 5323 m (Figure 28). Drilling confirmed the presence of the Red Lake greenstone belt below the surface. Assay highlights include 0.82 g/t Au from 317.6 to 318.65 m in drill-hole RLXDH22-02 and 1.96 g/t Au from 331.0 to 332.5 m drill-hole RLXDH22-07. Zones of intense alteration of biotite-sericite, ± potassium feldspar were also encountered, which contained low gold values but were enriched in pathfinder elements, such as silver, lead and zinc. These altered zones also contain up to several percent of disseminated pyrite-pyrrhotite with trace chalcopyrite. In addition, core from drill-hole RLXDH22-02 encountered 90 m of iron formation with semi-massive sulphides and alteration. A Phase 2 drill program is planned for areas best accessed in the winter, including areas to the south with strong EM responses, and following up on areas that Phase 1 drilling identified as having significant gold values (Solstice Gold Corp., news releases, August 2, and November 21, 2022).

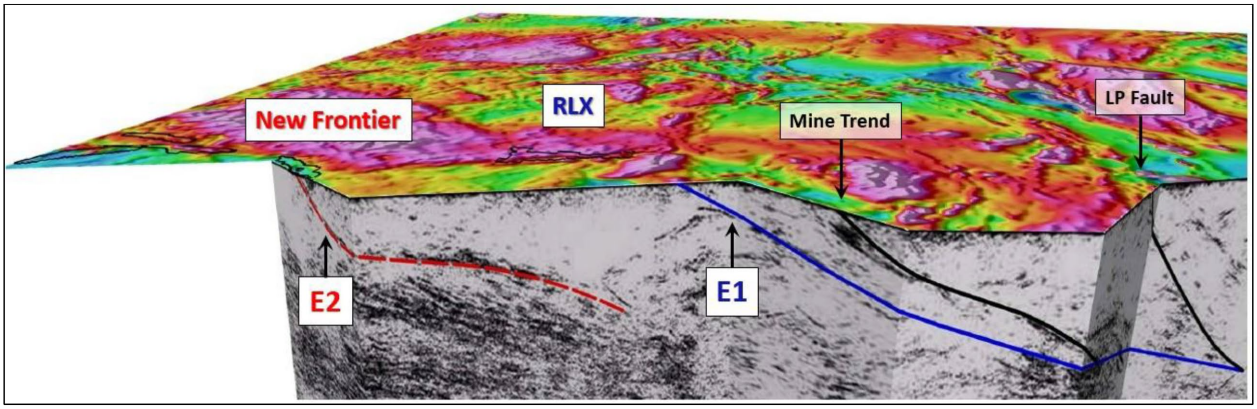


Figure 27. Location of the Solstice Gold Corp. New Frontier and RLX properties correlating to the underlying major structures interpreted from seismic data (*from* Solstice Gold Corp., news release, January 10, 2022).

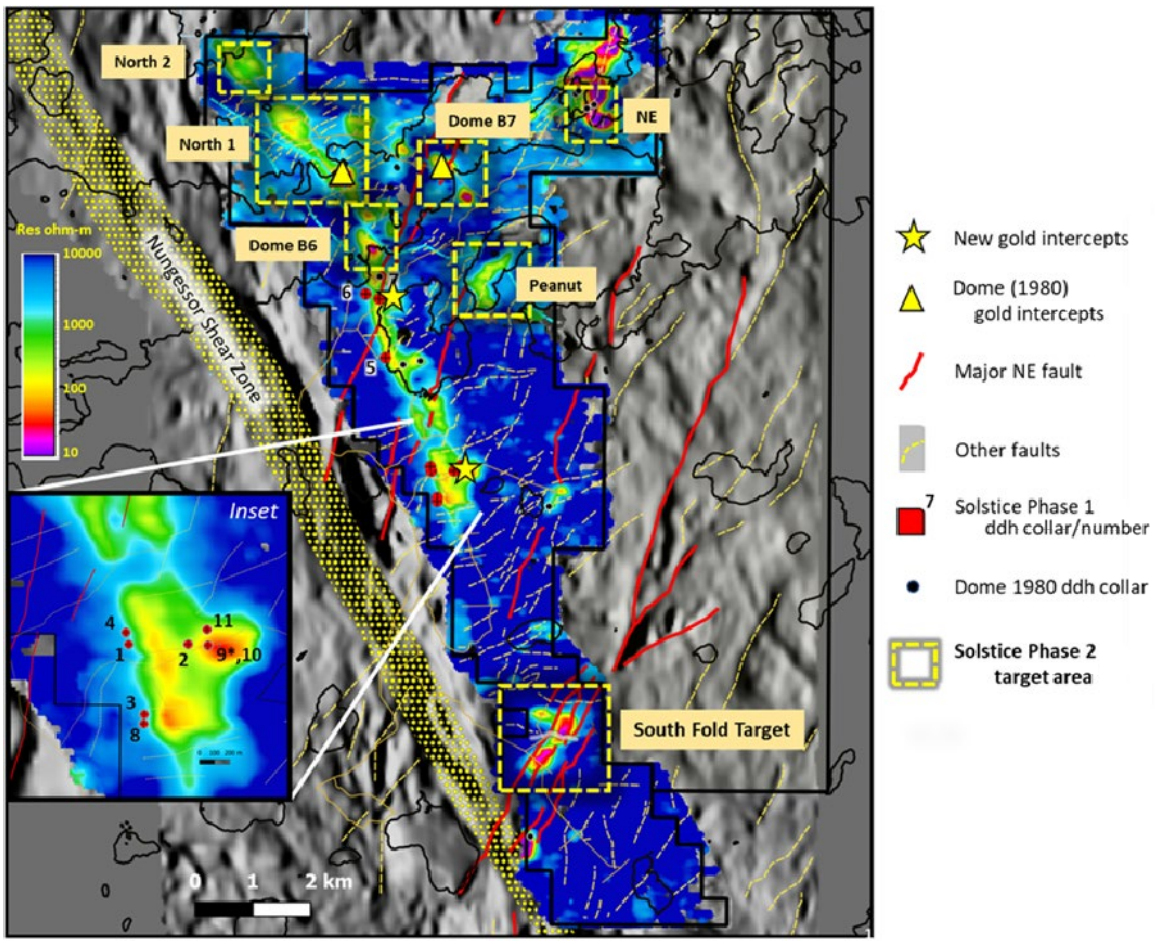


Figure 28. Locations of Phase 1 drill-hole collars on the Solstice Gold Corp. RLX property (*from* Solstice Gold Corp., news release, November 21, 2022).

StraightUp Resources Inc. (www.straightupresources.com; *see* Figure 8a, locations 53 and 54) announced they had received their exploration permit and are planning to begin working at the RLX North property. The RLX North property is underlain by the Balmer assemblage, whereas the RLX South property is interpreted to be underlain by the Confederation assemblage. The contact between these assemblages is considered prospective for gold deposits within the Red Lake District. With data compilation and airborne geophysical surveys completed in 2021, StraightUp planned to start drilling their high-priority targets in the summer of 2022. Geological interpretation of the property was completed, with results yet to be released (StraightUp Resources Inc., news release, January 13, and July 4, 2022). Lastly, through a purchase option agreement, the company announced the acquisition of additional claims north and contiguous to their RLX North property. The newly acquired claims are the Ranger–Otter project, covering an area of 3050 acres (StraightUp Resources Inc., news release, March 7, 2022).

Taura Gold (www.tauragold.com; *see* Figure 8a, location 55) announced a field work plan for the summer 2022 field season on the Shabu project. The Shabu project is a gold project located 80 km northeast of the Municipality of Red Lake. Gold has previously been found in shear zone hosted quartz-carbonate veins along dyke contacts and the company expects to complete prospecting, mapping, and sampling at targets across the project. Targets were selected by analyzing historical data, soil, VLF–EM, and heli-magnetic surveys completed across the project in 2019 and 2020. The company expanded the property in October by acquiring 116 claims along strike. These new claims are dubbed the Shabu extension property (Taura Gold Inc., news releases, March 24, June 20, and October 17, 2022).

Tearlach Resources Ltd. (https://tearlach.ca; *see* Figure 8a, locations 56 and 59; *see* Figure 8b, locations 57 and 58) announced the acquisition of numerous lithium projects in the Red Lake District (Figure 29). The Margot Lake project, composed of 102 claims covering 2706 ha, and the Pakwan project, comprising 51 claims covering 1271 ha, are along strike and adjacent, respectively, to the Frontier Lithium PAK project. The Wesley project, composed of 160 cells covering 3250 ha and the Harth project, consisting of 116 cells covering 2350 ha, is located approximately 75 km northeast of the Township of Ear Falls in proximity to the Sharpe Lake batholith (Tearlach Resources Ltd., news releases, September 26 and 28, and December 5, 2022). The company has performed mapping, prospecting and sampling on the Wesley project in the fall of 2022 (M. Enright-Morin, Mosam Ventures Inc., personal communication, 2023).

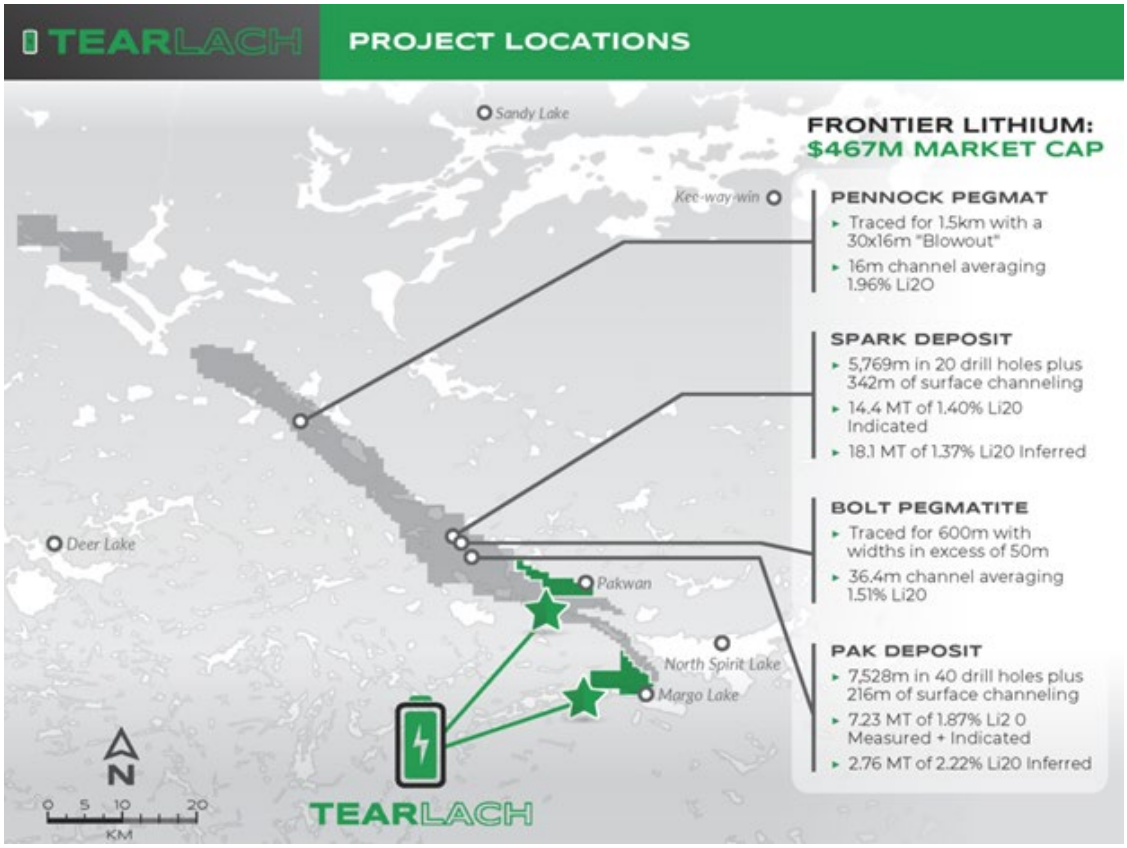


Figure 29. Location of the newly acquired Margo Lake and Pakwan properties by Tearlach Resources Ltd. (*from* Tearlach Resources Inc., https://tearlach.ca/projects [accessed January 16, 2023]).

Trillium Gold Mines Inc. (www.trilliumgold.com; *see* Figure 8a, locations 60, 61, 62 and 63) completed property acquisitions, field exploration and diamond-drilling programs throughout 2022. In April, Trillium announced it closed the purchase option agreements of the Uchi gold project (comprising the Lost Bay, Fly East and Leg Lake claims) and the Satterly gold project, covering areas of 4189 ha and 565 ha, respectively. In June, the company closed the acquisition of Imagine Lithium's Eastern Vision property holdings, covering an area of 13 958 ha. They also optioned the Wenasaga gold project from Bounty Gold Corp., covering an area of 1692 ha. These properties are located along the same structural trend as the Kinross Gold Corporation LP Fault zone. As a result, Trillium can now consolidate all their properties in the Birch–Uchi greenstone belt into one (Figure 30; Trillium Gold Mines Inc., news releases, April 5, April 26, June 2, June 22, and July 13, 2022).

Trillium began the year by releasing results from their 2021 SGH sampling program from the Confederation Belt properties. Multiple gold pathfinder anomalies were discovered over 17 SGH regional soil sampling grids. Some anomalies appear associated with known mineralization from historical drilling, such as the Joy–Copperlode blocks, whereas others were found where minimal historical exploration work has occurred. The new gold anomalies were used as the basis to begin the 2022 field season, including additional soil sampling, lithogeochemical sampling and prospecting (Trillium Gold Mines Inc., news release, January 11, 2022).

The company began a resampling program of historical drilling that was available and completed logging and sampling of the core. Since much of the area was previously only sampled for VMS-style base metal mineralization and not for gold, Trillium could sample sections of the core for the first time. This program focussed on the newly acquired Wenasaga and Panama Lake properties, as both are associated with fault structures favourable to gold mineralization. A total of 174 new samples from 4 previously drilled holes at Panama Lake were sent for gold assay, with core from 21 other holes from various parts of the Confederation Belt property being reviewed and assayed for gold (Trillium Gold Mines Inc., news release, August 9, 2022).

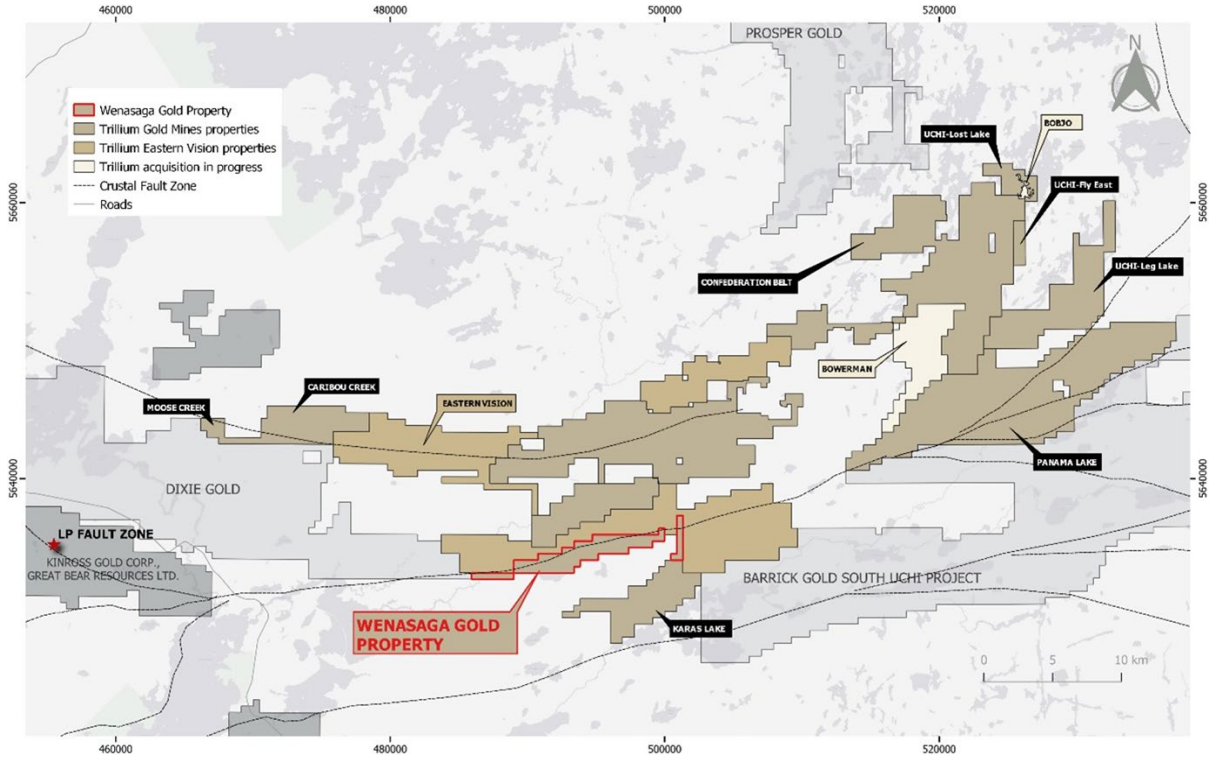


Figure 30. Map showing the locations of newly acquired properties by Trillium Gold Mines Inc. throughout the Confederation assemblage (*from* Trillium Gold Mines Inc., news release, June 2, 2022).

The Gold Centre property is adjacent to the Evolution Mining Red Lake operations and has been examined in both 2021 and 2022 drill programs. Results were released from the 2021 drilling, which comprised 8 drill holes, totalling 9329 m. The purpose of the drill program was to target similar stratigraphy and downdip extensions of mineralization from the Evolution Mining Red Lake operations. Drill-hole GC21-01 intersected a silica-altered gabbro within the Balmer assemblage with foliation-parallel shears associated with arsenopyrite and visible gold at a depth of 782 m, which returned a grade of 8.35 g/t Au over 0.58 m. This intercept is interpreted as analogous to ore at the Red Lake operations. The 2022 drill program explored deep targets at the property, drilling 5 holes, totalling 4950 m. Again, the company intersected Balmer assemblage rocks similar to that at the Red Lake operations, with moderate to strong foliation, patches of quartz-calcite veining, and biotite alteration. Drill-hole GC22-08 returned results of 5.67 g/t Au over 0.73 m at 848.44 m depth (Trillium Gold Mines Inc., news releases, March 16, and November 28, 2022).

Trillium has also received assays from its 2021 drill program at Newman Todd and Rivard properties and drilled 17 holes, totalling 7665 m. One of the main findings from the summer drill program is that gold mineralization, associated with the NT zone and east-trending shears, can be found southeast of the NT zone providing possible drill targets. Drilling in 2022 comprised 17 drill holes, totalling 7665 m, below previous drilling in the NT zone to fill in drilling gaps and the hanging-wall units southeast of the NT zone (drill-holes NT22-211 and NT22-212) (Figures 31 and 32). Significant assays include 3.36 g/t Au over 10.94 m from 187.36 m and 1.59 g/t Au over 17.92 m from 399.13 m in drill-hole NT21-204. On the Rivard property in 2022, 7 holes were drilled that were designed to test the west extension of the Main zone fault and downdip of previous high-grade results. Low-grade intersections were encountered at the target area, but drill-hole RV22-40 returned a grade of 2.79 g/t Au over 7.95 m at 32.85 m downhole. In addition, channel sampling was conducted in June 2022 on the Rivard property (Trillium Gold Mines Inc., news releases, April 20, August 11, September 26, and November 9, 2022). Significant assay results from the 2022 drill program are provided in Table 17.

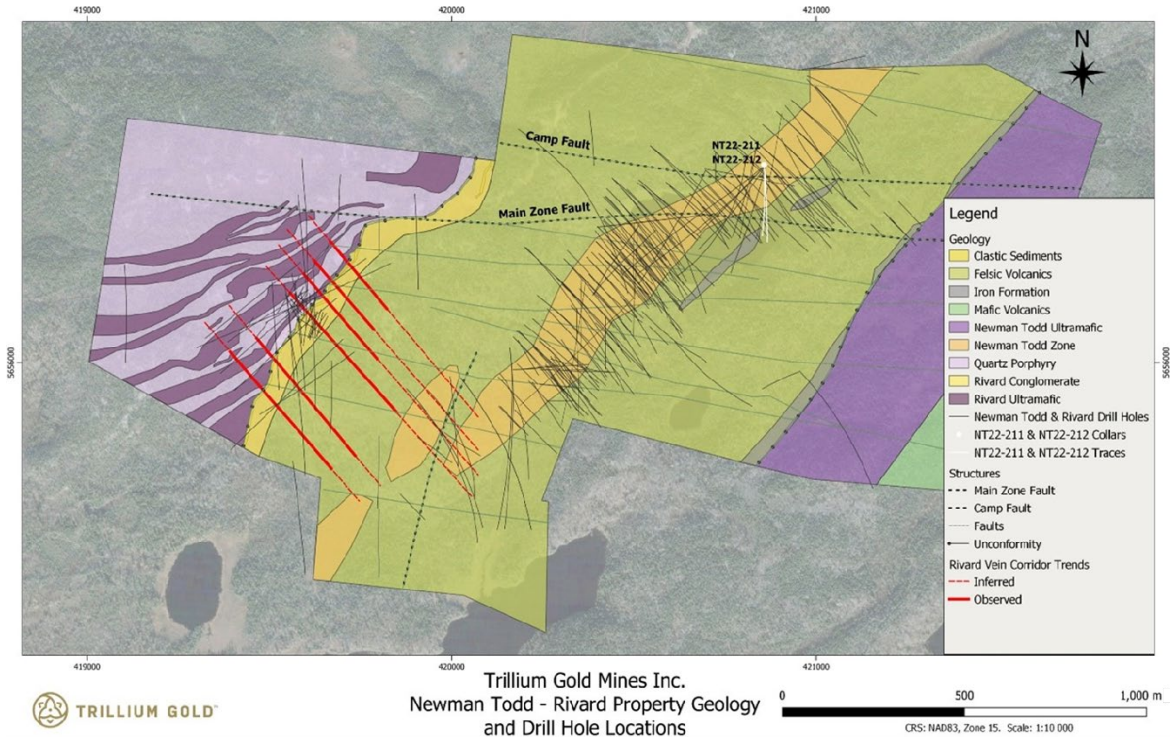


Figure 31. Plan view of drill-holes NT22-211 and NT22-212, Newman Todd and Rivard properties, Trillium Gold Mines Inc.. The east-trending structures of the Camp fault and Main Zone fault are noted (Trillium Gold Mines Inc., news release, November 9, 2022).

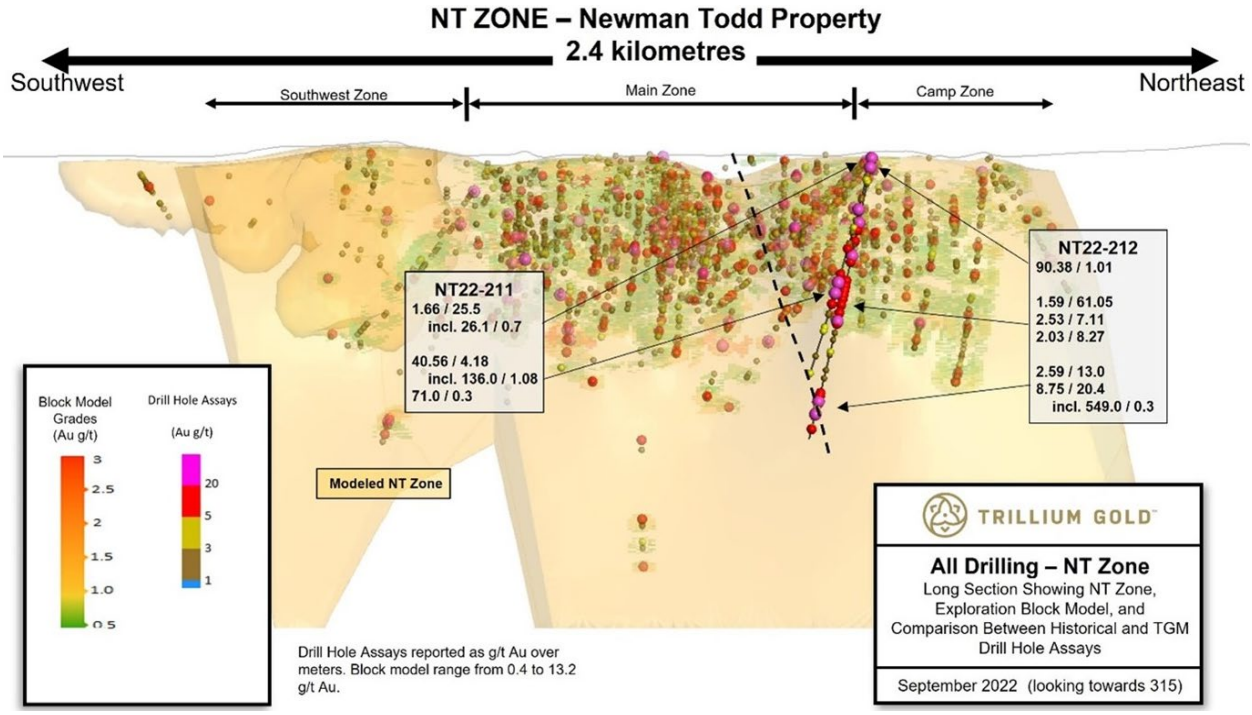


Figure 32. Long section view (looking northwest) showing the Trillium Gold Mines Inc. NT zone model, exploration block model, historical results, and highlights of the significant intersections from drill-holes NT22-211 and NT22-212 (Trillium Gold Mines Inc., news release, November 9, 2022).

Table 17. Highlights from the 2022 drilling across the Trillium Gold Mines Inc. Newman Todd and Rivard properties (Trillium Gold Mines Inc., news release, November 9, 2022).

Drill Hole	From (m)	To (m)	Width (m)	Gold (g/t)
NT22-207	51.85	55.7	3.85	4.12
includes	51.85	52.5	0.65	17.2
NT22-211	6.2	31.7	25.5	1.66
includes	9.3	10	0.7	26.1
and	132.4	133.4	1	27.8
and	307.47	311.65	4.18	40.56
includes	309.11	309.41	0.3	214
includes	309.41	310.19	0.78	106
and	334.28	334.58	0.3	71
NT22-212	30.64	31.65	1.01	90.38
includes	31.15	31.65	0.5	182
and	159	167.94	8.94	2.39
includes	160.5	161.59	1.09	17.22
includes	161	161.59	0.59	23.1
and	237.22	249.37	12.15	0.87
includes	238.76	239.06	0.3	24.2
and	392.84	401.11	8.27	2.03
includes	393.34	393.64	0.3	24.6
and	574.5	587.5	13	2.59
includes	584	584.5	0.5	18.6
and	596.1	616.5	20.4	8.75
includes	614.04	614.34	0.3	549
RV22-39	340.17	347.1	6.93	3.4
includes	346	347.1	1.1	17.6
RV22-40	32.85	40.8	7.95	2.79
includes	36.5	37.25	0.75	25.2
and	176.53	176.9	0.37	24.8

Westmount Minerals Corp. (www.westmountminerals.com; *see* Figure 8a, locations 64 and 65) has optioned 2 properties, Otatakan and Pilot East, to explore for lithium. The properties cover an area of 5002 ha and are within the English River Subprovince. The company plans to start mapping and sampling the properties in the future (Westmount Minerals Corp., news release, October 12, 2022).

West Red Lake Gold Mines Ltd. (https://westredlakegold.com; *see* Figure 8a, location 66) planned an initial spring–summer drill program with a follow-up program in the fall targeting the Porphyry Hill zone, located 300 m southeast of the Rowan Mine gold deposit. The company also planned a channel sampling program at zone 104D, near the Rowan Mine shaft to define any high-grade gold material that exists at surface for potential extraction (West Red Lake Gold Mines Ltd., news releases, April 4, and June 20, 2022). A new NI 43-101 technical report was released, effective October 31, 2022, which included an updated mineral resource at the Mount Jamie and Rowan properties (Table 18) (Kita 2022). Shareholders voted to amalgamate the company with DLV Resources Ltd. and change its previous name of West Red Lake Gold Mine Inc. to West Red Lake Gold Mines Ltd. (West Red Lake Gold Mines Ltd., news releases, November 11, and December 30, 2022); the name change was effective January 5, 2023.

Table 18. West Red Lake Gold Mines Ltd. mineral resource estimate (NI 43-101 compliant), including Mount Jamie and Rowan properties, as of October 31, 2022 (Kita 2022).

Mount Jamie	Tonnes	Grade (g/t)	Gold (ounces)
Indicated Resource	35 000	15.2	17 100
Inferred Resource	116 600	7.5	28 100
Rowan	**Tonnes**	**Grade (g/t)**	**Gold (ounces)**
Inferred Resource	2 790 700	9.2	827 462

Mineral resource cut-off grade is 3.8 g/t Au.

Xplore Resources Corp. (www.xploreresources.com; *see* Figure 8a, location 67) announced results from the October 2021 field season at their Upper Red Lake property, including till and rock sampling. A total of 19 till and 7 rock samples were collected from 3 target areas (C1, C2 and C3). The C1 target coincides with an east-trending magnetic high and a lithological contact, whereas the C2 and C3 targets may be the extension of Prosper Gold's Golden Corridor. Results from the till sampling have shown 60% of gold grains collected were classified as pristine and modified, suggesting a nearby source of gold. As well, a sample returned a concentrate grade of 7834 ppb Au. The company plans to complete a detailed till sampling grid over a 2.5 km strike length at the C1 target to identify potential drill targets (Xplore Resources Corp., news release, March 24, 2022).

DISTRICT STAFF AND ACTIVITIES

In 2022, the Red Lake Resident Geologist's staff comprised Paul Malegus, *P.Geo.,* Regional Resident Geologist; Colleen Kurcinka, District Geologist (Acting). Colleen joined the Red Lake office in an acting role in September. Other Regional Office staff who supported the District include Rosey Wilson, Administrative Assistant; Thérèse Pettigrew, *P.Geo*., Mineral Inventory Compilation Geoscientist; Genevieve Dorland, GIS Data Specialist; Catherine Daniels, *P.Geo.*, Land Use Planning and Policy Coordinator; Sarah Ferguson, *P.Geo.*, Regional Land Use Geologist; and Mathieu Levesque, Indigenous Geoscience Liaison.

With the restrictions easing completely from the COVID-19 pandemic highs, staff at the Resident Geologist Program (RGP) conducted their first full field season since the pandemic began in 2020. Over the year, staff conducted 17 visits in the field to active and inactive properties and core shacks across the Red Lake District. The office in Red Lake was now fully open to the public during regular work hours, although staff occasionally worked remotely. With the office open to the public, clients could access

physical copies of records, historical documents, assessment reports, etc. In addition, the Red Lake staff communicated with approximately 35 clients continually throughout the year, including a mixture of in-person visits, electronically and virtually. Paul Malegus conducted a field trip for BTU Metals Corp. staff on July 11, 2022, across the Red Lake greenstone belt. Lastly, in October, Paul Malegus and Colleen Kurcinka cleaned selected outcrops that are part of the Red Lake RGP Field Trip Guide.

Paul Malegus continued his active participation in the Red Lake branch of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM). During the AGM on October 26, 2022, Paul Malegus was elected as Chair for the Red Lake branch. As the representative for the RGP, Paul Malegus presented at the CIM Exploration Roundup in Red Lake on June 27, 2022, providing an update on mineral exploration activity in the Red Lake District. As well, the following individuals presented at the exploration roundup:

- Caroline Pienaar, Senior District Geologist, First Mining Gold Corp.
- Allan Bieber, Senior Exploration Geologist, Evolution Mining Ltd.
- Rick Greenwood, Exploration Manager, Kinross Gold Corporation
- Garth Drever, Vice-President Exploration, Frontier Lithium Inc.
- Samuel Lewis, Senior Project Geologist, Trillium Gold Mines Inc.

A field trip for the exploration roundup was conducted at the Kinross Gold Corporation Great Bear project core library.

On 3 separate occasions, Paul Malegus and Darla Bennett (Indigenous Geoscience Liaison) conducted virtual presentations on Critical Minerals. On March 3, 2022, the 2 staff made presentations to Mineral Development Advisors and Community Communications Liaison Officers; on April 14, 2022, presented during the OGS Project Pulse Spring 2022 Seminar; and on April 16, 2022, presented virtually to a grade 5 class in Thunder Bay, Ontario. Paul Malegus gave the “Exploration, Mining and Resident Geologist Program Activity Update for the Red Lake and Kenora Districts” presentation during the OGS Virtual Showcase 2022 on October 27, 2022.

Lastly, the Red Lake RGP office participated in 2 pan-provincial projects. The first project was the “Identification of Fertile Parent Granitoid Units in the Superior Province of Ontario” (Cundari 2022). Sampling for this program to identify fertile parent granites targeted granites primarily in the English River Subprovince and selected locations near the boundary between the Uchi and English River subprovinces east of Highway 105. While the other project was “Catching it by the Tailings: An Introduction to the Ontario Geological Survey Critical Minerals Mine Waste Sampling Project” (Bennett 2022). Sampling occurred at the South Bay Mine tailings site, with a total of 16 samples collected. Results from both projects will be released in a future publication.

Drill Core Storage Site

The Red Lake District remote diamond-drill core storage compound is located 6 km south of the Municipality of Red Lake on Highway 105. The Red Lake Resident Geologist’s office operates the compound as a self-serve facility. The Kenora Drill Core Library houses an additional 14 529.9 m of diamond-drill core from the Red Lake District. In 2022, Trillium Gold Mines Inc. visited the Red Lake diamond-drill core storage site.

PROPERTY EXAMINATIONS

Table 19 lists the property visits conducted by staff in 2022 in the Red Lake District. Locations, keyed to the property numbers, are shown in Figure 33.

Table 19. Property visits conducted by the Red Lake District Geologist and staff in 2022 (keyed to Figure 33).

Number	Client – Occurrence
1	Critical Resources Ltd. - Mavis Lake*
2	University of Michigan Tour – Highway 105 metasedimentary rocks
3	Mackenzie Bay Road
4	BTU Metals Corp. – RGP Red Lake Greenstone Belt tour
5	Vermilion Bay Road granites
6	Sharpe Lake batholith
7	Avalon Advanced Minerals Inc. – Separation Rapids*
8	A. Mowat - Big Mack Pegmatite*
9	Kinross Gold Corporation – Great Bear project core shack tour
10	Frontier Lithium Inc. – PAK Lithium project
11	Trout Bay prospect
12	Red Lake Greenstone Belt mapping compilation
13	Evolution Mining Ltd. – Red Lake Operations surface tour
14	Quibell*
15	South Bay Mine
16	Bounty Gold Corp. / Last Resort Resources Ltd. – McKenzie Bay pegmatite[PE]
17	Dixie mafic and intermediate rocks

[PE] *described in "Property Examinations", this report.*
** outside Red Lake District.*

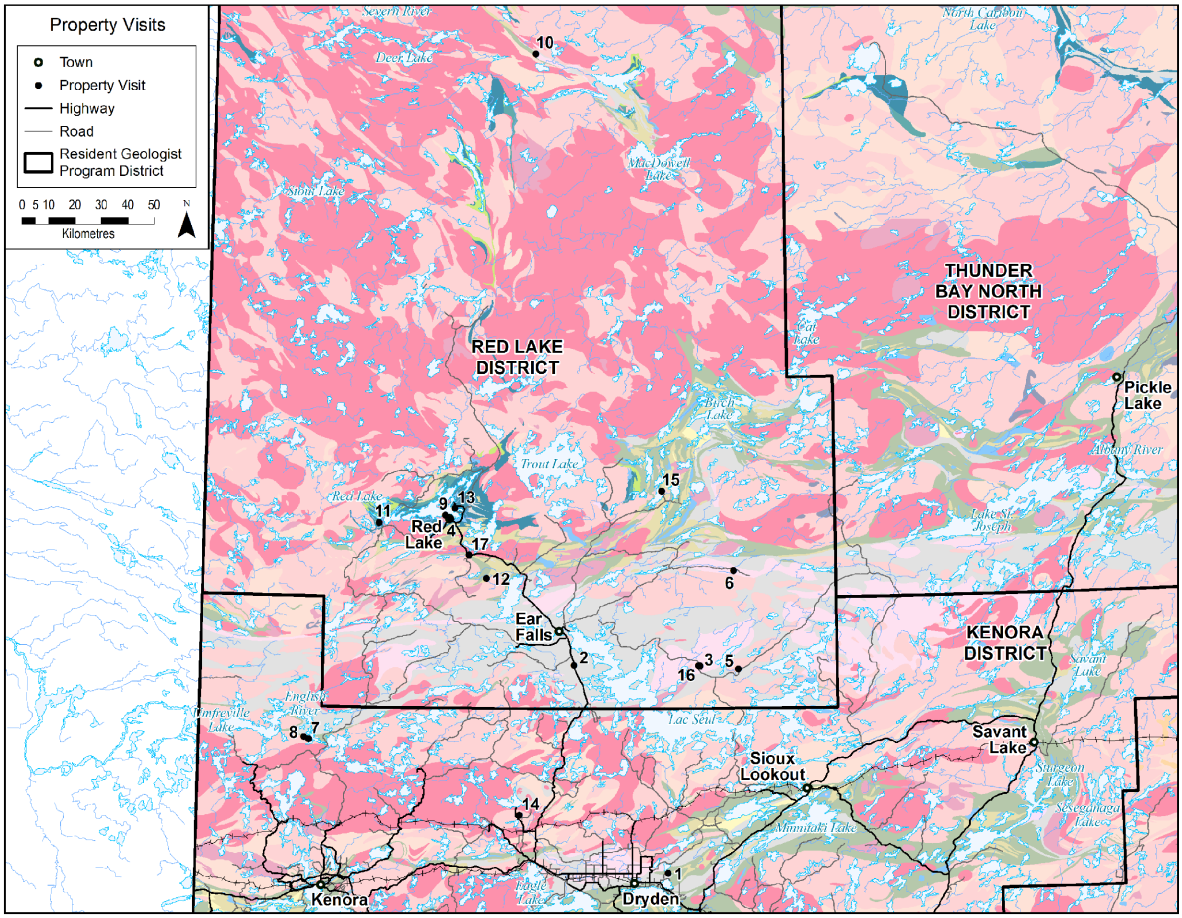


Figure 33. Property visits and field examinations conducted in the Red Lake District in 2022, with locations listed in Table 19 (*modified from* Ontario Geological Survey 2011).

