RECONNAISSANCE MINERAL AND GEOCHEMICAL SURVEY WITH EMPHASIS ON NORTHERN ALBERTA

REPORT FOR THE END FISCAL YEAR 1993-1994
YEAR 2 OF A 3 YEAR PROJECT

MDA Project Number: M92-04-006
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SUMMARY

The overall objectives of the project are: to determine the regional variations to be expected in the indicator minerals, geochemistry and texture of till to assist exploration by the mineral industry for diamondiferous kimberlite and lamproite, gold placers, and other minerals, and to determine the provenance of at least the surface till in northern Alberta. This is the interim report for the second year of a three year project.

Fieldwork focused principally on northwestern Alberta (north of 55 and west of 115 degrees) with a short visit to the Marguerite River - Firebag River area NE Alberta. Sixty two surface till sample sites and three stream sediment sample sites were visited. Six coreholes were augered in the High Level - Fort Vermilion region. Selected surface and auger corehole samples collected by the staff from the associate project on the Quaternary Stratigraphy and surficial geology in the Peace River Winagami regions (M93-04-35) were also analysed. The samples were analysed for indicator mineralogy and matrix geochemistry.

At present, minerals indicative of kimberlites, such as G1 or G2 garnets and picroilmenites, are rare. However a few samples in the Peace River area contain G9 or G11 garnets and chrome diopsides which possibly are indicative of peridotitic source rocks. The most common and perhaps the most important group of indicator minerals that have been recovered from the northern Alberta tills, are the low iron and high magnesium G3 and G5 garnets. These may be indicative of eclogitic source rocks, and some of these could have been derived from rock formed within the diamond stability field based on a comparison of their chemical composition with that of diamond inclusion eclogitic garnets obtained from elsewhere in the world. No picroilmenites of major interest were recognized in the grains analysed so far.

Although the sample distribution in northern Alberta is irregular three geographic trends, based on the number and quality of eclogitic and other indicator minerals, have been recognized in northern Alberta. These include: (a) a southwesterly trend from just north of the townsite of Peace River to the Birch Hills northeast of Grande Prairie, (b) a southerly trend from the lower Wabasca River to the Loon River, and (c) a

southwesterly trend in the Marguerite River to Fort Mackay area

A combination of atomic absorption and neutron activation techniques were used to determine the concentrations of the following elements in samples of the till matrix (<0.063 mm): antimony, arsenic, barium, bromine, cadmium, cerium, cesium, chromium, cobalt, copper, europium, gold, hafnium, iridium, iron, lanthanum, lead, lutetium, manganese, molybdenum, nickel, rubidium, samarium, scandium, selenium, silver, sodium, tantalum, tellurium, terbium, thorium, tin, tungsten, uranium, vanadium, ytterbium, zinc, zirconium.

The concentration of each element does not vary uniformly throughout the region: however in general the concentrations of most increases towards the west. The samples, with concentrations greater than or equal to the 75 percentile, have been grouped into ten subareas. The Clear Hills, Winagami, and Peace River subareas, contain the greatest number of total sites and the greatest number of sites with elements having concentrations ≥ to 75 percentile. The Clear Hills subarea has relatively high concentrations of Ag, As, Ce, Cr, Cs, Cu, Fe, La, Ni, Pb, Sb, Sc, Sm, Ta, Tb, Th, V, and Zn. The Winagami subarea has relatively high concentrations of Ag, As, Br, Cd, Ce, Co, Cr, Cs, Cu, Fe, La, Lu, Mn, Mo, Na, Ni, Pb, Rb, Sc, Sm, Ta, Th, U, V, and Zr.. The Peace River has subarea relatively high concentrations of Ag, As, Au, Ba, Br, Ca, Cd, Ce, Co, Cr, Cu, Eu, Fe, La, Mn, Mo, Na, Ni, Pb, Rb, Sb, Sm, Ta, Tb, Th, U, V, Zn, and Zr.

