KIMBERLITE INDICATOR MINERAL SURVEY

Introduction

Mineral such as garnet, chromite, ilmenite and diopside have been used as indicators of kimberlite. Specifically the chemistry of these grains has been used to imply their mode of occurrence in diamonds as inclusions or in kimberlites (cf. Dawson and Stephens, 1975; Gurney, 1984 and McCallum and Vos, 1993).

Garnets have received considerable attention as kimberlite indicators and have been chemically classified according to their relevance as kimberlite indicator minerals (KIM). Garnets that are Ca-depleted diamond inclusion chrome pyropes have been termed “GIO” (Gurney, 1984; Dawson and Stephens, 1975). Dawson and Stephens (1975) indicate that the recognition of GIO garnets in overburden is very important. These garnets indicate a harzburgitic peridotite origin and are more closely associated with diamonds than are the garnets of lherzolitic origin, which are termed “G9”. Eclogitic garnets, with Na_20 concentration of greater than 0.09%, have been observed as inclusions in diamonds and as such represent valuable kimberlite indicator minerals.

Diamond inclusion chromites with Cr_20_3 of greater than 60% are considered to be kimberlite indicator minerals, equal in significance to GIO garnets. Chrome diopside with greater than 1% Cr_20_3 has been utilized as a useful kimberlite indicator mineral (Morris *et al.,* 1994). Kimberlite-hosted ilmenite generally has Mg0 concentrations of 4-15 weight % and greater than 2% Cr_20_3.

Sample Collection

An eleven litre pail of glacial till was collected from each sampling site where appropriate material was encountered. These samples were shipped to MONOPROS Ltd. at the end of the 1997 sampling program for processing. A total of 186 samples were collected with 149 coming from the Edmund Lake belt and 137 from the Sharpe Lake belt.

Sample Preparation and Analysis

The eleven litre samples were screened at 2.0 mm, with the oversize discarded except for a representative aliquot of the +2.0 – 5.6 mm fraction, which is used for pebble counts. The –2.0 mm size fraction was passed over a 0.3 mm aperture sieve and the –0.3 mm size fraction was discarded. The +0.3 mm – 2.0 mm fraction was concentrated by gravity separation, dried in ovens and the further sieved into +1.0-2.0 mm, +0.5-1.0 mm and +0.3-0.5 mm size fractions, which were packaged, labelled and shipped to MONOPROS laboratories for further treatment.

These three size fractions were individually separated using the heavy liquid bromoform (Specific Gravity – 2.86). The heavy fractions that sink through the bromoform were washed and sorted for kimberlitic indicator minerals. Indicator minerals were analysed by microprobe. This paraphrased description of sample preparation and analysis was supplied by MONOPROS Ltd.

Data Display

Abundances of kimberlite indicator minerals are portrayed using bubble plots. The greater the abundances of any particular indicator mineral at a sample site the larger the bubble.

A mylar sample site location map overlay is available for purposes of overlaying the bubble plots.

PRELIMINARY INTERPRETATION OF THE 1997 KIMBERLITE INDICATOR MINERALS SURVEY

The chemistry of KIM picked and microprobed for this study are summarized in Appendix 1 and their abundances by sample site is given Appendix 11. Classification, based on mircoprobe chemistry in Appendix 1, utilized the chemical parameters in Tables 3 and 4 taken from Thorleifson *et al.,* (1994). A sample site location map for both the Edmund Lake and Sharpe Lake greenstone belts is provided in Figure 3a. Figure 3b is a mylar sample site location map overlay. Kimberlite indicator mineral abundances from each belt are presented in Table 5.

Results of 1997 Overburden Sampling

Figure 5 through 10 are bubble plots for individual kimberlite indicator minerals (KIM) throughout the 1997 survey area. These plots represent KIM from combined +1.0-2.0 mm, +0.5-1.0 mm and +0.3-0.5 mm size fractions of the sample. Total KIM abundances are plotted in Figure 11. It is important to note that bubble plots for KIM data portray all sites at which a sample was collected. To gain a true appreciation for the significance of these geographic distributions and clustering, these maps should be viewed using the mylar overlay depicting all multimedia sample locations. Survey results for each of the Edmund Lake and Sharpe Lake greenstone belts are described below and summarized in Table 3.

Edmund Lake Belt

A total of 43 KIM grains were retrieved from the 149 samples collected within the mapped limits of this belt. There were not G10 or Ti-Cr pyrope garnets identified in the Edmund Lake samples and the diffuse geographic distribution of chrome spinel and chrome diopside grains (Figs. 5, 6) is interpreted to be non-definitive.

The distribution of G9 garnets is somewhat different, with a four sample cluster identified in the immediate area of the Little Stull Lake gold deposits and a second three sample cluster near a small lake midway between Margaret Lake and Little Stull Lake on the Wolf Bay Shear Zone (“WBSZ”, Fig. 8). A seven sample cluster of Mg-ilmenite grains is also developed in the area of the three sample G9 cluster (Fig. 10). A four grain Mg-ilmenite cluster occurs southeast of Margaret Lake.

The plot of total abundances in the Edmund Lake belt (Fig. 11) enhances the Mg-ilmenite-dominated KIM signature at the mid-point of the WBSZ. Interestingly, this general area is the site of multi-media geochemical anomalies for Ni, Mg, Ti and Cr in rock samples as well as Ti in both till and b-horizon soil samples and is suggestive of a high-Mg source lithology. The site is worthy of ground follow-up.

Sharpe Lake Belt

Thirty-seven KIM grains were identified in 137 samples from the belt. The distribution of chrome spinel (Fig. 5), chrome diopside (Fig. 6), titanian-chrome pyrope garnets (Fig. 7) and G9 garnets (Fig. 8) are interpreted as non-definitive. A single G10 garnet was identified in a sample collected from the eastern end of Sharpe Lake (Fig. 9). The distribution of magnesian ilmenite (Fig. 10) in the belt is also diffuse except for a six grain cluster over a short stretch of the belt south and east of Webber Lake.

A small greenstone outlier just north of the west end of Sharpe Lake is marked by chrome spinel, a titanian-chrome pyrope garnet, and two grains of magnesian ilmenite. These minerals are probably related to a gabbroic intrusion identified in outcrop at Barclay Lake.

The plot of total abundances in Figure 11 reflects the generally scattered nature of the KIM grains in this belt. The area of the G10 garnet should be reconnoitered, although its occurrence as a single grain may suggest it has been derived from a distal source.

Table 3. Guidelines for preliminary mineral identification (Thorleifson *et al.,* 1994).

Total <70%	+ CA0 >44%	Apatite
Total <70%	+ Fe0 >50%	Siderite
Total <70%	+ Al_20_3 >40%	Gahnite
Total 34%	+ $Si0_2$ 33%	Zircon
Total <70%		low total; e.g. phosphate sulphate, carbonate
$Si0_2$ <20%	+ Cr_20_3 >60% + Mg0 >12%	diamond inclusion Cr-spinel
	+ Cr_20_3 >10%	Cr-spinel
	+ $Ti0_2$ >70%	Rutile
	+ $Ti0_2$ >30% + Mg0 >6%	Mg-ilmenite
	+ $Ti0_2$ >30%	Ilmenite
	+ $Ti0_2$ >1%	Ti-Fe-oxide
	+ Fe0t >90%	Magnetite
	+ Fe0t >80%	Hematite
	+ Fe0t >40%	Goethite
	+ Al_20_3 >80	Corundum
	+ Al_20_3 >30% + Fe0 >20%	Hercynite
	+ Al_20_3 >30%	Spinel
$Si0_2$ >75%		Quartz
$Si0_2$ >55%	+ Al_20_3 >16%	Feldspar
$Ti0_2$ >20%		Sphene
Al_20_3 >55%		Kyanite
Al_20_3 >45%		Staurolite
Al_20_3 >24%	+ total <90% + Mg0 >5.3%	Mg-tourmaline
Al_20_3 24%	+ total <90% + Mg0 <5.3%	Fe-tourmaline
Al_20_3 24%	+ total<98% + Ca0 22.2-25%	Epidote
$Si0_2$ <47%	+ K_20 >0.5% or Na_20 >1% or $Si0_2$ 41-47% _ Cr_20_3 <0.5%	Amphibole
$Si0_2$ >47%	+ Ca0 <3.1%	OPX
	+ Na_20 >2.7%	Na-CPX
	+ Fe0t >6.1%	Fe-CPX
	+ >0.5% Cr_20_3	Cr-diopside
	Remainder	Diopside
Mg0 >25%		Olivine
Garnet	+ Mg0 >13% + Cr_20_3 >0.5%	Cr-pyrope
	+ Mg0 >4% + Ca0 >2% + Ti02 >0.2%	Eclogitic garnet
	+ Cr_20_3 >14%	Uvarovite
	+ Mg0 >13%	Pyrope
	+ $Ti0_2$ >2.5 + Al_20_3 <11.5%	Melanite
	+ Ca0 >16% + Al_20_3 <11.5% + Cr_20_3 >1%	Cr-andradite
	+ Ca0 >16% + Al_20_3 <11.5%	Andradite
	Ca0 >30% + Cr_20_3 >1%	Cr-Grossularite
	+ Ca0 >30%	Grossularite
	+ Mn0 >21%	Spessartite
	+ Fe0t >25%	Almandite
	Remainder	Garnet