McKenzie Bay (P.M. Malegus)

LOCATION AND ACCESS

The McKenzie Bay property is a potential lithium-cesium-tantalum (LCT) pegmatite–bearing property that covers an area of 6171 ha (61.7km^2; as of January 11, 2023) and consists of 301 claim cells. The claims are held on a 50–50 basis by Bounty Gold Corp. and Last Resort Resources Ltd., at the time of publication. While most of the claims are within the Wapesi Lake and Clace Lake areas, sections fall within the Broad Lake and Maskerine Lake areas (Figure 34). The property is approximately 52 km southeast of the Township of Ear Falls, Ontario. Access is available by travelling east along Highway 657 and then using McKenzie Bay Road to travel southeast to access the property. Sections of the property have been cleared as a result of forestry activity in the area. The mining cell claims in Figure 34 show the property size as of January 18, 2023. While conducting the property examination on September 9, 2022, the property did not extend to include sample 2022PM055, as it does now.

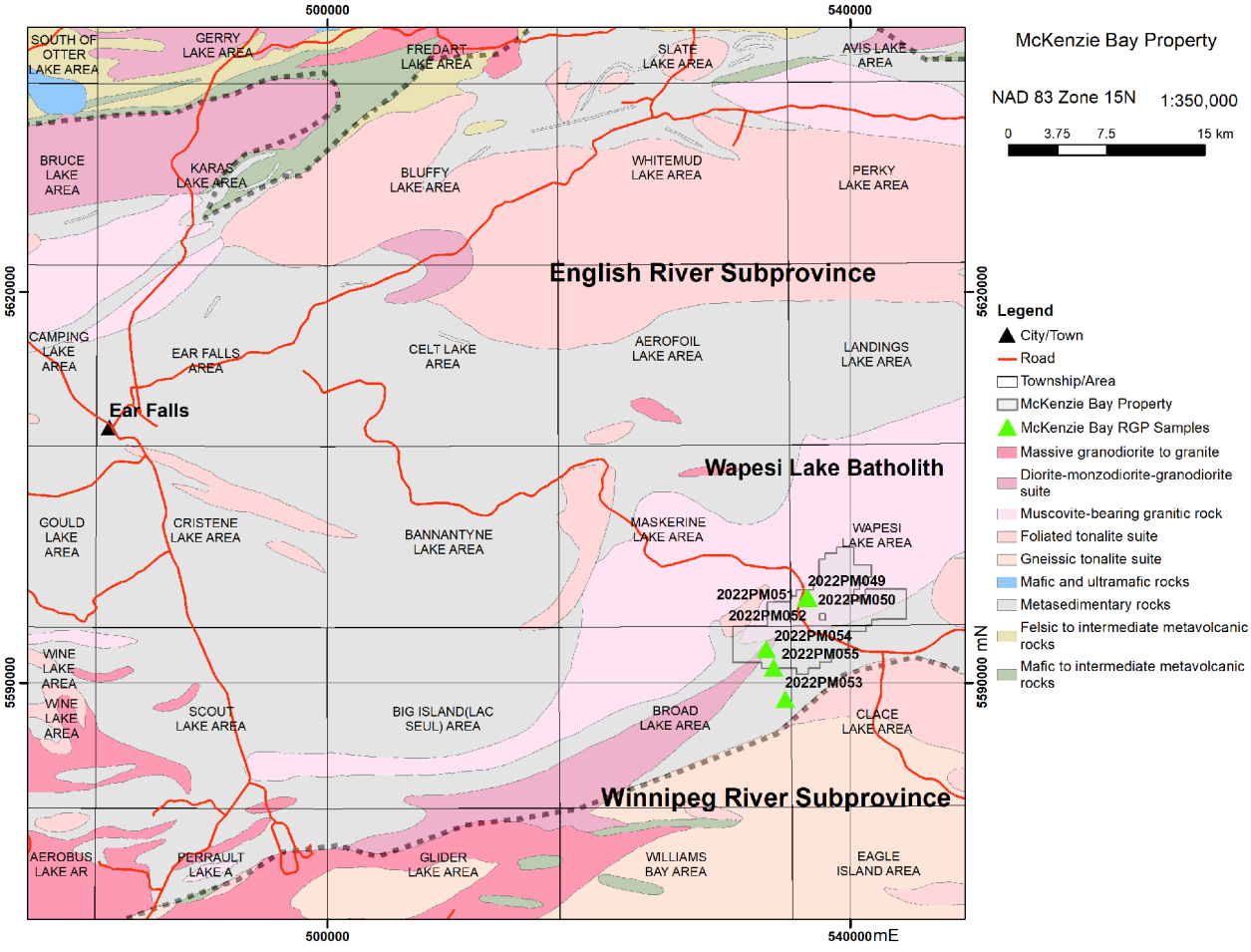


Figure 34. Location map of McKenzie Bay property, near the boundary between the English River and Winnipeg River subprovinces. Property claim is outlined and shows the location of samples collected by the RGP (*modified from* Ontario Geological Survey 2011).

GEOLOGY AND MINERALIZATION

The McKenzie Bay property is located within the English River Subprovince, adjacent to the boundary with the Winnipeg River Subprovince. The east-striking English River Subprovince includes many granitoid, tonalite, metasedimentary and trace metavolcanic rocks. Metasedimentary rocks are typically composed of migmatites with a paleosome of either wacke or pelite (Breaks and Bond 1993). With an age range of 2760 to 2650 Ma, the English River Subprovince hosts some of the youngest rocks within the Red Lake District. Metamorphic grade throughout the English River Subprovince typically increases from north to south (Breaks and Bond 1993). Additionally, there are significant areas near the boundary with the Winnipeg River Subprovince with granulite-grade metamorphism. Although historically, the English River Subprovince has been interpreted as an interarc sedimentary basin, more recent interpretations believe it was formed as an accretionary prism (Breaks 1991). Select granitoids in the English River Subprovince have been labelled as two-mica granites with the potential to be peraluminous (Breaks 1991).

The two-mica granites throughout the English River Subprovince have been the focus of recent exploration activity in the Red Lake District. Two-mica granites can be classified as S-type peraluminous granites typically associated with LCT pegmatites. Discovery of an LCT pegmatite often begins with the discovery of a fertile granite. Fertile granites are the peraluminous parental granite to an LCT pegmatite, commonly found within 10 km of a fertile granite over an area of 10 to 20 km^2 (Breaks, Selway and Tindle 2003).

Various characteristics are associated with fertile granites and LCT pegmatites, which can be examined by completing bulk whole rock and mineral composition analyses. The first characteristic is the degree to which a granite is peraluminous, which is calculated by the elemental ratio of A/CNK (aluminum/calcium, sodium and potassium: $Al_2O_3/(CaO + Na_2O + K_2O)$). For example, if the molecular ratio A/CNK = 1.0 to 1.1, the granite would be considered mildly peraluminous, but if A/CNK > 1.1, then the granite is strongly peraluminous (Breaks, Selway and Tindle 2003). The second characteristic is the degree of fractionation within a granite, which typically increases within a fertile granite toward its outer edges (Figure 35). Elemental ratios to assess the degree of fractionation include Mg/Li, K/Rb, K/Cs and Nb/Ta. Typical ratio ranges for fertile granites include Mg/Li = 1.7 to 50, K/Rb = 42 to 270 and K/Cs = 1600 to 15 400 (Černý 1989). Generally, the lower the elemental ratio value, the higher the degree of

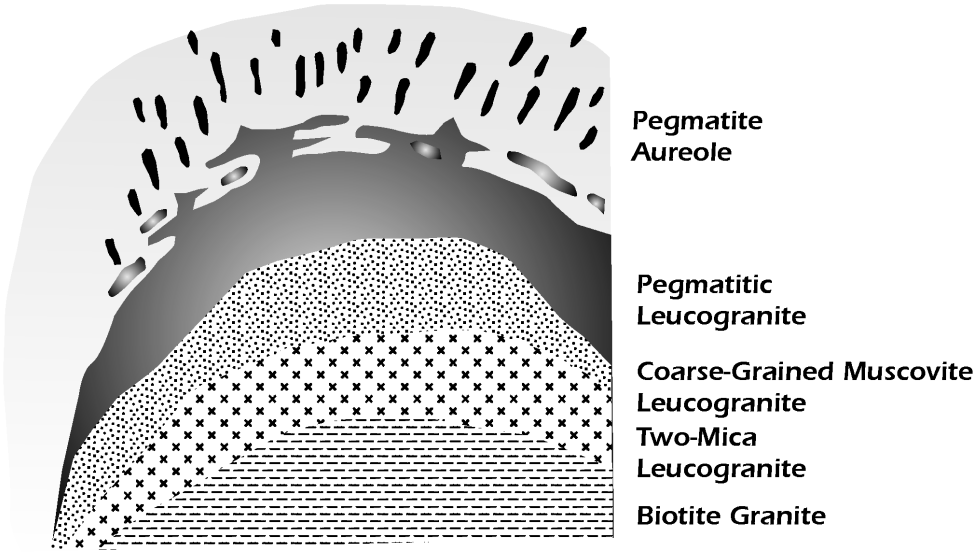


Figure 35. Fractionation pattern of typical fertile granite, leading toward LCT pegmatites (*from* Breaks, Selway and Tindle 2003).

fractionation in the granite (Breaks, Selway and Tindle 2003). Reviewing Paterson et al. (2020) shows how to complete the calculation for A/CNK. Specific minerals are associated with fertile granites, including potassium feldspar, muscovite, garnet, tourmaline, apatite and beryl. Breaks, Selway and Tindle (2003) describe in detail the specific elemental ratios or elevated elements to look for in minerals, such as potassium feldspar becoming enriched in rubidium with a value >1000 ppm Rb in a fertile granite.

The McKenzie Bay property lies along the southeastern contact of the Wapesi Lake batholith and metasedimentary rock; diorite intruded the area now at the southwest of the property boundary. Mapping by Breaks, Bond and Westerman (1993) identifies the Wapesi Lake batholith as a diatexitic metasedimentary migmatite (S-type granitoid rock), with the rocks adjacent to the batholith composed of metatexitic metasedimentary migmatite and foliated diorite and quartz diorite.

When the RGP staff visited the property, 7 samples were collected (Figure 36). Descriptions of the samples collected and their locations are provided in Table 20. The first 4 samples were collected from multiple pegmatites in the Wapesi Lake batholith. Location 2022PM049 was the first area sampled, which included a swarm of pegmatites ranging in size from 10 cm to 3 m. Next, samples 2022PM050, 2022PM051 and 2022PM052 were collected at a large outcrop of pegmatite. This pegmatite was sampled along the contact with the surrounding granitoid. There was a significant abundance of coarse-grained

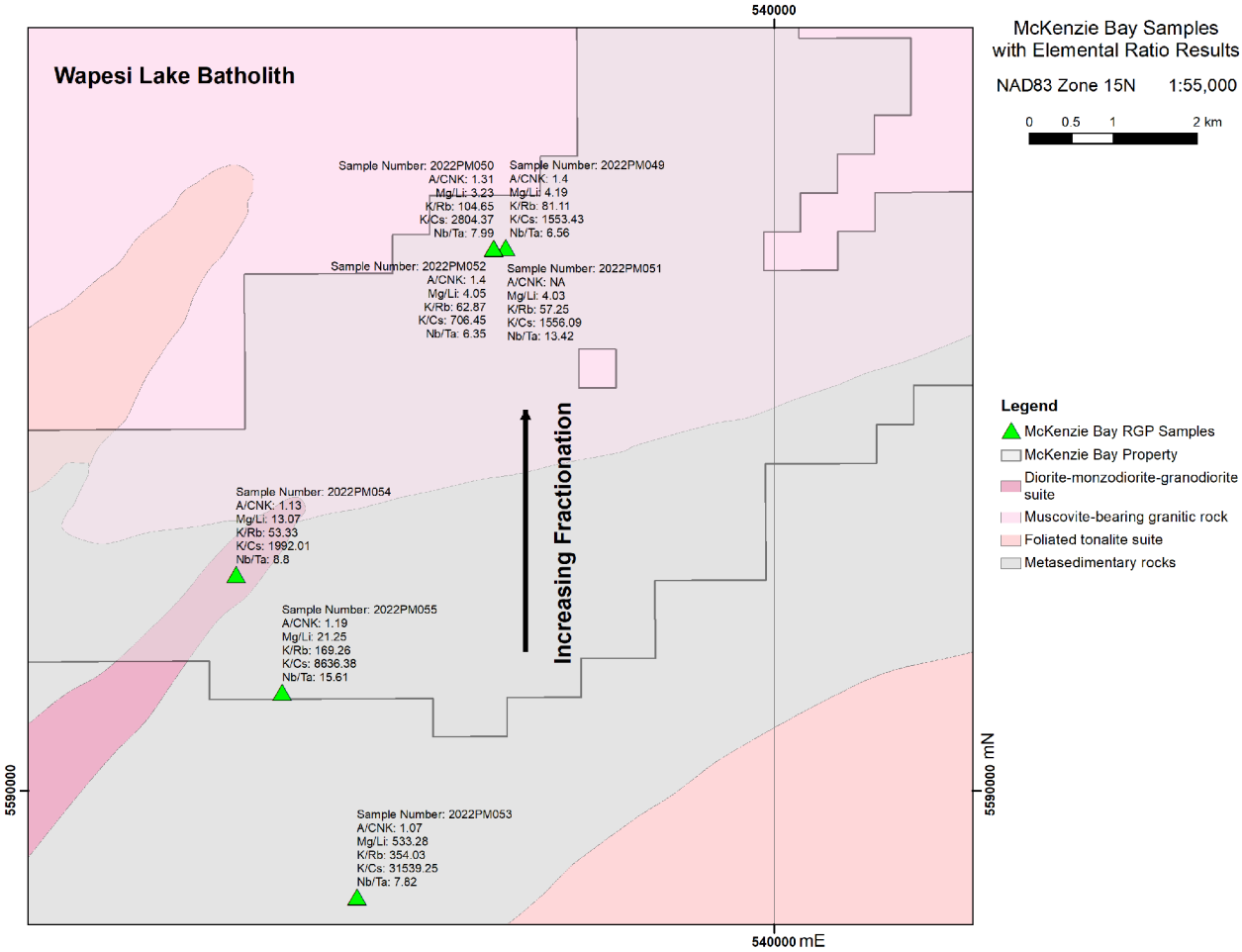


Figure 36. Map showing the locations of samples collected from the McKenzie Bay property. The elemental ratio data indicate that the degree of fractionation increases to the north, that is, toward the interior of the Wapesi Lake batholith (*modified from* Ontario Geological Survey 2011).

muscovite books throughout the pegmatite, composing up to 20% of the rock. Additionally, up to 2% subhedral garnet was observed throughout the pegmatite, typically 1 to 2 cm in diameter. Black tourmaline was rare in the pegmatite, but was observed as large clumps (Photo 1A). The contact between the pegmatite and granitoid strikes 035° and dips 88°. Muscovite books were sampled (sample 2022PM051) to determine the degree of fractionation of the specific pegmatite.

The final 3 samples were collected outside the Wapesi Lake batholith. According to the mapping by Breaks, Bond and Westerman (1993), sample 2022PM054 is in the tail of a foliated diorite or quartz diorite. Photo 1B shows what appears to be a leucogranite, with narrow pegmatites noted. Trace tourmaline and garnet were identified in the outcrop, with large muscovite books also present. Samples 2022PM053 and 2022PM055 were collected from a package of metasedimentary rocks. Sample 2022PM053 is from a pink granitoid with green mineral (presumably apatite) and no muscovite present, located outside the McKenzie Bay property. Sample 2022PM055 is a leucogranite sampled along the contact with metasedimentary rocks, with pervasive muscovite books. A white coarse-grained pegmatite, striking 136°, was noted at the location of sample 2022PM055, but the sample only contains the surrounding leucogranite. Unlike the other sites visited during this property examination, the leucogranite at location 2022PM055 has significantly more biotite.

Analyses of the samples examining the A/CNK elemental ratio show that samples 2022PM049, 2022PM050 and 2022PM051 are strongly peraluminous, whereas samples 2022PM053, 2022PM054 and 2022PM055 are moderately peraluminous. In addition, elemental ratios of Mg/Li, K/Rb, K/Cs and Nb/Ta were calculated for all the samples, showing that the pegmatites and granites are fractionated to varying degrees. However, the most highly fractionated samples are 2022PM049, 2022PM050 and 2022PM051, which are all from pegmatites. Therefore, because of the fractionation in the granitoids and pegmatites, it can be postulated that this is a reasonable area to explore for LCT pegmatites. Although the samples (2022PM053, 2022PM054 and 2022PM055) of granitoids outside of the Wapesi Lake batholith show that they are fractionated, it is nowhere to the same degree as the samples from pegmatites within the Wapesi Lake batholith.

Sample 2022PM051 is from muscovite books from the pegmatites at the McKenzie Bay property. Analyses show that the muscovite from the pegmatite is not an LCT or rare-element pegmatite, but still returned promising values. The muscovite sample returned a value of 50.518 ppm Cs, which is in the range for rare-element pegmatites. As well, the typical values for rare-element pegmatites for Li, Rb and Ta were all lower in sample 2022PM051 (Table 22; >1000 ppm Li, >10 000 ppm Rb and >65 ppm Ta, respectively (Breaks, Selway and Tindle 2003).

Nevertheless, the results are promising based on the elemental ratios for the degree of fractionation from whole rock analysis and examining the enrichment of rare-elements in muscovite. Finally, the degree of fractionation increases toward the north, with sample 2022PM053 being the least fractionated of all the samples collected (*see* Figure 36). All elemental ratios, major, trace and rare earth element data from the samples collected during this property visit are provided in Tables 20, 21, 22 and 23.

Finally, the Wapesi Lake batholith was last mapped by Breaks et al. (1976b); subsequently, 2 modern geophysical (magnetic gradiometer and gamma-ray spectrometry) surveys were completed by the OGS, both of which included parts of the area of the batholith. After examining the data from both surveys (OGS (2017a, 2017b), the Wapesi Lake batholith lithological contacts appear as though they could be shifted toward the northwest, which is the location of a magnetic high and away from the magnetic low (Figure 37). Future mapping by the OGS could examine if the current lithological contacts (*from* Ontario Geological Survey 2011) are in the correct location.

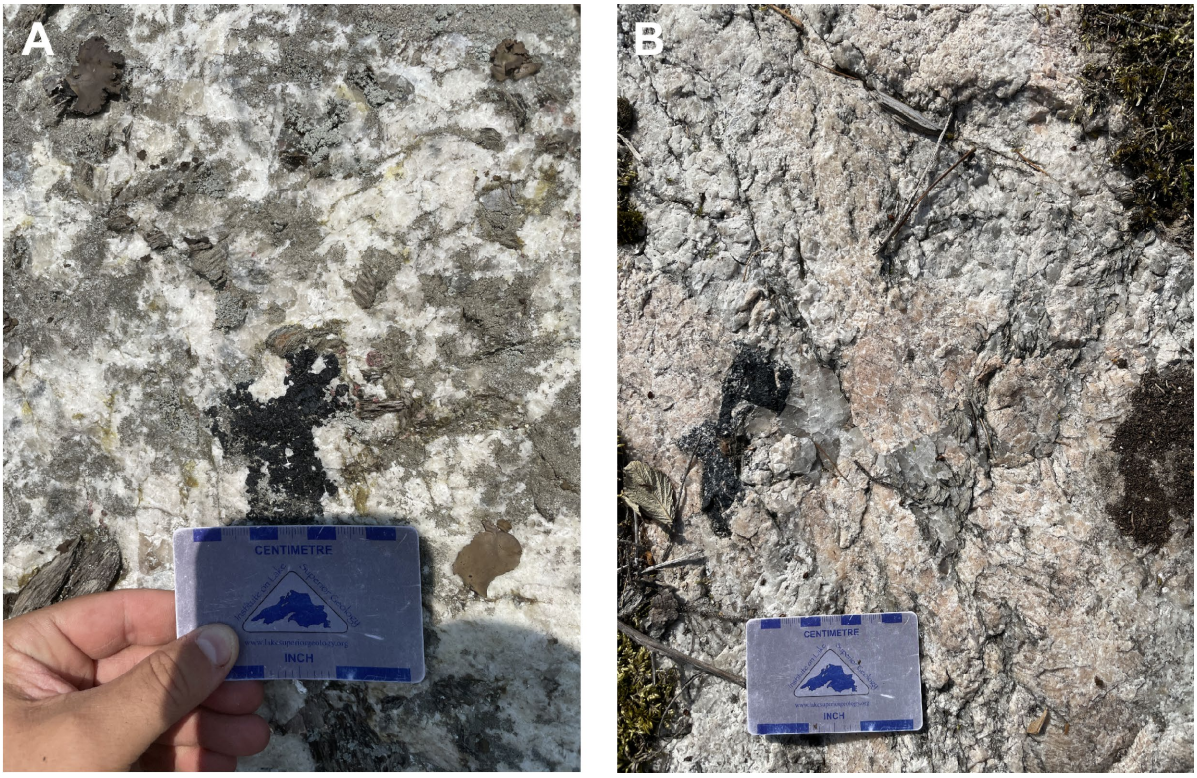


Photo 1. Photographs of sample collection sites on the McKenzie Bay property. **A)** Pegmatite from which samples 2022PM050, 2022PM051 and 2022PM052 were collected, with a large clump of black tourmaline, sporadic garnets and abundant muscovite books. **B)** Leucogranite from which sample 2022PM054 was collected. Note the large tourmaline crystal above the scale and muscovite books.

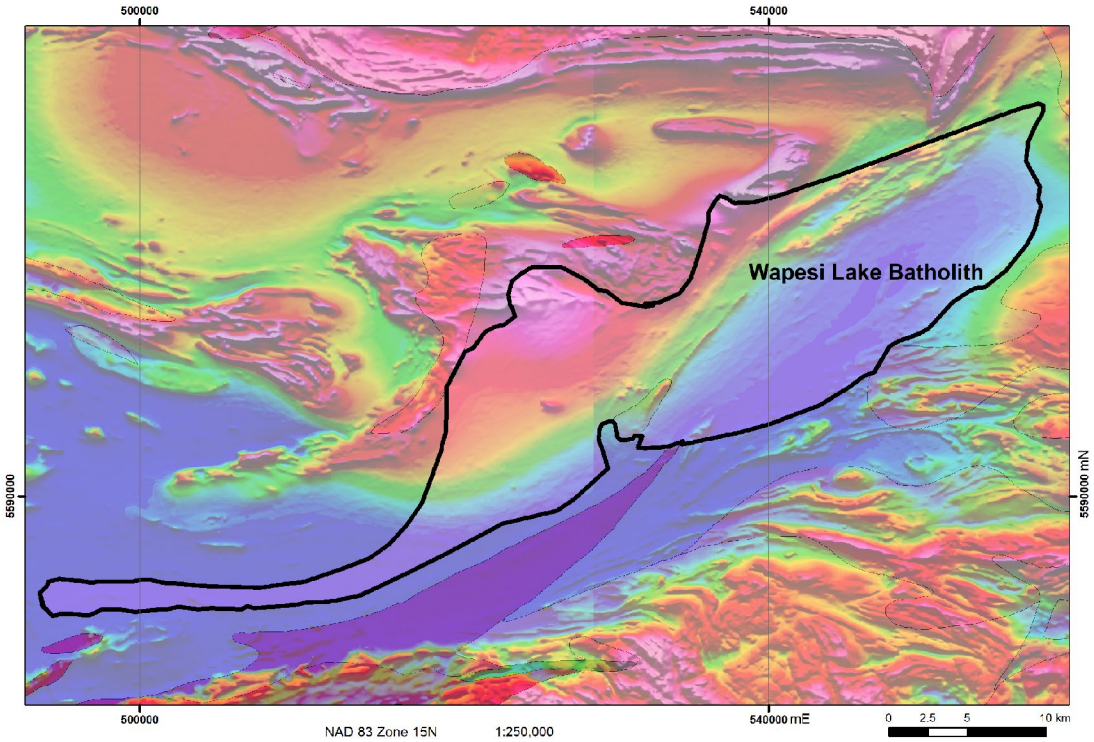


Figure 37. Map showing the outline of the Wapesi Lake batholith (*from* Ontario Geological Survey 2011), overlain on data from the Lac Seul east area and Separation Lake area magnetic surveys (*modified from* Ontario Geological Survey 2017a, 2017b).

Table 20. Samples, with descriptions and elemental ratio results, collected from the McKenzie Bay property and adjacent area in 2022 by the staff of the Red Lake RGP office.

Sample No.	Township/Area	Easting	Northing	Description	A/CNK	Mg/Li	K/Rb	K/Cs	Nb/T
2022PM049	Wapesi Lake Area	536796	5596510	White, pegmatite composed of feldspar, 20% quartz medium to coarse grained, with 15% pervasive muscovite books, 3% garnet in pegmatite but not in sample	1.40	4.19	81.11	1553.43	6.56
2022PM050	Wapesi Lake Area	536659	5596496	White to light pink pegmatite, graphic quartz, pegmatite composition is approximately 70% feldspar, 20% quartz and 10% muscovite books	1.31	3.23	104.65	2804.37	7.99
2022PM051	Wapesi Lake Area	536653	5596497	Muscovite books	NA	4.03	57.25	1556.09	13.42
2022PM052	Wapesi Lake Area	536653	5596497	Pegmatite composed of 50% feldspar, 25% quartz, 20% muscovite books, trace apatite, trace tourmaline and trace garnet	1.40	4.05	62.87	706.45	6.35
2022PM053	Broad Lake Area	535024	5588724	Pink granitoid, composed of 60% feldspar, 25% quartz, 5% biotite and 1–2% apatite?	1.07	533.28	354.03	31539.25	7.82
2022PM054	Broad Lake Area	533578	5592587	Light white/pink leucogranite, composed of 50% feldspar, 25% muscovite bands and books and 25% quartz. Garnets and tourmaline noted in rock, not in sample	1.13	13.07	53.33	1992.01	8.80
2022PM055	Broad Lake Area	534131	5591176	White-pink leucogranite, composed of 50–60% feldspar, 30% quartz, 10–15% biotite and 2–5% muscovite. Equigranular dark-grey quartz, fine to medium grained biotite pervasive throughout	1.19	21.25	169.26	8636.38	15.61

***Abbreviation**: NA = not available.*

EXPLORATION HISTORY

Across the entire property and area, there has been almost no historical or modern-day exploration activity on the McKenzie Bay property. Approximately 12 km toward the northeast of the property, the only assessment report work completed was by Gabrial (2000) and Buckner (2003), who both evaluated a small area for dimension stone potential.

The OGS has completed sporadic work in the area over the years. Mapping was completed by Breaks et al. (1976b, 1976c) and a compilation map by Breaks, Bond and Westerman (1993). The RGP has completed work at the McKenzie Bay granite, examining its potential for LCT pegmatites, which included sampling and prospecting by Lichtblau et al. (2002, 2008) and Paterson et al. (2020). Results from 2002 and 2020 sampling returned values of A/CNK ranging from 1.09 to 1.26. At the same time, Lichtblau et al. (2002) reported an Mg/Li of 11.9.

Table 21. Results of major element analyses for samples collected at the McKenzie Bay property.

Sample No.	Al_2O_3	BaO	CaO	Cr_2O_3	Fe_2O_3	K_2O	MgO	MnO	Na_2O	P_2O_5	SiO_2	TiO_2	Total	LOI
Units	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %	wt. %
Detection Limit:	*0.02*	*0.004*	*0.006*	*0.002*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.02*	*0.04*	*0.01*		
2022PM049	17.21	0.005	0.261	0.004	0.61	5.43	0.08	3.62	3.62	0.334	70.78	0.04	99.33	0.9
2022PM050	18.18	0.014	0.067	0.004	0.22	8.38	0.04	2.88	2.88	0.226	68.81	0.03	99.43	0.57
2022PM051	33.6	<0.004	0.017	<0.002	3.49	9.47	0.54	0.68	0.68	0.048	44.65	0.08	98.47	5.38
2022PM052	16.01	<0.004	0.433	0.004	0.86	1.53	0.13	5.49	5.49	0.23	73.72	0.006	99.49	1
2022PM053	18.87	0.179	1.54	0.004	1.36	9.7	0.45	2.61	2.61	0.984	62.51	0.13	99.25	0.86
2022PM054	14.66	<0.004	0.394	<0.002	0.63	1.4	0.09	6.5	6.5	0.36	74.63	0.04	99.49	0.77
2022PM055	14.57	<0.004	0.361	<0.002	0.55	4.97	0.1	3.79	3.79	0.177	74.33	0.04	99.49	0.6

Analyses by Geoscience Laboratories, Ministry of Mines, Sudbury, Ontario. All by XRF (X-ray fluorescence).

Table 22. Results of trace element analyses for samples collected at the McKenzie Bay property.

Sample No.	Be	Cs	Ga	In	Li	Mo	Nb	Rb	Sn	Sr	Ta	W	Zn	Zr
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit:	*0.024*	*0.018*	*0.04*	*0.0017*	*0.24*	*0.08*	*0.05*	*0.15*	*0.17*	*1.3*	*0.015*	*0.05*	*4*	*4*
2022PM049	5.131	29.016	27.28	0.0154	115.27	1.21	16.13	555.71	8.71	23.8	2.459	1.84	31	13
2022PM050	1.62	24.805	20.21	0.006	74.7	1.21	5.29	664.69	3.57	33.2	0.662	0.88	15	5
2022PM051	14.139	50.518	>70	0.0838	809.03	0.19	181.49	1373.11	98.47	<1.3	13.51	29.95	183	4
2022PM052	5.455	17.978	32.28	0.0242	193.57	2.26	22.14	202.02	10.7	22.6	3.489	3.75	54	4
2022PM053	0.421	2.553	18.66	0.0148	5.09	0.66	3.72	227.44	4.95	337	0.476	0.48	28	75
2022PM054	5.463	5.834	30.6	0.0416	41.54	0.78	23.48	217.93	15.42	7.8	2.668	3.04	23	14
2022PM055	0.478	4.777	23.28	0.0278	28.38	0.66	10.71	243.758	4.55	10.5	0.686	0.47	23	6

Analyses by Geoscience Laboratories, Ministry of Mines, Sudbury, Ontario. All by ICP–MS (inductively coupled plasma mass spectrometry).

Table 23. Results of rare earth element analyses for samples collected at the McKenzie Bay property.

Sample No.	Ce	Dy	Er	Eu	Gd	Hf	La	Lu	Nd	Pr	Sc	Sm	Tb	Th	Ti	Tl	Tm	U	Y	Yb
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Detection Limit:	*0.17*	*0.04*	*0.04*	*0.008*	*0.04*	*0.09*	*0.09*	*0.005*	*0.11*	*0.019*	*0.17*	*0.05*	*0.009*	*0.027*	*8*	*0.004*	*0.005*	*0.001*	*0.09*	*0.008*
2022PM049	1.96	0.07	0.07	0.038	0.07	0.44	0.74	0.021	0.39	0.141	0.57	0.08	0.011	0.539	114	3.377	0.017	11.82	0.55	0.131
2022PM050	0.92	<0.04	<0.04	0.04	<0.04	0.11	0.24	<0.005	0.12	0.042	0.36	<0.05	<0.009	0.112	79	4.431	<0.005	0.31	<0.09	0.008
2022PM051	<0.17	0.24	0.38	<0.008	<0.04	0.28	<0.09	0.143	<0.11	<0.019	3.74	<0.05	0.017	0.083	439	7.413	0.104	0.15	2.37	1.062
2022PM052	1.72	0.06	<0.04	0.05	0.05	0.15	0.95	0.005	0.4	0.143	1.41	0.08	0.01	0.514	240	1.122	0.005	1.6	0.36	0.036
2022PM053	20.1	7	4.14	0.791	5.27	2.26	7	0.532	13.76	3.034	3.23	4.61	1.035	0.737	740	1.089	0.607	7.19	42.74	3.888
2022PM054	3.3	1.03	0.57	0.015	0.72	0.55	1.41	0.105	1.32	0.384	4	0.57	0.169	1.37	90	1.077	0.103	2.84	6.84	0.756
2022PM055	2.8	0.97	0.6	0.026	0.67	0.24	1.32	0.107	1.11	0.31	1.01	1.01	0.148	1.222	114	1.419	0.101	0.82	6.54	0.782

Analyses by Geoscience Laboratories, Ministry of Mines, Sudbury, Ontario. All by ICP–MS (inductively coupled plasma mass spectrometry).

CONCLUSIONS AND RECOMMENDATIONS

Many criteria suggesting the presence of fertile granites are present throughout the McKenzie Bay property. With a large portion of the property within the Wapesi Lake batholith, there is potential for the unit to host an LCT pegmatite. With the analytical results showing the pegmatites are highly fractionated, the McKenzie Bay property appears to be located in the right geological environment to host an LCT pegmatite. Based on the elemental ratios, the degree of fractionation seems to increase from the south to the north, which could signify exploration work should be concentrated toward the north. Additional work that would benefit the property includes continued prospecting, detailed geological mapping, systematic channel sampling and geochemical analyses of the known pegmatites. Sampling individual minerals of potassium feldspar and muscovite, when large crystals are present, will aid in determining the fractionation of granitic rocks. Finally, sampling the surrounding metasedimentary rocks might reveal geochemical anomalies for targeting LCT pegmatites. All this work will aid in determining the direction of fractionation on the property.

RECOMMENDATIONS FOR EXPLORATION

Lithium-Cesium-Tantalum Pegmatite Exploration Potential Along Possible Continuation of the Bear Head Fault, Favourable Lake Greenstone Belt

Note: The following recommendation is modified from *Kurcinka (2023).*

Lithium plays a critical role in batteries produced for electric vehicles, which are continually increasing in popularity. Lithium-cesium-tantalum (LCT) pegmatites are associated with peraluminous granite plutons and are often found associated with deep faults and subprovince boundaries (Selway, Breaks and Tindle 2005). There are many areas along subprovince boundaries that have yet to be explored for a variety of critical minerals, including lithium, particularly those located in remote northern regions.

The Favourable Lake greenstone belt is located 200 km north of Red Lake, along the boundary between the Berens River Subprovince to the south and the Sachigo Subprovince to the north (Card and Ciesielski 1986). The Bear Head fault in the Favourable Lake greenstone belt has been explored in the eastern portion of the belt for lithium and uranium and contains the Spark and Pakeagama (PAK) lithium pegmatites (Ontario Geological Survey 2022). Currently, the PAK lithium deposit has a measured and indicated open pit resource of 5.9 Mt @ 1.81% Li_2O and an inferred resource of 680 500 t @ 1.75% Li_2O (McCracken et al. 2021); the Spark deposit contains an indicated resource of 14.4 Mt @ 1.4% Li_2O and an inferred resource of 18.1 Mt @ 1.37% Li_2O (www.frontierlithium.com, news release, March 1, 2022). The eastern part of the Favourable Lake greenstone belt was the subject of a previous *Recommendations for Exploration* article on lithium-bearing rare metal pegmatites (Lichtblau 2018). The portion of the belt west of the mapped Bear Head fault has received limited exploration; only 1 assessment file and 2 Ontario Mineral Inventory (OMI) occurrences are on recorded within this area (Table 24; Figure 38).

Table 24. Documented Ontario Mineral Inventory (OMI) occurrences in the western Favourable Lake greenstone belt. Data *from* Ontario Geological Survey (2022).

OMI Identifier	Deposit Name	Deposit Status	Primary Commodity
MDI53E01SW00004	Orlac Reed Lake Mines	Occurrence	Gold, lead, silver
MDI000000000417	Cochram Lake	Occurrence	Molybdenum, copper

The western portion of the Favourable Lake greenstone belt has undergone limited reconnaissance-scale mapping and no detailed mapping (Stone 1998a). The greenstone belt portion of this area comprises the Azure and Setting Net metasedimentary assemblages. The Azure assemblage occurs to the north and consists of conglomerate with lenses of mafic to intermediate tuffaceous flows. The grain size becomes finer toward the Manitoba border. The Setting Net assemblage occurs to the south and consists of clastic sedimentary rocks with mafic to ultramafic volcanic rocks and marble (Stone 1998a, 1998b). The sedimentary units are sandwiched between a biotite tonalite on both the north and south sides, followed by the Varveclay batholith to the north and the Warrington batholith to the south.