ACKNOWLEDGEMENTS

The author wish to thank Dr. B. Garret (GSC) for providing sufficient quantity of the GSC till standard to include a sufficient number of control samples within the sets submitted to the laboratories. Jennifer Piercey assisted with preparation of the manuscript. Thanks also to R. Richardson and R. Olson for reviewing the manuscript.

1 INTRODUCTION

The overall objectives of the project, which is partially funded under the Canada-Alberta Agreement on Mineral Development, are: a) to determine the regional variations to be expected in the texture, indicator minerals and geochemistry of till in order to assist exploration by industry for diamondiferous kimberlite and lamproite, gold placers, and other minerals, and b) to determine the provenance of at least the surface till in northern Alberta. Phase 2 (1993-94) activities focused primarily on northwestern Alberta.

This is the interim report for the second year of a three year project.

1.1 SAMPLE COLLECTION AND ANALYSIS

Fieldwork focused principally on northwestern Alberta (north of 55 and west of 115 degrees) with a short visit to the Marguerite River and Firebag River area in northeastern Alberta (Figure 1.1). Sixty-two surface till sample sites and three stream sediment sample sites were visited. Six coreholes were augered in the High Level to Fort Vermilion region, An additional fourteen core holes were augered in the Peace River and Winagami map areas as part of joint support for this project and a surficial geology and Quaternary stratigraphy project (MDA project # M93-04-35) focusing specifically on those map areas. The sites were chosen to allow a comparison between the mineralogy and geochemistry of surface till samples and those from just above bedrock, or the maximum augering depth of 45 m.

Most of the surface samples were collected from road accessible sites; the exceptions were the samples from northeastern Alberta where a helicopter was used to reach less accessible sites. Procedures used for sample collection and subsequent sample lab analysis were the same as those used for the complimentary MDA project being done by staff of the GSC on the southern half of Alberta.

At each site the sample was taken from below the top of the C soil horizon; generally between a depth of 1 and 2 m to minimize the effects of weathering on the carbonate content of the till, and to maximize the preservation of indicator mineral grains. About one half of the samples were collected from road cuts or other naturally exposed sections; the remainder were collected from hand-dug sample pits excavated into the land surface. Till samples of about 25 kg were collected for indicator minerals and 2-3 kg samples for geochemical analysis. The small samples were placed in plastic bags, and the large till sample into 5 gallon (~23 litre) plastic pails. The field data that were recorded at each site includes information on the general sampling environment and observations on the colour, texture, moisture content and mineralogy of the till.

This project is closely linked with MDA Project M93-04-35 which focuses on the surficial geology and Quaternary stratigraphy of the west-half of the Peace River and Winagami map areas. Selected surface and auger corehole samples which were collected by the staff from this project were also analysed for indicator mineral grain composition and for matrix geochemistry.

1.2 PHYSIOGRAPHY

The Alberta portion of the Interior Plains slopes toward the north and east from elevations of 1,200 m in the Foothills, adjacent to the Rocky Mountains, to 200 m adjacent to Lake Athabasca. Broad features, such as the Alberta Plain and the Peace River Lowlands, to the north, are cut by major drainageways such as the Peace, Athabasca, North Saskatchewan, Red Deer and South Saskatchewan Rivers. Major topographic highs include the Saddle Hills, Birch Hills, Cypress Hills, Hand Hills, Swan Hills, Pelican Mountains, Buffalo Head Hills, Clear Hills; Naylor Hills, Milligan Hills, Birch Mountains, Caribou Mountains, Cameron Hills, Elsa Hill, and Bootis Hill. Figure 1.2 shows these features for the northern portion of Alberta. Additional information can be found in Bostock (1970 a,b) and Klassen (1989, his Fig 2.16) and Pettapiece, 1986.