Table 4. Kimberlite indicator mineral classification (Thorleifson *et al.*, 1994)

1. Cr-spinel	>60% Cr203 + >12% Mg0	diamond inclusion Cr-spinel
2. Ilmenite	>-6% Mg0	Mg-ilmenite
3. Pyroxene	>0.50% Cr_20_3	Cr-diopside
4. Garnet	>13% Mg0 and >0.50% Cr_20_3	Cr-pyrope
	>0.30% $Ti0_2$ + 4.0% Cr_20_3	G11 titanian, Cr-pyrope
	>90% $Ti0_2$	G2 titanian, Cr-pyrope
	>0.30% $Ti0_2$	G1 titanian, Cr-pyrope
	>12.0% Cr_20_3	G12 Non-titanian, Cr-pyrope
	Ca0 <0.285 (Cr_20_3)+3.14	G10 Non-titanian, Cr-pyrope
	Ca0 >0.285 (Cr_20_3)+5.14	G7 Non-titanian, Cr-pyrope
	Remainder	G9
	>4.0% Mg0 + >2.0% Ca0 + >0.20% $Ti0_2$ + >19% Al_20_3 + <0.5% Cr_20_3	Eclogitic garnet
	>0.60% $Ti0_2$	G4
	>16.0% Ca0	G8
	>12.0% Ca0	G6
	Remainder	G3

Site	Cr-Spinel	Chrome Diopside	Ti-Cr Pyrope	G9	G10	Mg-Ilmenite
1. Edmund Lake Belt	5	7	nil	16	nil	5
2. Sharpe Lake Belt	6	2	3	11	1	14

Table 5. Summary of the geographic distribution of kimberlite indicator mineral grains.

Appendix 1

Mineral Chemistry (Monopros Limited) and Classifications (0.3 mm)

Sample Site	Mount	Grain	Size	MnO	Na2O	Al2O3	FeO	SiO2	TiO2	CaO	Cr2O3	MgO	Total	Mineralogy
			mm	%	%	%	%	%	%	%	%	%	%	
97T-006	1	1	0.3	0.14	4.91	4.63	4.25	52.88	0.36	15.66	1.08	14.62	98.52	Cr-diopside
97T-019	1	2	0.3	0.49	0.17	18.09	7.31	43.08	0.07	5.27	7.15	16.55	98.17	non-titanian Cr pyrope (G9)
97T-022	1	3	0.3	0.29	0.00	0.17	33.58	0.00	50.85	0.00	3.30	11.81	100.00	Mg-ilmenite
97T-023	1	4	0.3	0.33	0.00	0.00	36.48	0.00	48.70	0.00	2.80	10.25	98.56	Mg-ilmenite
97T-023	1	5	0.3	0.35	0.00	0.49	30.96	0.00	52.75	0.05	2.61	13.02	100.23	Mg-ilmenite
97T-023	1	6	0.3	0.34	0.11	0.13	37.09	0.01	51.76	0.03	0.17	10.05	99.70	Mg-ilmenite
97T-023	1	7	0.3	0.35	0.15	19.84	21.47	0.00	0.23	0.02	44.36	13.03	99.45	Cr-spinel
97T-028	1	8	0.3	0.08	3.88	2.93	3.50	55.73	0.32	18.08	2.59	13.71	100.82	Cr-diopside
97T-037	1	9	0.3	0.73	0.05	11.71	8.98	38.18	0.34	36.18	4.14	0.15	100.47	Cr-grossularite
97T-038	1	10	0.3	0.55	0.00	20.52	8.31	42.82	0.08	5.95	3.56	17.03	98.82	non-titanian Cr pyrope (G9)
97T-038	1	11	0.3	0.36	0.11	0.13	36.15	0.01	49.53	0.00	2.76	10.01	99.08	Mg-ilmenite
97T-038	1	12	0.3	0.44	0.00	0.15	41.57	0.00	47.17	0.03	2.45	7.52	99.32	Mg-ilmenite
97T-038	1	13	0.3	0.16	0.00	0.65	82.20	0.00	8.23	0.01	0.10	0.02	91.37	hematite
97T-045	1	14	0.3	0.45	0.14	19.52	7.33	43.69	0.17	5.47	5.33	17.68	99.78	non-titanian Cr pyrope (G9)
97T-045	1	15	0.3	0.36	0.00	0.22	37.65	0.00	48.52	0.00	2.45	9.51	98.71	Mg-ilmenite
97T-045	1	16	0.3	3.00	0.23	0.00	46.96	0.00	49.23	0.00	0.05	0.05	99.52	ilmenite
97T-045	1	17	0.3	1.66	0.00	0.04	48.51	0.08	49.77	0.01	0.01	0.30	100.37	ilmenite
97T-052	1	18	0.3	0.38	0.00	20.08	26.33	0.00	0.68	0.01	44.51	8.60	100.58	Cr-spinel
97T-056	1	19	0.3	0.32	0.11	17.52	7.35	41.91	0.18	5.57	6.45	16.18	95.60	non-titanian Cr pyrope (G9)
97T-059	1	20	0.3	0.31	0.06	0.22	32.15	0.01	51.83	0.00	2.36	13.61	100.57	Mg-ilmenite
97T-061	1	21	0.3	0.17	0.00	15.39	22.61	0.02	0.24	0.03	49.43	11.48	99.37	Cr-spinel
97T-064	1	22	0.3	0.09	1.57	0.20	2.42	54.19	0.12	23.30	2.22	15.62	99.72	Cr-diopside
97T-064	1	23	0.3	1.70	0.00	0.00	48.72	0.01	49.21	0.03	0.03	0.00	99.71	ilmenite
97T-064	1	24	0.3	3.61	0.07	0.05	46.28	0.06	47.53	0.04	0.00	0.21	97.85	ilmenite
97T-070	1	25	0.3	0.15	2.53	2.28	3.73	55.37	0.25	17.83	1.37	16.61	100.12	Cr-diopside
97T-071	1	26	0.3	0.50	0.05	21.47	8.44	42.72	0.11	5.70	3.00	15.89	97.87	non-titanian Cr pyrope (G9)
97T-072	1	27	0.3	0.18	0.46	2.04	4.12	54.34	0.14	21.92	1.49	16.52	101.21	Cr-diopside
97T-078	1	28	0.3	0.25	0.00	0.26	42.13	0.00	48.86	0.02	0.35	7.08	98.95	Mg-ilmenite
97T-088	1	29	0.3	0.38	0.08	19.88	7.66	43.24	0.21	5.20	5.25	16.69	98.58	non-titanian Cr pyrope (G9)
97T-088	1	30	0.3	0.53	0.02	19.85	35.57	38.81	0.06	4.35	0.02	1.69	100.92	almandite
97T-088	1	31	0.3	0.11	2.43	1.35	2.62	55.05	0.28	20.36	2.74	14.76	99.70	Cr-diopside
97T-090	1	32	0.3	0.17	0.23	0.07	0.16	35.35	0.13	0.06	0.16	0.00	36.34	zircon
97T-090	1	33	0.3	0.30	0.11	0.24	31.21	0.03	52.87	0.05	3.01	11.54	99.36	Mg-ilmenite
97T-091	1	34	0.3	0.46	0.00	17.68	7.35	43.00	0.29	5.57	7.90	16.91	99.17	non-titanian Cr pyrope (G9)
97T-091	1	35	0.3	0.49	0.00	17.53	32.15	0.00	0.38	0.00	36.57	10.11	97.23	Cr-spinel
97T-099	1	36	0.3	0.46	0.14	19.48	7.46	43.38	0.09	5.57	5.86	16.60	99.04	non-titanian Cr pyrope (G9)
97T-099	1	37	0.3	0.40	0.08	17.85	7.54	43.21	0.17	5.25	5.72	17.81	98.03	non-titanian Cr pyrope (G9)
97T-136	1	38	0.3	0.43	0.00	20.08	7.43	43.00	0.20	5.00	4.50	18.27	98.91	non-titanian Cr pyrope (G9)
97T-138	1	39	0.3	0.60	0.14	20.26	7.83	43.87	0.03	4.86	4.35	17.29	99.23	non-titanian Cr pyrope (G9)
97T-140	1	40	0.3	0.14	0.18	0.04	0.17	34.63	0.09	0.06	0.18	0.08	35.57	zircon
97T-140	1	41	0.3	0.14	0.70	1.12	5.69	54.20	0.07	21.08	0.96	17.29	101.25	Cr-diopside
97T-143	1	42	0.3	0.44	0.02	19.67	7.69	43.99	0.23	5.63	4.76	16.83	99.26	non-titanian Cr pyrope (G9)
97T-143	1	43	0.3	0.19	0.00	21.09	20.68	0.02	1.41	0.02	40.21	15.90	99.53	Cr-spinel
97T-152	1	44	0.3	0.64	0.02	20.62	8.10	43.67	0.01	5.05	3.52	16.50	98.13	non-titanian Cr pyrope (G9)
97T-153	1	45	0.3	0.48	0.02	18.45	8.31	43.10	0.35	5.35	6.21	17.54	99.79	titanian Cr-pyrope (G11)
97T-153	1	46	0.3	0.85	0.12	9.63	43.18	0.01	0.14	0.04	44.21	1.39	99.57	Cr-spinel
97T-159	1	47	0.3	0.43	0.00	0.04	35.58	0.00	48.92	0.02	3.61	11.43	100.01	Mg-ilmenite
97T-171	1	48	0.3	0.41	0.08	17.91	7.57	43.41	0.54	6.47	6.06	17.82	100.27	titanian Cr-pyrope (G11)
97T-171	1	49	0.3	0.00	0.01	97.94	0.27	0.00	0.00	0.00	1.28	0.00	99.50	corundum
97T-186	1	50	0.3	0.57	0.00	21.50	8.18	44.83	0.10	4.86	2.79	17.27	100.09	Non-titanian Cr pyrope (G9)
97T-197	1	51	0.3	0.06	1.31	0.45	2.84	54.39	0.19	23.10	1.96	15.01	99.31	Cr-diopside
97T-204	1	52	0.3	0.50	0.08	18.03	6.99	44.07	0.21	5.45	5.93	16.59	97.84	non-titanian Cr pyrope (G9)
97T-204	1	53	0.3	0.82	0.10	19.65	26.87	38.96	0.14	11.55	0.04	1.75	99.89	almandite
97T-219	1	54	0.3	0.38	0.00	0.11	35.26	0.01	49.87	0.00	4.20	10.68	100.52	Mg-ilmenite
97T-221	1	55	0.3	0.40	0.08	19.77	6.91	43.63	0.26	5.41	4.54	17.37	98.36	Non-titanian Cr pyrope (G9)
97T-221	1	56	0.3	0.40	0.00	0.40	40.70	0.00	47.98	0.06	0.18	8.80	98.52	Mg-ilmenite
97T-222	1	57	0.3	0.18	0.09	0.26	93.15	0.03	0.07	0.04	0.11	0.11	94.05	magnetite
97T-222	1	58	0.3	0.08	0.00	0.11	93.71	0.09	0.07	0.01	0.07	0.02	94.16	magnetite
97T-223	1	59	0.3	0.29	0.12	8.14	33.66	0.00	3.44	0.01	43.27	9.95	98.88	Cr-spinel
97T-225	1	60	0.3	0.59	0.00	0.19	48.53	0.00	49.91	0.05	0.01	0.30	99.57	ilmenite
97T-225	1	61	0.3	0.13	0.13	28.70	14.47	0.16	0.56	0.00	37.29	19.54	100.99	Cr-spinel
97T-240	1	62	0.3	0.11	0.00	42.90	33.98	0.00	0.05	0.00	15.56	5.03	97.63	Cr-spinel
97T-241	1	63	0.3	0.36	0.05	17.86	7.22	43.48	0.24	5.76	6.70	16.30	97.96	non-titanian Cr pyrope (G9)