Ontario Geological Survey helicopter-borne electromagnetic (EM) and magnetic survey Geophysical Data Set 1085 and Maps 82 919 to 82 949 (Ontario Geological Survey 2018a-g) cover the entire Favourable Lake greenstone belt. Stone (1998a) suggests the Bear Head fault terminates where the Bear Head batholith intruded the Favourable Lake greenstone belt (*see* Figure 38), although the geophysical signature attributed to the Bear Head fault appears to continue farther to the west along the same trend (Figure 39). This could potentially represent a previously unmapped continuation of the fault.

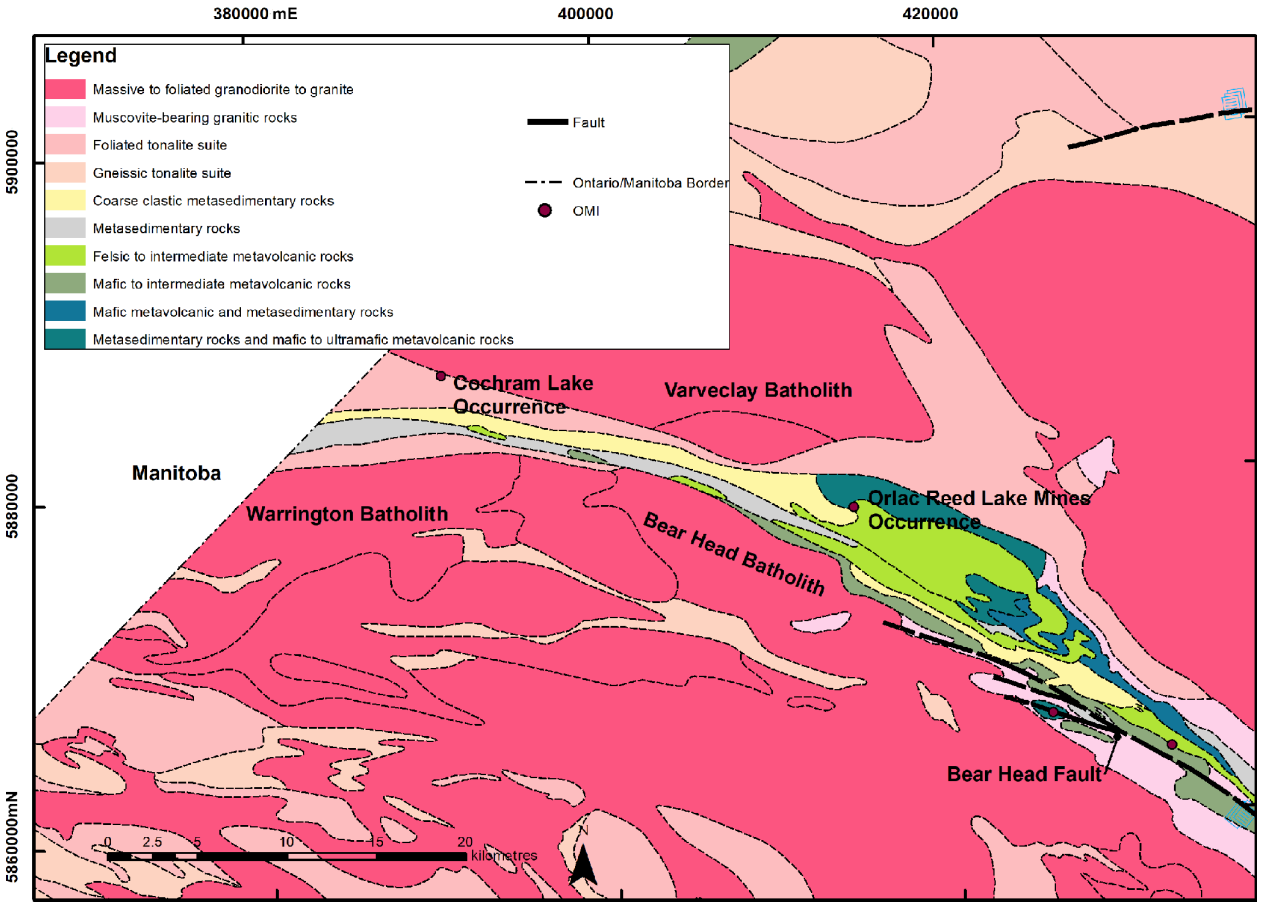


Figure 38. Geology of the western portion of the Favourable Lake greenstone belt (*modified from* Ontario Geological Survey 2011). The Bear Head fault is thought to end where the Bear Head batholith begins to impinge directly on the belt. Universal Transverse Mercator (UTM) co-ordinates in North American Datum 1983 (NAD83), Zone 15.

Recent updates to the Mineral Deposits Database in Manitoba (Rinne 2021) have brought attention to a tantalite, columbite, tourmaline and molybdenite discretionary occurrence noted by Quinn (1960) in the Cobham River–Gorman Lake greenstone belt (equivalent to the Favourable Lake greenstone belt), which is across the provincial border in Manitoba. This occurrence was also noted by Derry and Mackenzie (1931). Tantalite and columbite are rare elements that are present in pegmatites at increased levels of fractionation from a granitic melt (Selway, Breaks and Tindle 2005). The occurrence of tantalite and columbite in the Cobham River–Gorman Lake greenstone belt in Manitoba suggests an increasing fractionation in the area. While there are no discrete "peraluminous" granites mapped in the immediate vicinity of both the recommended area and the Manitoba tantalite occurrence, two-mica granites have been mapped along the Bear Head fault to the east (Stone 1998b).

The western portion of the Favourable Lake greenstone belt warrants more exploration for LCT pegmatites as it represents an underexplored area along the same subprovince boundary as the Spark and PAK lithium pegmatites. If the Bear Head fault does continue into this area, it may represent a deep crustal fault along a subprovince boundary, which can be an ideal location for LCT pegmatite exploration. The presence of a nearby tantalum and columbite discretionary occurrence in Manitoba supports the potential for a more highly fractionated melt and the concentration of incompatible elements.

At the time of writing, there were no active claims in this area.

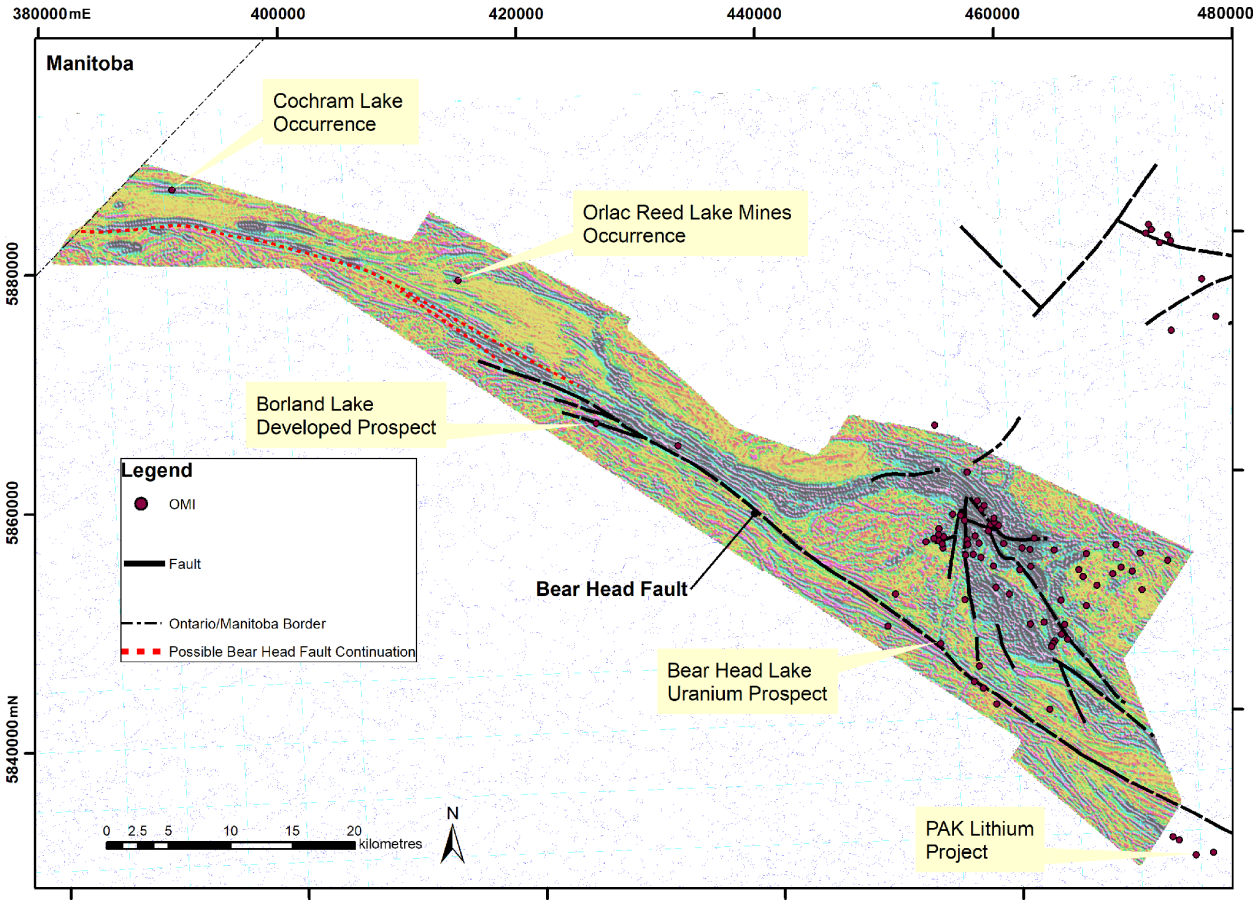


Figure 39. The second vertical derivative of the residual magnetic field in the Favourable Lake greenstone belt (*modified from* Ontario Geological Survey 2018a, 2018b), with the mapped Bear Head fault shown as black dashed lines. The geophysical survey highlights the potential continuation (red dashed line) of the Bear Head fault farther to the west of its current terminus. Universal Transverse Mercator (UTM) co-ordinates in North American Datum 1983 (NAD83), Zone 15.

Zinc with a Splash of Germanium and Indium in the Red Lake District

Note: The following recommendation is modified from *Malegus (2023).*

Critical minerals continue to be a main focus of the exploration and mining industry in Ontario and Canada. While the Red Lake District is historically renowned for its gold endowment, there is potential for deposits hosting significant critical minerals. This Recommendation for Exploration will focus on zinc deposits and occurrences within the Red Lake and Birch–Uchi greenstone belts and their potential to host value-added germanium and indium. Not only is zinc an important critical mineral, but germanium and indium are, as well, because of their specific technical applications and the challenges in using alternative materials. Throughout the Red Lake District, there are multiple zinc occurrences identified in the Ontario Mineral Inventory (OMI) (Figure 40; Table 25). In particular, this article will examine data collected from both the South Bay Mine and High Grade Lake at the Trout Bay property, with samples collected from both.

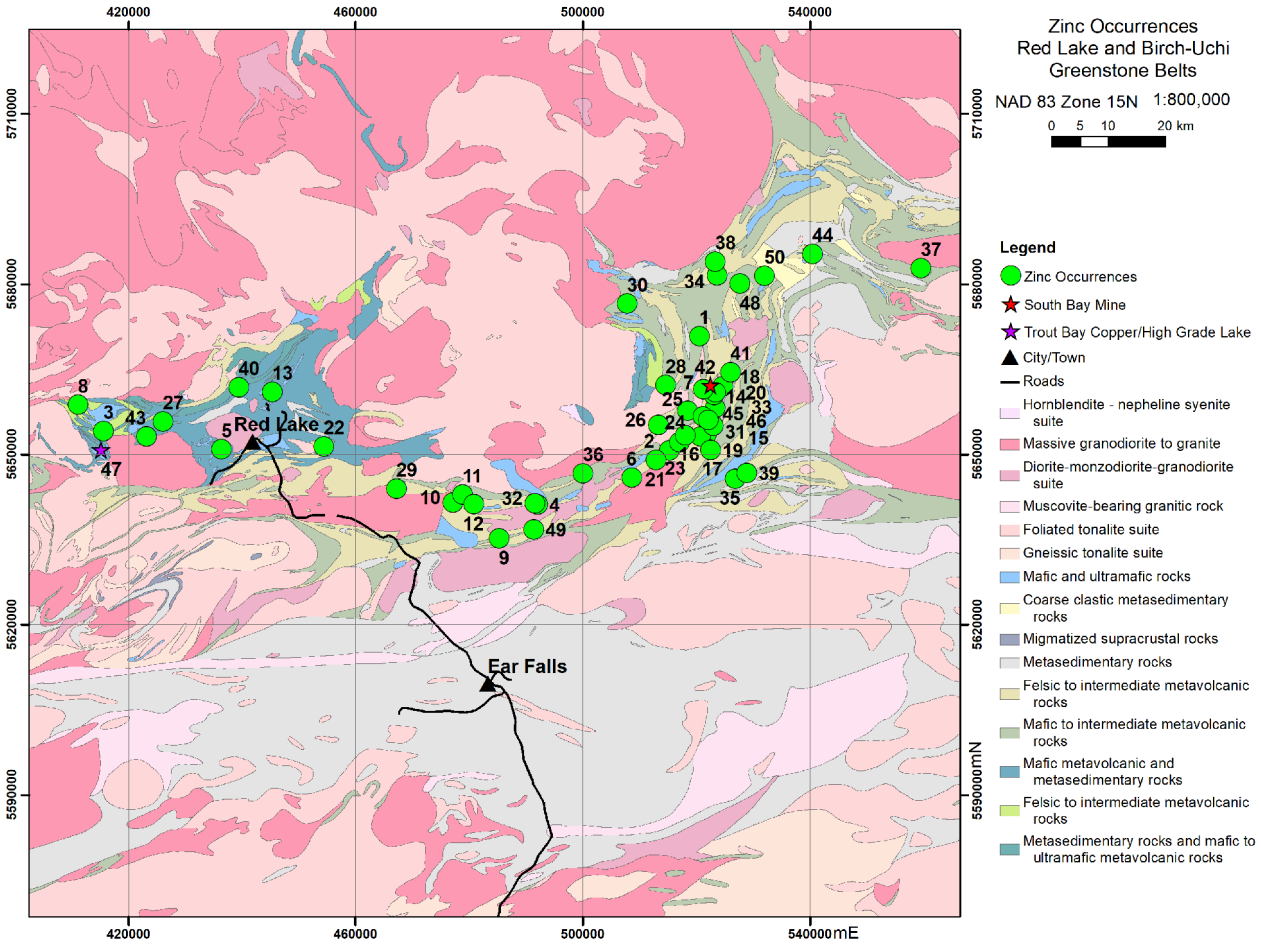


Figure 40. Locations of South Bay Mine, High Grade Lake and other zinc occurrences within the Red Lake and Birch–Uchi greenstone belts; *see* Table 25 for name and location information (*modified from* Ontario Geological Survey 2011; occurrences *from* Ontario Mineral Inventory, Ontario Geological Survey 2022).

ZINC OCCURRENCES IN THE RED LAKE DISTRICT

Most known zinc occurrences in the Birch–Uchi and Red Lake greenstone belts are located within the Confederation assemblage (*see* Figure 40), with sphalerite as the common zinc-bearing sulphide mineral. Rocks comprising the Confederation assemblage include mafic and felsic volcanic and felsic pyroclastic rocks formed during arc volcanism (Stott and Corfu 1991). Metavolcanic rocks in the Confederation assemblage have historically been explored for their volcanogenic massive sulphide (VMS) potential. However, despite a multitude of occurrences within the assemblage, only the South Bay Mine deposit has ever been brought into production. The Trout Bay assemblage is another location with potential for zinc mineralization. The Trout Bay assemblage is typically composed of basalt, calc-alkalic tuff, intercalated sedimentary rocks and magnetite-chert banded iron formation intruded by gabbro and ultramafic rocks produced in an extensional setting and a period of sedimentation (Zagorevski 2001). Table 25 lists known zinc occurrences within the previously mentioned assemblages.

GERMANIUM AND INDIUM OCCURRENCE AND USAGE

During 2021, 140 000 kg of germanium and 920 tonnes of indium were produced worldwide, with China leading production for both of these critical minerals (Anderson 2022; Tolcin 2022). While Canada does currently produce germanium and indium, there is a significant opportunity to increase production, particularly in Ontario. Currently, germanium and indium are both by-products from the mining of zinc deposits, such as VMS, sedimentary exhalative (SEDEX), Mississippi Valley-type (MVT) types (Shanks et al. 2017). Grades for germanium and indium from sphalerite concentrate typically range from 50 to 3000 ppm Ge and 70 to 200 ppm In (Paradis 2015). Examples of producing mine grades for germanium include an average of 68 ppm Ge from the Kipushi deposit in the Democratic Republic of Congo, and ranges from 104 to 249 ppm Ge at the Red Dog mining district in Alaska (Shanks et al. 2017), whereas the grade of indium recovered from zinc deposits typically is in the range from <1 to 100 ppm In (Anderson 2022). What makes both germanium and indium critical minerals is that their production is explicitly tied to zinc production. More zinc production produces more germanium and indium. Conversely, when zinc production decreases with dropping commodity prices, less germanium and indium are produced.

Table 25. Zinc-bearing sulphide occurrences within the Red Lake and Birch–Uchi greenstone belts (*compiled from* Ontario Geological Survey 2022). Numbers in column "ID" are keyed to Figure 40.

ID	Names	Township	Easting	Northing	Status	Commodity	Ontario Mineral Inventory (OMI)
1	Borgford Lake	Dent	520545	5670874	Occurrence Assays returned 12.9% Zn, 1.80% Cu, 0.51% Pb	Zn, Cu, Pb, Ag	MDI52N02NE00061
2	Bowerman 226-11-1,2	Bowerman	515287	5650721	Occurrence 1.88% Zn over 1.4 ft, 0.55% Zn over 1 ft	Zn	MDI52N02SW00022
3	Bridget Lake #5, W. Stupack (#5 - KRL 46184), Ball #49	Ball	415542	5654127	Occurrence 0.18% Cu, 0.05% Ni, 0.55% Zn	Zn	MDI52M01SE00228
4	Caravelle	Gerry Lake Area	492031	5641177	Occurrence 4.44% Zn and 0.22% Cu over 1.1 m	Zn	MDI52K14NE00006
5	CLS-Zn zone	Baird	436377	5650916	Occurrence 8.75% Zn over 1 ft and 0.65% Zn over 4.5 ft	Zn	MDI52N04SW00328
6	Copper Lode "E", Copper Lode - B, C, D, E zones, Copper Lode Main	Belanger	508637	5645911	Developed Prospect with Reported Reserves or Resources Possible Reserves – 145 150 t of 8.28% Zn	Zn, Cu, Ag	MDI52K15NW00019

ID	Names	Township	Easting	Northing	Status	Commodity	Ontario Mineral Inventory (OMI)
7	DDH 3200-2-80	Agnew	524687	5662021	Occurrence 0.11% Cu, 1.18% Zn over 0.82 m	Zn, Cu	MDI52N02SE00072
8	Discovery Pit zone, Biron Bay - Main Zone, Biron Bay B and C zones, Golden Chance Partnership - Pit/Main zone, Ledge 1	Ball	411087	5658769	Occurrence 6.39% Zn over 4 ft, 4.56% Zn over 1 ft	Zn, Au	MDI52M01SW00045
9	Dixie 3, Snake Falls property	Karas Lake Area	485250	5635223	Developed Prospect with Reported Reserves or Resources Unclassified – 91 000 t of 10% Zn, 1% Cu	Zn	MDI000000000290
10	Dixie prospect - 17B	South of Otter Lake Area	477132	5641521	Prospect 6.33% Zn and 1.5% Cu over 3.35 m, 7.34% Zn and 1.44% Cu over 9.5 m	Zn, Cu	MDI52K14NW00011
11	Dixie prospect - 18	South of Otter Lake Area	478790	5642921	Developed Prospect with Reported Reserves or Resources Unclassified – 110 000 t of 12.5% Zn, 0.55% Cu	Zn, Cu	MDI52K14NW00010
12	Dixie prospect - 19	South of Otter Lake Area	480807	5641268	Prospect 6.33% Zn, 1.61% Cu over 9 ft	Zn, Cu	MDI52K14NW00012
13	East Bay - West, KRL-1516 and 1517	Dome	445279	5661029	Discretionary Occurrence Sphalerite noted	Zn	MDI52N04SW00026
14	Fly Lake	Mitchell	523281	5658158	Occurrence 2.64% Zn over 5.4 ft	Zn	MDI52N02SE00062
15	Fly Lake 3197-6-80	Mitchell	521532	5653085	Occurrence 7.44% Zn over 0.64 m	Zn, Pb, Cu, Ag	MDI52N02SE00077
16	Fly Lake DDH 3197-7-80	Mitchell	521764	5653487	Occurrence 3.63% Zn over 1.24 m	Zn, Pb, Ag	MDI52N02SE00078
17	Fly Lake DDH FL-90-3	Mitchell	520733	5653174	Occurrence 6.48% Zn over 0.5 m	Zn, Cu	MDI52N02SE00076
18	Fly Lake drill holes UW-40, UW-41	Mitchell	523089	5660475	Occurrence 0.23% Zn and 1.63% Cu over 0.64 m	Cu, Ag, Zn	MDI52N02SE00074
19	Fly Lake project	Bowerman	522509	5650777	Occurrence 1.84% Zn over 7.5 ft and 3.09% Zn over 0.2 m	Zn, Cu	MDI52N02SE00085
20	Fly Lake UW-36, 37	Mitchell	523405	5661001	Occurrence 1.26% over 2.3 ft and 1.28% over 1.9 ft	Zn	MDI52N02SE00073
21	Garnet Lake property - Arrow Zone, Selco	Belanger	512866	5649081	Developed Prospect with Reported Reserves or Resources Inferred Resource – 2 100 000 t of 5.78% Zn and 0.72% Cu	Zn	MDI52K15NW00017
22	Hermiston zinc showing, Keg Lake - East	Byshe	454384	5651452	Occurrence 14.4% Zn and 4599, 8081, 11 256 ppm Zn	Zn, Pb	MDI52N04SE00118
23	Horseshoe Lake prospect, Elbow Lake prospect	Mitchell	517003	5652197	Prospect 2.44% Zn over 5.2 ft, up to 5.5% Zn over 37 ft	Zn, Pb, Ag	MDI52N02SW00016
24	Horseshoe Lake UA-41	Mitchell	518044	5653411	Occurrence 2.79% Zn over 3 ft and 1.02% Zn over 3 ft	Zn	MDI52N02SE00075
25	Jam prospect, KRL 61479, South Bay Mines DDH U5	Mitchell	518457	5657738	Occurrence 8290 ppm Zn grab sample	Cu, Zn	MDI52N02SE00005

ID	Names	Township	Easting	Northing	Status	Commodity	Ontario Mineral Inventory (OMI)
26	Joey prospect	Knott	513275	5655215	Discretionary Occurrence 0.48% Zn and 967 ppm Cu over 1.54 m	Zn	MDI000000001353
27	Martin Bay SW, E.M. Hall property, Cochenour Exploration Ltd.	Todd	426054	5655845	Occurrence 12.8% Zn from a grab sample	Zn, Pb, Ag, Cu	MDI52M01SE00197
28	Medicine Rock, Frank property, Gloster option (Selco), Caribou vein	Dent	514587	5662221	Occurrence 5.46% Zn over 5 to 14 ft	Zn, Cu, Au	MDI52N02SW00020
29	Moose Creek - West, South of Otter Lake Area RLX	South of Otter Lake Area	467163	5643970	Occurrence 3.22% Zn and 0.96% Cu over 1.2 ft	Zn, Cu	MDI52K14NW00013
30	Narrow Lake North	Skinner	507802	5676585	Occurrence 0.93% Zn over 1.1 ft	Zn, Cu, Ag, Au	MDI52N02NW00036
31	Nekapean Bay, Sulpetro DDH 3197-1-81	Mitchell	523003	5655068	Occurrence 8.25% Zn and 0.34% Cu over 1 m and 3.77% Zn over 0.3 m	Zn, Cu	MDI52N02SE00079
32	New Zone - Big Falls property, Joy Zone - Big Falls property	Gerry Lake Area	491526	5641411	Developed Prospect with Reported Reserves or Resources Inferred Resource – 300 000 t of 4% Cu-Zn	Zn, Cu	MDI000000000255
33	Northern Drill Target - Nuinsco Resources	Mitchell	521221	5661513	Prospect 1.31% Zn over 1 m, 0.56% Zn over 2.4 m and 0.83% over 1.5 m	Zn	MDI000000001355
34	Northwest Explorers	Shabumeni Lake Area	523641	5681545	Discretionary Occurrence 0.40% Zn, 0.05% Cu	Zn	MDI52N07SE00005
35	Panama Zn	Slate Lake Area	526851	5645728	Discretionary Occurrence 1200 ppm Zn and 270 ppm Cu over 1 m	Zn	MDI000000002286
36	Roxmark West, Roxmark “B”, Queensland occurrence, Gerry Lake North	Fredart Lake Area	500045	5646689	Occurrence 2.94% Zn grab sample	Ag, Zn, Pb	MDI52K15NW00020
37	Seagrave Lake	Seagrave Lake Area	559566	5682826	Occurrence 2.68% Zn and 8.38% Zn from grab samples	Zn	MDI52N08SE00007
38	Shabumeni Lake-Pn	Shabumeni Lake Area	523320	5683985	Occurrence Drilling includes sections up to 0.83% Zn over 27.9 ft	Zn	MDI52N07SE00053
39	Slate Lake Cu-Zn-Ag	Slate Lake Area	528892	5646726	Occurrence 5.84% Zn and 1.84% Cu over 0.5 m, 8.36% Zn and 11.6% Cu over 0.25 m	Cu, Zn, Ag	MDI52K15NE00013
40	Slate Peninsula, DDH Gs-66-38	McDonough	439377	5661828	Discretionary Occurrence 0.5% Zn and 0.03% Cu over 6.2 ft	Zn, Ag	MDI52N04SW00243
41	South Bay - Crab Grid	Agnew	526032	5664470	Discretionary Occurrence 0.16% Zn over 0.9 ft and 0.22% Zn over 2.5 ft	Zn	MDI52N02NE00002
42	South Bay Mine, South Bay, Selco prospect*	Dent	522504	5662176	Past Producing Mine Without Reserves or Resources Produced: 1 637 948 tons at 11.06% Zn and 1.8% Cu	Zn, Cu, Ag	MDI52N02SE00012
43	South Wolf Bay	Todd	423113	5653149	Discretionary Occurrence 0.36% Zn grab sample	Zn, Pb	MDI52M01SE00026

ID	Names	Township	Easting	Northing	Status	Commodity	Ontario Mineral Inventory (OMI)
44	Superstition Lake - Northwest, Loydex showing	Satterly Lake Area	540466	5685358	Discretionary Occurrence Sphalerite noted	Zn	MDI52N08SW00009
45	Triangle Lake Northwest, Meyer Option - North Group	Mitchell	521127	5656728	Occurrence 1.18%, 1.13% and 2.29% Zn from grab samples	Zn	MDI52N02SE00081
46	Triangle Lake Southeast	Mitchell	522103	5656114	Occurrence 4.36% Zn and 0.14% Cu over 3 ft	Zn	MDI52N02SE00080
47	High Grade Lake, Trout Bay copper prospect	Mulcahy	415137	5650822	Developed Prospect with Reported Reserves or Resources Unclassified Resources: Trout Bay Zinc Pit Zone West – 12 500 tonnes of 4.75% Zn Trout Bay Zinc Pit East – 113 180 tonnes of 7.86% Zn	Zn, Cu, Ag	MDI52M01SE00166
48	Vanco	Honeywell	527639	5680145	Discretionary Occurrence 0.20% Zn and 0.09% Cu	Zn	MDI52N07SE00002
49	Whitefish Falls East	Gerry Lake Area	491330	5636800	Occurrence 9579 ppm Zn over 4.4 ft	Cu, Zn	MDI52K14NE00007
50	Zip Lake	Shabumeni Lake Area	532011	5681467	Occurrence 6300 ppm Zn in DDH	Zn	MDI52N07SE00073

** Lichtblau et al. (2016).* ***Abbreviations****: DDH, diamond-drill hole; ft, feet; t, tonnes.*

Germanium has a range of applications that include fibre optics, infrared optics and the base layer within multi-junction solar cells (Shanks et al. 2017). In 2021, the average price in the USA for germanium was US$1200/kg. Production of germanium worldwide has stayed steady at 140 000 kg, with the majority of production coming from China (95 000 kg; Tolcin 2022). While there are some substitutes for germanium, they typically impact the quality of the end-product being produced (Shanks et al. 2017).

Indium is primarily used for 1 application, creating the coating on the surface of flat panel displays and touchscreens, without a viable alternative readily available (Shanks et al. 2017). By the end of 2021, the average price in the USA for indium was US$220/kg. Again, similar to germanium, China is the main producer of indium for the world, producing 530 tonnes out of the world production of 920 tonnes in 2021 (Anderson 2022).

PROPERTY GEOLOGY AT SOUTH BAY MINE AND HIGH GRADE LAKE

The South Bay Mine is located within the Confederation assemblage of the Birch–Uchi greenstone belt, hosted within felsic metavolcanic and felsic intrusive rocks. The mine was in production from 1971 until 1981, when production ceased as a result of the depletion of mining reserves. Throughout the mine's 10 years of production, a total of 1 637 948 tons of ore were milled with average grades of 11.06% Zn and 1.8% Cu (Storey 2015).

Ore at South Bay Mine is composed of steeply dipping bodies of massive sulphides with a composition of pyrite, sphalerite, chalcopyrite and lesser amounts of pyrrhotite. The ore itself is hosted within felsic tuffs and lesser amounts of rhyolite, with pyrite masses and felsic clasts occurring within these felsic tuffs (Corkery 1977). Ore hosted within the felsic tuff has collected along the contact with the quartz feldspar porphyry toward the east (Figure 41; Storey 2015). The quartz feldspar porphyry is composed of both quartz and plagioclase phenocrysts that are approximately 4 to 10 mm in width (Corkery 1977). The deposit has an alteration halo around the orebody consisting of chlorite, with sericite alteration along the margins of the chlorite alteration within the quartz feldspar porphyry and felsic tuff (Storey 2015).

High Grade Lake (also known as the Trout Bay copper prospect) is a known zinc occurrence in the Red Lake District. High Grade Lake is hosted within the Trout Bay assemblage in the western portion of the Red Lake greenstone belt. Although High Grade Lake is a zinc and copper occurrence, the Trout Bay assemblage is also known for its nickel-copper-platinum group element (PGE) mineralization. The geology at High Grade Lake is hosted within folded argillaceous greywackes and siliceous metasedimentary rocks that occur along a contact with a gabbro sill (Figure 42). Mineralization is composed primarily of a mass of sphalerite, with a halo of disseminated pyrrhotite, pyrite and chalcopyrite (Selway and Lavigne 2006).

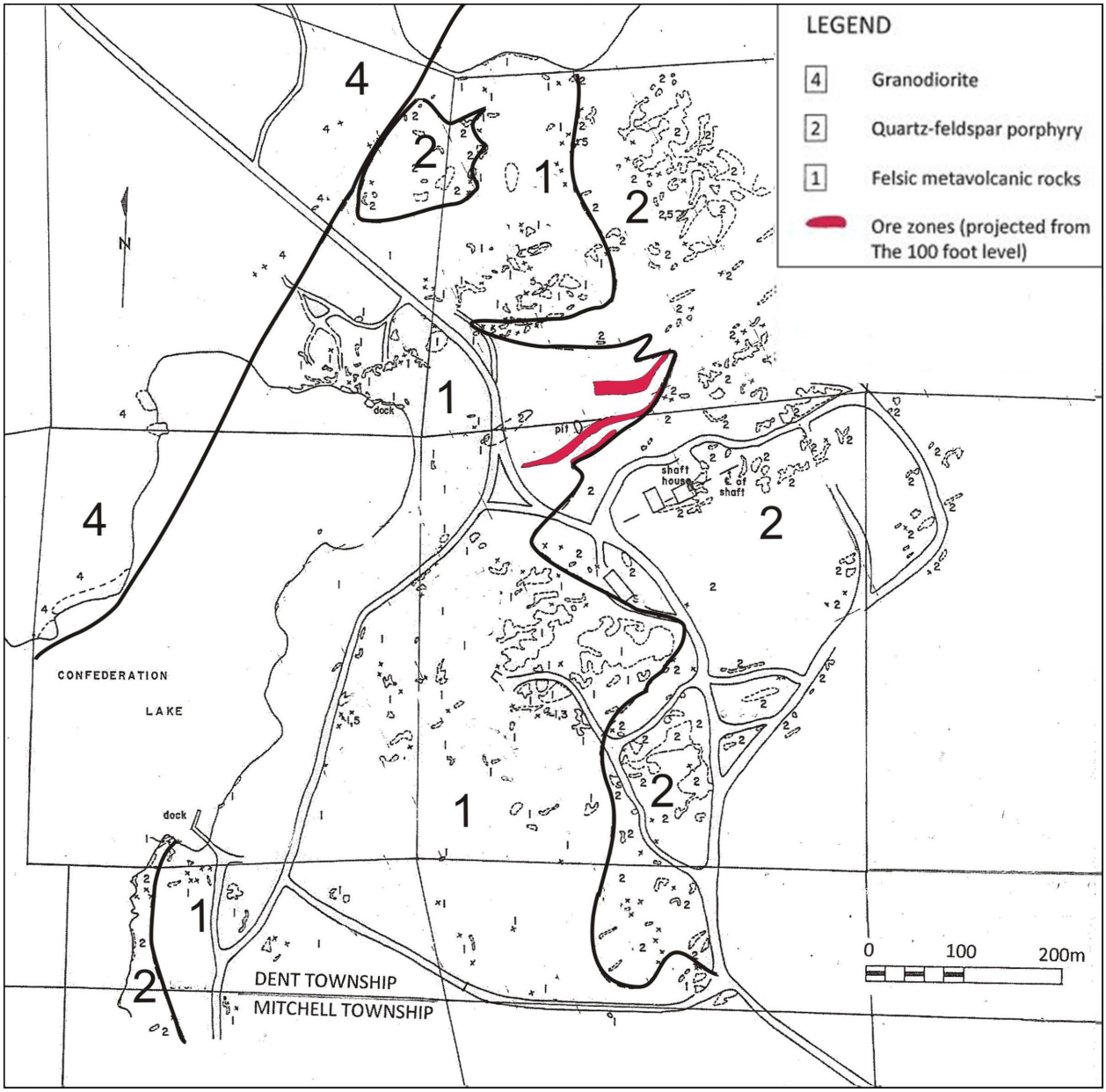


Figure 41. Surface geology of the South Bay Mine (*modified from* Storey 2015, p.25).

Table 26. Description, location and results of trace element analyses* for samples collected from South Bay Mine and High Grade Lake.

Sample No.	Location	Easting	Northing	Type	Description	Ge (ppm)	In (ppm)
					Detection Limit:	***0.7***	***0.2***
2022PM028	Dent Township South Bay Mine	522504	5662176	Concentrate	Oxidized concentrate material from the site, gravel like	3.7	99.5
2022PM029	Dent Township South Bay Mine	522504	5662176	Concentrate	Oxidized concentrate material from the site, gravel like	4.3	100
2022PM030	Dent Township South Bay Mine	522504	5662176	Float	Massive sulphide ore material, heavily oxidized. Composed of 75% chalcopyrite	5.4	111
2022PM031	Dent Township South Bay Mine	522504	5662176	Float	Massive sulphide, heavily oxidized. Composed of 60% pyrite, 30% chalcopyrite and 10% sphalerite	10.6	145
2022PM041	Mulcahy Township High Grade Lake	415175	5650822	Float	Heavily oxidized mafic (basalt?) sample from historical Zinc Pit, approximately 5% blebs of sulphide (pyrrhotite and pyrite)	78.2	1.1
2022PM042	Mulcahy Township High Grade Lake	415175	5650822	Float	Banded iron formation with possible bands of argillite, and massive bands of sulphide composed of pyrite, pyrrhotite and sphalerite.	44.6	14.4

**Analyses by Activation Laboratories Ltd., Ancaster, Ontario. All samples were analyzed by inductively coupled plasma optical emission spectrometry (ICP–OES) and inductively coupled plasma mass spectrometry (ICP–MS) with sodium peroxide fusion.*

GERMANIUM AND INDIUM IN THE RED LAKE DISTRICT

Throughout 2022, samples were collected and sent for analysis by staff of the Resident Geologist Program (RGP) from the Red Lake District. The 2 sites selected for sampling were the South Bay Mine and High Grade Lake because of their historical production of zinc and significance as a zinc occurrence; respectively. As mentioned previously, germanium and indium are typically found in VMS-, SEDEX- and MVT-type deposits. While the South Bay Mine is a known VMS deposit, High Grade Lake's geological model is not well defined. High Grade Lake has been described, by Hughes (2002), as having VMS-type mineralization because of the sulphide minerals present (sphalerite, pyrrhotite, pyrite and chalcopyrite). Selway and Lavigne (2006) suggest, however, that there are multiple indicators missing to fit High Grade Lake into the VMS geological model, such as synvolcanic intrusions, semi-conformable alteration, fragmental felsic volcanic rocks, and correlations between mineralization and pathfinder elements. Regardless, there is precedent to examine High Grade Lake for germanium and indium, because intercepts of 64 g/t Ge and 28.44 g/t In were reported by Hughes (2008) at High Grade Lake.