97T-244	1	64	0.3	0.26	0.00	23.11	27.59	0.03	0.34	0.00	38.86	10.85	101.04	Cr-spinel
97T-249	1	65	0.3	0.48	0.08	16.23	1.00	40.56	0.43	36.89	2.02	0.14	97.83	Cr-grossularite
97T-254	1	66	0.3	0.47	0.05	16.98	7.65	43.63	0.25	6.40	8.52	17.15	101.10	non-titanian Cr pyrope (G9)
97T-254	1	67	0.3	0.13	1.52	1.74	2.08	53.87	0.13	23.37	0.96	14.70	98.49	Cr-diopside
97T-255	1	68	0.3	0.36	0.26	19.06	7.42	43.82	0.20	5.29	4.91	17.32	98.65	non-titanian Cr pyrope (G9)
97T-255	1	69	0.3	0.23	0.02	0.00	13.42	0.05	72.14	0.10	3.99	8.42	98.36	rutile
97T-256	1	70	0.3	0.36	0.14	17.60	7.66	42.16	0.10	6.84	7.98	15.73	98.56	non-titanian Cr pyrope (G9)
97T-257	1	71	0.3	0.33	0.16	0.00	32.50	0.00	50.13	0.02	3.98	11.10	98.21	Mg-ilmenite
97T-262	1	72	0.3	0.45	0.11	19.08	7.80	41.12	0.27	5.62	4.81	15.81	95.07	non-titanian Cr pyrope (G9)
97T-267	1	73	0.3	0.17	0.06	0.38	41.28	0.00	49.03	0.03	0.44	8.11	99.49	Mg-ilmenite
97T-272	1	74	0.3	0.07	0.00	0.00	92.83	0.00	0.00	0.05	0.12	0.02	93.10	magnetite
97T-273	1	75	0.3	0.49	0.00	17.03	7.43	42.10	0.01	3.95	8.27	18.19	97.48	non-titanian Cr pyrope (G10)
97T-279	1	76	0.3	0.34	0.00	0.11	35.82	0.00	50.17	0.00	3.37	10.67	100.46	Mg-ilmenite
97T-283	1	77	0.3	0.29	0.00	8.50	32.15	0.10	4.10	0.05	41.85	13.08	100.12	Cr-spinel
97T-285	1	78	0.3	0.38	0.00	20.23	7.54	42.24	0.38	5.64	5.17	16.60	98.19	titanian Cr-pyrope (G11)

Appendix 1

Mineral Chemistry (Monopros Limited) and Classifications (0.5 mm)

Sample Site	Mount	Grain	Size	MnO	Na2O	Al2O3	FeO	SiO2	TiO2	CaO	Cr2O3	MgO	Total	Mineralogy
			mm	%	%	%	%	%	%	%	%	%	%	
97T-006	1	1	0.5	0.47	0.00	22.18	8.64	42.28	0.02	4.53	1.43	20.23	99.76	non-titanian Cr pyrope (G9)
97T-023	1	2	0.5	0.53	0.02	20.10	8.20	41.59	0.07	4.61	4.06	18.97	98.15	non-titanian Cr pyrope (G9)
97T-023	1	3	0.5	0.41	0.00	18.15	8.31	42.04	0.28	5.76	5.36	18.12	98.43	non-titanian Cr pyrope (G9)
97T-026	1	4	0.5	0.81	0.00	21.14	19.79	39.99	0.11	5.89	0.15	10.56	98.43	almandite
97T-037	1	5	0.5	0.38	0.00	0.00	41.51	0.02	45.61	0.00	2.66	7.85	98.03	magnesian ilmenite
97T-045	1	6	0.5	0.33	0.00	0.09	33.03	0.00	51.22	0.00	2.26	11.69	98.62	magnesian ilmenite
97T-071	1	7	0.5	0.37	0.00	21.13	7.47	43.18	0.20	4.47	2.09	20.69	99.59	non-titanian Cr pyrope (G9)
97T-138	1	8	0.5	0.23	0.01	0.15	33.28	0.02	51.61	0.00	3.43	12.44	101.17	magnesian ilmenite
97T-143	1	9	0.5	0.06	0.07	0.04	93.12	0.04	0.10	0.00	0.04	0.15	93.62	magnetite
97T-159	1	10	0.5	0.32	0.00	0.16	33.73	0.00	48.15	0.00	3.53	11.65	97.54	magnesian ilmenite
97T-171	1	11	0.5	0.36	0.00	18.99	7.71	43.25	0.13	5.00	4.81	18.12	98.37	non-titanian Cr pyrope (G9)
97T-171	1	12	0.5	0.34	0.00	0.21	38.98	0.00	45.15	0.00	5.66	8.60	98.95	magnesian ilmenite
97T-184	1	13	0.5	0.55	0.13	21.53	25.20	39.88	0.16	6.18	0.06	7.47	101.14	almandite
97T-190	1	14	0.5	0.18	0.00	0.24	33.34	0.00	49.55	0.00	3.23	13.08	99.63	magnesian ilmenite
97T-221	1	15	0.5	0.26	0.00	0.01	93.54	0.00	0.00	0.01	0.00	0.11	93.94	magnetite
97T-244	1	16	0.5	0.10	0.00	0.08	93.59	0.00	0.08	0.00	0.01	0.00	93.87	magnetite
97T-245	1	17	0.5	0.04	0.00	0.00	94.24	0.00	0.02	0.00	0.02	0.00	94.32	magnetite
97T-252	1	18	0.5	0.28	0.01	0.05	32.70	0.02	52.06	0.00	3.64	11.32	100.07	magnesian ilmenite
97T-252	1	19	0.5	0.29	0.01	0.05	36.13	0.00	49.72	0.00	3.18	10.69	100.07	magnesian ilmenite
97T-261	1	20	0.5	0.37	0.25	0.03	34.46	0.00	50.02	0.00	3.15	10.97	99.25	magnesian ilmenite
97T-271	1	21	0.5	0.45	0.11	16.90	7.08	41.36	0.12	5.94	8.35	17.63	97.95	non-titanian Cr pyrope (G9)

Appendix 1

Mineral Chemistry (Monopros Limited) and Classifications (1 mm)

Sample Site	Mount	Grain	Size	MnO	Na2O	Al2O3	FeO	SiO2	TiO2	CaO	Cr2O3	MgO	Total	Mineralogy
			mm	%	%	%	%	%	%	%	%	%	%	
97T-019	1	1	1	0.30	0.01	0.09	33.45	0.00	51.37	0.00	2.70	11.38	99.29	magnesian ilmenite
97T-071	1	2	1	0.27	0.00	0.27	34.85	0.00	51.01	0.00	1.52	12.13	100.05	magnesian ilmenite
97T-275	1	3	1	0.36	0.00	0.06	33.71	0.00	52.14	0.00	2.54	11.07	99.87	magnesian ilmenite
97T-284	1	4	1	0.28	0.01	0.30	34.35	0.00	50.72	0.02	2.78	12.09	100.55	magnesian ilmenite

Appendix 2

Total Kimberlite Indicator Mineral Abundances (0.3 mm)

Sample Site	UTM		Size	Ti-Cr Pyrope	G9	G10	Cr-Spinel	Mg-Ilmenite	Cr-Diopside	Total Kimberlite
	EAST	NORTH	mm							Indicator Minerals
97T-006	518401	6043035	0.3						1	1
97T-019	503981	6058302	0.3		1					1
97T-022	509841	6054884	0.3					1		1
97T-023	509948	6053778	0.3				1	3		4
97T-028	500798	6058006	0.3						1	1
97T-038	511021	6053344	0.3		1			2		3
97T-045	501781	6059766	0.3		1			1		2
97T-052	504799	6056393	0.3				1			1
97T-056	485088	6068682	0.3		1					1
97T-059	500719	6060166	0.3					1		1
97T-061	497206	6060852	0.3				1			1
97T-064	495880	6064914	0.3						1	1
97T-070	492821	6062333	0.3						1	1
97T-071	518287	6046419	0.3		1					1
97T-072	518901	6044811	0.3						1	1
97T-078	522282	6036707	0.3					1		1
97T-088	520527	6041691	0.3		1				1	2
97T-090	523174	6042220	0.3					1		1
97T-091	518535	6038263	0.3		1		1			2
97T-099	517575	6045717	0.3		2					2
97T-136	513377	6052104	0.3		1					1
97T-138	513788	6053203	0.3		1					1
97T-140	510561	6051207	0.3						1	1
97T-143	503707	6055102	0.3		1		1			2
97T-152	517917	6030851	0.3		1					1
97T-153	517089	6028676	0.3	1			1			2
97T-159	512845	6033996	0.3					1		1
97T-171	516472	6033483	0.3	1						1
97T-186	518573	6031574	0.3		1					1
97T-197	496064	6031902	0.3						1	1
97T-204	493311	6034135	0.3		1					1
97T-219	476476	6033291	0.3					1		1
97T-221	491778	6033333	0.3		1			1		2
97T-223	482129	6034706	0.3				1			1
97T-225	484355	6033976	0.3				1			1
97T-240	460875	6028462	0.3				1			1
97T-241	461875	6027235	0.3		1					1
97T-244	453747	6028681	0.3				1			1
97T-254	443423	6028525	0.3		1				1	2
97T-255	442843	6030013	0.3		1					1
97T-256	442448	6029172	0.3		1					1
97T-257	439225	6030492	0.3					1		1
97T-262	435111	6031848	0.3		1					1
97T-267	449222	6028541	0.3					1		1
97T-273	466096	6029651	0.3			1				1
97T-279	455920	6035035	0.3					1		1
97T-283	457995	6036193	0.3				1			1
97T-285	454410	6030342	0.3	1						1
Total				**3**	**21**	**1**	**11**	**16**	**9**	**61**

Appendix 2

Total Kimberlite Indicator Mineral Abundances (0.5 mm)

Sample Site	UTM		Size	Ti-Cr Pyrope	G9	G10	Cr-Spinel	Mg-Ilmenite	Cr-Diopside	Total Kimberlite
	EAST	NORTH	mm							Indicator Minerals
97T-006	518401	6043035	0.5		1					1
97T-023	509948	6053778	0.5		2					2
97T-037	512445	6053053	0.5					1		1
97T-045	501781	6059766	0.5					1		1
97T-071	518287	6046419	0.5		1					1
97T-138	513788	6053203	0.5					1		1
97T-159	512845	6033996	0.5					1		1
97T-171	516472	6033483	0.5		1			1		2
97T-190	498167	6028367	0.5					1		1
97T-252	445395	6029398	0.5					2		2
97T-261	448532	6027763	0.5					1		1
97T-271	465155	6030614	0.5		1					1
Total					**6**			**9**		**15**