A total of 6 samples were collected and analyzed for their germanium and indium content, with 4 samples from South Bay Mine and 2 from High Grade Lake. The samples are described in detail with their analytical results in Table 26. Although all the samples are floats, or, in the case of South Bay Mine, 2 samples are concentrate material, it can be assumed that all the samples are still relatively representative of mineralized material from both sites. The analysis showed that the South Bay Mine was deficient in germanium, but both the concentrate and float samples returned grades of indium up to 145 ppm In, which could be of economic value when mined as a by-product alongside zinc. High Grade Lake was deficient in indium but returned anomalous values of germanium, up to 78.2 ppm Ge.

CONCLUSION

The main goal of this article is to show that the Red Lake District has the potential for critical mineral by-products. While zinc is a critical mineral in its own right, having the added value of additional critical minerals, such as germanium and indium, is a bonus. When exploring for the next base metal deposit in the Red Lake District, it would be wise to expand the scope for exploration and complete analysis on a wider range of commodities, including germanium and indium. Therefore, this recommendation for exploration is a reminder to companies and/or prospectors currently exploring or looking to acquire property in the Red Lake and Birch–Uchi greenstone belt that there may be more to your typical massive sulphide deposit in the district than meets the eye. By continuing to look outside the box when exploring for critical minerals, Ontario can expand its presence in the development and production of critical minerals, including zinc, germanium and indium.

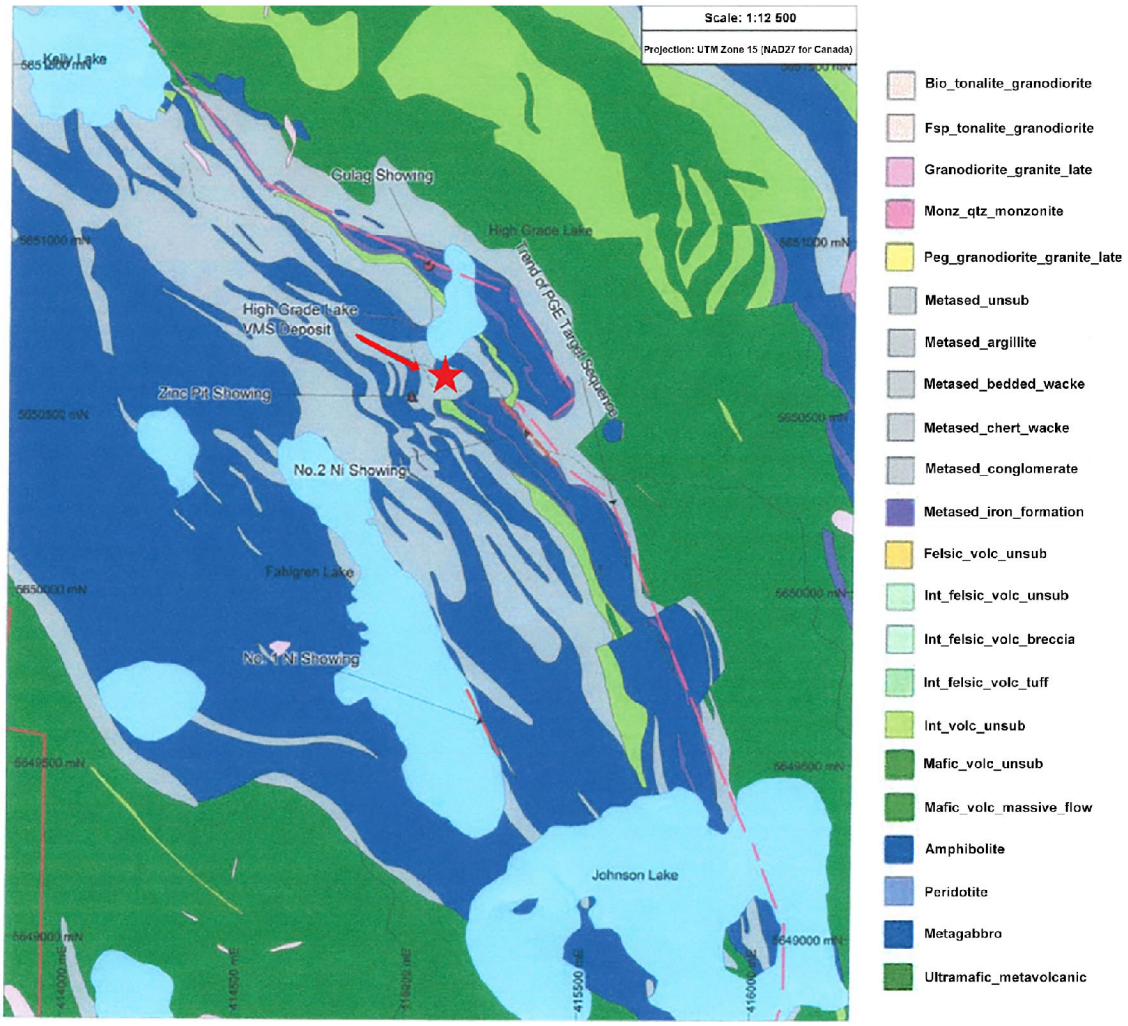


Figure 42. Property geology and location of the High Grade Lake occurrence (red star) in the Trout Bay assemblage (*modified from* Selway and Lavigne 2006). Abbreviations used: Bio = biotite; Fsp = feldspar; Int = intermediate; Metased = metasedimentary; Monz = monzonite; peg = pegmatite; qtz = quartz; unsub = unsubdivided; volc = volcanic. All UTM co-ordinates are provided using NAD27 in Zone 15.

OGS ACTIVITIES AND RESEARCH BY OTHERS

Four Ontario Geological Survey (OGS) field projects were conducted in the Red Lake District in 2022. Publications received in the Red Lake District Geologist office during 2022 are listed in Table 27.

- P.J. MacDonald and P.M. Malegus (OGS–ERGMS and RGP, respectively) continued work on the Red Lake bedrock geology mapping compilation project. During the summer of 2022, ground truthing and sample collection occurred throughout the project boundaries. The Red Lake project aims to update the regional 1:50 000 scale bedrock geology map of the Red Lake greenstone belt. Sample collection has occurred and new geochemical and geochronological data from the Dixie Lake area, will significantly enhance the data from the previous bedrock geology maps (MacDonald and Malegus 2021).
- E.C.G. Hastie (OGS–ERGMS) continued work on a multi-year collaborative project between the Ontario Geological Survey, the Royal Ontario Museum and the Metal Earth research program. The project is developing a method for analyzing major and trace elements associated with gold and working towards a public database for gold geochemistry across Ontario and the world (Hastie et al. 2020; Melo-Gómez et al. 2021, 2022).
- D.J. Bennett (OGS–RGP) continued work on the Mine Waste Sampling project by introducing Phase 2. In Phase 2, Red Lake RGP personnel collected 16 samples from the past producing South Bay Mine. The tailings have the potential for zinc, copper, silver and possibly indium, gallium and germanium. Results are pending (Bennett 2022).
- R.M. Cundari (OGS–RGP) began work on the Fertile Parent Granitoid project in the Superior province, which included the Red Lake District. Samples were collected by RGP personnel throughout the district, with most work occurring in the English River Subprovince. Compilation work is ongoing for the project, with plans to publish the data in the future. Results are pending (Cundari 2022).

The first annual OGS Virtual Showcase was held from October 25 to 27, 2022. Beginning December 15, 2022, selected presentations will be available to download until October 31, 2023 (note: not all presenters made recordings available). The presentations are provided in video format and are accompanied by the OGS Virtual Showcase 2022 Technical Program and other documentation. Presentations relevant to the Red Lake District are listed in Table 27.

Academic research activities in the Red Lake District in 2022 are listed below.

- J. Mamos of Lakehead University in Thunder Bay is currently working on an undergraduate thesis titled “Lithology and alteration assemblages of the McFinley Deposit, Red Lake, ON” supervised by Dr. Shannon Zurevinski and Dr. Peter Hollings.
- A.Q. Adetunji, G. Launay, I.J. Ferguson, J.M. Simmons, C. Ma, J. Ayer and B. Lafrance from the Mineral Exploration Research Centre at Laurentian University and University of Manitoba have published a paper titled “Crustal conductivity footprint of the orogenic gold district in the Red Lake greenstone belt, western Superior craton, Canada” (Adetunji et al. 2023).
- H. Schroder of the University of Michigan–College of Literature, Science, and the Arts is currently working on a PhD thesis “Archean metamorphism and tectonics of the English River and Winnipeg River subprovinces, NW Ontario”, supervised by Dr. Robert Holder.

Table 27. Publications received by the Red Lake District Geologist office in 2022.

Title	Author	Type and Year of Publication
Report of Activities 2021, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	P.M. Malegus, E.G. Amyotte, C.J. Adrianwalla, K.E. Wiebe, P. Bousquet, C.M. Daniels, T.K. Pettigrew and G. Dorland	Ontario Geological Survey, Open File Report 6381 (2022)
Recommendations for Exploration, 2021–2022	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration (2022)
An Introduction to Ontario's Critical Minerals, With Highlights from the Ontario Mineral Inventory	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program (2022)
Recommendations for Exploration Special Edition: Critical Minerals Compilation 2000–2022	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration Special Edition (2022)
Index to Published Reports, Maps and Digital Data, 2016–2020	Ontario Geological Survey	Ontario Geological Survey, Supplement to Miscellaneous Paper (MP) 177 (2011–2020) (2022)
Geographic Index to Published Reports, Maps and Digital Data, 2016–2020	Ontario Geological Survey	Ontario Geological Survey, Supplement to Miscellaneous Paper (MP) 178 (2011–2020) (2022)
Summary of Field Work and Other Activities, 2022	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6390 (2022)
Specific articles of interest:		
Trace Element Content of Gold Across Ontario: An Update on the Gold Fingerprinting Project	J.D. Melo-Gómez, E.C.G. Hastie, H.L. Gibson, K.T. Tait and J.A. Petrus	OFR 6390, article 15, 11p.
Identification of Fertile Parent Granitoid Units in the Superior Province of Ontario: Project Description	R.M. Cundari	OFR 6390, article 30, 11p.
Catching it by the Tailings: An Introduction to the Ontario Geological Survey Critical Minerals Mine Waste Sampling Project	D.J. Bennett	OFR 6390, article 32, 6p.
OGS Showcase	Ontario Geological Survey	Ontario Geological Survey Virtual Showcase 2022, October 25–27 (2022)
Specific presentations of interest:		
Ontario Critical Minerals Projects and Exploration Opportunities	M.A. Puumala	presentation SHOWCASE-22-103 (2022)
Introduction to the OGS Fertile Granites Project	R.M. Cundari	presentation SHOWCASE-22-106 (2022)
Catching it by the Tailings: An Introduction to the OGS Critical Minerals Mine Waste Sampling Project	D.J. Bennett	presentation SHOWCASE-22-104 (2022)
Investigation of Biogeochemistry Exploration Techniques to Aid in Exploration for Lithium-Cesium-Tantalum (LCT) Pegmatite Units	E.G. Amyotte	presentation SHOWCASE-22-108 (2022)
Analytical Developments at the OGS's Geoscience Laboratories in Support of Ontario's Critical Minerals Strategy	O.M. Burnham	presentation SHOWCASE-22-110 (2022)
The Role of the Geoscience Laboratories Mineralogy Section in Supporting Ontario Geological Survey Projects	D.C. Crabtree and S.A. Clarke	presentation SHOWCASE-22-111 (2022)
Producing and Delivering the Best Provincial Geoscience Data for Users	C. Castrechino	presentation SHOWCASE-22-112 (2022)
Demo of OGSEarth Data Sets Including OGSFocus and the OGS GeoData Listing	G. Dorland	presentation SHOWCASE-22-113 (2022)
Adding New Data Sets: A Work in Progress	S. Préfontaine	presentation SHOWCASE-22-114 (2022)
Resident Geologist Program's Drill Core Libraries – An Invaluable Tool for Exploration	D.-A. Metsaranta	presentation SHOWCASE-22-116 (2022)
Exploration, Mining and Resident Geologist Program Activity Update for the Red Lake and Kenora Districts	P.M. Malegus	presentation SHOWCASE-22-302 (2022)
Probing the Earth: Geophysics at the OGS	S. Biswas and J. Evangelatos	presentation SHOWCASE-22-310 (2022)
Resident Geologist Program's Land Use Geology – Informing Land-Use Planning Decisions	C.M. Daniels	presentation SHOWCASE-22-311 (2022)

MINERAL DEPOSITS NOT BEING MINED

Table 28. Mineral deposits not being mined in the Red Lake District in 2022.

Abbreviations

AF ..... Assessment Files
CAMH ..... *Canadian and American Mines Handbook*
CMH ..... *Canadian Mines Handbook*
GR ..... Geological Report
MDC ..... Mineral Deposit Circular [No.15–]
..... [*formerly* Mineral Resources Circular, No.1-14]
MLS ..... Mining Lands, Sudbury
MR ..... Mining Recorder
NM ..... *The Northern Miner*
OFR ..... Open File Report
OMIR ..... Ontario Mineral Inventory record (formerly MDI)
PC ..... Personal Communication
TR ..... Technical Report

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Abino Bateman, Balmer and Dome townships (MDI52N04SW00043; 52 N/04SW)	Au	Total granodiorite zone: Drill-indicated tonnage 405 162 tons 0.203 opt Au from 3 subzones	AF (McClean 1976)	Patent
Aiken–Russet Baird Township (MDI52K13NW00037; 52 K/13NW)	Au	Total resource in Vein #3 of 22 715 t @ 0.17 opt Au	AF (Kuryliw 1967)	Patent
Alcourt (Copper Man, Hanson–Campbell) Fairlie Township (MDI52N04SW00003; 52 N/04SW)	Au	Resource: Potential of 20 000 tonnes of 0.45 ounces of Au per tonne from 1959–1960 diamond drilling No. 1 vein: 17 000 tonnes of 0.2429 ounces of Au per tonne from 1959–1960 diamond drilling and 1981 sampling program	AF (Tilsley 1981)	Patent
Annco Mine Dome Township (MDI52N04SW00019; 52 N/04SW)	Au	Resource: 50 000 tons of "Excellent Grade" (0.35 ounces of Au per ton?)	Energy, Mines and Resources Canada (1990)	Patent
Bear Head Lake prospect Setting Net Lake Area, South of Favourable Lake Area (MDI53C13SE00061; 53 C/13SE)	U_3O_8	Resource: 978 810 tons of 0.06% U_3O_8 to a depth of 500 feet	MDC 25 (Robertson and Gould 1983)	Staked Claim
Berens River Mine (Golsil, Zahavy) Setting Net Lake Area (MDI53C13SE00011; 53 C/13SE)	Au, Ag, Pb, Zn	Resource: No. 1 zone: 75 000 tons of 0.10-0.2 ounces of Au per ton 4.0-5.0 ounces of Ag per ton No. 3 zone: 713 249 tons indicated of 0.249 ounces of Au per ton, 4.83 ounces of Ag per ton, 0.67% Pb, 1.03% Zn, 268 964 tons inferred of 0.287 ounces of Au per ton, 4.73 ounces of Ag per ton, 1.05% Pb, 1.37% Zn at 0.15 opt Au cut-off to 750 m level	AF (Bevan 1983)	Staked Claim
Bluffy Lake Karas Lake Area (MDI52K14SE00004; 52 K/14SE)	Fe	Resource: 21 000 000 tons at 22.86% Fe	Breaks et al. (1976a)	Staked Claim
Borland Lake Borland Lake Area (MDI53D16NE00006; 53D/16NE)	Ag, Au	Probable Resource: 502 412 tons of 8.09 ounces of Ag per ton and 0.02 ounces of Au per ton	Massive Resources Ltd., Preliminary Prospectus, Aug. 6, 1987	Staked Claims
Buffalo Red Lake Heyson Township (MDI52N04SW00009; 52 N/04SW)	Au	Indicated Resources (NI 43-101–compliant): 1.632 Mt at 1.18 g/t Au Inferred Resources (NI 43-101–compliant): 0.604 Mt at 1.12 g/t Au	TR (Jourdain, Langton and Ladidi 2017)	Patent

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Central Zone Dome and Heyson Townships (MDI000000002070; 52 N/04SW)	Au	Indicated Resources (NI 43-101–compliant): 31.613 Mt at 0.79 g/t Au Inferred Resources (NI 43-101–compliant): 23.733 Mt at 0.76 g/t Au	TR (Jourdain, Langton and Ladidi 2017)	Patent
Cole Gold Mine Ball Township (MDI52M01SE00182; 52 M/01SE)	Au	Resource: 119 780 tons of 0.41 ounces of Au per ton probable and indicated	AF (Wilton 1973)	Staked Claims
Consolidated Marcus Dome Township (MDI52N04SW00022; 52 N/04SW)	Au	Resource: 60 000 tons of 0.18 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent
Copper Lode A–Rexdale Group prospect Fredart Lake (MDI52K15NW00016; 52 K/15NW)	Cu, Ag	Resource: 236 424 tons of 1.94% Cu, 1.22 ounces of Ag per ton or 425 612 tons of 1.56% Cu, 0.98 ounces of Ag per ton or 854 007 tons of 1.01% Cu, 0.57 ounces of Ag per ton	AF (Archibald 1970); MP 152 (Atkinson, Parker and Storey 1991)	Staked Claim
Copper–Lode D Belanger Township (MDI52K15NW00019; 52 K/15NW)	Cu, Zn	Resource: 32 660 tons of 0.26% Cu, 7.58% Zn	AF (MacDougall 1996)	Staked Claims
Copper–Lode E Belanger Township (MDI52K15NW00019; 52 K/15NW)	Cu, Ag	Resource: 145 150 tons of 8.28% Zn, 1.02% Cu, 0.39 ounces of Ag per ton	AF (Archibald 1970)	Staked Claims
Dixie Limb zone Dixie Lake Area (MDI52K13SE00003; 52 K/13SE)	Au	Resource: 417 000 tons of 0.12 ounces of Au per ton	OMIR	Staked Claim
Dixie 3 prospect Karas Lake Area (MDI000000000290; 52 K/14SE)	Cu, Zn	Resource: 91 000 tons of 10.0% Zn, 1.0% Cu	AF (MacDougall 1995)	Staked Claim
Dixie 18 prospect South of Otter Lake Area (MDI52K14NW00010; 52 K/14NW)	Zn	Resource: 110 000 tons of 0.5% Cu, 12.5% Zn, 0.57 ounces of Ag per ton	AF (King and Petrie 1998)	Staked Claim
El Sol property Avis Lake Area (MDI52K16NW00012; 52 K/16NW)	Fe	Resource: 312 500 000 tons of 31.1% Fe to a depth of 100 feet	MRC 11 (Shklanka 1968)	Staked Claim
GAZ Bateman Township (MDI000000000249; 52 N/04NE)	Au	Resource (NI 43-101–compliant): 1 400 000 t of 8.0 g/t Au, in 5 lenses	Wolfden Resources Inc., news release, Feb. 23, 2005	Staked Claims
Gold Eagle Mine (Western Discovery zone) Dome Township (MDI52N04SW00020; 52 N/04SW)	Au	Resource (NI 43-101–compliant): 309 000 t at 16.67 g/t Au (uncut)	Micon International (Pressacco 2004)	Patent
Grassett prospect Earngey Township (MDI52N02SE00009; 52 N/02SE)	Au	Resource: 78 295 tons of 0.22 ounces of Au per ton (part of the Hill–Sloan–Tivy vein)	Energy, Mines and Resources Canada (1990)	Patent
Griffith Mine Bruce Lake Area (MDI52K14SW00002; 52 K/14SW)	Fe	Resource: 120 000 000 tons of 29% Fe	GR 82 (Shklanka 1970)	Staked Claims

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Hasaga Heyson Township (MDI52N04SW00007; 52 N/04SW)	Au	Indicated Resource (NI 43-101–compliant): 9.050 Mt at 0.89 g/t Au Inferred Resource (NI 43-101–compliant): 0.806 Mt at 0.78 g/t Au	TR (Jourdain, Langton and Ladidi 2017)	Patent
Horseshoe Island Casummit Lake Area (MDI52N08NW00020; 52 N/08NW)	Au	Resource: 893 508 tons of 0.14 ounces of Au per ton	*Northwest Prospector*, March/April 1990, p.27	Staked Claim
Howey Mine Heyson Township (MDI52N04SW00036' 52 N/04SW)	Au	Resource: 780 000 tons of 0.08 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent, Licence of Occupation
Jackson–Manion Mine Dent Township (MDI52N02SW00003; 52 N/02SE)	Au	Resource: 40 000 tons of 0.5 ounces of Au per ton	NM – Mar. 14, 1985, p.21	Patent
Laverty (Thrall) Heyson Township (52N/04SW00085)	Au	Resource: 790 000 tons of 0.08 ounces of Au per ton (Gillies 1982) Indicated Resource (NI 43-101–compliant): 395 000 t of 2.56 g/t Au on a portion of the Laverty dike zone (Harron and Puritch 2010); This property is included in the North Madsen property	AF (Gillies 1982) TR (Harron and Puritch 2010)	Patent
Lingman Lake (53F/15SW00002)	Au	Resource: 1 172 753 tons of 0.20 ounces of Au per ton in all zones at 5.0 foot minimum width and a cut-off grade of 0.08 ounces of Au per ton	AF (McPhee 1989)	Patent
May–Spiers Ball Township (52M/01SE00023)	Au	Resource: 30 000 tons of 0.09 ounces Au per ton	AF (Bayne 1981)	Staked Claim
McFinley (includes Batmen gold project, McFinley zone and F2 gold deposit) Bateman Township (MDI52N04SE00005/ MDI000000001374; 52N/04SE)	Au	Indicated Resources (JORC Code 2012–compliant): 2.1 Mt @ 4.93 g/t Inferred Resources (JORC Code 2012–compliant): 3.0 Mt @ 4.37 g/t	Evolution Mining Ltd., news release, February 16, 2022	Patent, Licence of Occupation
Mount Jamie Todd Township (52M/01SE00012)	Au	Indicated Resources (NI 43-101–compliant): 35 000 t @ 15.2 g/t Inferred Resources (NI 43-101–compliant): 116 600 t @ 7.5 g/t	TR (Kita 2022)	Patent
New Faulkenham Mines Ltd. (Faulkenham Lake) Baird Township (52K/13NW00006)	Au	Resource: 15 000 tons of $15.00 per ton ore (0.428 ounces of Au per ton at $35.00 per ounce Au)	AF (Holbrooke 1958)	Patent
New zone (Diamond Willow zone, Creek zone) Gerry Lake Area (MDI000000000255; 52 K/14NE)	Cu, Zn	Resource: 300 000 tons of 4% combined Cu+Zn	AF (Lewis 1994)	Staked Claim

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
North Madsen Heyson Township (MDI000000001647; 52 N/04SW)	Au	Measured Resource (NI 43-101–compliant): Main Zone: 15 253 810 t of 1.26 g/t Au Laverty Dyke – Dyke: 996 830 t of 1.67 g/t Au Laverty Dyke – Granodiorite: 477 670 t of 0.98 g/t Au Indicated Resource (NI 43-101–compliant): Main Zone: 3 759 600 t of 1.02 g/t Au Laverty Dyke – Dyke: 303 500 t of 1.33 g/t Au Laverty Dyke – Granodiorite: 422 600 t of 0.97 g/t Au Buffalo – Disseminated: 122 800 t of 1.07 g/t Au Buffalo – Quartz-Tourmaline: 1 622 100 of 0.97 g/t Au Inferred Resource (NI 43-101–compliant): Main Zone: 4 526 000 t of 1.31 g/t Au Laverty Dyke – Dyke: 676 000 t of 1.52 g/t Au Laverty Dyke – Granodiorite: 1 669 000 t of 0.84 g/t Au Buffalo – Disseminated: 613 000 t of 1.32 g/t Au Buffalo – Quartz-Tourmaline: 2 698 000 t of 0.97 g/t Au Central: 893 000 t of 0.81 g/t Au South: 272 000 t of 1.25 g/t Au	TR (McCracken and Utiger 2014)	Patent
Northgate prospect (Bobjo) Earngey Township (MDI52N02SE00013; 52 N/02SE)	Au	Resource: 64 600 tons of 0.28 ounces of Au per ton	AF (Zinn 1984)	Patent
North Spirit Lake (Crown Trust) Hewitt Lake Area (MDI53C07NW00025; 53 C/07NW)	Fe	Resource: 1.3 million tons per vertical foot of 33.94% Fe	MRC 11 (Shklanka 1968); GR 150 (Wood 1977)	Staked
Ogani Lake Slate Lake Area (MDI52K15NE00012; 52 K/15NE)	Fe	Resource: 100 000 000 tons of 21.6% Fe	MRC 11 (Shklanka 1968)	Staked Claim
PAK pegmatite Pakeagama Lake area (MDI53C11SW00003; 53 C/11SW)	Rare elements	Open Pit Mineral Resource: Measured Resource (NI 43-101–compliant): 1 344 600 t at 2.14 Li_2O Indicated Resource (NI 43-101–compliant): 4 075 300 at 1.94 Li_2O Inferred Resource (NI 43-101–compliant): 603 100 t at 1.97 Li_2O Underground Mineral Resource: Indicated Resource (NI 43-101–compliant): 1 261 700 t at 2.15 Li_2O Inferred Resource (NI 43-101–compliant): 2 070 850 at 2.38 Li_2O	TR (McCracken et al. 2021)	Patent, Staked Claim
Papaonga Lake Curie Lake Area (MDI52K16NE00006; 52 K/16NE)	Fe	Resource: 13 500 000 tons of 31.06% Fe	OMIR	Staked Claim

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Pure Gold Mine Baird Township (MDI52K13NW00008; 52 K/13NW)	Au	Probable Reserve (NI 43-101–compliant) (Makarenko et al. 2019): 3.512 Mt of 8.97 g/t Au Indicated Resource (NI 43-101–compliant) (Revering, Barnett and McLeod 2022): Madsen – Austin: 4 147 000 t of 6.9 g/t Au Madsen – South Austin: 1 696 000 t of 8.7 g/t Au Madsen – McVeigh: 388 700 t of 6.4 g/t Au Madsen – 8 Zone: 152 000 t of 18.0 g/t Au Fork: 123 800 t of 5.3 g/t Au Russet: 88 700 t of 6.9 g/t Au Wedge: 313 700 t of 5.6 g/t Au Inferred Resource (NI 43-101-compliant): Madsen – Austin: 504 800 t of 6.5 g/t Au Madsen – South Austin: 114 100 of 8.7 g/t Au Madsen – McVeigh: 64 600 t of 6.9 g/t Au Madsen – 8 Zone: 38 700 t of 14.6 g/t Au Fork: 298 200 t of 5.2 g/t Au Russet: 367 800 t of 5.8 g/t Au Wedge: 431 100 t of 5.7 g/t Au	TR (Makarenko et al. 2019) TR (Revering, Barnett and McLeod 2022)	
Rahill–Bonanza deposit Dome Township (MDI52N04SW00065; 52 N/04SW)	Au	Inferred Resource (NI 43-101–compliant): 1.59 Mt @ 7.6 g/t Au	TR (Harron 2009)	Patent
Redaurum (No. 2, 3, 14a and Camp Zone) Baird Township (MDI52N04SW00047, MDI52N04SW00048, MDI52N04SW00049, MDI52K13NW00021; 52 N/04SW)	Au	Possible Resource: 14A zone: 243 750 tons of 0.22 ounces of Au per ton 26 250 tons of 0.20 ounces of Au per ton No.2 zone: 137 500 tons of 0.18 ounces of Au per ton No.3 zone: 102 500 tons of 0.18 ounces of Au per ton Camp zone: 24 750 tons of 0.13 ounces of Au per ton	AF (Barclay 1986)	Patent
Red Crest (Red Summit) Todd Township (MDI52M01SE00011; 52 M/012SE)	Au	Resource: 47 439 tons of 0.269 ounces of Au per ton (uncut grade) (Horwood 1945) 38 000 tons of 0.3 ounces of Au per ton	NM - Mar. 14, 1985, p.21; ODM Annual Report (Horwood 1945)	Patent
Richardson (Kostynuk Bros. Mine) Brownstone Lake Area (MDI52N09SW00002; 52 N/09SW)	Au	Resource: 700 000 tons of 0.2 ounces of Au per ton	OFR 5835 (Parker and Atkinson 1992)	Patent
Rowan Todd Township (MDI52M01SE00013; 52 M/01SE)	Au	Inferred Resource (NI 43-101–compliant): 2 790 700 t at 9.2 g/t Au	TR (Kita 2022)	Patent
Sachigo River Mine Aljo Lake Area (MDI53J11SW00002; 53 J/11SW)	Au	Resource: 6000 t of 10 g/t Au for No.1 vein	TR (Hawkins 2009)	Withdrawn from staking
Sanshaw (Whitehorse Island) Dome Township (MDI52N04SW00014; 52 N/04SW)	Au	Resource: 175 000 tons of 0.20 ounces of Au per ton	NM - June 11, 1953	Patent
Setting Net Lake Setting Net Lake Area (MDI53C13SE00066; 53 C/13SE)	MoS_2	Resource: 100 000 000 tons of 0.09% MoS_2	OMIR NM - Mar. 23, 1973	Staked Claims
Sidace Lake gold property Coli Lake Area (MDI000000001360; 52 N/05SE)	Au	Indicated Resources (NI 43-101–compliant): Main Discovery Zone: 1 119 500 t of 3.0 g/t Au, Upper Duck Zone: 247 600 t of 4.19 g/t Au Inferred Resources (NI 43-101–compliant): Main Discovery Zone: 1 677 200 t of 3.01 g/t Au, Upper Duck Zone: 425 800 t of 4.11 g/t Au	Power-Fardy and Breede (2009)	Staked Claims

Deposit Name (OMI/NTS)	Commodity	Tonnage-Grade Estimates and/or Dimensions	Reserve References	Status
Sol d'Or Honeywell Township (MDI000000001360; 52 N/07SE)	Au	Resource: 8565 tons of 0.57 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Staked Claim
Spark Pegmatite Pakeagama Lake area (MDI000000002277; 53 C/11SW)	Rare elements	Open Pit Mineral Resource: Indicated Resource (NI 43-101–compliant): 14 414 000 t at 1.40 Li_2O Inferred Resource (NI 43-101–compliant): 18 118 000 t at 1.37 Li_2O	Frontier Lithium Inc., news release, March 1, 2022	Staked Claim
Springpole Lake Casummit Lake Area (MDI52N08NW00008; 52 N/08NW)	Au, Ag	Pre-Feasibility Study Probable Reserves (NI 43-101–compliant): 121.6 Mt at 0.97 g/t Au and 5.23 g/t Ag Indicated Resource (NI 43-101–compliant): 151 Mt @ 0.94 Au, 5.0 g/t Ag, inclusive of mineral reserves Inferred Resource (NI 43-101–compliant): 16 Mt @ 0.54 g/t Au, 2.8 g/t Ag, inclusive of mineral reserves	TR (Arseneau et al. 2021)	Patent, Staked Claims
Starratt–Olsen Mine Baird Township (MDI52K13NW00011; 52 K/13NW)	Au	Resource: 15 000 tons of 0.45 ounces of Au per ton	NM - July 26, 1973	Patent
Trout Bay Copper prospect (High Grade Lake) Mulcahy Township (MDI52M01SE00166; 52 M/01SE)	Zn, Cu, Pb, Ag, Au	Resource: West zone: 13 776 tons of 4.75% Zn, 0.68% Cu, 0.94 ounces of Ag per ton East zone: 124 760 tons 7.86% Zn, 1.5% Cu, 0.24% Pb, 1.7 ounces Ag per ton, 0.007 ounce of Au per ton	MP 147 (Atkinson, Parker and Storey 1990); Preliminary Map P.567 (Riley 1969); OMIR	Patent
Uchi Mine Earngey Township (MDI52N02SE00007; 52 N/02SE)	Au	Resource: 214 000 tons of 0.147 ounces of Au per ton	Energy, Mines and Resources Canada (1990)	Patent
Uchi Jalda–Hill–Tivy–Sloan Earngey Township (MDI52N02SE00008; 52 N/02SE)	Au	Resource: 296 000 tons of 0.219 ounces of Au per ton (Grassett prospect Resource may be included in total)	AF (Germundson 1995)	Patent
Wilmar Mine Dome Township (MDI52N04SW00017; 52 N/04SW)	Au	Resource (*from* OFR 5558 unless otherwise indicated): Diorite Dike zone: 140 000 tons of 0.21 ounces of Au per ton East Breccia zone: 31 500 tons of 0.32 ounces of Au per ton (Proven) 50 500 tons of 0.25 ounces of Au per ton (Probable) 1 777 000 tons of 0.24 ounces of Au per ton (Possible) Carbonate zone: 25 000 tons of 0.17 ounces of Au per ton (Probable) 7500 tons of 0.15 ounces of Au per ton (Possible) West Granodiorite zone: 3.15 to 4.5 million tons of 0.076 to 0.131 ounces of Au per ton (Energy, Mines and Resources Canada 1990) Granodiorite zone: 5 700 000 tons of 0.10 to 0.15 ounces of Au per ton	OFR 5558 (Durocher, Burchell and Andrews 1987) Energy, Mines and Resources Canada (1990)	Patent
Woco vein Earngey Township (MDI000000000289; 52 N/02SE)	Au	Resource: 21 263 tons of 0.80 ounces of Au per ton	AF (Germundson 1995)	Staked Claims
Young, H.G., Mines Ltd. Balmer Township (52N/04SE00015)	Au	Indicated Resource (NI 43-101–compliant): 304 000 t at 17.02 g/t Au Inferred Resource (NI 43-101–compliant): 1 190 000 t at 18.08 g/t Au	Goldcorp Inc., news release, Oct. 26, 2016	Patent

Note: *This table contains tonnage and grade estimates referred to as reserves (indicated, possible, probable), which were determined at various times by methods largely unreported. Except where noted, none of these estimates are known to conform to the standards required for National Instrument 43-101 and should be considered inferred mineral resources not reserves.*

Unit abbreviations used*: g/t = grams per tonne; lbs = pounds; Mt = million tonnes; opt = ounces per ton; oz = ounce(s); t = tonnes.*

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHWEST REGION

Land-Use Planning Activities

The northwest Regional Land Use Geologist (RLUG), based in Thunder Bay, co-ordinates input into land-use planning activities in the Thunder Bay South, Thunder Bay North, Red Lake and Kenora Resident Geologist districts. In 2022, the northwest Regional Land Use Geologist position was staffed from March through December by Sarah Ferguson, *P.Geo*. For the months of January and February, the duties were carried out by the southern and northeast Regional Land Use Geologists, Peter LeBaron, *P.Geo.*, and Pierre Bousquet, *P.Geo*, respectively.

The boundaries of the Regional Land Use Geologists' regions are indicated on Figure 43.

Figure 43. Extent of the Regional Land Use Geologists' ("RLUG") areas of responsibility (red lines indicate the regional boundaries; grey lines indicate the municipal boundaries).

The objective of the position is to ensure that geoscience information is considered in policy and land-use planning decisions. The geoscience information relates to

- mineral-related values and economic opportunities
- natural geological and mining-related hazards
- renewable and non-renewable energy sources
- groundwater resources

Program activities that support this objective include helping develop, deliver and administer provincial policies, practices and procedures; and providing advice and guidance to municipalities, agencies and others involved in or affected by land-use planning regarding geoscience-related matters.

In 2022, the northwest Regional Land Use Geologist dealt with a variety of land-use planning issues throughout the northwest region. The following sections summarize the work that was done.

CROWN LANDS

In July of 2022, the former Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF) was divided to create 3 separate Ministries: Ministry of Mines (MINES), Ministry of Northern Development (MND) and Ministry of Natural Resources and Forestry (MNRF). The Ministry of Mines (MINES) continues to be responsible for all geoscience mapping within the province and administers mineral exploration and development under the *Mining Act*. The Ministry of Natural Resources and Forestry (MNRF) continues to be responsible for mineral aggregate extraction under the *Aggregate Resources Act*, in addition to being responsible for mapping and regulating many other natural resource features and activities.

The Ministry of Mines (MINES) engages with the Ministry of Natural Resources and Forestry (MNRF) when Crown land-use planning activities have the potential to impact provincial mineral interests, or to expose those using Crown lands to natural geological or mining-related hazards. These activities relate to forest management planning; energy and other major infrastructure projects; Far North land-use planning; proposals to modify existing parks or create new ones; and various other initiatives related to Crown land use.

Crown Land Disposition

In 2022, the northwest Regional Land Use Geologist provided geoscience information to MNRF regarding a case study to support the disposition of Crown Land to the Municipality of Red Lake for commercial and residential development to meet future demands of the community. Geoscience information was also provided to MNRF for a lot in the Red Lake district being evaluated for a disposition of surface rights.