Appendix 2

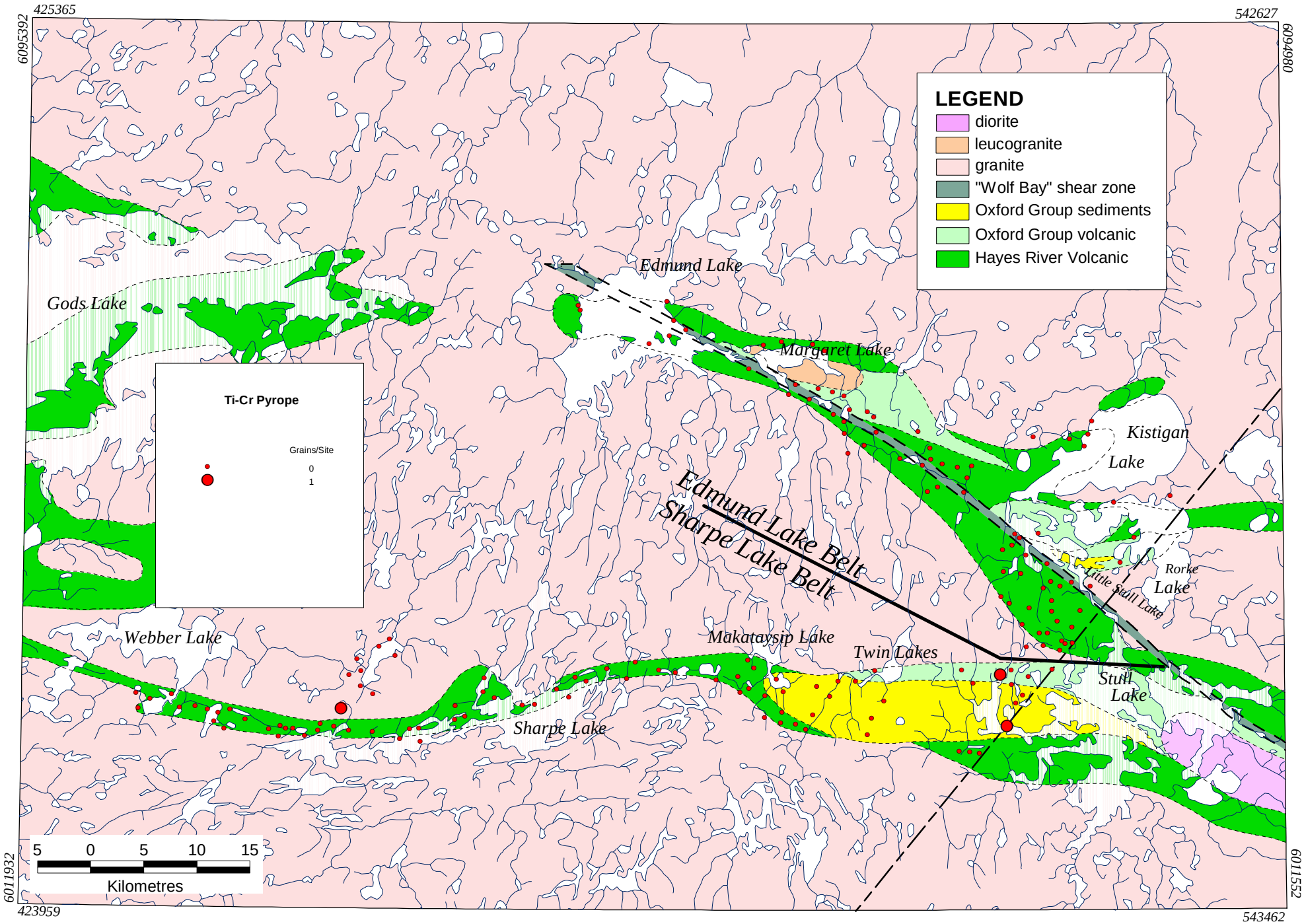
Total Kimberlite Indicator Mineral Abundances (1.0 mm)

Sample Site	UTM		Size	Ti-Cr Pyrope	G9	G10	Cr-Spinel	Mg-Ilmenite	Cr-Diopside	Total Kimberlite
	EAST	NORTH	mm							Indicator Minerals
97T-019	503981	6058302	1					1		1
97T-071	518287	6046419	1					1		1
97T-275	441854	6030334	1					1		1
97T-284	457394	6031755	1					1		1
Total								**4**		**4**

Appendix 2

Total Kimberlite Indicator Mineral Abundances (0.3 mm + 0.5 mm + 1.0 mm)

Sample Site	UTM		Ti-Cr Pyrope	G9	G10	Cr-Spinel	Mg-Ilmenite	Cr-Diopside	Total Kimberlite Indicator Minerals
	EAST	NORTH							
97T-006	518401	6043035		1				1	2
97T-019	503981	6058302		1			1		2
97T-022	509841	6054884					1		1
97T-023	509948	6053778		2		1	3		6
97T-028	500798	6058006						1	1
97T-037	512445	6053053					1		1
97T-038	511021	6053344		1			2		3
97T-045	501781	6059766		1			2		3
97T-052	504799	6056393				1			1
97T-056	485088	6068682		1					1
97T-059	500719	6060166					1		1
97T-061	497206	6060852				1			1
97T-064	495880	6064914						1	1
97T-070	492821	6062333						1	1
97T-071	518287	6046419		2			1		3
97T-072	518901	6044811						1	1
97T-078	522282	6036707					1		1
97T-088	520527	6041691		1				1	2
97T-090	523174	6042220					1		1
97T-091	518535	6038263		1		1			2
97T-099	517575	6045717		2					2
97T-136	513377	6052104		1					1
97T-138	513788	6053203		1			1		2
97T-140	510561	6051207						1	1
97T-143	503707	6055102		1		1			2
97T-152	517917	6030851		1					1
97T-153	517089	6028676	1			1			2
97T-159	512845	6033996					2		2
97T-171	516472	6033483	1	1			1		3
97T-186	518573	6031574		1					1
97T-190	498167	6028367					1		1
97T-197	496064	6031902						1	1
97T-204	493311	6034135		1					1
97T-219	476476	6033291					1		1
97T-221	491778	6033333		1			1		2
97T-223	482129	6034706				1			1
97T-225	484355	6033976				1			1
97T-240	460875	6028462				1			1
97T-241	461875	6027235		1					1
97T-244	453747	6028681				1			1