Forest Management Planning

The forest management planning process involves consideration of a wide range of values, including mineral values, in the context of forestry activities, and the relevance of legislation other than the *Crown Forest Sustainability Act*, such as the *Mining Act*. The northwest Regional Land Use Geologist provided input into the development of the following Forest Management Plans:

- Lac Seul Forest Management Plan 2024–2034
- Wabadowgang Noopming Forest Management Plan 2023–2033

The northwest Regional Land Use Geologist also provided information pertaining to planned road construction, road closures, water crossing decommissioning and slash pile burning from the annual work schedules to local District Geologists and Regional Resident Geologists so they could inform affected stakeholders. Information was provided for the Red Lake, Trout Lake, Whitefeather, Dog River–Matawin, Black Spruce, Lakehead, Wabadowgang Noopming, Boundary Waters, Kenora, Whiskey Jack, Dryden, English River, Wabigoon, White River, Pic and Nagagami Forest Management Units.

Approved forest management plans, with detailed information about annual operations, including plans for creating new access routes or decommissioning existing routes, and maps showing forest access roads are posted on the MNRF Natural Resources Information Portal (https://nrip.mnr.gov.on.ca).

Far North Land Use Planning

The Far North Land Use Planning Initiative is about working with First Nations to identify where development may occur and where land will be designated for protection in the Far North of Ontario. The Far North encompasses 42% of Ontario's land mass in an area generally north of the areas where forest management planning is done (for the planning area boundary, *see* www.ontario.ca/rural-and-north/far-north-ontario). For detailed information about Far North Land Use Planning and the *Far North Act*, *see* www.ontario.ca/page/far-north-land-use-planning-initiative.

In 2021, changes to the *Far North Act, 2010* were reviewed and approved in Schedule 10 to Bill 43, the *Build Ontario Act (Budget Measures) 2021*. These changes will encourage collaboration between Ontario and First Nations on land use planning and foster economic growth in the Far North while maintaining critical cultural and environmental protections.

All but a few First Nation communities in the Far North are working on a range of land-use planning activities, although they are not all at the same stage in the planning process. Over the years, the Regional Land Use Geologist has provided geoscience information to a number of communities in northwestern Ontario, working on gathering information for their planning areas, and learning about the land-use planning process. *Far North Act* planning initiatives are listed in Table 29.

Table 29. *Far North Act* planning initiatives with MINES, northwestern Ontario.

Completed Plan
Pikangikum First Nation
Cat Lake and Slate Falls First Nations (working jointly)
Pauingassi First Nation
Little Grand Rapids First Nation

Completed Draft Plan
Deer Lake First Nation

Completed Terms of Reference
Deer Lake First Nation
Eabametoong and Mishkeegogamang First Nations (working jointly)
Marten Falls First Nation
Mishi Sakahiganiing First Nation (McDowell Lake)
North Spirit Lake First Nation
Peawanuck First Nation
Wawakapewin First Nation
Webequie First Nation

In 2022, the northwest Regional Land Use Geologist was not called upon for geoscience information or review of any planning initiatives under the *Far North Act*.

Withdrawal Orders

Other work related to Crown land use in the northwest region may include reviews of applications for withdrawal of lands from claim registration under Section 35 of the *Mining Act*. Applications may be for mining rights only, surface rights only and for both mining and surface rights. Reviews by the northwest Regional Land Use Geologist ensure that mineral potential, mineral sector activity and mining-related hazards are identified and considered before decisions are made. In 2022, a total of 9 withdrawal applications were reviewed for the northwest, with the following withdrawal orders having been issued at the time of publication.

- Rainy Lake First Nations – Flooding Claim
  - W-K-30/21 – 574 ha
  - W-K-31/21 – 10 650 ha
- Biinjitiwaabik Zaaging Anishinaabek (BZA) – Aboriginal Title Claim
  - W-TB-14/22 – 38 593.30 ha
- Bingwi Neyaashi Anishinaabek (BNA) – Aboriginal Title Claim
  - W-TB-15/22 – 31 973.84 ha
- Pays Plat First Nation – Aboriginal Title Claim
  - W-TB-34/22 – 22 212.24 ha
- Long Lake No. 58 First Nation - Aboriginal Title Claim (a small portion of this withdrawal occurs in the Porcupine District of the northeast RLUG region)
  - W-TB-110/22 – 94 493.96 ha

Aggregates

The northwest Regional Land Use Geologist ensured that mineral potential, mineral sector activity and mining-related hazards were identified and considered before decisions were made regarding 1 aggregate permit application that was received in 2022. The application was located in the Obikoba Lake Area (District of Rainy River). Information was also provided for 4 early consultations for aggregate permit applications in the District of Rainy River in the geographic townships and areas of Griesinger, Obikoba Lake Area, Otukamamoan Lake Area and Porter Inlet Area.

Parks and Protected Areas

In 2022, MINES was contacted by MNRF to provide an analysis of the mineral potential for nonharvestable areas identified within managed Crown forest areas in the Area of the Undertaking. This was requested to evaluate the potential to incorporate these nonharvestable areas in the forest management areas into the Other Effective Area-based Conservation Measures (OECM) initiative to support Canada's 2020 Biodiversity Goals and Targets. The northwest Regional Land Use Geologist worked with the northwest GIS Data Specialist, the Land Use Planning and Policy Co-ordinator and the northeast Regional Land Use Geologist to develop a mineral potential ranking system to assess each of the nonharvestable area polygons using information from the Ontario Mineral Inventory (OMI), Metallic Mineral Potential Estimation Tool (MMPET) and Mining Lands Administration System (MLAS).

In 2022, the northwest Land Use Geologist also provided mineral potential information for a Minister's Office request regarding areas withdrawn from claim registration that are being considered as additions to the Woodland Caribou Provincial Park and the Northern Piesk Lake Park, both in the Red Lake district.

In 2022, the Land Use Planning and Policy Coordinator continued to provide support to the Ministry of the Environment, Conservation and Parks (MECP) for the Conservation Agreement for Boreal Caribou in Ontario (2022) to ensure the interests of MINES are considered in the implementation of the agreement.

MUNICIPAL AND PRIVATE LANDS

The Ministry of Mines supports municipal and private land-use planning through the One Window Planning Service, led by the Ministry of Municipal Affairs and Housing (MMAH), and through the Municipal Plan Review process where a municipality has approval authority. When requested, the northwest Regional Land Use Geologist provides input into, and reviews, draft Official Plans, Official Plan Amendments, draft plans of subdivision and consent (severance) applications to ensure that provincial mineral interests, natural geological hazards and mining-related hazards are appropriately considered in the planning process.

Municipal Planning

The Provincial Policy Statement (PPS), which guides municipal planning in Ontario, is issued under the provisions of the *Planning Act*. The PPS helps to ensure that municipal Official Plans recognize mining operations and areas with significant mineral potential, so that they can be protected from incompatible land uses. The PPS was last modified in 2020. There were no revisions in 2020 directly applicable to the review process of the Regional Land Use Geologist. All municipalities in Ontario were required to update their Official Plans to conform with the 2020 version of the PPS by July 2022.

In October 2022, MMAH began a policy review of A Place to Grow and the Provincial Policy Statement (https://ero.ontario.ca/notice/019-6177), seeking input on how to create a streamlined province-wide land use planning policy framework that enables municipalities to approve housing faster and increase housing supply. The Land Use Planning and Policy Coordinator provided review and feedback to MMAH for this update, as well as, the More Homes Built Faster: Ontario's Housing Supply Action Plan 2022-2023 (https://ero.ontario.ca/notice/019-6162).

As a participant in MMAH's One Window Planning Service for Official Plans and their amendments, the Regional Land Use Geologist provides comments, mineral values mapping and other input as required for Official Plans and Official Plan Amendments. Where a municipality has approval authority, the Regional Land Use Geologist participates in the Municipal Plan review directly with the municipality for Official Plan amendments and related planning initiatives.

In addition, reviews are completed, and information provided for pre-consultation for consent applications and formal consent applications, and plan of subdivision and/or condominium applications. Although such decisions are normally made by municipal governments, most of the area of the northwest region is outside of towns and cities. In the absence of a municipal government to manage planning decisions related to private land in those areas, decisions are made by the MMAH, with the support of partner ministries, including MINES.

In 2022, the northwest Regional Land Use Geologist provided maps, comments and other input as required for municipal planning activities that included

- 58 consent (severance) and plan of subdivision and/or condominium applications, including early consultations, in 7 single-tier municipalities and 5 unorganized geographic townships or areas
- 27 Official Plans and related planning initiatives (such as Offical Plan amendments, zoning by-laws, and minor variances) in 6 communities
- 7 new draft Official Plans or Official Plan updates

The municipalities involved in these planning initiatives are listed in Table 30.

Table 30. Municipal planning initiatives with MINES input, northwestern Ontario, 2022.

Consent (Severance) and Subdivision and/or Condominium Applications
Consent, Municipality of Greenstone (2)
Consent, Municipality of Oliver Paipoonge (20)
Consent, Municipality of Shuniah (3)
Consent, Township of Gillies (5)
Consent, Township of O'Connor (6)
Consent, Township of Machin (1)
Consent, Gorham, District of Thunder Bay (7)
Consent, Ware, District of Thunder Bay (8)
Consent, Strange, District of Thunder Bay (2)
Consent, Stirling, District of Thunder Bay (1)
Consent, Sibley, District of Thunder Bay (1)
Plan of Subdivision, City of Thunder Bay (1)
Plan of Subdivision, Strange, District of Thunder Bay (1)

Official Plans and Related Initiatives
Minor variance, Municipality of Oliver Paipoonge (2)
Minor Variance, Municipality of Shuniah (7)
Official Plan amendment, City of Thunder Bay (1)
Official Plan amendment, Municipality of Oliver Paipoonge (1)
Zoning By-law amendment, Gorham, District of Thunder Bay (1)
Zoning By-law amendment, Township of Emo (1)
Zoning By-law amendment, Municipality of Oliver Paipoonge (7)
Zoning By-law amendment, Municipality of Shuniah (3)
Zoning By-law amendment, Municipality of Greenstone (2)
Zoning By-law amendment, City of Thunder Bay (2)

Draft Official Plans and Official Plan Updates
Greenstone, Municipality of
Pickle Lake, Township of
Dryden, City of
Sioux Narrows-Nestor Falls, Township of
Fort Frances, Town of
Manitouwadge, Township of
Neebing, Municipality of

Exemptions from Mining Tax

Section 189 (1) of the *Mining Act* allows owners of patented land to apply for exemption from paying mining tax. Key factors that are considered when applications are reviewed include whether or not the lands are being used for mining-related purposes, and whether or not there would be third-party interest in using the lands for mining-related purposes (e.g., the surrounding lands are being explored or the sites in question have provincially significant mineral potential). The Land Use Geologist's comments are provided to the Ministry of Mines Mining Lands Section to be consolidated with other information for the Ministry's consideration and decision.

During 2022, no applications were reviewed for the northwest region.

FIRST NATIONS

In addition to doing work related to Far North land-use planning, the northwest Regional Land Use Geologist provided information on mineral occurrence sites, past or present mining and exploration activity, geology and mineral potential for 2 Aboriginal Title Claim areas, 1 Treaty Land Entitlement area and 1 proposed Indigenous Protected and Conserved Area (IPAC) in northwestern Ontario.

Other Activities

Because of provincial government–mandated work-from-home directives, following public health restrictions that were implemented in response to the COVID-19 pandemic, Resident Geologist Program (RGP) staff continued to work remotely in 2022 until May 16, after which staff returned to the office for a minimum of 3 days per week for the remainder of the year. Field activities also resumed at this time, allowing the northwest Regional Land Use Geologist to accompany other RGP staff of the Thunder Bay, Tweed (southern) and Timmins (northeast) offices on 5 general interest field trips in 2022.

The northwest Regional Land Use Geologist also undertook a number of additional activities in 2022, as outlined below.

CLASS ENVIRONMENTAL ASSESSMENTS

Class Environmental Assessments ("Class EAs") are documents that set out a standard environmental assessment process to evaluate the potential environmental effects of a project. There are currently 11 Class EAs in effect in Ontario (www.ontario.ca/page/class-environmental-assessments-approved-class-ea-information), relating to the development of new infrastructure, such as dams, transmission lines, pipelines, highway corridors, commuter rail stations and bus terminals, and sewer and water facilities; the establishment of new parks and conservation reserves; forest management plans; and Crown land dispositions.

The northwest Regional Land Use Geologist works with staff from MNRF and other ministries to ensure that relevant geoscience information and provincial mineral interests were identified and accommodated early in the planning process of projects subject to Class EAs. In 2022, feedback was provided for reviews of 2 documents, and 2 virtual workshops were attended, related to the following 3 Class EA projects within northwestern Ontario:

- Marten Falls First Nation and Webequie First Nation, Northern Road Link Project – proposed terms of reference
- Ministry of Transportation, Highway 17 Little Pic River Preliminary Design and Westerly Extension Study
- Hydro One Networks Inc., Waasigan Transmission Line Project – government review team workshops to discuss project updates and route evaluation

SITE READINESS PROGRAM

The Ministry of Economic Development, Job Creation and Trade (MEDJCT) launched the Site Readiness Program in 2021 to provide municipalities and industrial landowners an opportunity to increase the development readiness of their industrial sites. The program complements the Investment Ready: Certified Site Program, providing a more streamlined process with a focus on smaller sites.

Requests for comments were received for 2 Site Readiness applications in 1 community in 2022, and are listed in Table 31.

Table 31. Site Readiness Applications submitted for Regional Land Use Geologist input, northwestern Ontario, 2022.

Site Readiness Applications
City of Thunder Bay, Innovation Drive
City of Thunder Bay, Central Avenue

POLICY AND GUIDANCE

The northwest Regional Land Use Geologist assisted staff from the Resident Geologist Program offices in Kenora, Red Lake, Thunder Bay South and Thunder Bay North with inquiries that included a land-use component. Land use–related inquiries from other MINES branches, partner ministries, municipalities and planning boards, and the general public were also addressed, and information pertaining to abandoned mines, mineral potential, bedrock and surficial geology, and mining land status was provided as needed. Support was also provided to the Minister's Office when requested.

Input was provided for the draft guidelines for the Community Infrastructure and Housing Accelerator (CIHA) tool that would be introduced as part of Bill 109, the *More Homes for Everyone Act*, 2022, to allow MMAH to expedite certain municipal zoning requests outside the Greenbelt Area. The northwest Regional Land Use Geologist reviewed the document and provided input as part of a co-ordinated MINES response to MMAH.

The Land Use Planning and Policy Co-ordinator provided review and feedback to MMAH for the policy review of A Place to Grow and the Provincial Policy Statement as well as, the More Homes Built Faster: Ontario's Housing Supply Action Plan 2022-2023.

CONFERENCES AND OUTREACH ACTIVITIES

In 2022, the northwest Regional Land Use Geologist attended or participated in the following events:

In person:

- Central Canada's Resources Expo, Thunder Bay – attended the Ring of Fire and Projects in the Pipeline technical sessions
- Lakehead University Department of Geology Seminar Series 2022, Thunder Bay – monthly presentations given by students and industry professionals on various geoscience topics

Virtual meetings and conferences:

- Ontario Geological Survey, Project Pulse – a series of technical presentations featuring project collaborations between OGS units such as the Earth Resources Geoscience Mapping Section and the Resident Geologist Program
- Ontario Geological Survey, Critical Minerals Strategy – technical presentations and program updates
- Ontario Geological Survey Virtual Showcase 2022 – a series of technical presentations over 3 days featuring results of geoscience projects in progress by the Ontario Geological Survey, summaries of activities in all districts of the Resident Geologist Program, and updates on OGS data sets and online applications
- Professional Geoscientists Ontario, 2022 Virtual Symposium – a series of sessions over 4 days covering the topics of reconciliation, diversity and inclusion, professionalism as a qualified person, effective communication, and sustainability and climate change.

MINERAL DEPOSIT COMPILATION GEOSCIENTIST ACTIVITIES—NORTHWESTERN ONTARIO

The Ontario Mineral Inventory (OMI), previously known as the Mineral Deposit Inventory (MDI), database is a dynamic compilation of over 19 100 records describing most of the known mineral occurrences in Ontario. It is an important reference tool for explorationists interested in exploring and acquiring mining properties in Ontario. When used in conjunction with other spatial databases generated by the Ontario Geological Survey (OGS), it provides additional tools for making mineral discoveries in Ontario.

In April 2021, the OGS Resident Geologist Program (RGP) initiated a project to add the OMI database to an existing intranet site that contained other RGP geoscience databases. This existing intranet site is called Ontario Mineral Exploration Information System (OMEIS). For more information on this migration and the reasoning behind it, *see* the 2021 Report of Activities (Malegus et al. 2022, p.94-95). This migration to a user-friendly database model allowed the Mineral Deposit Compilation Geoscientists (MDCG) to complete extensive data cleanup that was unfeasible in the previous system. Alongside data cleanup, regular updates of OMI entries were completed along with input of new occurrences.

The Mineral Deposit Compilation Geoscientists (MDCG) investigate and document mineral deposits and occurrences across the province. Through field visits, comprehensive literature research and personal research, they work with regional and district Resident Geologist Program staff to ensure that the OMI database is regularly updated. Regular updates are required to ensure that the Ministry of Mines is using the most up-to-date information in making land-use planning and policy decisions and that mineral industry clients have access to comprehensive and up-to-date records. Records for certain areas are reviewed and updated in support of bedrock mapping and other field work conducted by the Earth Resources and Geoscience Mapping Section (ERGMS) of the Ontario Geological Survey (OGS). For 2022, Therese Pettigrew was the northwestern Ontario MDCG.

Total contributions to the OMI database for northwestern Ontario in 2022 included 4066 updated records, 18 records deleted and 50 new records. A breakdown of the provincial records revised by district is provided in Table 32.

Table 32. Ontario Mineral Inventory records revision in northwestern Ontario in 2022.

Resident or District Office	Updates	Deletions	New
Kenora	1462	3	8
Red Lake	785	0	10
Thunder Bay North	848	15	18
Thunder Bay South	971	0	14
Total	**4066**	**18**	**50**

GEOGRAPHIC INFORMATION SYSTEM DATA SPECIALISTS ACTIVITIES—NORTHWESTERN AND NORTHEASTERN ONTARIO

The Resident Geologist Program's Geographic Information System (GIS) Data Specialist positions are currently based in the Thunder Bay and Tweed offices and serve the northwest and, northeast and southern RGP regions respectively. During 2022, the Thunder Bay position was occupied by Genevieve Dorland. The Tweed position was filled by Lucas Beckering Vinckers-Stofer between February and June. Nazha Sabiri moved into the Tweed position on an interim basis in July and assumed the role permanently in September. The GIS Data Specialists create maps and graphics, manage geospatial data and conduct data analysis for land-use planning purposes, geoscience compilations, reports, posters and presentations. They provide ongoing GIS support to the Resident Geologist Program (RGP) and respond to client requests for assistance with accessing geoscience data.

Existing Data Products

ONTARIO ASSESSMENT FILE DATABASE AND ONTARIO DRILL HOLE DATABASE

The Ontario Assessment File Database (OAFD), Ontario Drill Hole Database (ODHD) and Ontario Mineral Inventory (OMI) are updated on a continual basis by RGP staff using the Ontario Mineral Exploration Information System (OMEIS). An intranet-based application, OMEIS was launched in 2018 and is used by RGP and Mining Lands staff to maintain and update assessment file and drill-hole data. New assessment files and related drill holes are added to the database as soon as the files are received from Mining Lands. Updates to existing data are made on an ongoing basis. These updates can include corrections to address errors reported by clients or other Ministry of Mines (MINES) staff, or improvements, such as the addition of details that had not been captured for older files. Updated information and new files are accessible through the GeologyOntario search tool within 24 hours. Most of the data entry is carried out by the District Geological Assistants. The GIS Data Specialists are responsible for the administration of OMEIS, the creation of GIS data for the new files and drill holes as well as corrections to existing assessment file polygons. The GIS Data Specialists extract the tabular and spatial data at the beginning of each month and compile it for release as both 1) a graphical interface or data layer (keyhole mark-up language (*.kml*) file) through OGSEarth (www.ontario.ca/ogsearth) which can be viewed using geographic information applications, such as Google Earth™ mapping service; and 2) a compressed (*.zip*) downloadable file on GeologyOntario (www.hub.geologyontario.mines.gov.on.ca). A summary of new items added, and existing items updated in 2022 is provided in Table 33.

Table 33. Ontario Mineral Exploration Information System (OMEIS) statistics for 2022.

File Type	New Files Added	Existing Files Updated	New Drill Holes Added	Existing Drill Holes Updated
Approved Assessment	517	27 120	2849	557
Non-Assessment Exploration Work	0	557	80	2
Total	**517**	**27 677**	**2929**	**559**

**Data cleanup was carried out on a large number of assessment file records.*

New Data Products

CRITICAL MINERALS LAYER

The GIS Data Specialists were involved in the development of the Critical Minerals layer for OGSEarth. This new data set allows users to view mineral inventory locations that have critical minerals as primary or secondary commodities. The points are categorized by commodity and include links to view the full description of the features on GeologyOntario. The Critical Minerals layer can be downloaded on the OGSEarth Web site (www.hub.geologyontario.mines.gov.on.ca) and is updated monthly to include new and updated mineral inventory locations.

Other Projects

UPGRADES TO GEOLOGYONTARIO

In 2022, the project to create a spatial search tool and upgrade the text search for GeologyOntario continued. The GIS Data Specialists were part of the project team, helping to translate the results of user research into spatial search tool features and providing advice on the functionality of the text search.

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Ontario

Ontario Geological Survey
Resident Geologist Program

Red Lake Regional Resident Geologist (Kenora District)—2022

by

E.G. Amyotte and K.E. Wiebe

2023

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E.G. Amyotte[1] and K.E. Wiebe[2]

[1]District Geologist, Kenora District, Resident Geologist Program, Ontario Geological Survey

[2]District Geological Assistant, Kenora District, Resident Geologist Program, Ontario Geological Survey

INTRODUCTION

The Kenora District extends east from the Manitoba border to Savant Lake and south to the international border with the United States. It encompasses the towns of Kenora, Vermilion Bay, Dryden, Ignace, Sioux Lookout, Savant Lake, Fort Frances and several First Nation communities of Treaty 3 affiliation.

Gold and silver continued to be the only metallic minerals mined in the District in 2022. New Gold Inc. continued production from the Rainy River gold-silver deposit with 229 822 ounces of gold and 417 900 ounces of silver produced. In addition, Nelson Granite Ltd. continued to produce dimension stone from 4 quarries.

In 2022, in the District, mining claim coverage increased by 250 106 ha, and there were at least 35 active mining and exploration projects (Figures 2 and 3, respectively). Gold, silver, lithium and base metals were the main commodities targeted by the exploration activity. Significant areas of claim coverage increases were along the Separation Rapids greenstone belt and within the geological western Wabigoon Subprovince in proximity to Dryden and Sturgeon Lake.

Exploration activity highlights from 2022 includes a positive preliminary economic assessment (PEA) published for the Kenbridge nickel project, a mineral resource estimate released for the Thundercloud gold property and resource delineation commencing at the Mavis Lake lithium project.

Tartisan Nickel Corp. demonstrated the economic potential of the Kenbridge nickel project through the release of a PEA that outlined positive economics for an underground mining operation which could produce 41 million pounds of nickel and 21 million pounds of copper over a 9 year life-of-mine. Advancements on the project in 2022 also included environmental baseline studies and construction of an all-season access road.

Dynasty Gold Corp. released an independent mineral resource estimate for the Pelham zone of the Thundercloud property, which estimates an Inferred Resource of 182 000 ounces of gold. Gold in the Pelham zone is hosted within quartz veins hosted by a gabbroic body in the metavolcanic rocks of the western Wabigoon Subprovince. Diamond drilling was conducted on the property late in 2022, which highlighted a significant intersection of 7.35 g/t Au over 51 m.

Critical Resources Ltd. conducted diamond drilling, totalling approximately 20 000 m on the Mavis Lake lithium project in 2022 aimed to support the development of a Joint Ore Reserve Committee (JORC) code–compliant mineral resource estimate for the project in 2023. Drilling to date has demonstrated lithium mineralization over a 1300 m strike length that is still open along strike and at depth. The company acquired the Mavis Lake project in 2021 with a historic resource of 500 000 tons at 1% lithium superoxide (Table 8).

Metal Earth continued an applied research and development program, led by Laurentian University, focussing on 3 study areas in the Kenora District. As part of this program, 3 research and 3 university thesis studies were conducted in 2022 in the District and are summarized in "OGS Activities and Research by Others".

The authors note that, for ease of reading, all Web addresses were accessed on January 31, 2023, unless otherwise noted. Dollar amounts are provided as Canadian, unless otherwise indicated.

MINING ACTIVITY AND QUARRYING ACTIVITY

Gold and Silver Production – New Gold Inc.

New Gold Inc. (http://newgold.com; *see* Figure 3, location 1) continued open pit and underground mining, and ore processing operations at its Rainy River gold-silver mine approximately 65 km northwest of Fort Frances. Notably in 2022, the operation met their updated production guidance, producing 229 822 ounces of gold, which translates to 235 194 equivalent ounces based on a ratio of $1800 per gold ounce and $24.00 per silver ounce (New Gold Inc., news release, January 10, 2023). Average head grade for production at Rainy River was 0.91 g/t Au. New Gold also began underground production mining from the Intrepid zone (Figure 1; New Gold Inc., news release, November 3, 2022). Rainy River hosts a mineral reserve of 2.8 million ounces of gold and 7 million ounces of silver, and mineral resources estimated at 1.7 million ounces of gold and 4.1 million ounces of silver. The operation is expected to produce between 225 000 to 245 000 ounces of gold and 407 000 ounces of silver annually to end of the life-of-mine in 2029 (New Gold Inc., news release, January 10, 2023; Lecomte et al. 2022).

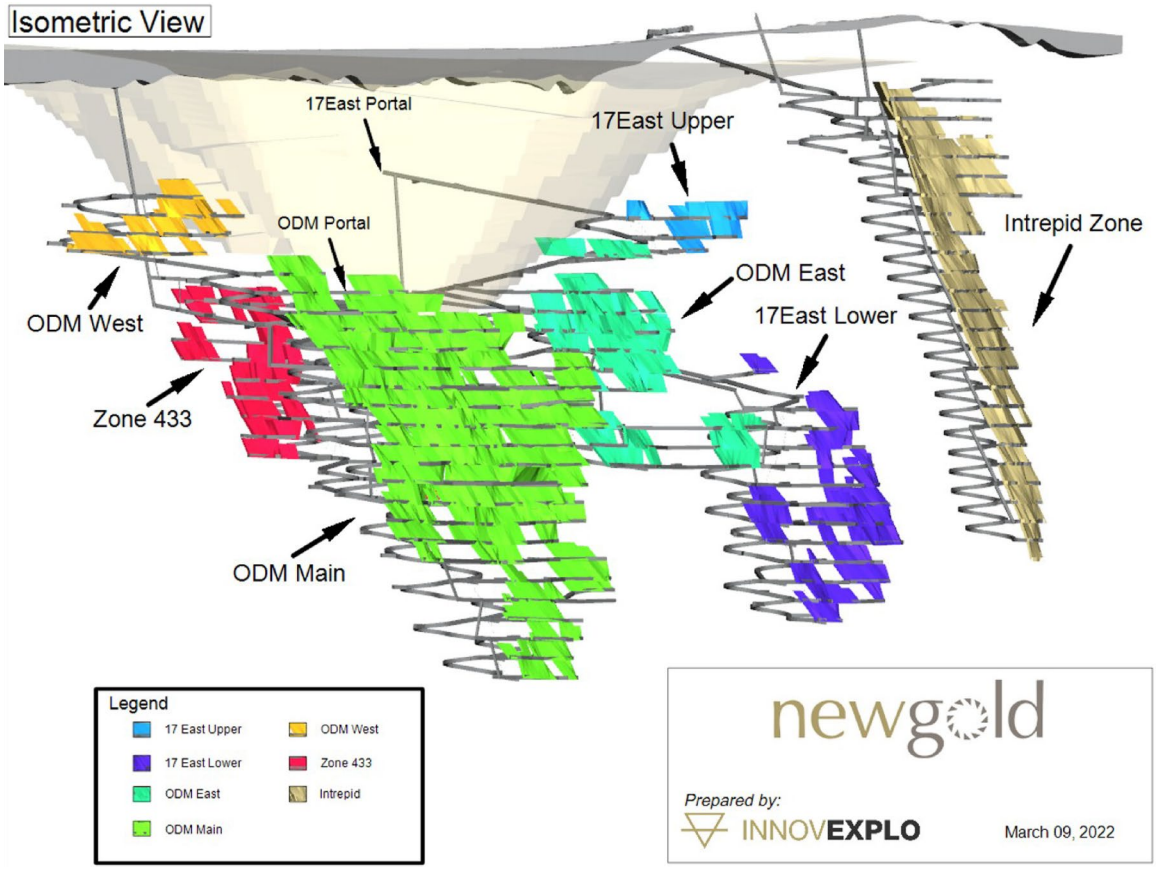


Figure 1. Isometric view of underground resource domains at the New Gold Inc. Rainy River Mine (*from* Lecomte et al. 2022).

Stone Production – Nelson Granite Ltd.

Nelson Granite Ltd. (www.nelsongranite.com) continued year-round production from 4 established stone quarries (*see* Figure 3).

Production continued at the **Docker Township quarry** (V), 10 km southwest of Vermilion Bay. Homogeneous, medium-grained, pink granite is produced from a granite plug, which is part of the Dryberry Batholith. The majority of the stone produced is used in the monument industry and is sold as "Vermilion Pink". In 2022, approximately 5368.4 m^3 (189 584 $feet^3$) were produced (C. Spence, Nelson Granite Ltd., personal communication, 2023).

The company also continued to produce stone from their **Forgotten Lake quarry** (W) on the eastern side of Forgotten Lake, approximately 35 km north of Kenora and 10 km north of Redditt. The green, feldspar-megacrystic "Pine Green" stone is used as monument and building stone. A total of 1730.4 m^3 (61 108 $feet^3$) were produced in 2022 (C. Spence, Nelson Granite Ltd., personal communication, 2023).

The **Redditt quarry** (X) is located approximately 10 km southwest of the Forgotten Lake quarry and 3 km west of Redditt. The stone from the quarry is white, feldspar-megacrystic granite and marketed as "Bimini" and was used as monument and building stone. A total of 336.3 m^3 (11 877 $feet^3$) were produced in 2022 (C. Spence, Nelson Granite Ltd., personal communication, 2023).

Production continued at the **Red Deer Lake quarry** (Y) in 2022. The quarry is located near Red Deer Lake, approximately 40 km northeast of Kenora and 12.6 km east of the Forgotten Lake quarry. The stone is marketed as "Red Deer Brown" or "Canadian Mahogany". A total of 1600.1 m^3 (56 506 $feet^3$) were produced for use as monument and building stone (C. Spence, Nelson Granite Ltd., personal communication, 2023).

EXPLORATION ACTIVITY

A complete summary of exploration for 2022 activity, including prospecting, is provided in Table 1 with numbers keyed to Figure 2.

Mining claim coverage in the Kenora District increased by 250 106 ha in 2022 and totals 935 407 ha as of January 4, 2023, representing 36% year over year increase in claim coverage within the District (*see* Figure 2). New claim registrations were largely focussed within the Separation Lake greenstone belt, and the Dryden, Gold Rock, Manitou and Sturgeon Lake areas of the western Wabigoon Subprovince.

Activities presented in Table 1, the Exploration Activity Table, are grouped into 4 sections, each representing different stages of program activity.

Projects listed in the ***Mine Development Stage*** have experienced success from several years of exploration activity and are entering the construction and initiation of the mine. Exploration activity continues to occur on the property.

Projects listed in the ***Economic Analysis Stage*** are those that have initiated an economic review of potential production, such as a Preliminary Economic Assessment.

Projects lists in the ***Resource Delineation Stage*** are those where exploration efforts are focussed on upgrading the National Instrument (NI) 43-101 compliant or historical mineral resource estimate of a deposit on the property.

The remaining exploration activity is presented in the ***Exploration Stage*** section of Table 1. Mineral deposits not being mined can be found in Table 8.

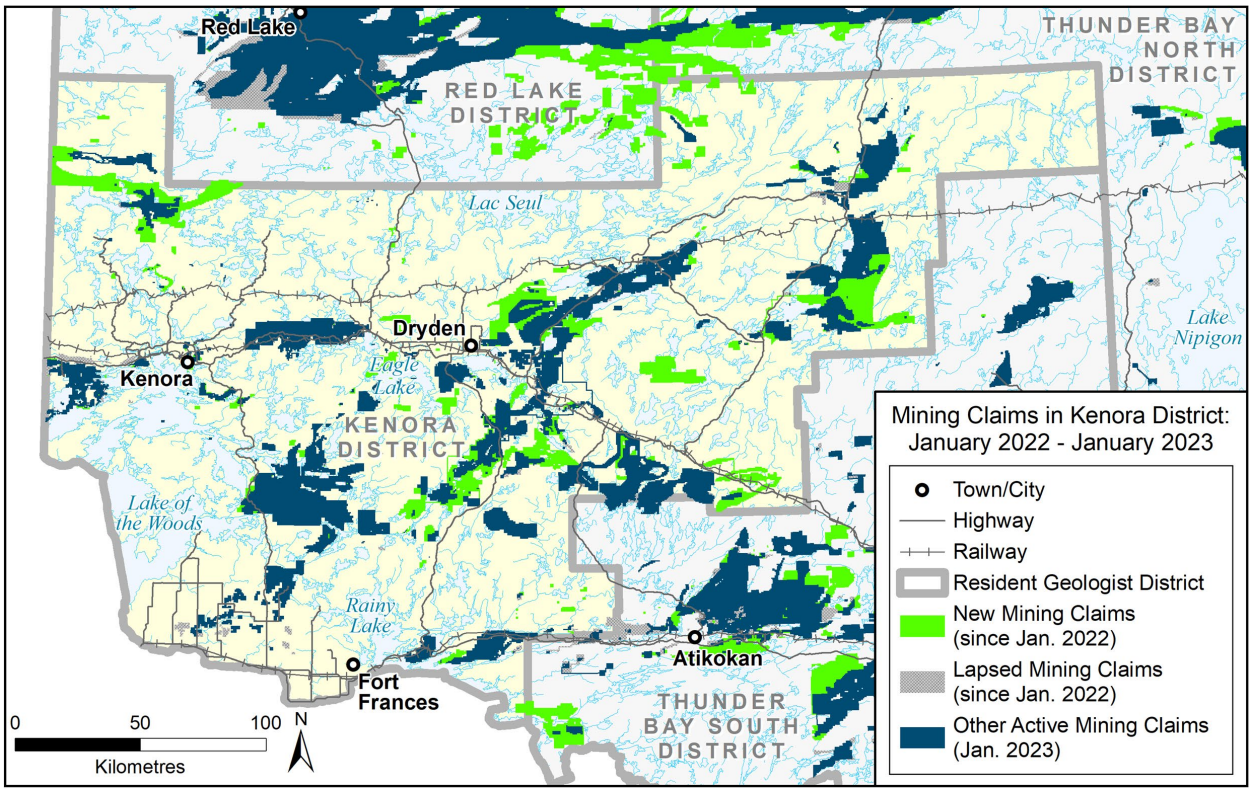


Figure 2. Extent of staking in the Kenora District during 2022.

Table 1. Exploration activity in the Kenora District in 2022 (keyed by number to Figure 3).

Abbreviations

AEM	Airborne electromagnetic survey	MET	Metallurgical testing
ASD	Assay data	MRE	Mineral Resource Estimate (NI 43-101)
Comp	Compilation	NR	News release
DDH	Diamond-drill hole(s)	PEA	Preliminary economic assessment
EA	Environmental Assessment study	Pr	Prospecting
GL	Geological survey	Samp	Sampling (other than bulk)
Interp	Interpretation	Str	Stripping
MDA	Mine development activities	Tr	Trenching

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity
	MINE ACTIVITY / DEVELOPMENT STAGE		
1	New Gold Inc. (Rainy River Mine)	Richardson Township (Au, Ag, Cu, Zn, Pt, Pd)	MDA
	ECONOMIC ANALYSIS STAGE		
2	Avalon Advanced Materials Inc. (Big Whopper deposit on Separation Rapids property)	Paterson Lake area (Li, Cs, Rb, Ta)	NR
3	Tartisan Nickel Corp. (Kenbridge project)	Atikwa Lake Area (Ni, Cu)	PEA, EA, DDH
4	Treasury Metals Inc. (Goliath gold complex)	Zealand Township (Au)	MRE, DDH, ASD, NR
	RESOURCE DELINEATION STAGE		
5	Critical Resources Ltd. (Mavis Lake lithium project)	Brownridge Township (Li)	MRE, MET, DDH, ASD, NR
6	Dynasty Gold Corp. (Thundercloud Lake)	Boyer Lake Area (Au)	MRE, Tr, Str, DDH

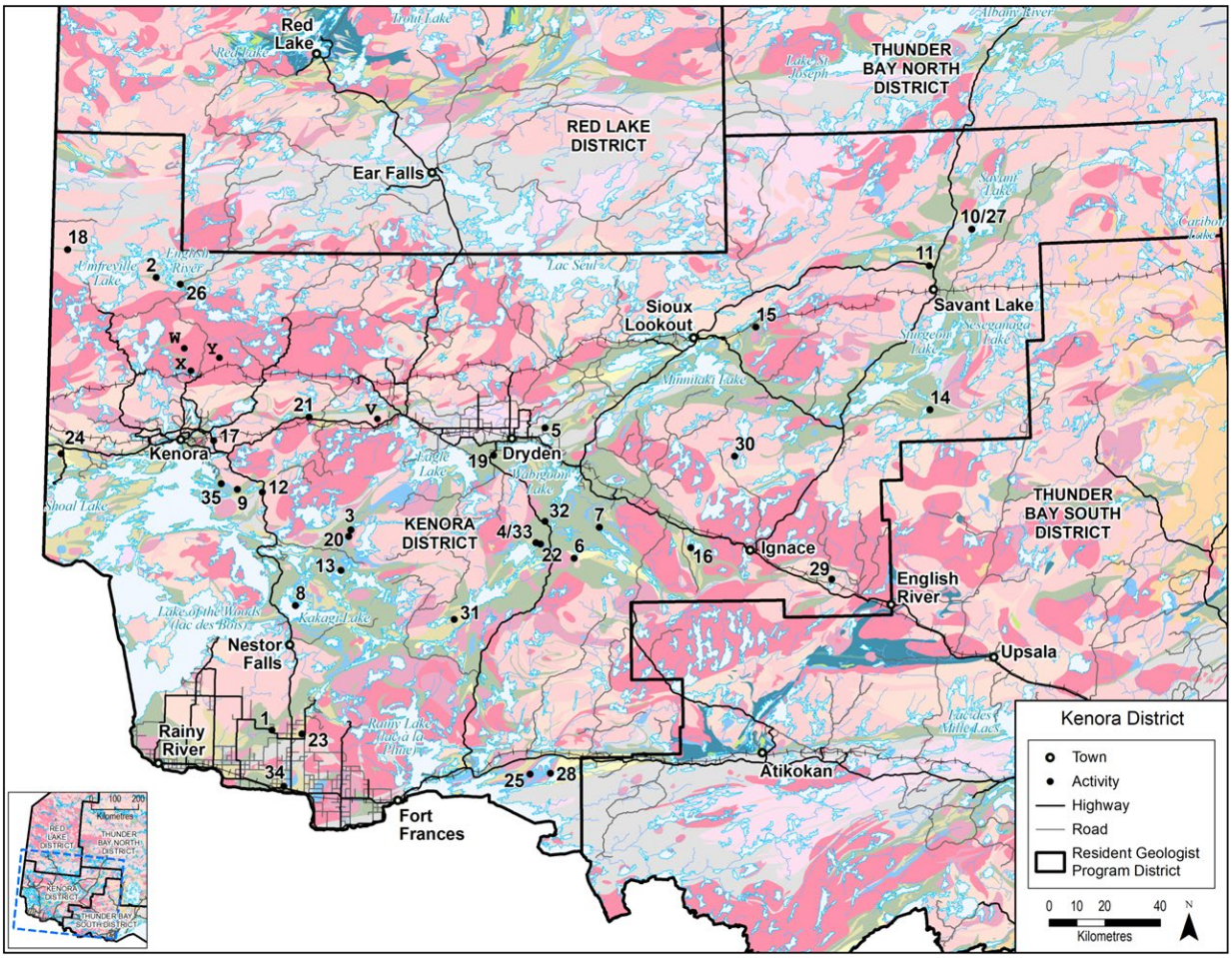


Figure 3. Location of mining and exploration activity within the Kenora District in 2022 (bedrock geology *from* Ontario Geological Survey 2011). Numbers are referenced to Table 1; letters v, w, x and y provide locations for quarries described in "Stone Production – Nelson Granite Ltd.".

Table 1, *continued*.

Abbreviations

AEM ..... Airborne electromagnetic survey	MET ..... Metallurgical testing
ASD ..... Assay data	MRE ..... Mineral Resource Estimate (NI 43-101)
Comp ..... Compilation	NR ..... News release
DDH ..... Diamond-drill hole(s)	PEA ..... Preliminary economic assessment
EA ..... Environmental Assessment study	Pr ..... Prospecting
GL ..... Geological survey	Samp ..... Sampling (other than bulk)
Interp ..... Interpretation	Str ..... Stripping
MDA ..... Mine development activities	Tr ..... Trenching

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity
	EXPLORATION STAGE		
7	Ashley Gold Corp. (Tabor Lake Mine–Santa Maria properties)	Kawashegamuk Lake Area (Au)	Pr, Samp, GL, NR
8	Big Gold Inc. (Martin Kenty)	Heronry Lake Area (Au)	Pr, Samp, NR
9	Burt, D. and Bundy, D. (Olympian property)	Code Township (Au. Cu)	Pr, Samp

No.	Company/Individual (Stock Symbol) Property Name	Township/Area (Commodity)	Exploration Activity
10	Capella Minerals Ltd. (Savant Lake gold property)	Poisson Township (Au)	Pr, Samp
11	Commander Resources Ltd. (Sabin property)	Houghton Lake Area (Cu, Zn, Au, Ag, Pb)	Pr, Samp, ASD
12	Critical Resources Ltd. (Graphic Lake)	Work Township (Li)	Pr, Samp
13	Gold Hunter Resources Inc. (Cameron Lake East)	Rowan Lake Area (Au, Cu)	Samp
14	Gossan Resource Ltd. (Glitter–Sturgeon Lake)	Bell Lake Area (Zn, Cu, Ag)	DDH, ASD, Intrep
15	Hertiage Mining Ltd. (Drayton–Black Lake)	Drayton Township (Au, Cu)	AEM, Pr, Samp, ASD
16	International Lithium Corp. (Raleigh Lake)	Raleigh Lake Area (Li, Rb)	DDH, ASD, Samp
17	Joshua Gold Resources Inc. (Champion Mine)	Haycock Township (Au)	NR
18	Kenorland Minerals Ltd. (Separation property)	West of Umfreville Lake Area (Li, Cs, Ta, Be)	NR
19	KG Exploration Canada Inc. (Van Horne property)	Van Horne Township (Au)	GL
20	King's Bay Resources Corp. (Maybrun property)	Atikwa Lake Area (Au, Cu)	NR
21	Madison Metals Inc. (Kenora uranium property)	Tustin Township (Ur, Th)	GL, Pr, Samp, Comp
22	Manitou Gold Inc. (Kenwest property)	Boyer Lake Area (Au)	NR
23	Max Power Mining Corp. (Nicobat property)	Potts Township (Ni, Cu, Zn)	NR, DDH, Samp, ASD, Intrep
24	McFarlane Lake Mining Ltd. (High Lake property)	Ewart Township (Au)	DDH, ASD
25	Numax Resources Inc. (Mine Centre property)	Bliss Lake Area (Fe, Ni, Cu, Pt, Pd, V, Au)	GL
26	Power Metals Corp. (Paterson Lake)	Paterson Lake Area (Li, Cs, Ta, Be, Rb)	NR
27	Prospector Metals Corp. (Savant Lake Gold)	Poisson Township (Au)	Pr, GL, Samp, ASD
28	Q-Gold Resources Ltd. (Mine Centre–Foley Mine)	Bad Vermilion Lake (Au)	DDH, Samp
29	Solstice Gold Corp. (Lightspeed lithium property)	Burk Township (Li)	NR
30	Solstice Gold Corp. (Raven–Furniss lithium property)	Heathwalt Lake Area (Li)	NR
31	Storm Exploration Inc. (Gold Standard property)	Napanee Lake Area (Au, Sb)	Pr, GL, Samp
32	Tartisan Nickel Corp. (Turtle pond property)	Turtlepond Lake area (Ni, Cu, Co, Au)	NR
33	Treasury Metals Inc. (Gold Rock)	Boyer Lake area (Au)	Pr, AEM
34	Usha Resources Ltd. (Nicobat property)	Dobie Township (Ni, Cu, Fe, Co)	NR
35	Zebruck, G. (Magnet Lake)	Manross (Au, Cu)	Pr, Samp, Comp

Plans and Permits

Since April 1, 2013, certain prescribed early mineral exploration activities have required an Exploration Plan or Permit issued by the Ministry of Mines (MINES) under the *Mining Act*.

> Exploration Plans must be filed for geophysical surveys requiring a power generator; line cutting where the line widths are less than 1.5 m; drilling with a drill rig lighter than 150 kg; mechanized stripping where the total surface area stripped does not exceed 100 m^2 within a 200 m radius; and test pitting and trenching of bedrock where the volume extracted is between 1 and 3 m^3 within a 200 m radius (www.ontario.ca/page/exploration-plans).
>
> Exploration Permits must be obtained for line cutting where the line widths exceed 1.5 m; drilling with drill rigs heavier than 150 kg; mechanized stripping where the total surface area stripped exceeds 100 m^2 within a 200 m radius; and test pitting and trenching of bedrock where the total volume extracted exceeds 3 m^3 within a 200 m radius (www.ontario.ca/page/exploration-permits).

Plan submissions and Permit applications for properties located in the Kenora District are processed by the MINES Northwest Region Mineral Development and Lands Branch office in Thunder Bay. There was a single active exploration plan and 38 active exploration permits for properties in the Kenora District as of December 31, 2022 (Tables 2 and 3). Assessment files received by the Kenora District are provided in Table 4.

Table 2. Active exploration plans ("PL-") in the Kenora District as of December 31, 2022.

Plan Number	Plan Holder	Property Name
PL-21-000002	Capella Minerals Limited	Savant Lake East

Table 3. Active exploration permits ("PR-") in the Kenora District as of December 31, 2022.

Permit Number	Permit Holder	Property Name	Exploration Activity Number in Table 1 and Figure 3
PR-19-000201	Dynasty Gold Corp., F. Troughton	Thundercloud	6
PR-19-000297	Benton Resources Inc.	Iron Duke	
PR-19-000311	Glencore Canada Corporation	Sturgeon Lake	
PR-19-000326	Benton Resources Inc.	Abernethy	
PR-19-000335	New Gold Inc.	Rainy River North Trend	1
PR-19-000337	KG Exploration (Canada) Inc.	Van Horne	19
PR-20-000001	International Lithium Canada Ltd.	Raleigh Lake	16
PR-20-000002	Breakthrough Exploration Inc., R. Angove	Polygon Lake	
PR-20-000026	A. Tims	Redhat	
PR-20-000056	EMX Properties (Canada) Inc.	Armit Lake	
PR-20-000071	New Gold Inc.	Rainy River north trend	1
PR-20-000109	Group Ten Metals Inc	Drayton–Black Lake	
PR-20-000199	Nuvision Resources ULC	Cat Key	
PR-20-000245	Magabra Resources Corp.	St. Anthony	
PR-20-000248	Metalcorp Limited	North Rock	
PR-20-000294	11106252 Canada Limited	V3 project	
PR-20-000298	Gossan Resources Limited	Sturgeon Lake drilling 2020	14
PR-20-000301	Q-Gold (Ontario) Ltd.	Mine Centre	28
PR-20-000328	R. Etherington, D. Burt, J. Burt, D. Bundy	Witch Bay	
PR-20-000351	Kesselrun Resources Ltd.	Bluffpoint	
PR-21-000104	Sassy Resources Corporation	Carpenter	
PR-21-000105	Sassy Resources Corporation	Potts	

Permit Number	Permit Holder	Property Name	Exploration Activity Number in Table 1 and Figure 3
PR-21-000106	Sassy Resources Corporation	Kingsford	
PR-21-000107	Sassy Resources Corporation	Fleming–Kingsford	
PR-21-000219	Q-Gold (Ontario) Ltd.	Mine Centre	28
PR-21-000254	Trans Canada Gold Corp.	Dinorwic	
PR-22-000012	KG Exploration (Canada) Inc.	Van Horne	19
PR-22-000026	Canada Critical Resources Corp.	Mavis Lake	5
PR-22-000027	Nuvision Resources ULC	West Turtle Tank	
PR-22-000039	K. Desjardins	Turtle Tank	
PR-22-000083	Orebot Inc.	Lost Lake	
PR-22-000114	Midex Resources Ltd.	Sturgeon Lake–Darkwater	
PR-22-000152	EMX Properties (Canada) Inc.	Manitou	
PR-22-000155	Treasury Metals Inc.	Goliath Gold project	4
PR-22-000159	Canada Critical Resources Corp.	Mavis Lake	5
PR-22-000212	Commander Resources Ltd.	Sabin	11
PR-22-000220	McFarlane Lake Mining Incorporated	High Lake	24
PR-22-000282	Q-Gold (Ontario) Ltd.	Mine Centre	28

Table 4. Assessment files received in the Kenora District in 2022.

Abbreviations

AEM ..... Airborne electromagnetic survey
AM ..... Airborne magnetic survey
ASD ..... Assay data
Assays ..... Assays (standard metallics)
CC ..... Channel cutting
Chnl ..... Channel sampling
DDH ..... Diamond-drill hole(s)
DHRL ..... Drill-hole re-logging
DHRS ..... Drill-hole re-sampling
GL ..... Geological survey
Pr ..... Prospecting
Samp ..... Sampling (other than bulk)

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File ID
20000020544	Beckington Lake Area	Magabra Resources Corp.	CNR property	2022	Pr	$3,872	5030, 86299
20000020474	Echo	Treasury Metals Inc.	Goldlund property	2019	DDH	$832,233	4820, 83306
20000020493	Redditt	K. Meyer	Mining Claim 632929	2022	Pr	$1,400	4844, 83733
20000020492	Phillips	K. Meyer	Mining Claim 652450	2022	Pr	$1,400	4843, 83731
20000020483	Dogpaw Lake Area	K. Meyer	Mining Claim 650364	2022	Pr	$1,400	4832, 83517
20000020491	Dogpaw Lake Area	K. Meyer	Mining Claim 652449	2022	Pr	$1,400	4842, 83723
20000020414	Atikwa Lake Area	Laxmi Resources Inc.	Maybrun Extension property	2022	AM	$78,649	4655, 80783
20000020385	Dogpaw Lake Area	Endurance Gold Corp., Manning Ventures Inc., Metals Creek Resources Corp.	Flint Lake gold project	2021	AM	$66,524	4527, 4528, 4529, 4530, 78910, 78911, 78912, 78913
20000020364	Beckington Lake Area	Midex Resources Ltd.	Sturgeon Lake property	2021	AM	$77,807	4412, 4416, 4417, 4418, 77049, 77103, 77104, 77106
20000020346	Dogpaw Lake Area	K. Meyer		2021	Pr	$2,800	4135, 73934
20000020326	Bridges	Madison Metals Inc.	Kenora uranium property	2021	Assays, CC, GL, Pr	$105,502	4723, 81991
20000020316	Lower Manitou Lake Area	Solstice Gold Corp.	Manitou project	2021	Assays, Pr, Samp	$91,100	4708, 4709, 81785, 81786

File Identifier	Township/Area	Company Name	Property	Year	Work Type	Work Approved	Other File ID
20000020306	Ewart	Riverside Resources Inc.	High Lake project, Oakes property	2020	Assays, DHRL, DHRS, Pr, Samp	$90,000	4600, 79887
20000020300	Heronry Lake Area	Big Gold Inc.	Martin Kenty property	2021	AEM	$140,888	4522, 78838
20000020280	Houghton Lake Area	Commander Resources Ltd.	Sabin property	2020	Assays, GL, Samp	$41,723	4676, 81196
20000020261	Glass	M. Tremblay, P. Escher	Shoal Lake property	2021	Assays, Pr, Samp	$82,127	4621, 80365
20000020285	Treelined Lake Area	Magabra Resources Corp.	Treelined Lake graphite occurrence, Trout Lake property	2020	Pr	$3,300	4682, 81269
20000020253	Van Horne	KG Exploration (Canada) Inc.	Van Horne project	2021	Assays, GL, DDH, Chnl	$1,669,475	4634, 4635, 80543, 80546
20000020222	Webb	Power Metals Corp.	Gullwing–Tot Lakes property, Tot Lake pegmatite	2020	ASD, Chnl, Pr	$54,488	4557, 79343
20000020133	Haycock	G.R. Zebruck	Black Sturgeon Mine (prospect)	2021	CC, DDH, DHRS, Assays, Pr	$10,358	4480, 78093
20000020111	Work	T. Gallik	Graphic Lake property	2020	Assays, Pr, Samp	$10,300	4468, 77945
20000020098	Tanner	D. Healey	Flanders gold property	2022	Assays, Pr, Samp	$6,958	4437, 77381
20000020048	Valora Lake Area	CJP Exploration Inc.	Darkwater property	2020	Assays, Pr, Samp	$3,347	4362, 76576
20000019991	Bad Vermilion Lake Area	Q-Gold (Ontario) Ltd.	Mine Centre project	2021	AM	$37,585	4305, 75865
20000019998	Bennett Lake Area	R.C. Angove	Bennett West	2021	Assays, Pr, Samp	$2,362	4325, 76113
20000019978	Watin Lake Area	R. Carpenter	Fairchild project	2021	Assays, Pr, Samp	$103,896	4256, 75431
20000019931	Van Horne	KG Exploration (Canada) Inc.	Van Horne project	2020	Assays, GL, DDH, Samp	$1,644,128	4220, 4222, 74814, 74816
20000019928	Bennett Lake Area	R. Angove	Bennett East project	2021	Pr	$2,334	4209, 74715

Economic Analysis Stage

Avalon Advanced Materials Inc. (https://avalonadvancedmaterials.com; *see* Figure 3, location 2) continued advancing the Separation Rapids lithium deposit located 57 km north of Kenora toward the goal of producing glass-ceramic and battery materials. The company reached a multi-year off-take agreement with an international glass-ceramic manufacturer to purchase petalite concentrates produced at Separation Rapids (Avalon Advanced Materials Inc., news release, September 27, 2022). A number of conditions are in place, including the delivery and acceptance of a large commercial sample of the petalite product. Avalon Advanced Materials secured access to a dense media separation processing facility that will allow the company to produce trial quantities of the petalite product for glass-ceramic manufactures expressing interest in the product.

Avalon Advanced Materials signed a non-binding memorandum of understanding with LG Energy Solution to supply LG Energy with battery-grade lithium hydroxide beginning in 2025 (Avalon Advanced Materials Inc., news release, September 22, 2022). Avalon has plans to establish a lithium battery materials processing facility in the region and has identified a potential industrial site in the Thunder Bay area and is pursing agreements with potential investors.

Continued exploration is planned for the northwestern portion of the Separation Rapids project. Following encouraging assays from the 2021 sampling program, a drilling and exploration program has been planned for the Snowbank and Glitter pegmatite areas in 2023.

Tartisan Nickel Corp. (https://tartisannickel.com; *see* Figure 3, location 3) continued advancing the Kenbridge nickel project located approximately 70 km southeast of Kenora. In 2022, Tartisan Nickel Corp. completed and filed a Preliminary Economic Assessment (PEA) report. The PEA focussed solely on the underground mining of the mineral resource and indicates a 9-year mine plan expected to produce a total of 4.52 Mt of process plant feed with an average metal content of 0.81% Ni and 0.40% Cu based on 1500 tonnes per day mining and processing operation (Barry et al. 2022). The Mineral Resource Estimate is summarized in Table 5.

Table 5. Mineral Resource Estimate for the Tartisan Nickel Corp. Kenbridge nickel project (*from* Barry et al. 2022, p.6).

Category	Cut-off NSR ($/t)	Tonnes (× 1000)	Ni (%)	Ni (Mlbs)	Cu (%)	Cu (Mlbs)	Co (%)	NSR ($/t)
Measured	100	1867	0.99	41	0.5	20.6	0.017	184.4
Indicated	100	1578	0.95	33	0.53	1825	0.009	180.26
Measured + Indicated	100	3445	0.97	74	0.52	39.1	0.013	182.51
Inferred	100	1014	1.47	32.7	0.67	14.9	0.011	263.39

***Abbreviations**: Ni =nickel, Cu = copper, Co = cobalt, Mlbs = million pounds; NSR = Net Smelter Return.*

The Kenbridge nickel sulphide deposit has an approximate strike length of 250 by 60 m and is hosted within vertically dipping, lenticular gabbro and gabbro breccia (Barry et al. 2022). A rendering of the deposit and potential underground infrastructure is shown in Figure 4 and is described as follows:

> "The Kenbridge Deposit is comprised of three steeply-dripping sub-parallel structures (HW, FW and Central) of varying extents... The largest structure (Central) extends approximately 1 km from surface; the smallest (HW) extends approximately 300 m from the surface; and the remaining structure (FW) extends to approximately 600 m from surface. All three structures outcrop at the existing surface/overburden interface. Mineralization is planned to be extracted from all three structures over the Life of Mine." (Barry et al. 2022, p.150)

Additional activities at the Kenbridge nickel deposit in 2022 included the phase 1 completion of an environmental baseline study and the commencement of phase 2 environmental baseline work. The construction of an all-season access road into the project was also initiated.

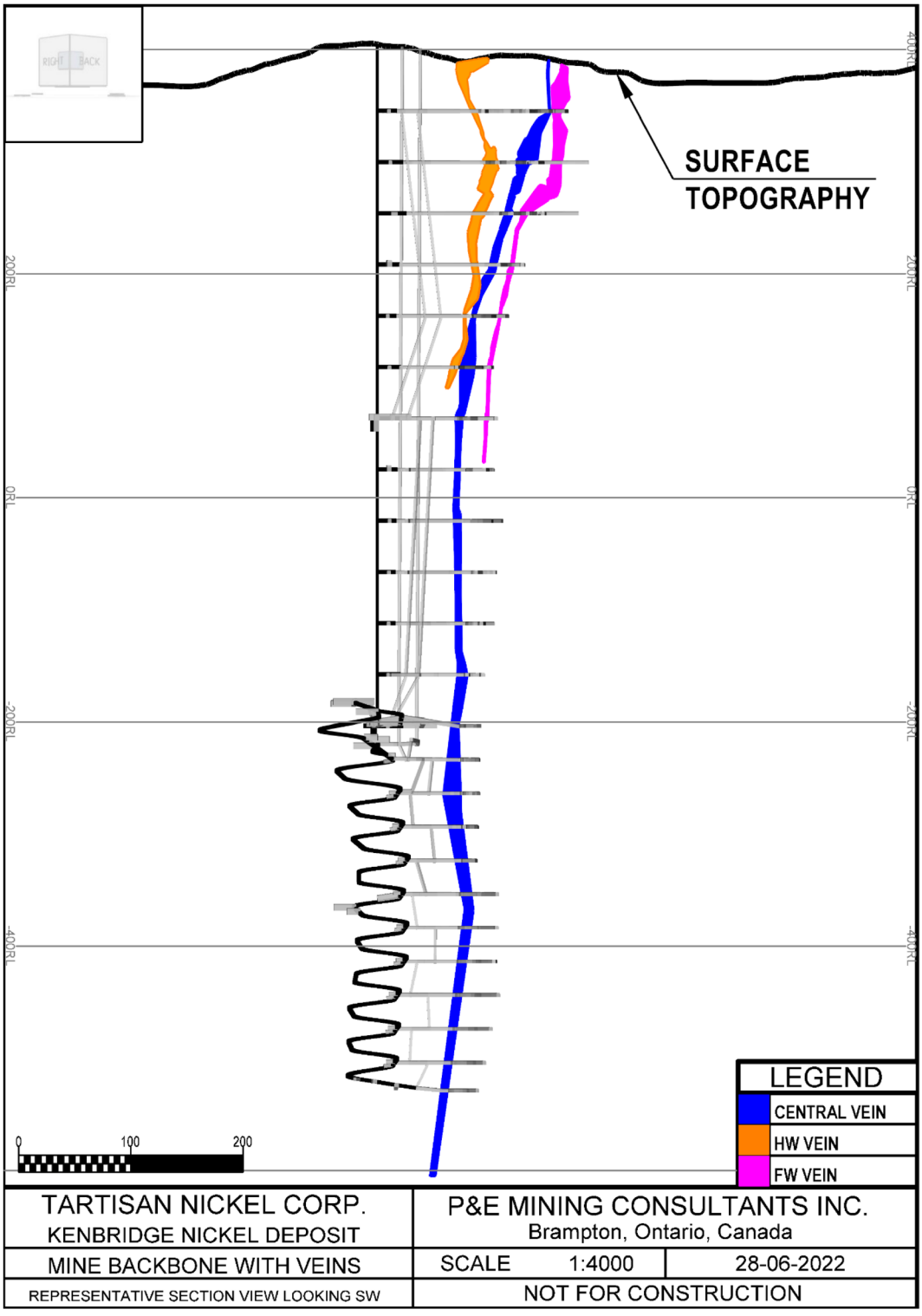


Figure 4. Underground rendition of the 3 steeply dipping subparallel structures at the Tartisan Nickel Corp. Kenbridge nickel property and potential underground infrastructure (*from* Barry et al. 2022, p.151).

Treasury Metals Inc. (https://treasurymetals.com; *see* Figure 3, location 4) continued work on the Goliath gold complex located 20 km east of Dryden. The complex hosts a global gold resource of 2.5 million ounces of gold at 1 g/t Au over a 65 km trend comprising 3 projects: Goliath, Goldlund and Miller (Figure 5; Raponi et al. 2021). In 2022, the Mineral Resources Estimate for the complex was updated by incorporating results from 176 new drill holes, totalling 41 072 m, of drilling. The updated Measured and Indicated Mineral Resource for the Goliath gold complex is 2 138 600 gold ounces (Treasury Metals Inc., news release, April 14, 2022). The updated Mineral Resource Estimate will form the basis for the pre-feasibility study on the project, which the company expects to release in 2023. All 3 deposits at the Goliath gold complex would be mined by open-pit methods, with the Goliath also being mined by underground methods beneath the open pit. A rendering of the Goliath open-pit mineral resource with block model grade intervals shown in Figure 6.

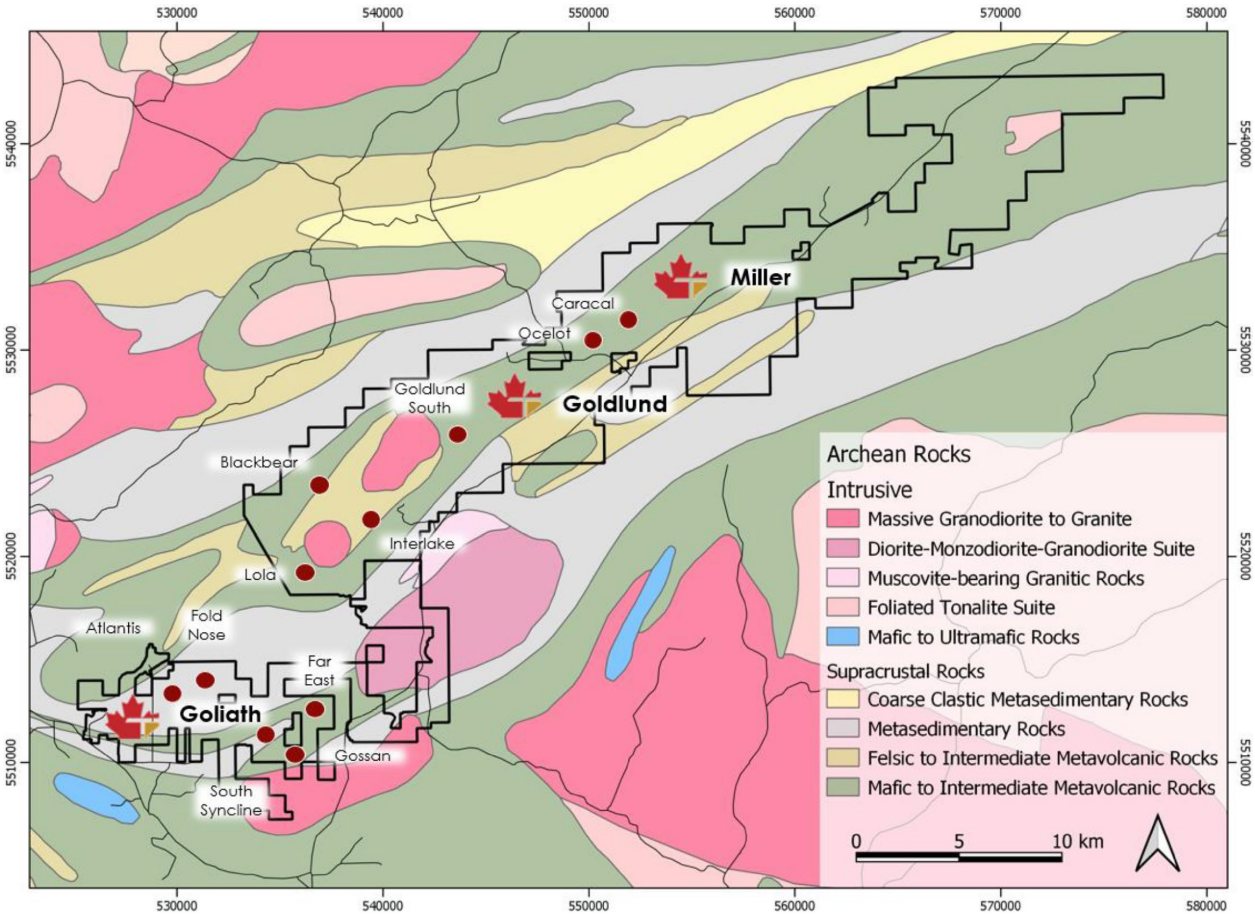
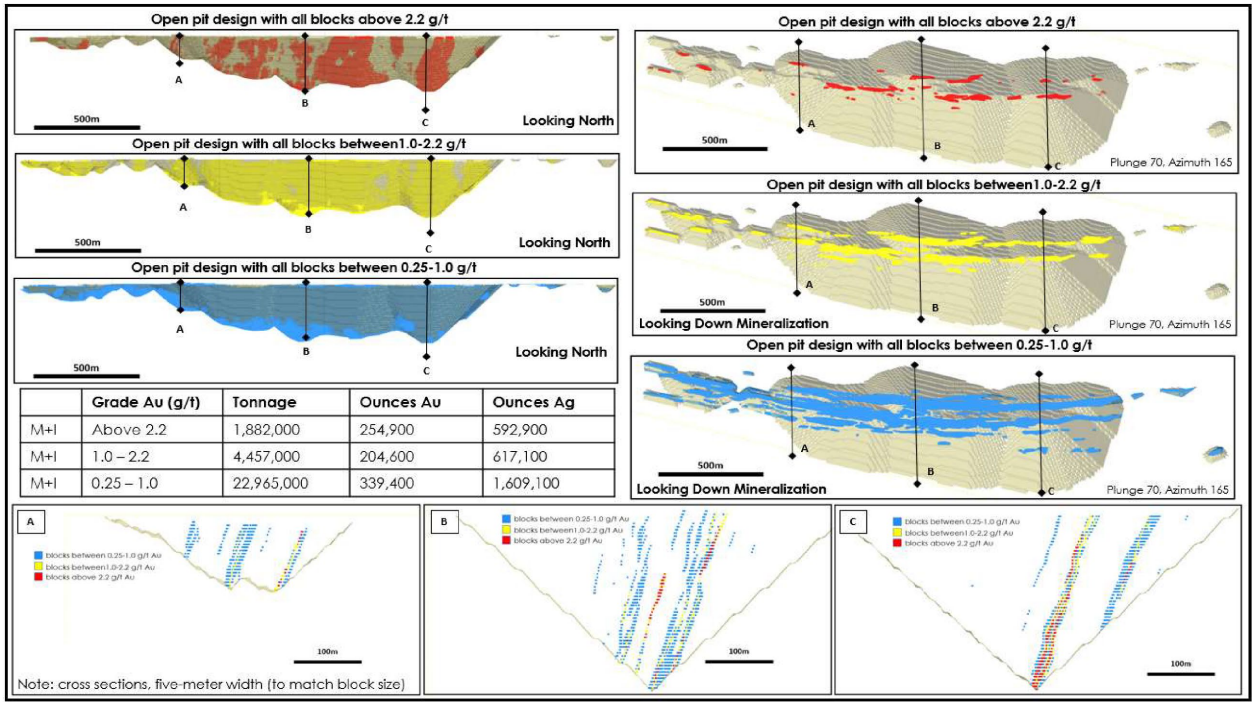


Figure 5. Areas of claims (black outline), deposits (names in bold) and exploration targets (black text surrounded by white halo) of the Treasury Metals Inc. Goliath gold complex (Treasury Metals Inc., news release, February 2, 2022). Co-ordinates provided as Universal Transverse Mercator (UTM) using North American Datum 1983 (NAD83) in Zone 15N.

Exploration efforts completed in 2022 at the projects of the Goliath gold complex are as follows:

- Goliath project: Positive gold and silver assays were received from the 2021–2022 drill programs at both the Far East and Fold Nose mineralization targets (*see* Figure 5). For the Far East target, located 8 km east of the Goliath deposit, 8 holes were diamond drilled, totalling 2330 m; in drill-hole TL22-616 an assayed intersection returned 16.90 g/t Au over 9.0 m (Treasury Metals Inc., news release, May 12, 2022). The Fold Nose target is located 2 km east of the Goliath deposit; in drill-hole TL21-579A, assay highlights included 10.98 g/t Au over 10.5 m (Treasury Metals Inc., news release, April 28, 2022). Drilling at the Fold Nose target in 2022 included 3 holes, totalling 1444 m. An 8 hole diamond-drill program, totalling 3200 m, was conducted at the new South Syncline target and received positive gold assays. Additionally, a 4 hole drill program, totalling 1444 m, was conducted at the South Ridge target; and, for a geotechnical program testing the proposed pit walls, 2 holes were drilled, totalling 931 m.
- Goldlund project: A 5 drill-hole program, totalling 870 m, was completed within zone 1 to provide material for metallurgical test work related to the Pre-Feasibility Study. Assay results were received from the 2021 drilling at the Ocelot and Caracal targets (*see* Figure 5) with assay highlights that included 0.92 g/t Au over 28.0 m in drill-hole OC-21-0003 and 1.04 g/t Au over 28.4 m in drill-hole CC-21-006 (Treasury Metals Inc., news release, March 16, 2022). A 4 hole follow-up drilling program, totalling 1380 m, was completed at the Caracal target in 2022.
- Goldrock property (*see* Figure 3, location 33): The company completed a prospecting, sampling and airborne geophysical program at the Goldrock property located 30 km south of Dryden.



	Grade Au (g/t)	Tonnage	Ounces Au	Ounces Ag
M+I	Above 2.2	1,882,000	254,900	592,900
M+I	1.0 – 2.2	4,457,000	204,600	617,100
M+I	0.25 – 1.0	22,965,000	339,400	1,609,100

Figure 6. Mineral Resource with block model grade intervals for the proposed open pit at the Treasury Metals Inc. Goliath deposit. The top 3 images on the left side are long section view looking north. The top 3 images on the right side are looking down the plunge of mineralization at the Goliath deposit and have been rotated 30° from looking straight down on the deposit. The underground cut-off grade is 2.2 g/t Au (Treasury Metals Inc., news release, April 14, 2022).

Resource Delineation Stage

Critical Resource Ltd. (www.criticalresources.com.au; *see* Figure 3, location 5) acquired the Mavis Lake lithium project in 2021, located approximately 19 km east-northeast of Dryden. In 2022, the company completed 19 878 m of diamond drilling that intersected lithium mineralization over a 1.3 km strike length and has intersected additional pegmatites at depth (Figure 7; *see also* Critical Resources Ltd., news release, December 13, 2021). The Australia-based company has also engaged with a third party to complete a technical report on the property that will include a Joint Ore Reserve Committee (JORC) compliant Mineral Resource Estimate, with results expected for early 2023. Diamond drilling will continue at the property in 2023, with a minimum of 20 000 m planned to test the extension of the Main zone and other outcropping spodumene-bearing pegmatites within the vicinity (Figure 8; *see also* Critical Resources Ltd., news release, January 12, 2023).

In addition, the company satisfied the condition precedent to acquire the Gullwing–Tot Lakes property from Power Metals Corp. The property shares a boundary with, and will be added to, the Mavis Lake lithium project, and increases the total project area to approximately 30 km long and 9.5 km wide (Figure 9; *see also* Critical Resources Ltd., news release, December 29, 2022). Lithogeochemical sampling is planned on the area for drill target generation in 2023.

Figure 7. Plan view of the Critical Resources Ltd. Mavis Lake project area illustrating diamond-drill hole (DDH) collar locations, pegmatites and the extent of currently recognized lithium mineralization (*from* Critical Resources Ltd., news release, December 13, 2022).