97T-252	445395	6029398					2		2
97T-254	443423	6028525		1				1	2
97T-255	442843	6030013		1					1
97T-256	442448	6029172		1					1
97T-257	439225	6030492					1		1
97T-261	448532	6027763					1		1
97T-262	435111	6031848		1					1
97T-267	449222	6028541					1		1
97T-271	465155	6030614		1					1
97T-273	466096	6029651			1				1
97T-275	441854	6030334					1		1
97T-279	455920	6035035					1		1
97T-283	457995	6036193				1			1
97T-284	457394	6031755					1		1
97T-285	454410	6030342	1						1
		Total	3	27	1	11	29	9	80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Oxford Group volcanic
Hayes River Volcanic
Edmund Lake
Gods Lake
Margaret Lake
Ti-Cr Pyrope
Grains/Site
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Kistigan
Lake
Edmund Lake Belt
Sharpe Lake Belt
Rorke
Lake
Little Stull Lake
Webber Lake
Makataysip Lake
Twin Lakes
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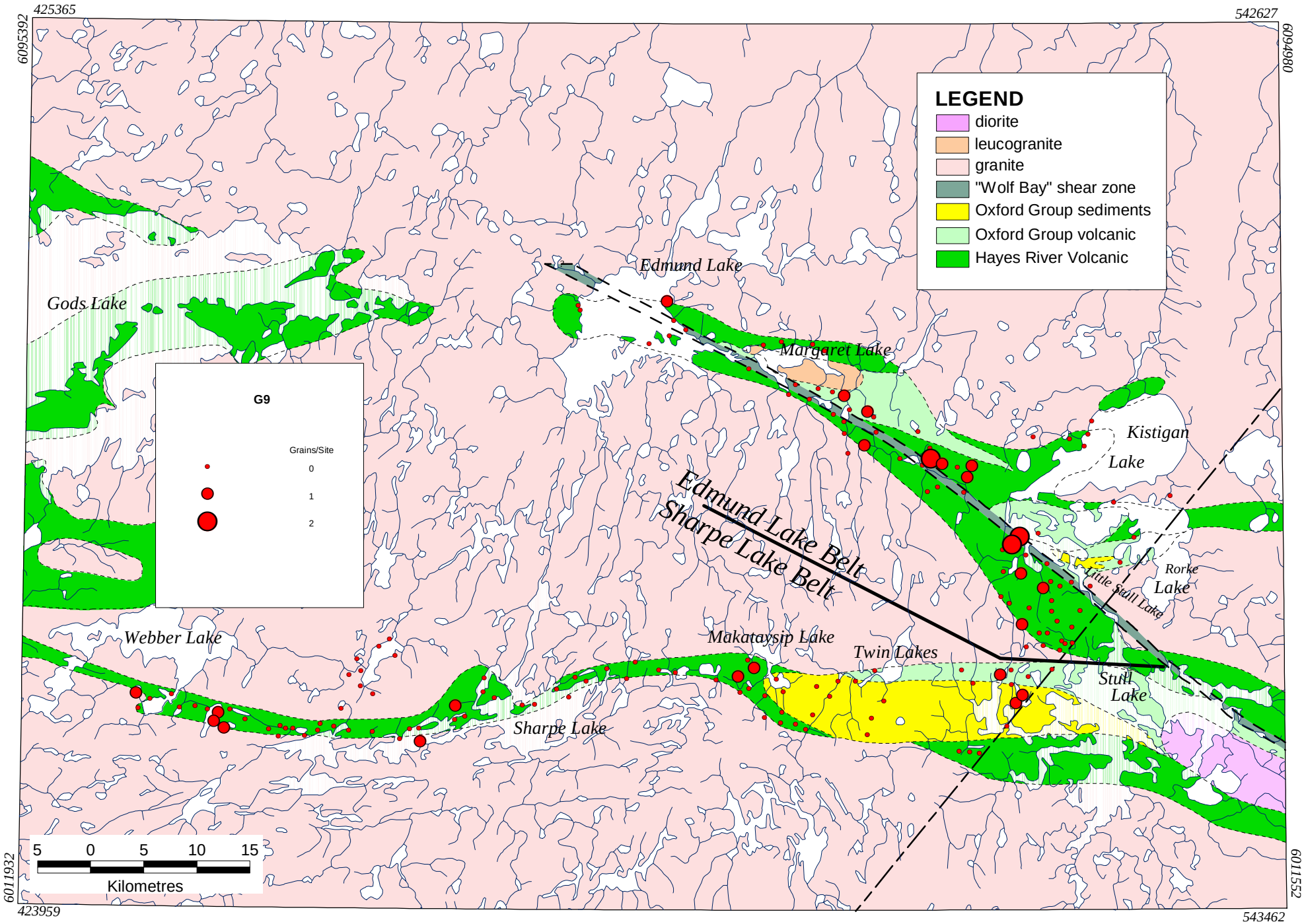
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Edmund Lake
Gods Lake
Margaret Lake
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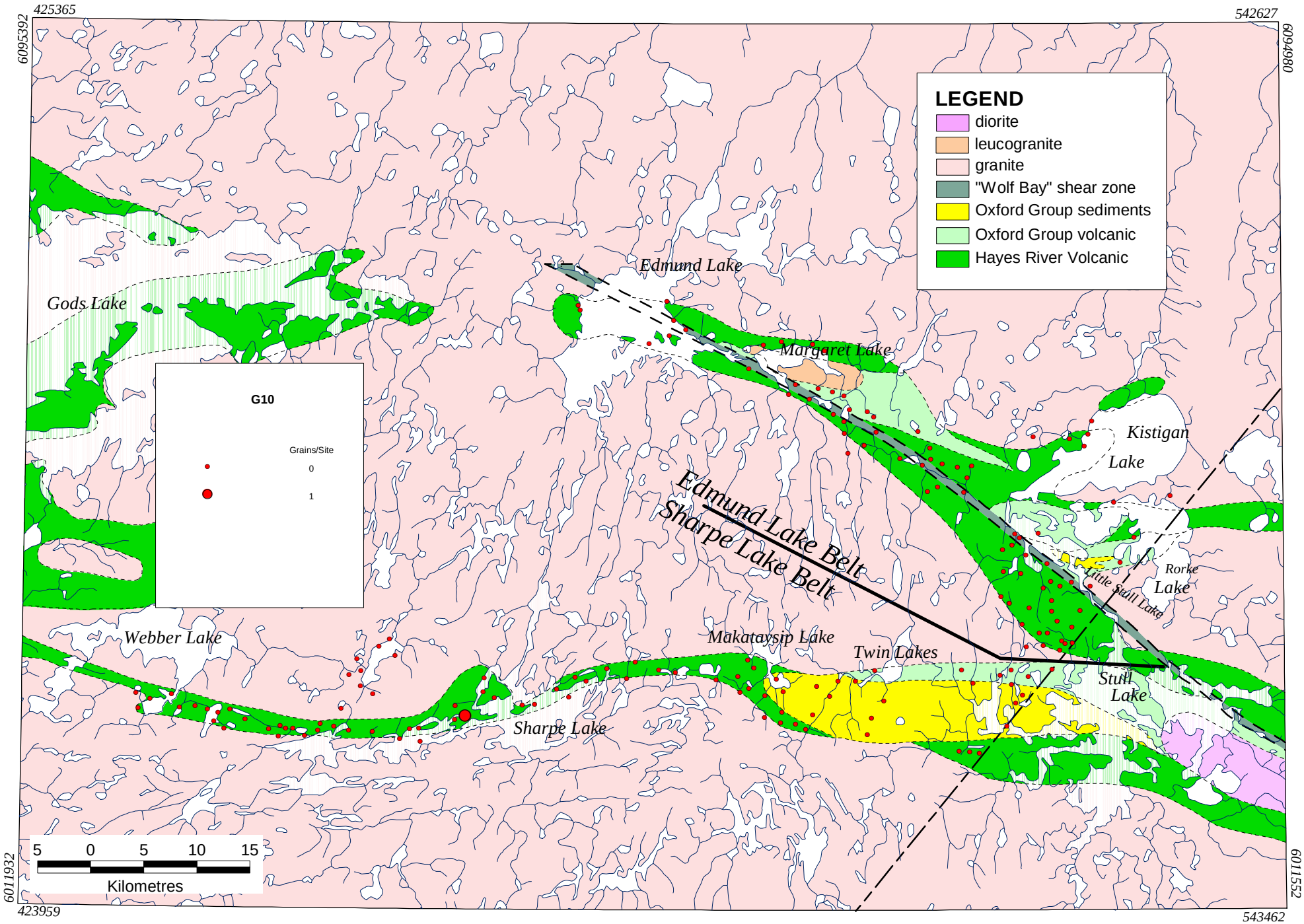
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Gods Lake
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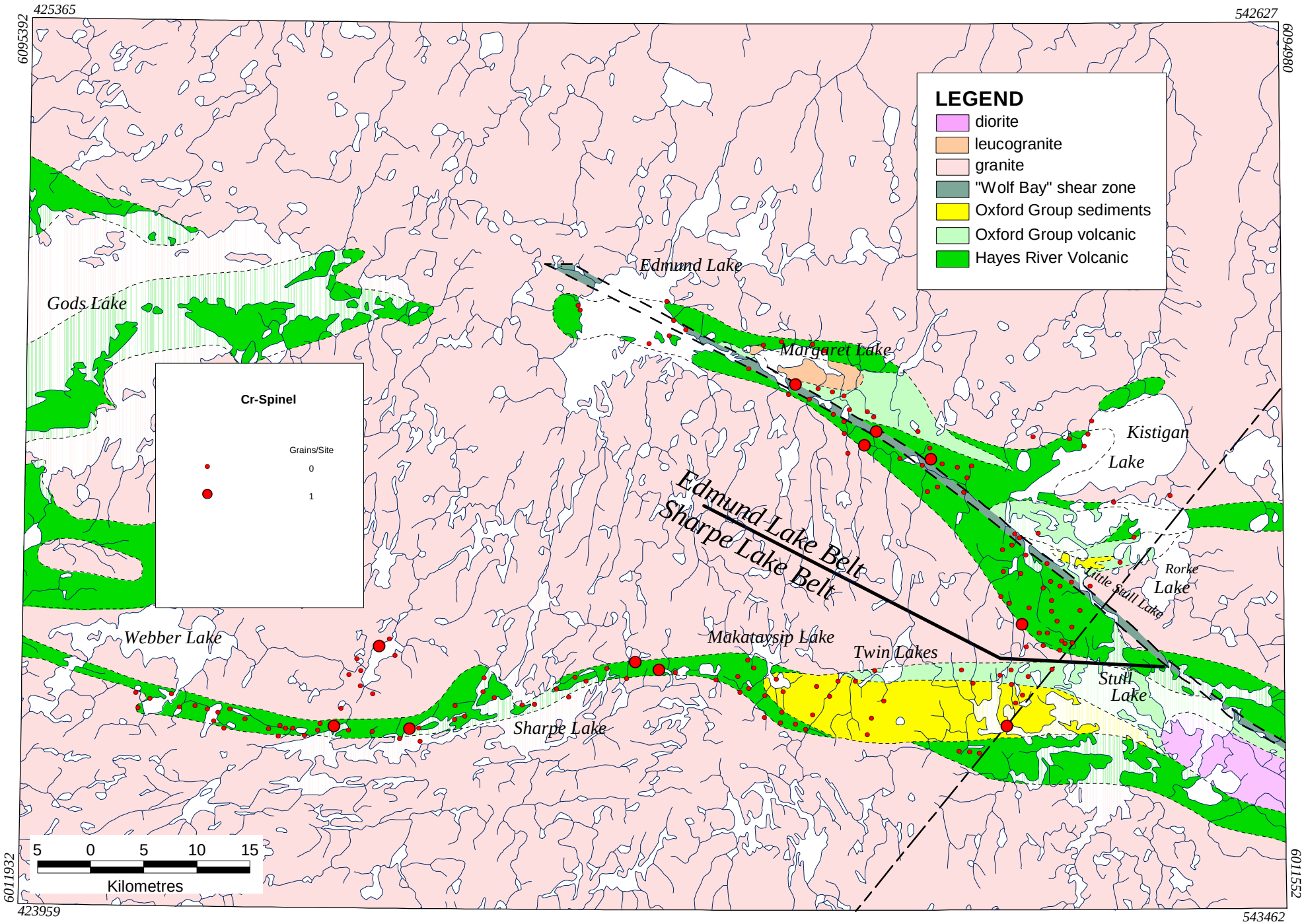
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Oxford Group volcanic
Hayes River Volcanic
Edmund Lake
Gods Lake
Margaret Lake