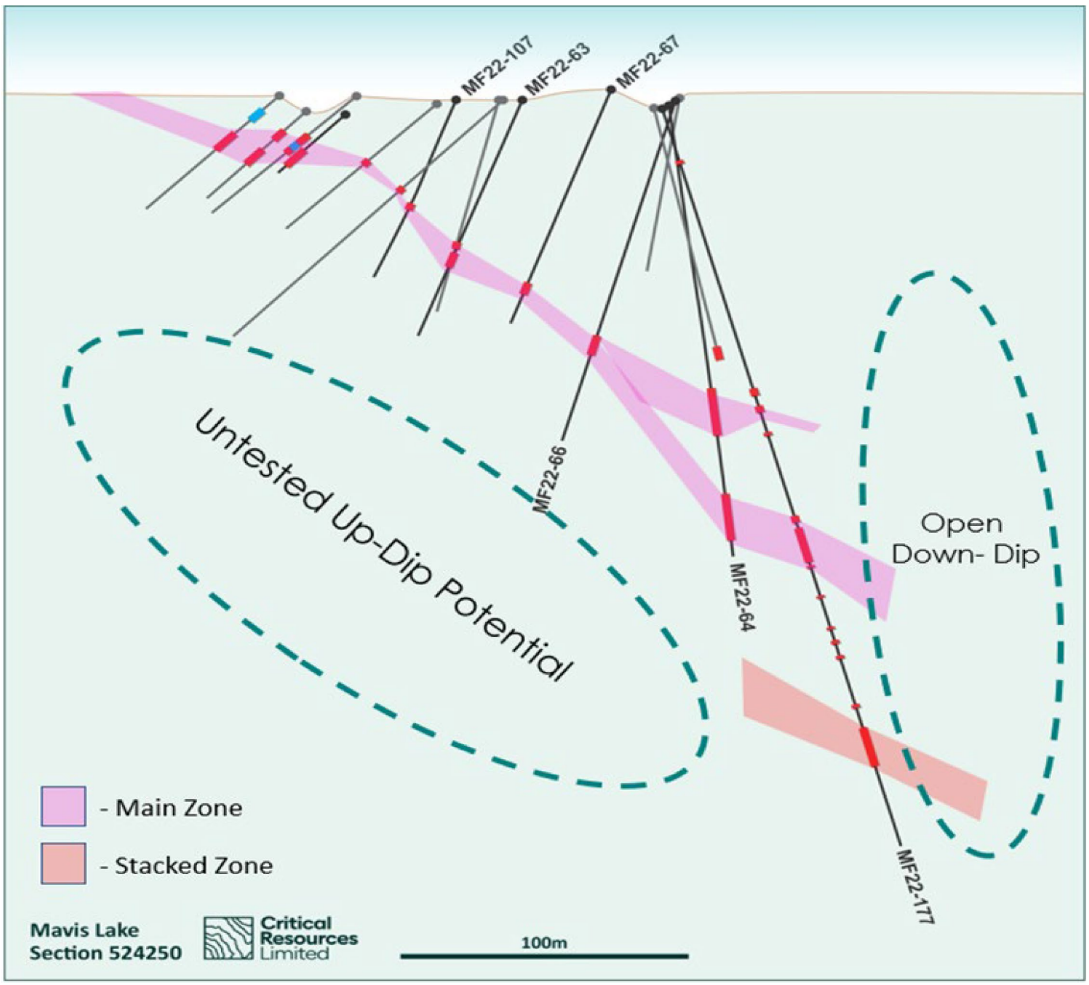


Figure 8. Cross-sectional view of the Main zone at the Critical Resources Ltd. Mavis Lake lithium project (*from* Critical Resources Ltd., news release, January 12, 2023).

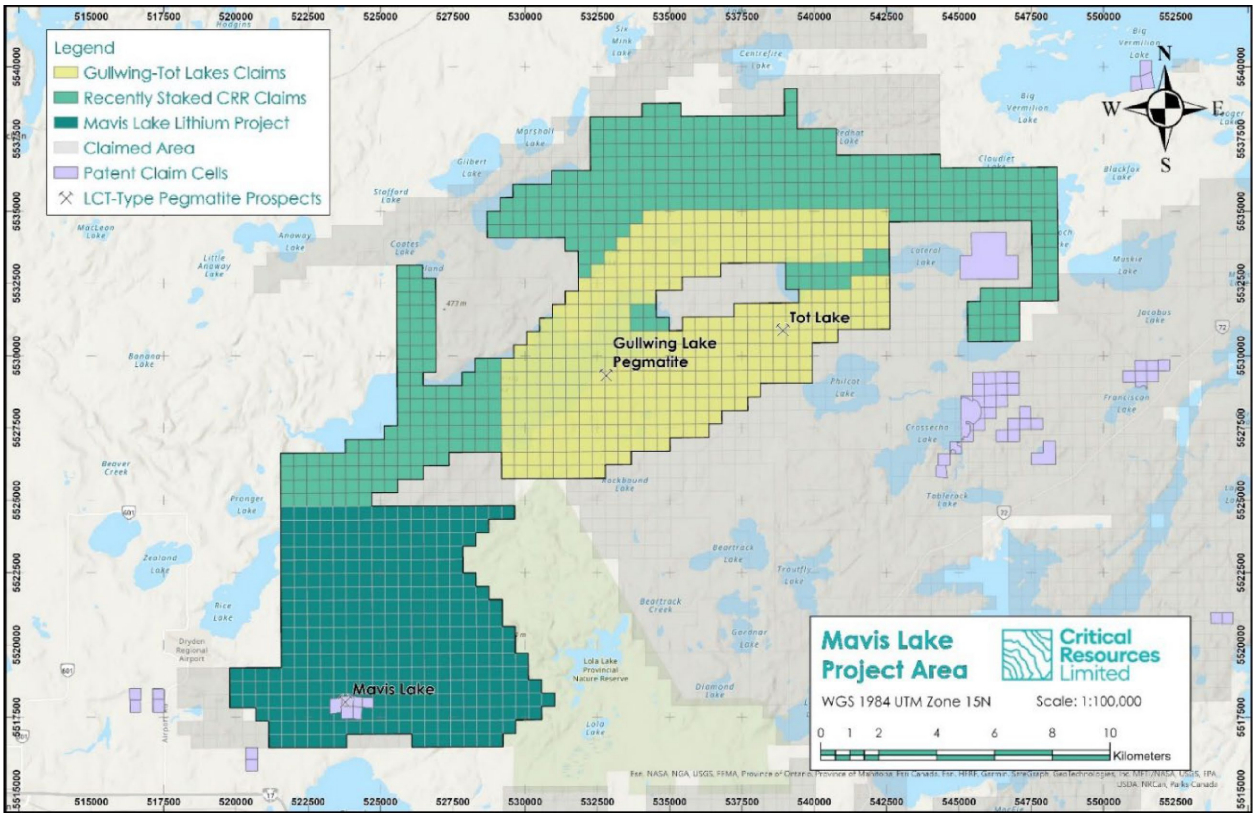


Figure 9. Mining claim tenure of the Critical Resources Ltd. Mavis Lake project area (*from* Critical Resources Ltd., news release, December 29, 2022). The UTM co-ordinates are provided using World Geodetic System (WGS) 1984 in Zone 15N.

Dynasty Gold Corp. (www.dynastygoldcorp.com; *see* Figure 3, location 6) completed an independent NI 43-101 mineral resource estimate report at the Thundercloud gold project located 47 km southwest of Dryden. The report estimates an Inferred Resource of 182 000 ounces of gold and is confined to the Pelham zone portion of the project (Dynasty Gold Corp., news release, January 4, 2022).

In July 2022, a high-resolution airborne magnetic survey was completed at the project and results assisted in defining the mineralization and increasing confidence in new targets at the Pelham zone. A phase 1, 3000 m diamond-drill program, designed to confirm historic drill results and to expand the Pelham resource, was initiated on the property. By November 2022, 4 holes, totalling 1000 m, were completed and results from the drill program will be used to update the NI 43-101 resource, which is anticipated to be released in 2023.

Exploration Stage

Ashley Gold Corp. (https://ashleygoldcorp.com; *see* Figure 3, location 7) commenced exploration on 2 projects in the Kenora District in 2022. The Tabor Lake Mine–Santa Maria gold project is located 40 km southeast of Dryden and initial exploration involved reconnaissance on geophysical anomalies and rock sample collection for assay.

The Howie Lake project is located 55 km southeast of Dryden and a prospecting and rock sampling program at the Main Katisha shear zone returned gold assays verifying historic sample results.

Additionally, the Alto–Gardner project located 50 km east of Dryden was acquired by Ashley Gold Corp. in October 2022.

Big Gold Inc. (https://biggold.ca; *see* Figure 3, location 8) continued exploration on the Martin Kenty gold project located 79 km southeast of Kenora. The company expanded the project area by 6100 ha and initiated a prospecting and reconnaissance program in the fall of 2022.

Commander Resources Ltd. (https://commanderresources.com; *see* Figure 3, location 11) released results from a sampling program at the Sabin zinc-copper-gold project located approximately 10 km north of Savant Lake. Assays include 1.5 g/t Au at the Quarry gold zone and intrusive hosted gold is now documented over 1 km^2 (Commander Resources Ltd., news release, March 22, 2022).

Gossan Resources Ltd. (https://gossan.ca; *see* Figure 3, location 14) completed an eleven-hole diamond-drill program, totalling 4042 m, at the Glitter zinc-copper volcanogenic massive sulphide property located approximately 75 km northeast of Ignace in the Sturgeon Lake greenstone belt. The program tested 3 targets identified by gravity highs and electromagnetic, magnetic and geochemical anomalies (Figure 10). Sulphide mineralization, ranging from intercepts exceeding 100 m of footwall-style quartz-carbonate-sulphide stringers to bedded and replacement-style disseminated, stringer, semi massive and massive sulphide, was variously intersected in each drill hole with 4 holes intersecting anomalous zinc, copper, silver and gold mineralization (Gossan Resources Ltd., news release, November 2, 2022).

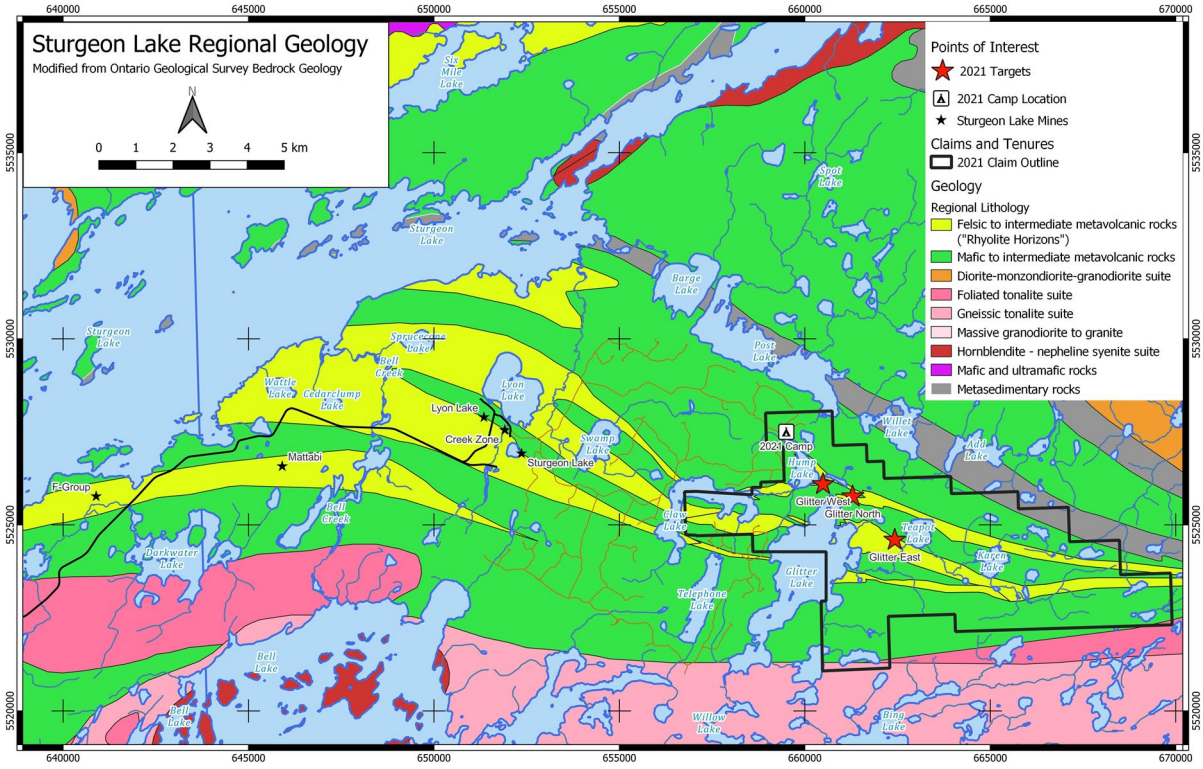


Figure 10. Regional geology of the Sturgeon Lake greenstone belt highlighting the location (area outlined in black) and geology of the Gossan Resources Ltd. Glitter property (*from* Gossan Resources Ltd., news release, April 13, 2022). The UTM co-ordinates are provided using NAD83 in Zone 15N.

Heritage Mining Ltd. (https://heritagemining.ca; *see* Figure 3, location 15) completed a channel sampling program and an airborne geophysical survey at the Drayton–Black gold-copper-silver project located 20 km east of Sioux Lookout. The channel sampling program tested 14 specific areas over 5 targets in the Alcona and Moretti areas of the project. Assays include 21.9 g/t Au and 121.0 g/t Ag over 1.0 m from the Central vein set at the Alcona–Main zone and 19.2 g/t Au and 72.8 g/t Ag over 0.8 m from the North vein prospect at the Moretti–Main zone (Heritage Mining Ltd., news release, November 29, 2022).

International Lithium Corp. (www.internationallithium.ca; *see* Figure 3, location 16) continued exploration on the Raleigh Lake lithium-rubidium-cesium project located 15 km west of Ignace. Results from a lithogeochemistry sampling program completed in October 2021 were received in early 2022. A total of 1019 lithogeochemistry samples were collected covering an approximate area of 40 km^2 and results identified over 15 new lithium, cesium, and rubidium drill targets (Figure 11). Results from a biogeochemical survey were also received in early 2022 and demonstrated cesium and rubidium anomalies over pegmatites visible at surface and pegmatites buried under shallow overburden. During 2022, a, airborne electromagnetic and magnetic survey (MobileMTm), totalling 6308 line-kilometres, was conducted over the project area. The survey was designed to map bedrock and structural features that may influence pegmatite emplacement.

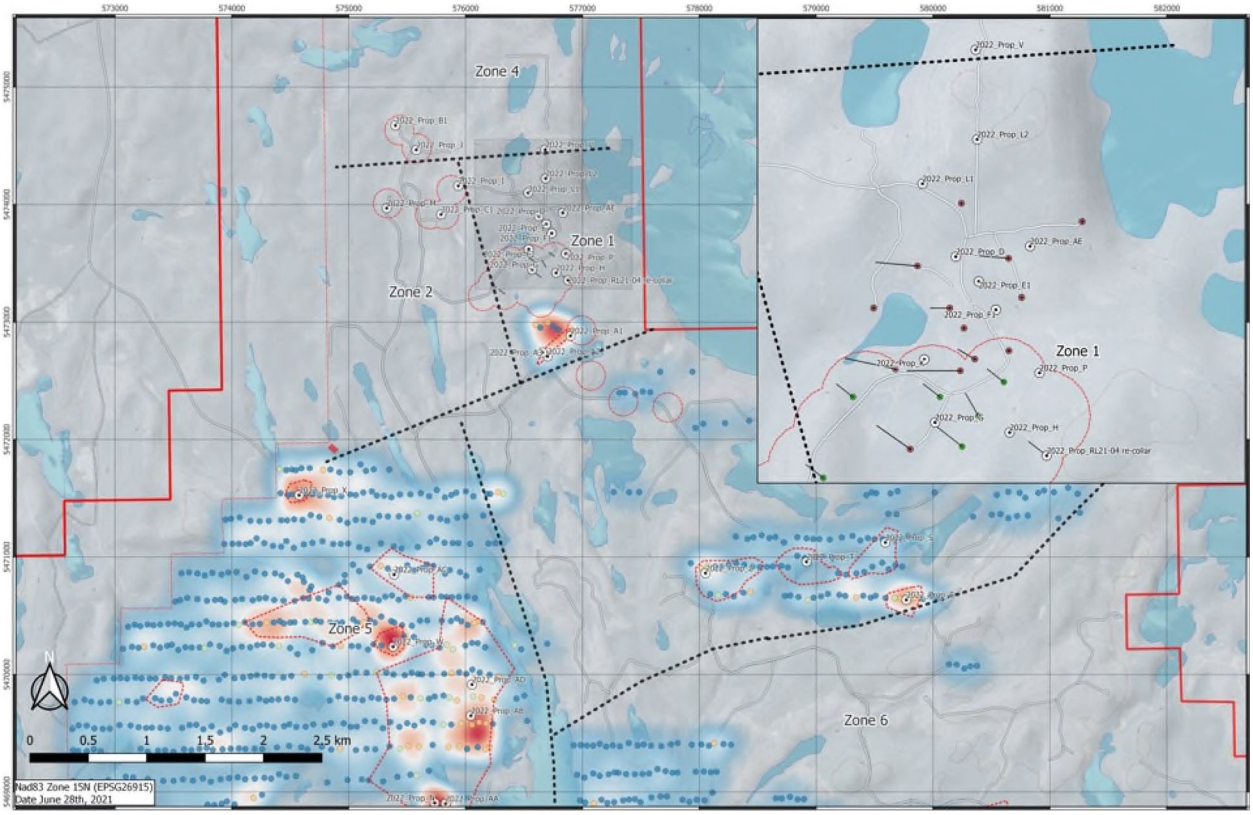


Figure 11. Project map showing lithium anomalies from the 2021 lithogeochemical survey and proposed drilling at the International Lithium Ltd. Raleigh Lake project (*from* International Lithium Ltd., news release, February 9, 2022). The UTM co-ordinates are provided using NAD83 in Zone 15N.

Three phases of diamond drilling were implemented over the Raleigh Lake project area in 2022. Phase 1 completed 10 drill holes, totalling 2053 m, in zone 1 targeting pegmatites 1 and 3, and zone 2 targeting pegmatite 2. All drill holes intersected spodumene-bearing pegmatites; assay highlights (International Lithium Corp., news release, June 23, 2022) include

- DDH RL22-09: 10.15 m grading 2.4% Li_2O including 7.05 m averaging 3.46% Li_2O and 4.2 m grading 0.81% Rb_2O
- DDH RL22-10: 21.45 m grading 1.29% Li_2O including 9.05 m averaging 2.46% Li_2O

Phase 2 included 26 drill holes, totalling 4198 m, and was designed to test the up-dip and eastern extent of pegmatites 1 and 3 in zone 1 and lithogeochemical anomalies and alteration corridors identified in zones 2, 3, 5 and 6. All but 2 holes testing pegmatite 1 intersected spodumene-bearing pegmatite; assay highlights (International Lithium Corp., news release, September 20, 2022) include

- DDH RL22-35: 9.9 m grading 2.45% Li_2O and 2.44 m grading 0.95% Rb_2O
- DDH RL22-36: 6.46 m grading 3.62% Li_2O

Phase 3 began in late September with approximately 2500 m of proposed drilling. The drill program was designed to continue infill drilling at pegmatite 1 in zone 1 and to test targets at zone 3, 5 and 6 (Figure 12).

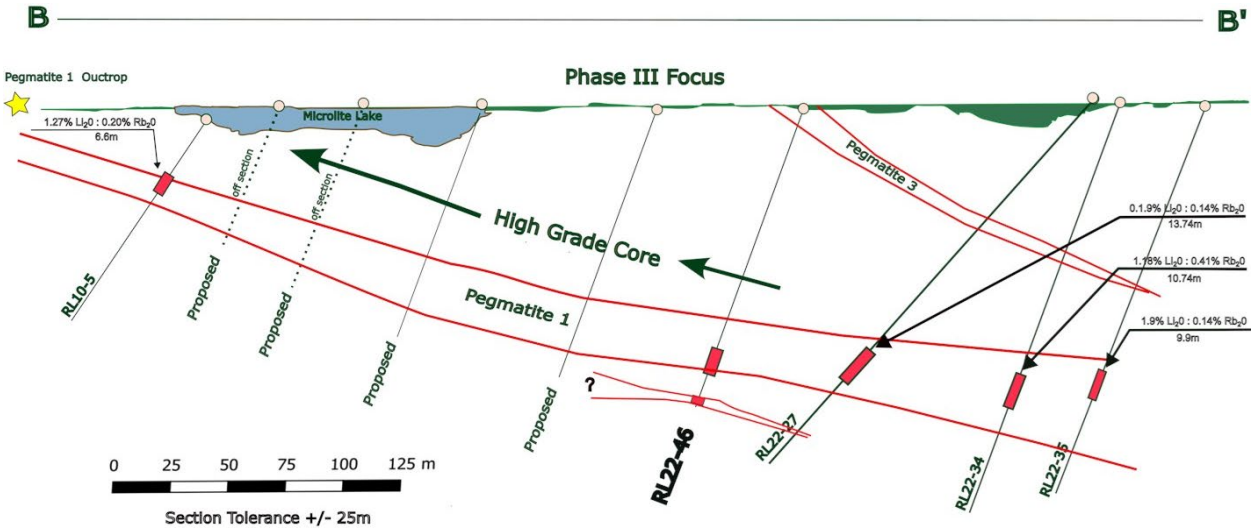


Figure 12. Cross section of pegmatite 1 illustrating phase 3 drilling and the up-dip projection to surface outcrop at the International Lithium Corp. Raleigh Lake project *(from* International Lithium Corp., news release, October 5, 2022).

Max Power Mining Corp. (www.maxpowermining.com; *see* Figure 3, location 23) completed a reconnaissance diamond-drill program at the Nicobat zinc property located approximately 42 km northwest of Fort Francis. The program was designed to target geophysical conductors and 4 holes, totalling 668 m, were drilled. Assay highlights include drill-hole MPN22-04 in which 1.02% zinc was intersected over 0.30 m (Max Power Mining Corp., news release, November 3, 2022).

McFarlane Lake Mining (https://mcfarlanelakemining.com; *see* Figure 3, location 24) completed an induced polarization ground survey and commenced a diamond-drill program at the High Lake gold property located 45 km west of Kenora. The drill program was planned for 8000 to 10 000 m and

32 holes, totalling 7274 m, were completed in 2022. Drilling targeted the Purdex zone; assay highlights (McFarlane Lake Mining, news release, January 9, 2022) include

- DDH MLHL-22-06 intersected 24.96 g/t Au over 14.90 m, including 43.22 g/t Au over 7.99 m and 53.87 g/t Au over 3.15 m
- DDH MLHL-22-04 intersected 32.58 g/t Au over 1.45 m

Prospector Metals Corp. (https://prospectormetalscorp.com; *see* Figure 3, location 27) commenced exploration at the Savant gold project located 24 km northeast of Savant Lake. A high-resolution airborne magnetic survey, light detection and ranging (lidar) survey, prospecting, and a sampling program, consisting of 594 grab samples, were completed over the project area. The prospecting and sampling program confirmed the presence of a gold-bearing shear zone at the Wiggle Creek prospect, as well as the presence of gold at the Snowbird and Horseshoe occurrences.

Q-Gold Resources Ltd. (https://qgoldresources.com; *see* Figure 3, location 28) completed a light detection and ranging (lidar) survey and Mobile Metal Ion (MMI™) soil sampling survey over the Mine Centre gold property located 52 km east of Fort Francis. The results from the surveys, as well as the results of a previous airborne magnetic geophysical survey, were used to generate targets for a diamond-drill program. The diamond-drill program was designed to extend the known mineralization of the Bonanza and Jumbo veins historically mined at the Foley Mine, as well as to test the anomalies generated from the lidar, MMI™ and geophysical surveys. An eight-hole drill program was completed with 5 of the 8 holes intersecting the targeted veins.

DISTRICT STAFF AND ACTIVITIES

In 2022, staff at the Kenora Resident Geologist's office included Ethan Amyotte, District Geologist and Kristen Wiebe, District Geological Assistant. Other Regional Office staff who supported the District included Steven Meade, *P.Geo.* (Precambrian Geoscientist), Paul Malegus, *P.Geo.* (Regional Resident Geologist, Red Lake–Kenora), Justin Jonsson (District Geologist, Thunder Bay South), Rosey Wilson (Administrative Assistant), Thérèse Pettigrew, *P.Geo.* (Mineral Deposit Compilation Geoscientist), Genevieve Dorland (GIS Data Specialist), Catherine Daniels, *P.Geo.* (Land Use Planning and Policy Co-ordinator), Pierre Bousquet, *P.Geo.* (Regional Land Use Geologist) and Mathieu Levesque (Indigenous Geoscience Liaison).

In 2022, 28 property visits were undertaken in the Kenora, Red Lake, Thunder Bay North and Thunder Bay South districts by Kenora District Staff (Table 6). Through property visits during the field season, staff supported the development of mineral properties and occurrences, academic study and earth resource and geoscience mapping in northwestern Ontario by providing expertise, field assistance and sampling of rock for further analysis. Table 6 lists the mineral properties and occurrences visited. Support for academic study included field work for a University of Manitoba MSc thesis research study in the Separation Rapids area and for mapping included a project in the Esox Lake area conducted by S.R. Meade of the Earth Resource and Geoscience Mapping Section of the OGS. Additionally, staff supported OGS project work that include fertile granite research, a mine tailings sampling program and a biogeochemical study. For more details on the involvement of District staff on OGS projects, *see* Ontario Geological Survey (2022: *Summary of Field Work and Other Activities, 2022*).

If you would be interested in any of the services the Resident Geologists Program can provide, please contact your local District office.

Kenora staff hosted more than 42 in-person client and/or stakeholder inquiries in the RGP office, as well as responded to numerous telephone and e-mail inquiries. District staff also attended a Manito Aki Inakonigaawin learning day hosted by Wauzhushk Onigum Nation.

PROPERTY EXAMINATIONS

Table 6 lists the property visits conducted by staff in 2022 in the Kenora District. Locations are keyed to Figure 13.

Table 6. Property visits conducted by the Kenora District Geologist and staff in 2022 (keyed to Figure 13).

Number	Client / Project – Occurrence	Location
1	Cross, J. – Kenricia Road	Kenora area
2	MacDonald, J. – Western pegmatite	Separation Rapids
3	MacDonald, J. – Glitter	Separation Rapids
4	Avalon Advanced Materials – Big Whopper	Separation Rapids
5	Mowatt, A. – Big Mac	Separation Rapids
6	Mowatt, A. – Sprinkler zone	Separation Rapids
7	Critical Resources Ltd. – Mavis Lake	Dryden area
8	International Lithium Corp. – Raleigh Lake	Ignace area
9	Critical Resources Ltd. – Graphic Lake	Graphic Lake
10	Skead, K. – Rat Portage quarry	Rat Portage
11	Taylor, A. – Highway 596	Marion Lake
12	Zebruk, G. – Black Sturgeon	Island Lake
13	Zebruk, G. – Black Sturgeon east zone	Island Lake
14	Zebruk, G. – Island Lake	Island Lake
15	Staff examination - Temple Bay pegmatite	Eagle River
16 *	Biogeochemical sampling – Jackpot	Georgia Lake
17 *	Biogeochemical sampling – Georgia Lake	Georgia Lake
18	Staff examination – Esox Lake stock	Esox Lake
19	Tartisan Nickel Corp. – Kenbridge	Sioux Narrows
20	Zebruk, G. – Gold Lake	Kenora area
21	Staff examination – Ardis Lake	Eagle River
22	Staff examination – Dryden field guide	Dryden area
23	Mine tailings sampling – Quibell	Wabigoon
24 **	Mine tailings sampling – South Bay Mine	Dent area
25	Fertile granite sampling – Rat River Road	Rainy River
26	Dynasty Gold Corp. – Thundercloud	Thundercloud Lake
27	Bundy, D. – Witch Bay	Riley Lake
28 **	Tearlach Resources Ltd. – Wesley lithium	Sharp Lake

* *in Thunder Bay South District (not shown on Figure 13).*
** *in Red Lake District (shown on Figure 13).*

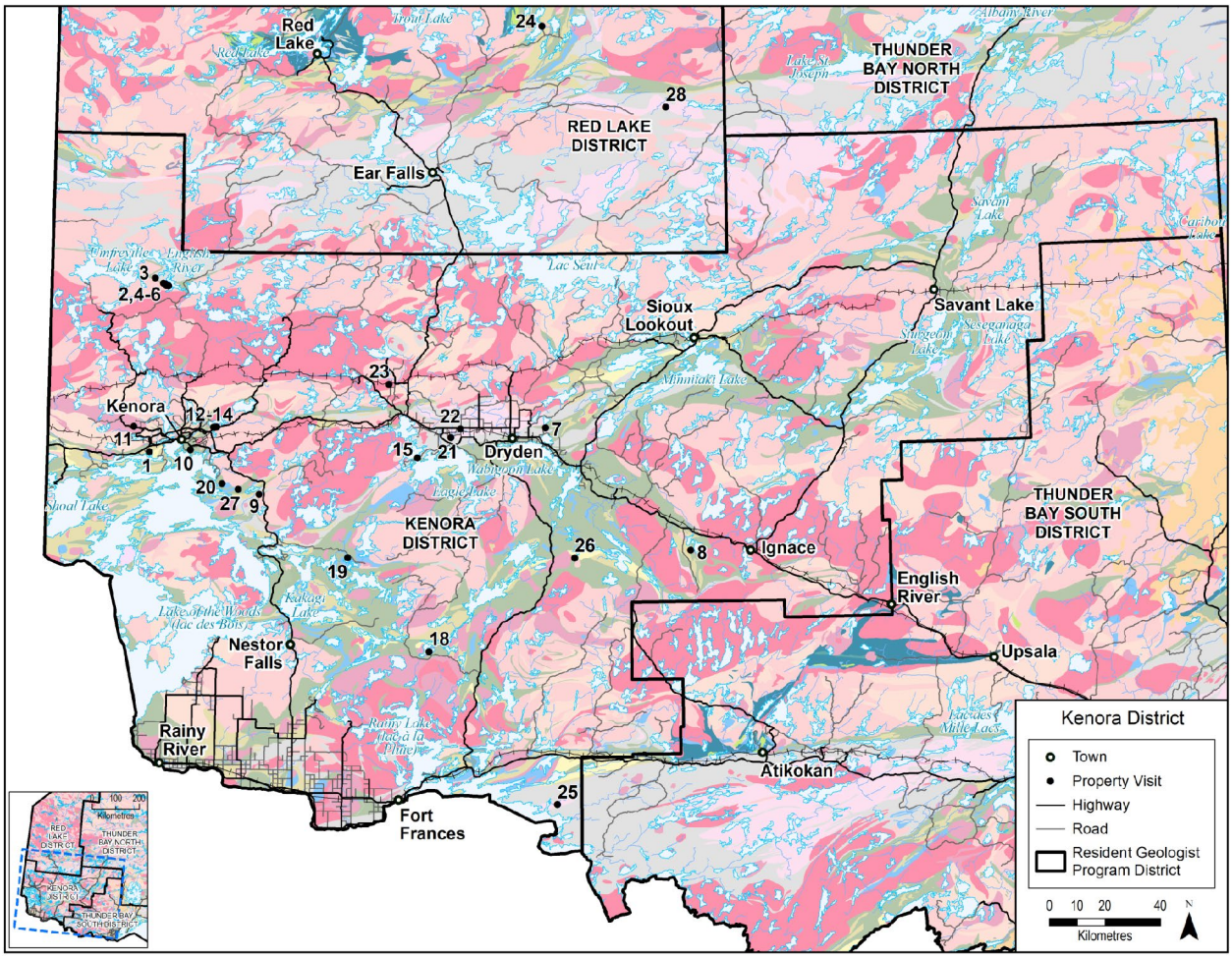


Figure 13. Location map of property visits conducted by the Kenora District Geologist and staff in 2022. The locations of property visit numbers 16 and 17, listed in Table 6, are outside the Kenora District (farther to the east in the Thunder Bay South District) and are not shown on this figure.

Investigation of Biogeochemical Exploration Techniques to Aid in the Exploration for Lithium-Cesium-Tantalum Pegmatite Dikes: An Update

This pilot study, led by E.G. Amyotte of the Resident Geologist Program (RGP) Kenora District office, seeks to refine methods for using biogeochemical techniques as an exploration tool for lithium-cesium-tantalum (LCT) pegmatites (classification of Černý 1982). As part of this study, vegetation and rock samples over 2 LCT pegmatites and their metasedimentary host rocks were collected to determine if inductively coupled plasma mass spectrometry (ICP–MS) trace element analyses of the vegetation samples could be used to interpret the presence of the buried rock types. During the 2022 sampling program, RGP staff collected 113 vegetation (e.g., black spruce, grey alder and humus) and 21 rock samples from 2 locations (Georgia Lake lithium and Jackpot properties) in the Georgia Lake area (RGP Thunder Bay South District). For further details about this study (e.g., locations, geology and sampling methods), refer to Amyotte et al. (2022).

Results of trace element analyses (using ICP–MS)of the vegetation, conducted at the OGS Geoscience Laboratories in Sudbury, show lithium, beryllium and tantalum anomalies when comparing the analyses of samples collected from over LCT pegmatites with those collected over metasedimentary host rocks. Black spruce twig and bark analysis appear to present the most consistent lithium, beryllium and tantalum

anomalies. Analyses of grey alder twigs and leaves show significant scatter in lithium values, potentially because of the mobility of the element and the plants' shallow root system and rapid growth cycle. A review of this work and subsequent 2023 field work with analytical data is anticipated to be published in 2024.

RECOMMENDATIONS FOR EXPLORATION

Note: The following article is modified from *Amyotte (2023).*

South Sturgeon Assemblage Rocks Open for Acquisition

Approximately 70 km north-northeast of the town of Ignace, the Sturgeon Lake mining camp was a prolific producer of volcanogenic massive sulphide ore from 1970 to 1991, producing 19.8 million tons at an average of 8.50% Zn, 1.06% Cu, 0.91% Pb and 119.7 g/t Ag (Franklin 1996). Ore production in the Sturgeon Lake camp came from the contacts between 4 stratigraphic sequences within the Sturgeon Lake caldera complex (Doyle and Allen 2003). These sequences include the "Pre-Caldera", "Early Caldera", "Late Caldera" and the Lyon Lake fault sequences (Hudak 1996; Figure 14). The largest deposit (Mattabi) is hosted by intermediate to felsic volcanic rocks of the Early Caldera and Late Caldera sequences, grouped by Sanborn-Barrie and Skulski (2005) and termed the South Sturgeon assemblage (SSA).

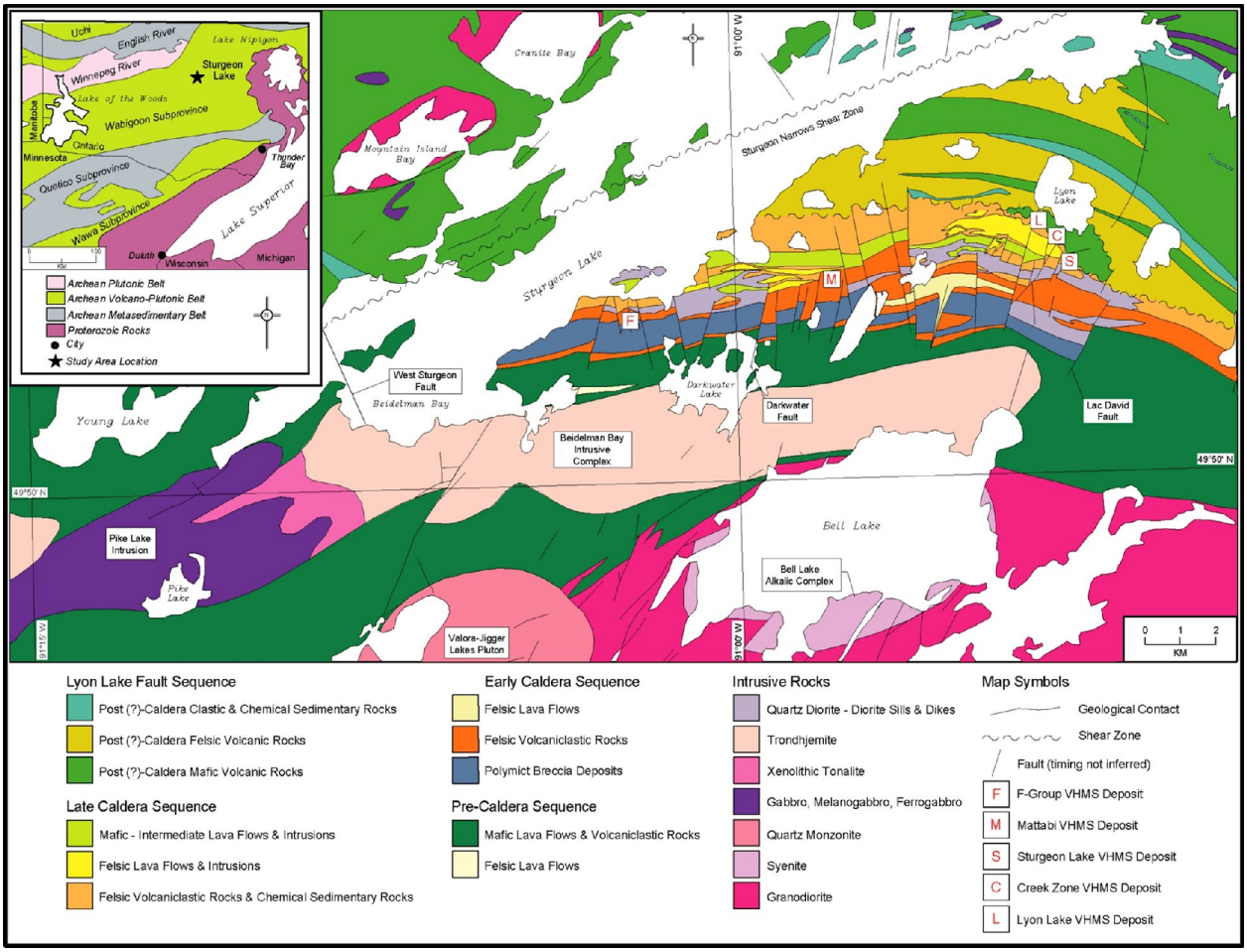


Figure 14. Geology of the Sturgeon Lake caldera complex (*from* Lessard and Ratthe 2020). Abbreviation: VHMS = volcanic-hosted massive sulphide.