Kistigan Lake
Cr-Spinel
Grains/Site
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Edmund Lake Belt
Sharpe Lake Belt
Rorke Lake
Little Stull Lake
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Twin Lakes
Stull Lake
Sharpe Lake
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Kilometres
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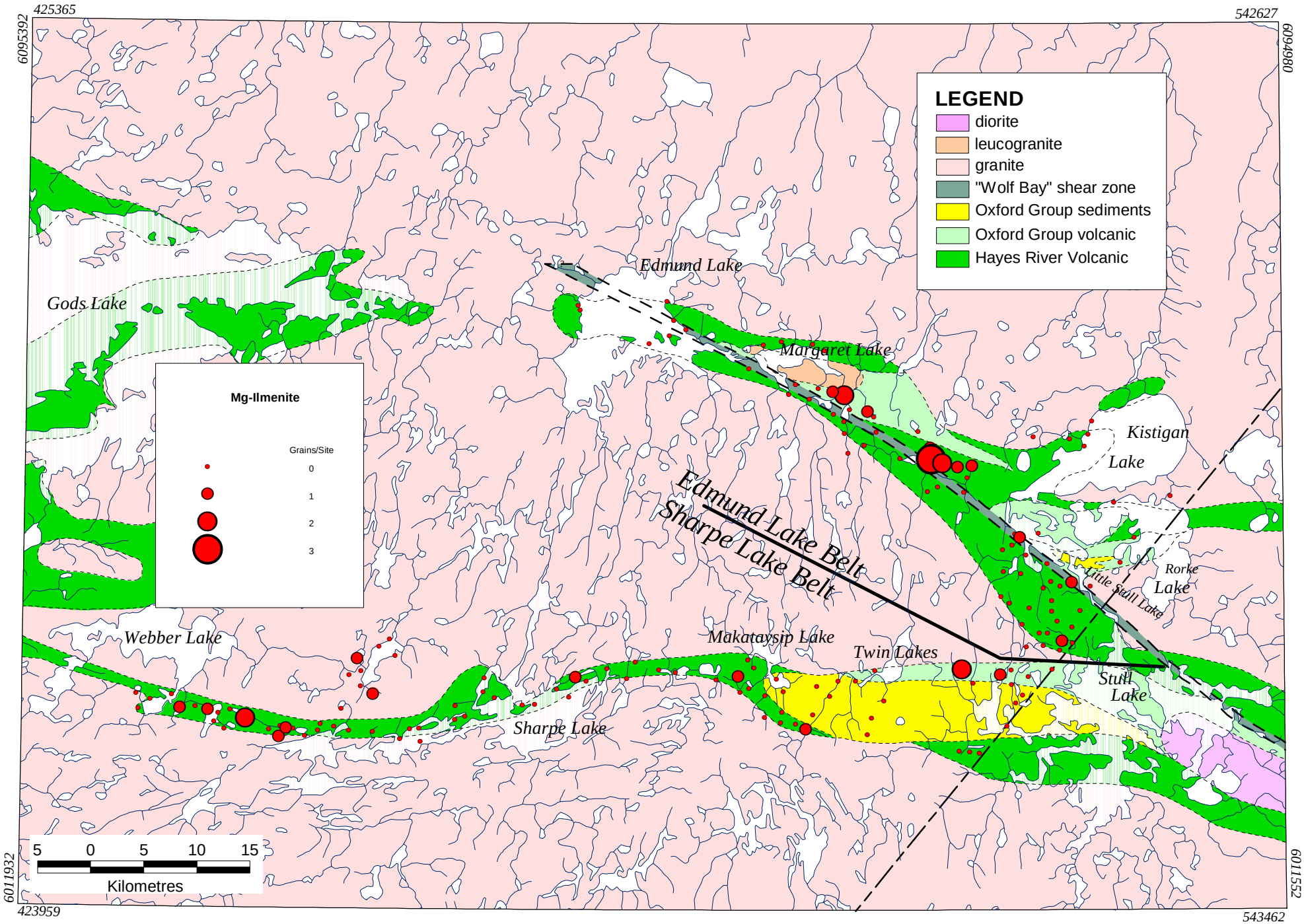
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Oxford Group volcanic
Hayes River Volcanic
Edmund Lake
Gods Lake
Margaret Lake
Kistigan Lake
Mg-Ilmenite
Grains/Site
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Sharpe Lake Belt
Rorke Lake
Little Stull Lake
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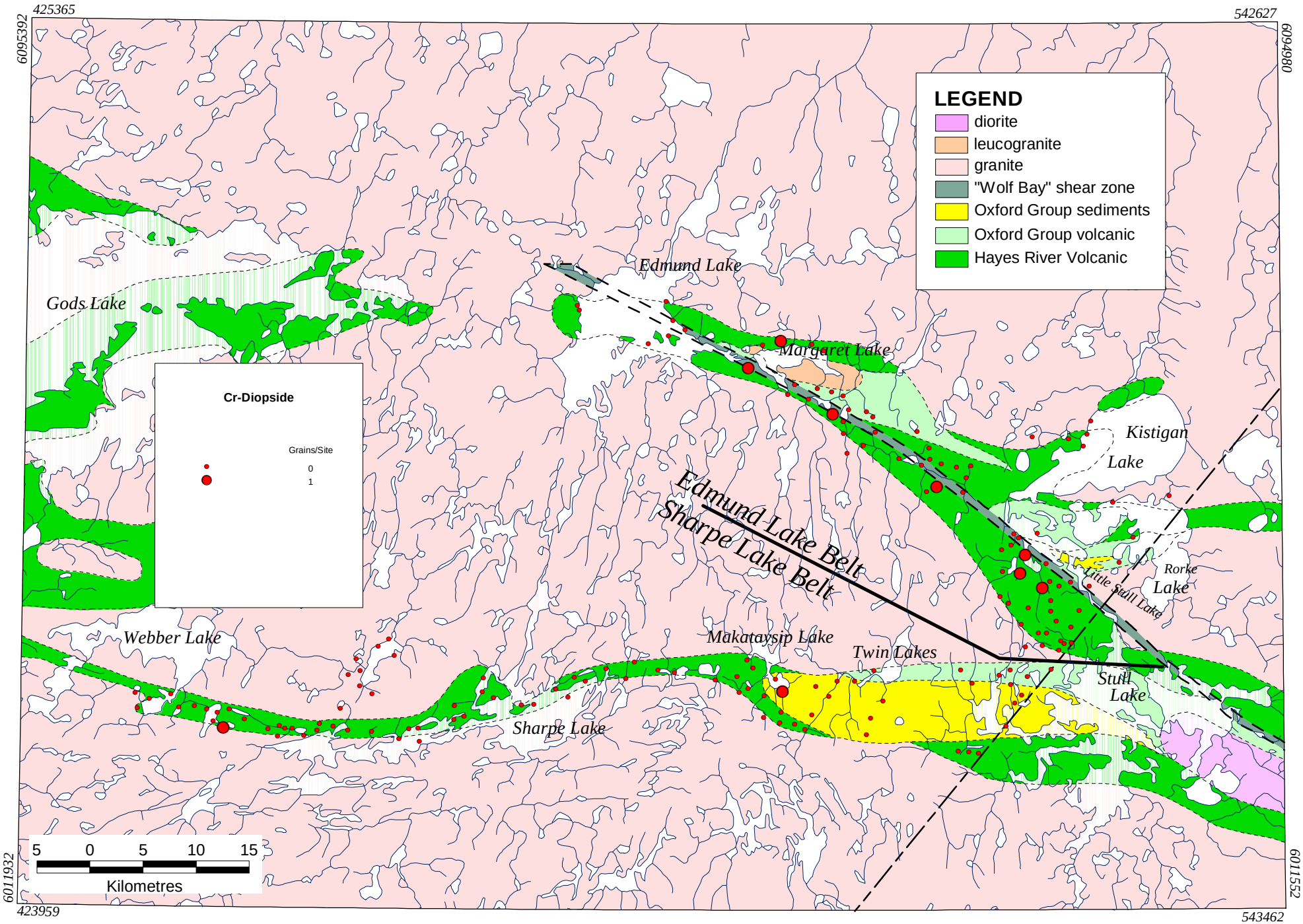
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Cr-Diopside
Grains/Site
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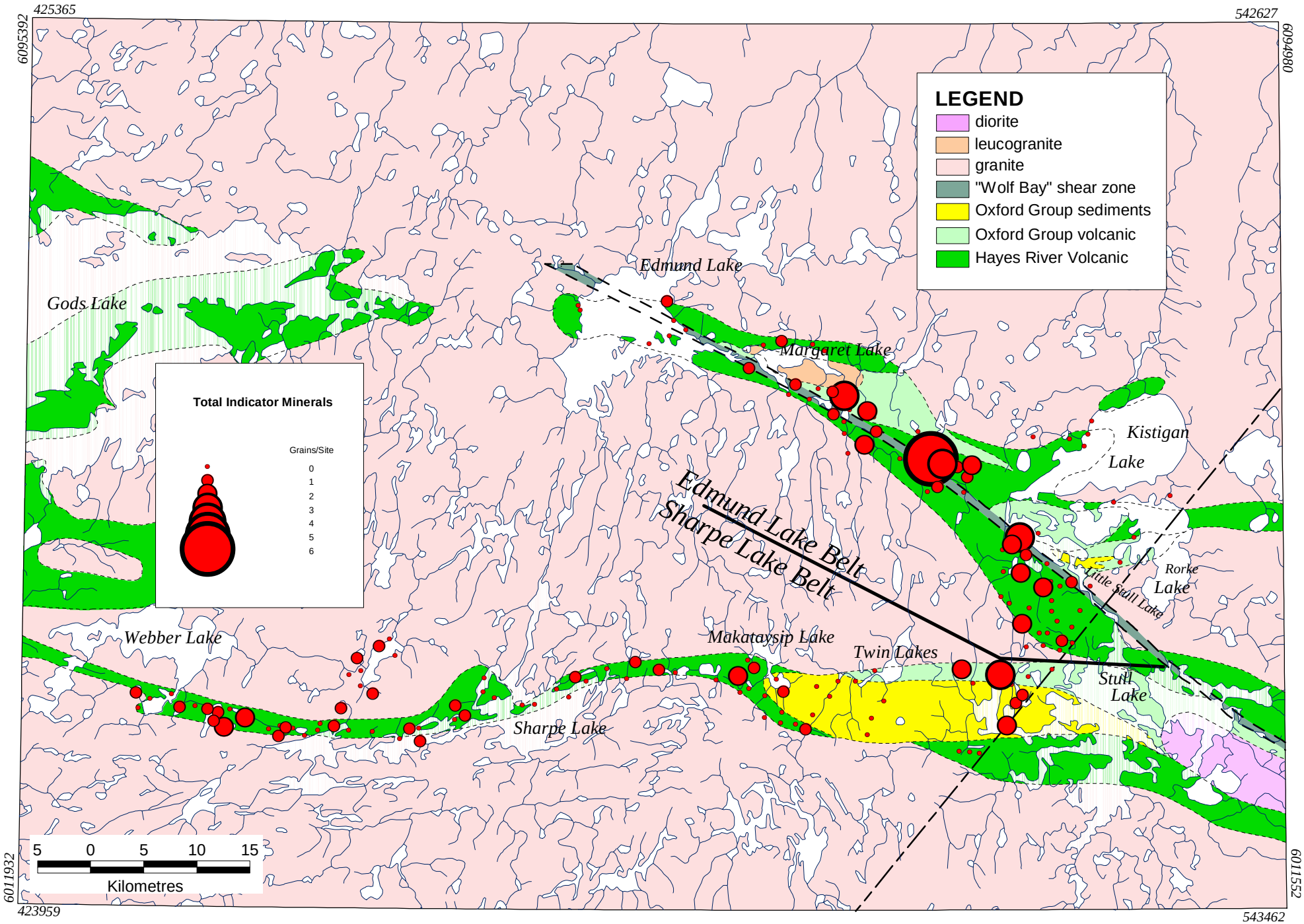
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leucogranite
granite
"Wolf Bay" shear zone
Oxford Group sediments
Oxford Group volcanic
Hayes River Volcanic
Total Indicator Minerals
Grains/Site
0
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6
Edmund Lake
Gods Lake
Margaret Lake
Kistigan Lake
Edmund Lake Belt
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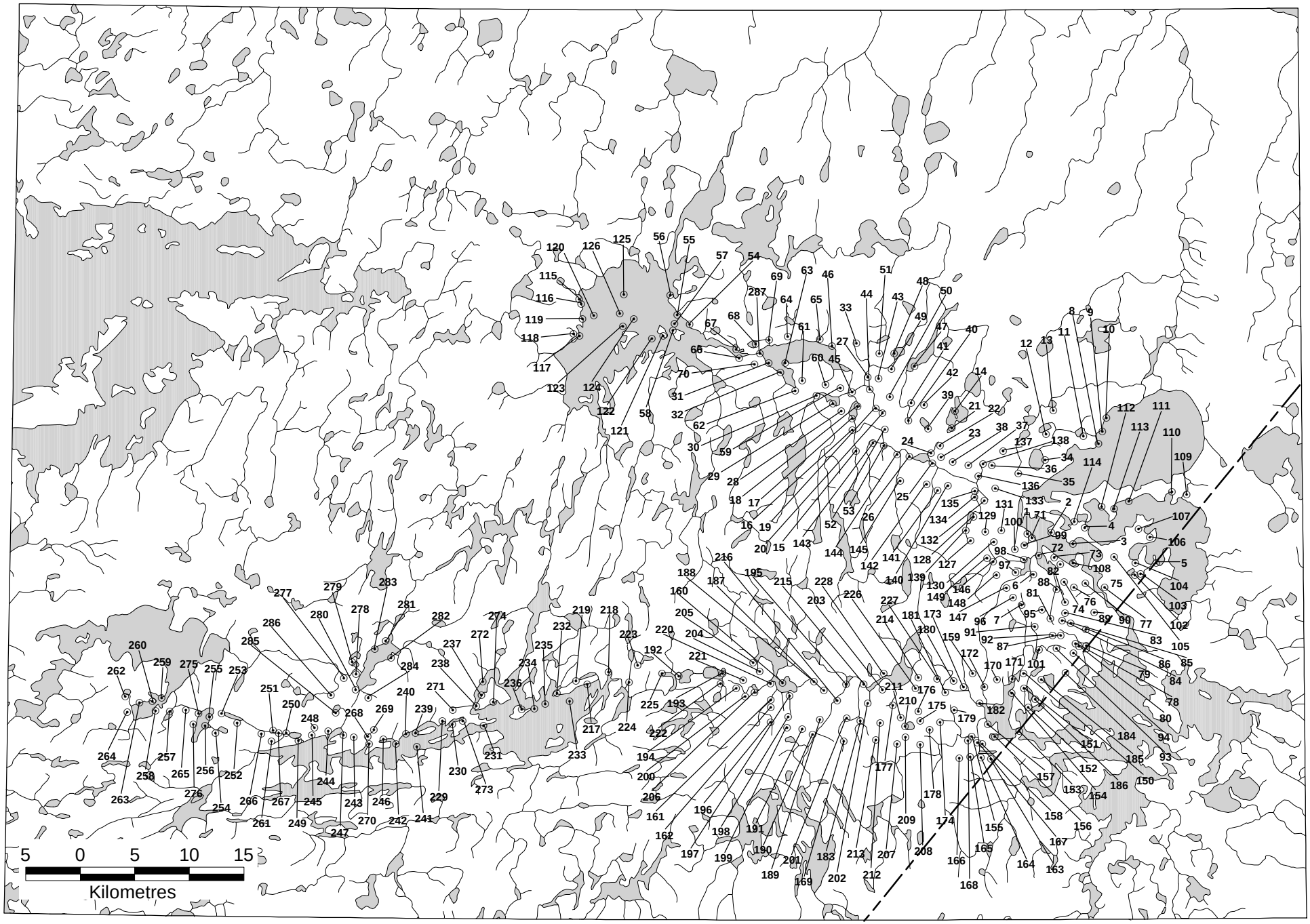
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