Figure 15 illustrates a potential western continuation of the SSA rocks host to volcanogenic massive sulphide mineralization which are here recommended for follow-up exploration. The SSA rocks may continue along a lineament that has been identified in second vertical derivative geophysical imagery and which continues beyond the western extent of the Sanborn-Barrie and Skulski (2005) map area (Figure 16). Previous exploration in the recommended area occurred *circa* 1970 (Amos 1971) and mainly consisted of geophysical surveys, where multiple anomalies were identified. Of particular interest, an anomalous magnetic response that aligns with a weak electromagnetic conductor is noted which suggests the presence of sulphides and coincides with a portion of the proposed continuation of SSA rocks (Amos 1971; *see* Figure 16).

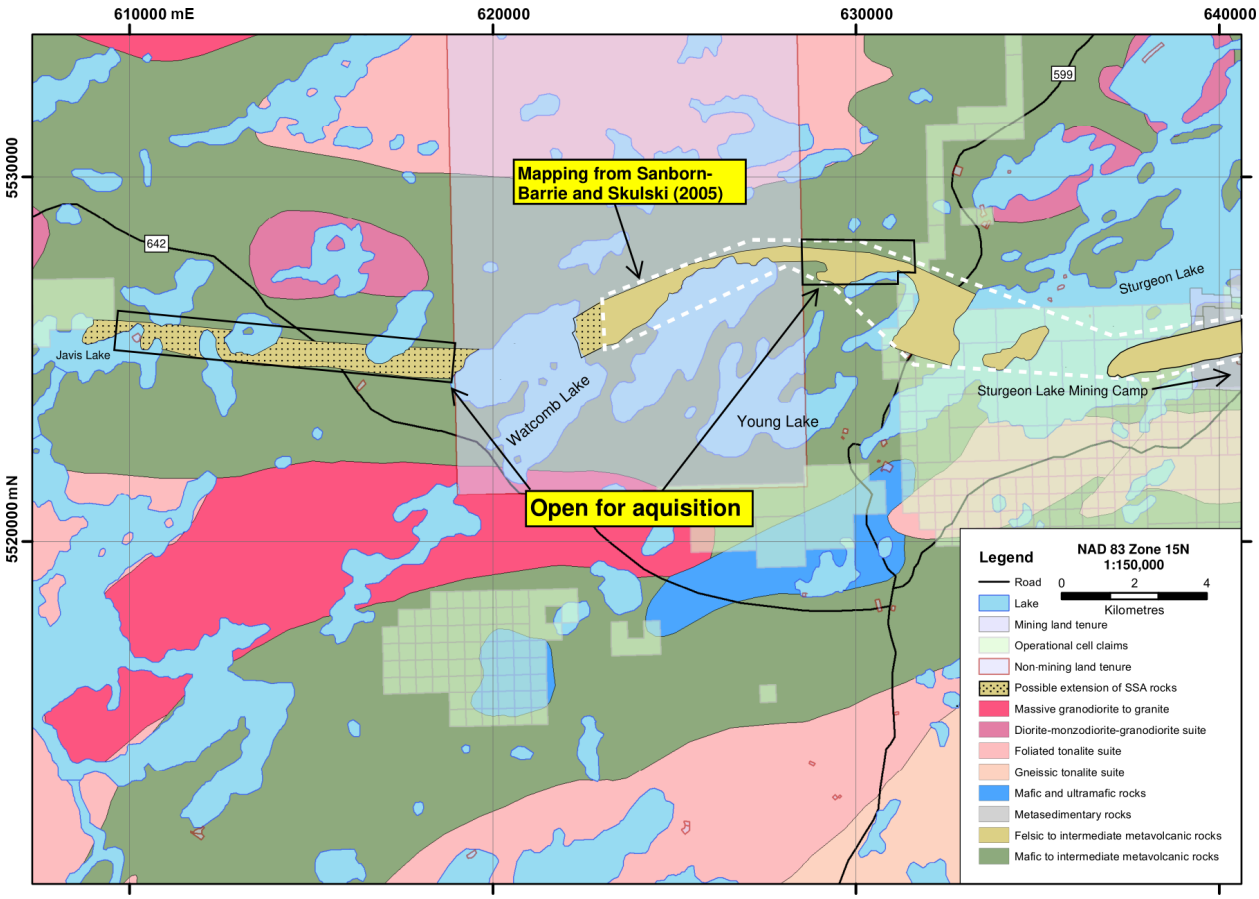


Figure 15. Simplified bedrock geology of the Sturgeon Lake greenstone belt illustrating areas of the South Sturgeon assemblage (SSA) open for acquisition. The felsic to intermediate metavolcanic rocks (shown in yellow-brown) were mapped by Sanborn-Barrie and Skulski (2005). A trace of SSA rocks (shown by a dotted yellow-brown polygon) may extend beyond the western limit of Sanborn-Barrie and Skulski (2005) mapping, along a lineament identified from second vertical derivative geophysical imagery (Ontario Geological Survey 2003a, 2003b) (geology *from* Sanborn-Barrie and Skulski 2005 and *from* Ontario Geological Survey 2011). The UTM co-ordinates are provided using NAD83 in Zone 15N.

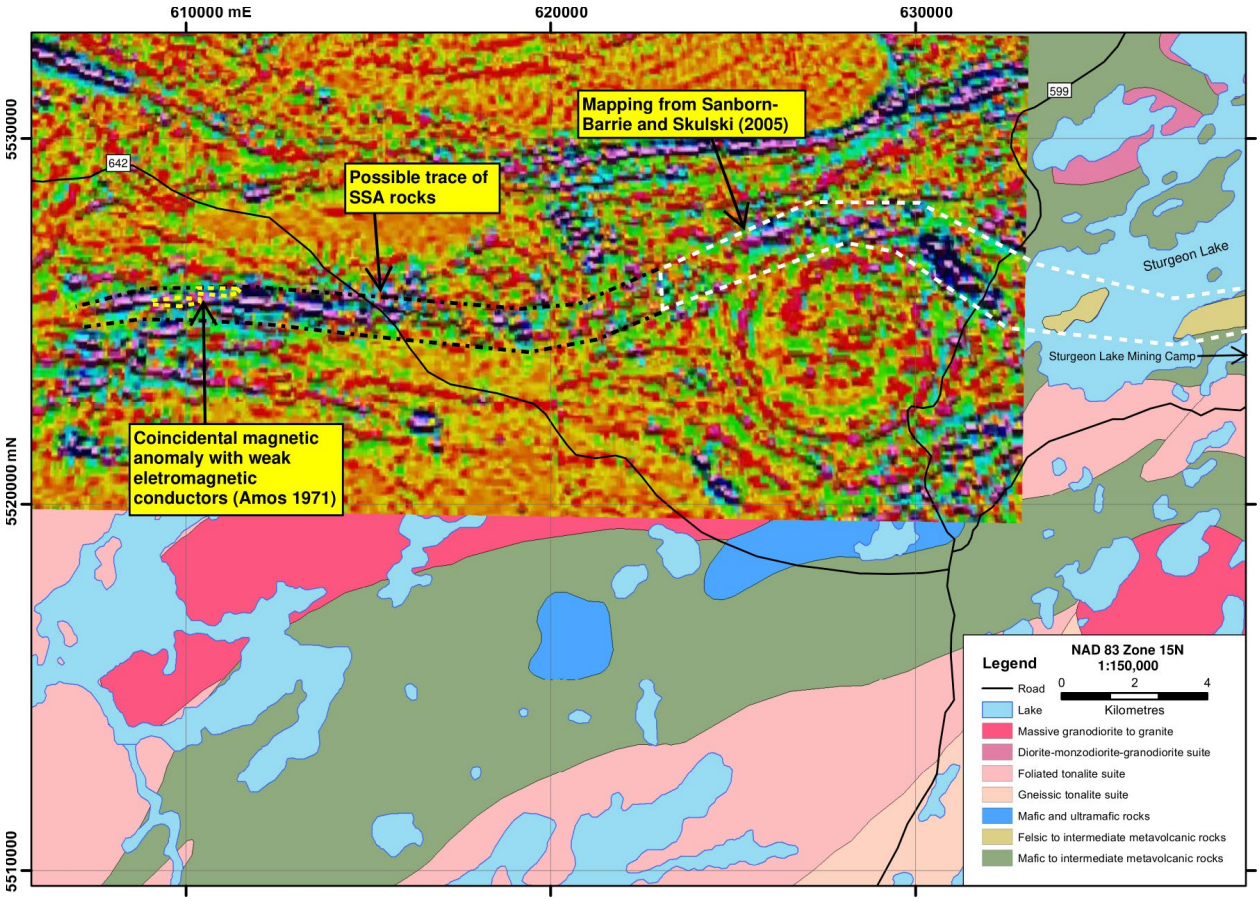


Figure 16. Simplified bedrock geology of the Sturgeon Lake greenstone belt overlain by second vertical derivative geophysical imagery, showing a possible trace of South Sturgeon assemblage (SSA) rocks along the lineament within the dashed lines (shown by black dotted–dashed lines, *from* Amos 1971; geophysical imagery *from* Ontario Geological Survey 2003a, 2003b; geology *from* Ontario Geological Survey 2011). Felsic to intermediate metavolcanic rocks of the SSA mapped by Sanborn-Barrie and Skulski (2005) shown as white dashed line. The UTM co-ordinates are provided using NAD83 in Zone 15N.

OGS ACTIVITIES AND RESEARCH BY OTHERS

Four Ontario Geological Survey (OGS) field projects were conducted in the Kenora District in 2022. Publications received in the Kenora District Geologist office during 2022 are listed in Table 7.

- S.R. Meade (OGS–ERGMS) continued work on the Straw Lake–Esox Lake area bedrock geology mapping project as part of a multi-year study of the Rowan–Kakagi greenstone belt (Meade 2022).
- E.C.G. Hastie (OGS–ERGMS) continued work on a multi-year collaborative project between the Ontario Geological Survey, the Royal Ontario Museum and the Metal Earth research program. The project is developing a method for analyzing major and trace elements associated with gold and working towards a public database for gold geochemistry across Ontario and the world. (Hastie et al. 2020; Melo-Gómez et al. 2021, 2022).
- D.J. Bennett (OGS–RGP) continued work on the Mine Waste Sampling project by introducing Phase 2. In Phase 2, the RGP staff attempted to sample one site, but were hampered by lack of access. The site may be moved to phase 3 of the project. Results are pending (Bennett 2022).

- R.M. Cundari (OGS–RGP) began work on the Fertile Parent Granitoid project in the Superior province, which included the Kenora District. Samples were collected by RGP personnel throughout the district, with most work occurring in the English River Subprovince. Compilation work is ongoing for the project, with plans to publish the data in the future. Results are pending (Cundari 2022).

The first annual OGS Virtual Showcase was held from October 25 to 27, 2022. Beginning December 15, 2022, selected presentations will be available to download until October 31, 2023 (note: not all presenters made recordings available). The presentations are provided in video format and are accompanied by the OGS Virtual Showcase 2022 Technical Program and other documentation. Presentations relevant to the Kenora District are listed in Table 7.

As part of Metal Earth, 3 research and 3 university thesis studies were conducted. Metal Earth is an applied research and development program, led by Mineral Exploration Research Centre (MERC) (Harquail School of Mines, Laurentian University), that aims to "transform our understanding of the genesis of base and precious metal deposits during Earth's evolution" (https://merc.laurentian.ca/research/metal-earth/about). One other university study by the University of Manitoba was conducted in the Kenora District in 2022.

Metal Earth research studies (https://merc.laurentian.ca/research/activities):

- B.M. Frieman and S. Perrouty (Metal Earth) continued structural and stratigraphic investigations along the Dryden–Stormy Lake Transect.
- G. Launay, M.L. McRae and R.L. Sherlock (Metal Earth) continued structural and stratigraphic investigations along the Rainy River Transect.
- C. Ma and R.W.D. Lodge (Metal Earth) continued a study investigating the variation of structures along the Sturgeon Transect.

University thesis studies supported by Metal Earth:

- M.L. McRae (Laurentian University) completed her MSc thesis study on the chemostratigraphy and structural framework for gold mineralization at the Goliath gold deposit, western Wabigoon Subprovince, Ontario. The thesis focussed on the synvolcanic gold-rich sulphide deposit of Goliath (McRae 2022).
- M. Tamosauskas (Laurentian University) continued a MSc thesis study on depositional history and contact relationships of the Ament Bay metasedimentary assemblage.
- R.M. Montsion (Laurentian University and University of Western Australia) continued a cotutelle PhD thesis study on factors contributing to metal endowment in the western Wabigoon and Abitibi subprovinces by developing a mineral perspectivity modelling approach for Precambrian greenstone belts as part of the Dryden–Stormy Lake Transect. A presentation updating progress was presented to the March 2021 Metal Earth Partner Meeting (Montsion 2021).

University of Manitoba research studies:

- J. Macdonald continued a MSc thesis study investigating the emplacement mechanisms of rare elemental pegmatites in the Separation Lake greenstone belt.

Table 7. Publications received by the Kenora District Geologist office in 2022.

Title	Author	Type and Year of Publication
Report of Activities 2021, Resident Geologist Program, Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts	P.M. Malegus, E.G. Amyotte, C.J. Adrianwalla, K.E. Wiebe, P. Bousquet, C.M. Daniels, T.K. Pettigrew and G. Dorland	Ontario Geological Survey, Open File Report 6381 (2022)
Recommendations for Exploration, 2021–2022	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration (2022)
An Introduction to Ontario's Critical Minerals, With Highlights from the Ontario Mineral Inventory	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program (2022)
Recommendations for Exploration Special Edition: Critical Minerals Compilation 2000–2022	Ontario Geological Survey	Ontario Geological Survey, Resident Geologist Program, Recommendations for Exploration Special Edition (2022)
Index to Published Reports, Maps and Digital Data, 2016–2020	Ontario Geological Survey	Ontario Geological Survey, Supplement to Miscellaneous Paper (MP) 177 (2011–2020) (2022)
Geographic Index to Published Reports, Maps and Digital Data, 2016–2020	Ontario Geological Survey	Ontario Geological Survey, Supplement to Miscellaneous Paper (MP) 178 (2011–2020) (2022)
Summary of Field Work and Other Activities, 2022	Ontario Geological Survey	Ontario Geological Survey, Open File Report 6390 (2022)
Specific articles of interest:		
Precambrian Geology of the Straw Lake–Esox Lake Area, Western Wabigoon Subprovince, Northwestern Ontario	S.R. Meade	OFR 6390, article 10, 6p.
Trace Element Content of Gold Across Ontario: An Update on the Gold Fingerprinting Project	J.D. Melo-Gómez, E.C.G. Hastie, H.L. Gibson, K.T. Tait and J.A. Petrus	OFR 6390, article 15, 11p.
Identification of Fertile Parent Granitoid Units in the Superior Province of Ontario: Project Description	R.M. Cundari	OFR 6390, article 30, 11p.
Catching it by the Tailings: An Introduction to the Ontario Geological Survey Critical Minerals Mine Waste Sampling Project	D.J. Bennett	OFR 6390, article 32, 6p.
OGS Showcase	Ontario Geological Survey	Ontario Geological Survey Virtual Showcase 2022, October 25–27 (2022)
Specific presentations of interest:		
Ontario Critical Minerals Projects and Exploration Opportunities	M.A. Puumala	presentation SHOWCASE-22-103 (2022)
Introduction to the OGS Fertile Granites Project	R.M. Cundari	presentation SHOWCASE-22-106 (2022)
Catching it by the Tailings: An Introduction to the OGS Critical Minerals Mine Waste Sampling Project	D.J. Bennett	presentation SHOWCASE-22-104 (2022)
Investigation of Biogeochemistry Exploration Techniques to Aid in Exploration for Lithium-Cesium-Tantalum (LCT) Pegmatite Units	E.G. Amyotte	presentation SHOWCASE-22-108 (2022)
Analytical Developments at the OGS's Geoscience Laboratories in Support of Ontario's Critical Minerals Strategy	O.M. Burnham	presentation SHOWCASE-22-110 (2022)
The Role of the Geoscience Laboratories Mineralogy Section in Supporting Ontario Geological Survey Projects	D.C. Crabtree and S.A. Clarke	presentation SHOWCASE-22-111 (2022)
Producing and Delivering the Best Provincial Geoscience Data for Users	C. Castrechino	presentation SHOWCASE-22-112 (2022)
Demo of OGSEarth Data Sets Including OGSFocus and the OGS GeoData Listing	G. Dorland	presentation SHOWCASE-22-113 (2022)
Adding New Data Sets: A Work in Progress	S. Préfontaine	presentation SHOWCASE-22-114 (2022)
Resident Geologist Program's Drill Core Libraries – An Invaluable Tool for Exploration	D.-A. Metsaranta	presentation SHOWCASE-22-116 (2022)
Exploration, Mining and Resident Geologist Program Activity Update for the Red Lake and Kenora Districts	P.M. Malegus	presentation SHOWCASE-22-302 (2022)
Probing the Earth: Geophysics at the OGS	S. Biswas and J. Evangelatos	presentation SHOWCASE-22-310 (2022)
Resident Geologist Program's Land Use Geology – Informing Land-Use Planning Decisions	C.M. Daniels	presentation SHOWCASE-22-311 (2022)

MINERAL DEPOSITS NOT BEING MINED

Table 8. Mineral deposits not being mined in the Kenora District.

Abbreviations

AF ..... Assessment Files
CMH ..... Canadian Mines Handbook
GR ..... Geological Report
MDC ..... Mineral Deposit Circular [No.15–]
[formerly Mineral Resources Circular, No.1–14]
MDIR ..... Mineral Deposit Inventory record
MLS ..... Mining Lands, Sudbury
MR ..... Mining Recorder
NM ..... The Northern Miner
OFR ..... Open File Report
PC ..... Personal Communication
SMDR ..... Source Mineral Deposit Record

Deposit Name (NTS – MDIR#)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of December 2022)
Angel Hill Zone (52F/05SW - 140)	Au	Inferred Resource*: 106 400 t @ 2.97 g/t Au	Houston Lake Mining, news release, Oct. 20, 2005	Inactive
Bad Vermilion Lake–Seine Bay (52C/10NW - 031)	Fe, Ti, V	Possible Resource: 1 200 000 tons @ 15% TiO_2, 45% Fe	NM 08/15/85, p.3 (Beaver Energy Resource)	Active
Bending Lake Josephine Cone (52F/08SE - 004)	Fe	Mineral Resource Estimate*: Indicated: 185.2 Mt @ 29.59% magnetite Inferred: 151.4 Mt @ 30.38% magnetite	Arnold, Horan and Gharapetian (2011)	Active
Big Master (52F/07NE - 002)	Au, Ag	Production: 2565 oz Au and 184 oz Ag from 14 470 tons Possible Resource: 123 000 tons @ 0.30 opt Au Based on 1967 drilling: 30 000 tons @ 0.36 opt Au	Beard and Garratt (1976, p.9) CMH, 1988–1989, p.92 (Canamerica Precious Metals Inc.)	Active
Big Whopper – Separation Rapids (52L/07SE - 030)	Li, Cs, Rb, Ta	Lithium Resource Estimate* (cut-off 0.6% Li_2O): Measured: 3 364 000 t @ 1.431% Li_2O Indicated: 5 041 000 t @ 1.393% Li_2O Total: 8 405 000 t @ 1.408% Li_2O Inferred: 1 791 000 t @ 1.349% Li_2O	Avalon Advanced Materials Inc., news release, May 23, 2018	Active
Cameron (52F/05SE - 008)	Au	Resource Estimate*: Open Pit Constraint (cut-off 0.55 g/t Au) Total Measured and Indicated: 3 490 000 t @ 2.45 g/t Au; 274 000 oz Au Inferred: 35 000 t @ 2.45 g/t Au; 3000 oz Au Underground Constraint (cut-off 2.00 g/t Au) Total Measured and Indicated: 2 040 000 t @ 2.90 g/t Au; 190 000 oz Au Inferred: 6 535 000 t @ 2.54 g/t Au; 533 000 oz Au	First Mining Finance Corp. (now First Mining Gold Corp.), news release, Mar. 22, 2017 Mineral Resource Estimate effective Jan. 17, 2017	Inactive
Cates (52F/13SE - 065)	Zn, Ag	Possible Resource: 5.83 Mt @ 0.5% Zn and 0.5 opt Ag	AF 52F/13SE M-1 to M-6 (Noranda) and AF 52F/13SE B-1 to B-6 (Rio Algom)	Inactive
Cedar Island and Extension (52E/10SW - 017)	Au	Resource Estimate* (cut-off 1.0 g/t Au) Indicated: 1.00 Mt @ 4.18 g/t Au Inferred: 3.050 Mt @ 3.25 g/t Au	Everton Resources Inc., news release, Feb. 4, 2010	Inactive
Dobie (52C/12NW - 011)	Cu, Ni	Possible Resource: 5 000 000 tons @ 0.28% Cu and 0.24% Ni	AF 52C/12NW B-3 Falconbridge Ltd. 1966	Active
Dogpaw (52F/05SW - 012)	Au	Resource Estimate* (cut-off 0.5 g/t Au): Indicated: 247 000 t @ 3.02 g/t Au Inferred: 64 000 t @ 2.28 g/t Au	Chalice Gold Mines Ltd., news release, July 28, 2014	Inactive
Dubenski (52F/05SW - 013)	Au	Resource Estimate* (cut-off 1.0 g/t Au) Indicated: 806 000 t @ 2.28 g/t Au Inferred: 392 000 t @ 1.44 g/t Au	Coventry Resources Inc., news release, Dec. 9, 2013	Inactive
Duport (52E/11SE - 002)	Au	Production: 4672 oz Au, 1143 oz Ag from 1287 tons Resource Estimate*: Indicated: 424 000 t @ 13.4 g/t Au Inferred: 387 000 t @ 10.7 g/t Au	Beard and Garratt (1976, p.11) Halo Resources Ltd., news release, Aug. 19, 2005	Inactive

Deposit Name (NTS – MDIR#)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of December 2022)
East Burns - Intrepid (52D/16SE - 1043)	Au, Ag	Resource Estimate at Western and East Burns - Intrepid zones * Open Pit Category to 500 m (cut-off 0.35 g/t AuEq): Indicated: 1 253 000 t @ 1.0 g/t Au, 14.7 g/t Ag Inferred: 2 788 000 t @ 1.2 g/t Au, 14.4 g/t Ag Underground Category (cut-off 2.50 g/t AuEq) Indicated: 79 000 t @ 7.9 g/t Au, 37.0 g/t Ag Inferred: 195 000 t @ 7.4 g/t Au, 43.0 g/t Ag	Bayfield Ventures Corp., news release, Jan. 14, 2014	Active
East Cedartree (52F05SW – 142)	Au	Resources Estimate * (cut-off 1.0 g/t Au) Indicated: 434 505 t @ 3.91 g/t Au Inferred: 294 155 t @ 3.21 g/t Au	Metalore Resources Ltd., news release, Mar. 14, 2012	Inactive
Elora (52F/07NE - 015)	Au	Production: 1370 oz Au and 296 oz Ag from 13 766 tons Resource Estimate: Possible: 228 500 tons @ 0.18 opt Au Inferred: 5000 tons @ 0.10 opt Au	Beard and Garratt (1976, p.15) Neilson and Bray (1981, p.37, Table 8)	Inactive
F-Group (52G/14SE - 004)	Cu, Zn, Pb, Ag	Original Reserves (Dec. 1978): 630 000 t @ 8.10% Zn, 0.98% Cu, 0.49% Pb, 1.80 opt Ag Indicated Reserves (Dec. 1982): 200 000 t @ 8.20% Zn, 0.80% Cu, 0.60% Pb, 1.80 opt Ag	CMH 1979–1980, p.194 (Noranda) CMH 1982–1983, p.254 (Noranda)	Rehabilitated
Foley Mine (52C/10NE - 032)	Au	Production: 855 oz Au, 149 oz Ag from 568 tons Resource Estimate: Possible: 40 000 t @ 0.5 opt Au Inferred: 400 000 t @ 0.5 opt Au	Beard and Garratt (1976, p.16) NM 09/25/80 (Seaforth Mines Ltd.); Schnieders and Dutka (1985, p.194)	Active
Goliath Gold Complex (52 F/15SE - 053)	Au	Resource Estimates* for zones at deposit (combined open pit and underground) (cut-off grades: open-pit 0.25 g/t AuEq and underground 1.60 g/t AuEq) Measured and Indicated: 67 711 000 t @ 0.98 g/t Au Metal Content: 2 138 600 oz Au Inferred: 32 571 000 t @ 0.75 g/t Au Metal Content: 782 000 oz Au	Treasury Metals Inc., news release, April 14, 2022	Active
Gordon Lake (52L/07NW - 004)	Cu, Ni, PGE	Production: 1.6 Mt @ 0.78% Ni, 0.41% Cu, 0.026 opt Pd (Dec. 1971) Indicated Reserves (1971): 170 420 tons @ 0.85% Ni and 0.35% Cu	Parker (1998, p.121)	Rehabilitated
High Lake–Evenlode (52E/11NE - 061)	Mo, Au	Possible Resource: 200 000 t @ 0.63% MoS_2	Davies and Smith (1988, p.114)	Inactive
Kenbridge (52F/05NE - 047)	Ni, Cu, Co	Resource Estimates*: Measured & Indicated: 3 445 000 t @ 0.97% Ni, 0.52% Cu, 0.013% Co Metal Content: 94.0 Mlbs Ni, 52.6 Mlbs Cu Inferred: 1 014 000 t @ 1.47% Ni, 0.67% Cu, 0.011% Co	Tartisan Nickel Corp., news release, July 12, 2022	Active
Lockhart Lake (52C/10NW - 029)	Zn, Cu, Au, Ag	Possible Resource: 6.1 Mt @ 1.06% Zn, 0.27% Cu, 3.2 g/t Ag, 0.006 g/t Au	AF Minnova 1989 - 52C/10NW Y-6	Inactive
Lyon Lake (52G/15NW - 007)	Cu, Zn, Pb, Ag	Original Reserves: 3.945 Mt @ 6.53% Zn, 1.24% Cu, 0.63% Pb, 3.42 opt Ag, 0.01 opt Au Indicated Reserves: 0.695 Mt of 10.34% Zn, 0.75% Cu, 1.62% Pb, 5.96 opt Ag	CMH 1979–1980, p.194 (Noranda) CMH 1990–1991, p.332 (Noranda)	Rehabilitated
Marchington Road (52J/07SE - 016)	Cu, Zn, Pb, Ag	Possible Resource: 150 000 tons @ 0.98% Cu, 3.11% Zn, 1.16% Pb, 1.97 opt Ag	Umex Inc. AF 52J/7SW 0024	Inactive
Mattabi (52G/15SW - 002)	Cu, Zn, Pb, Ag	Original Reserves: 13.66 Mt @ 7.50% Zn, 0.80% Cu, 0.77% Pb, 3.10 opt Ag Indicated Reserves: 0.387 Mt of 0.13% Cu, 9.28% Zn, 0.58% Pb, 1.77 opt Ag	Trowell (1983, p.4) CMH 1988–1989, p.338 (Noranda)	Rehabilitated
Mavis Lake (52F/15SE - 038)	Li, Ta	Possible Resource: 500 000 tons of 1% LiO_2	Storey (1990, p.151)	Active

Deposit Name (NTS – MDIR#)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of December 2022)
Maybrun (52F/05NE - 008)	Cu, Au	Resource Estimate* for the Maybrun zones: Main Indicated: 7 366 000 t @ 0.41% Cu, 0.64 g/t Au Main Inferred: 1 738 000 t @ 0.30% Cu, 0.115 g/t Au Footwall Inferred: 5 400 000 t @ 0.18% Cu, 0.94 g/t Au North Inferred: 3 454 000 t @ 0.25% Cu, 0.67 g/t Au	Opawica Exploration Inc., news release, July 16, 2009	Active
McKenzie–Gray (52C10NE - 050)	Au	Possible Resource: 98 701 tons @ 0.30 opt Au	Larouche (1992)	Inactive
Mikado (52E/10SW - 006)	Au	Resource Estimate* (cut-off 1.0 g/t Au): Indicated: 968 300 t @ 4.18 g/t Au Inferred: 3 014 000 t @ 3.25 g/t Au	Everton Resources Inc., news release, Mar. 1, 2010	Inactive
Norpax (52L/06NE - 016)	Ni, Cu	Possible Resource: 1 010 000 tons @ 1.2% Ni, 0.5% Cu	Parker (1998, p.128)	Inactive
North Kaskaweogama (52J/07NW - 016)	Fe	Possible Resource: 405 000 tons @ 28% Fe	Shklanka (1968, p.443)	Inactive
North Pines (52K/01SE - 005)	Fe	Production: 500 000 t @ 28% Fe (1909–1921)	Johnston (1972, p.36)	Inactive
North Rock – Beaverpond (52C/11NE - 029)	Cu	Possible Resource: 1 020 458 tons @ 1.17% Cu	Poulsen (1984, p.50)	Inactive
Pelham 52F07NE - 00013	Au	Inferred Resource* (cut-off grade 0.45 g/t Au): 4 140 000 t @ 1.37 g/t Au Metal content: 182 000 oz Au	Dynasty Gold Corp., news release, Jan. 4, 2022	Active
Pidgeon Molybdenum (52F/16NW - 043)	Mo	Resource Estimate* (cut-off grade 0.04% Mo) Indicated: 2.66 Mt @ 0.117% Mo Inferred: 12.39 Mt @ 0.084% Mo	MPH Ventures Ltd., news release, Sept. 13, 2012	Inactive
Plomp Farm (52F/14SW - 009)	Au	Inferred Resources* (cut-off grade 0.30 g/t Au): 5 702 000 t @ 0.58 g/t Au, 0.21 g/t Ag Metal content: 107 100 oz Au, 38 400 oz Ag	Champion Bear Resources Ltd., news release, Nov. 21, 2017	Inactive
Purdex A-D (52E/11NE - 017)	Au	Possible Resource: 226 800 t grading between 8.57 g/t Au and 10.28 g/t Au	Sears (2006)	Active
Rainy River Au-Ag zones (52D/16SE – 004)	Au, Ag	Estimates for all zones at including Intrepid zone*: <u>Reserve and Resource cut-off grades:</u> Open Pit: 0.3–0.5 g/t AuEq Underground: 2.2 g/t AuEq Proven and Probable Reserve: 77 572 000 t @ 1.06 g/t Au, 2.5 g/t Ag Metal Content: 2 636 000 oz Au, 6 226 000 oz Ag Measured and Indicated Resource: 23 127 000 t @ 2.57 g/t Au, 6.9 g/t Ag Metal Content: 1 914 000 oz Au, 5 120 000 oz Ag Inferred Resource: 3 479 000 t @ 1.77 g/t Au, 2.4 g/t Ag Metal Content: 198 000 oz Au, 268 000 oz Ag	 McCann et al. (2020) McCann et al. (2020) McCann et al. (2020)	Active
34 zone	Pt, Pd, Ni, Cu	Indicated Resource* (cut-off 0.30 g/t Au): 191 000 t @ 0.60 g/t Au, 0.23 g/t Pt, 0.62 g/t Pd, 1656 ppm Ni, 1424 ppm Cu Metal Content: 3710 oz Au, 1390 oz Pt, 3800 oz Pd, 317 t Ni, 272 t Cu	Hardie et al. (2014)	Inactive
Silver zone	Au, Ag	Indicated Resource* (cut-off 0.30 g/t Au): 2 108 000 t @ 0.54 g/t Au, 20.34 g/t Ag Metal Content: 36 510 oz Au, 1 378 000 oz Ag	Hardie et al. (2014)	Inactive
Richard Lake (52F/13SW - 044)	U	Possible Resource: 650 000 tons of 0.10% U_3O_8	Pryslak (1976, p.46)	Inactive
Scramble (52E/16SW - 091)	Au	Possible Resource: 150 000 t @ 0.24 opt Au Drill estimated: 70 000 oz Au (cut-off 0.05 opt Au)	Parr and Kuehnbaum (1990)	Active

Deposit Name (NTS – MDIR#)	Commodity	Tonnage–Grade Estimates and/or Dimensions (*NI-43-101 Compliant)	Reserve References	Status (as of December 2022)
St. Anthony (52J/02SE - 003)	Au	Possible Resource: 37 800 tons @ 0.18 opt Au Production: 331 069 tons @ 0.19 opt Au	Ferguson, Groen and Haynes (1971, p.295)	Active
Sturgeon Lake (52G/15NW - 004)	Cu, Zn, Pb, Ag	Original Reserves (Dec. 1974): 2.10 Mt @ 10.64% Zn, 2.98% Cu, 1.47% Pb, 6.14 opt Ag, 0.021 opt Au Indicated Reserves (Dec. 1978): 599 000 t @ 2.34% Cu, 8.98% Zn, 1.30% Pb, 5.17 opt Ag, 0.018 opt Au	Trowell (1983, p.4) CMH 1980–1981, p.102 (Falconbridge)	Inactive - Rehabilitated
Vanlas (52F/10NW - 032)	Au	Possible Resource: 100 000 t @ 0.20 opt Au	Power Expl. Inc. AF 52F/10NW UU-1	Inactive
Wendigo (52E/09NE - 003)	Au, Ag, Cu	Produced: 67 423 oz Au, 14 762 oz Ag and 1.89 million lbs of Cu from 20 054 t Tailings: 61 970 t @ 0.027 opt Au	SMDR 001350 Davies and Smith (1988, p.352)	Inactive
Werner Lake (52L/07NW – 003)	Co, Cu	Resource Estimates* (cut-off 0.25% Co) Indicated Resource: 57 900 t @ 0.51% Co, 0.25% Cu, 0.22 g/t Au Metal Content: 650 000 lbs Co, 319 000 lbs Cu Inferred Resource: 6300 t @ 0.48% Co, 0.14% Cu, 0.24 g/t Au Metal Content: 67 000 lbs Co, 19 000 lb Cu Production: recovered 389 363 lbs of Co (1932, 1940–1944); grades 2% Co, 0.75% Cu	Global Energy Metals Corporation, news release, Sept. 7, 2017 Thomson et al. (1954, p.37)	Inactive

***Unit abbreviations used**: lbs = pounds; Mlbs = million pounds; Mt = million tonnes; opt = ounces per ton; oz = ounce(s); t = tonnes.*
***Note:** This table contains tonnage and grade estimates, referred to as "resource" (estimated, possible, and proposed), that were determined at various times by methods largely unreported. The values of these resource estimates were calculated prior to the reporting standards required by National Instrument 43-101.*
** Resources estimate values presented as measured, indicated or inferred are in compliance with the reporting standards required by National Instrument 43-101.*

$$AuEq\ (g/t) = Au\ (g/t) + \left\{ \frac{(Ag\ (g/t) \times Ag\ price\ (\$/oz) \times Ag\ mill\ recovery\ (\%))}{(Au\ price\ (\$/oz) \times Au\ mill\ recovery\ (\%))} \right\}$$

Wilson et al. (2008) present the minimum grade and tonnage thresholds for the deposits presented in this table.

REGIONAL LAND USE GEOLOGIST ACTIVITIES—NORTHWEST REGION

The activities of the Regional Land Use Geologist are described in "Regional Land Use Geologist Activities—Northwest Region" in the Red Lake District report of this volume.

MINERAL DEPOSIT COMPILATION GEOSCIENTIST ACTIVITIES—NORTHWESTERN ONTARIO

The activities of the Mineral Deposit Compilation Geoscientist are described in "Mineral Deposit Compilation Geoscientist Activities—Northwestern Ontario" in the Red Lake District report of this volume.

GEOGRAPHIC INFORMATION SYSTEM DATA SPECIALIST ACTIVITIES—NORTHWESTERN AND NORTHEASTERN ONTARIO

The activities of the Geographic Information System Data Specialists are described in "Geographic Information System Data Specialists Activities—Northwestern and Northeastern Ontario" in the Red Lake District report of this volume.

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Metric Conversion Table

Conversion from SI to Imperial			Conversion from Imperial to SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 023	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.307 951	cubic yards	1 cubic yard	0.764 554 86	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 962	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 747	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 622 6	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton(short)	**907.184 74**	kg
1 t	1.102 311 3	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 9**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy) / ton (short)	1 ounce (troy) / ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights / ton (short)	1 pennyweight / ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

	Multiplied by	
1 ounce (troy) per ton (short)	31.103 477	grams per ton (short)
1 gram per ton (short)	0.032 151	ounces (troy) per ton (short)
1 ounce (troy) per ton (short)	20.0	pennyweights per ton (short)
1 pennyweight per ton (short)	0.05	ounces (troy) per ton (short)

*Note: Conversion factors in **bold** type are exact. The conversion factors have been taken from or have been derived from factors given in the* Metric Practice Guide for the Canadian Mining and Metallurgical Industries*, published by the Mining Association of Canada in co-operation with the Coal Association of Canada.*

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