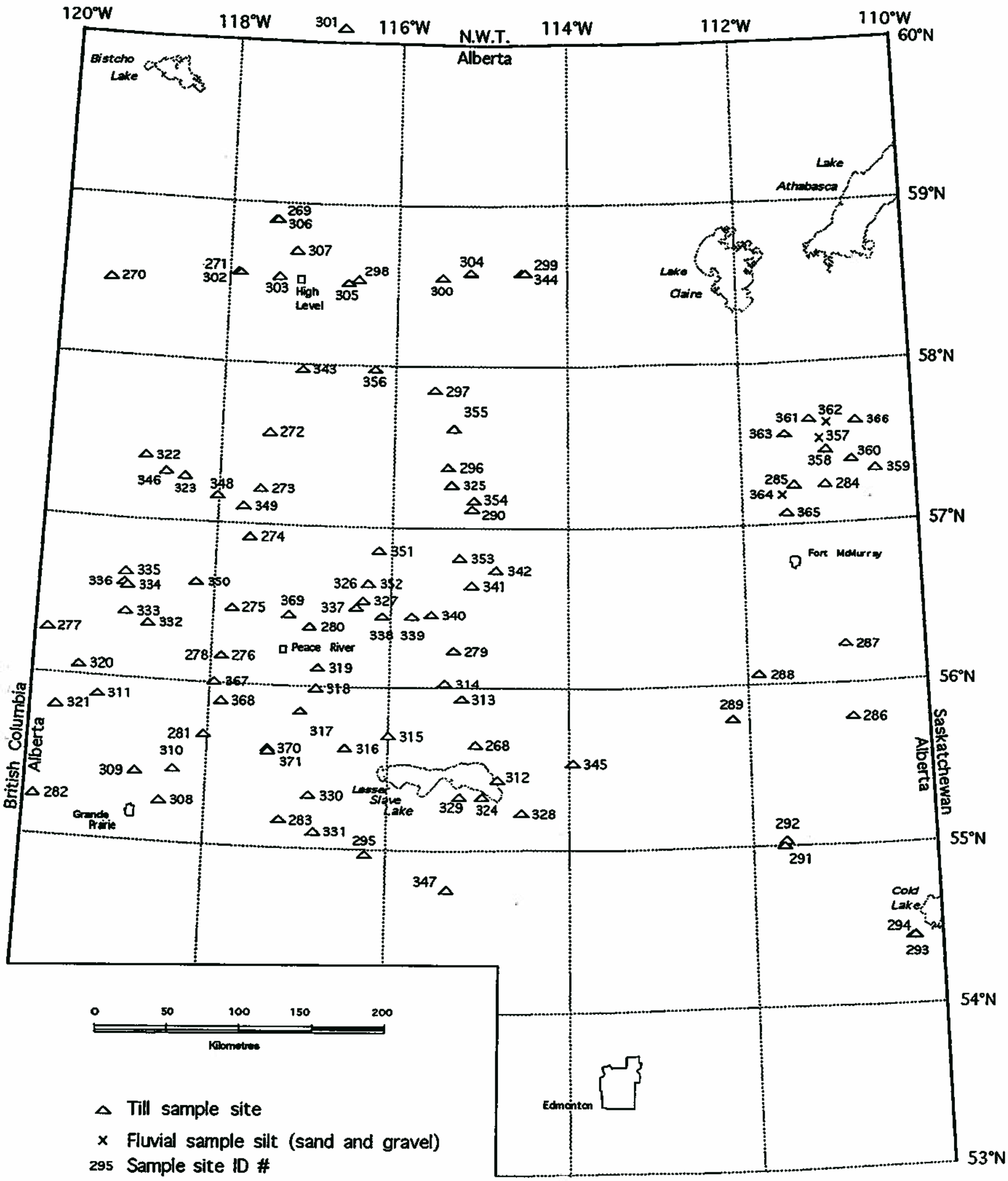


Figure 1.1. Location map of sample sites showing sample ID # used in this report.

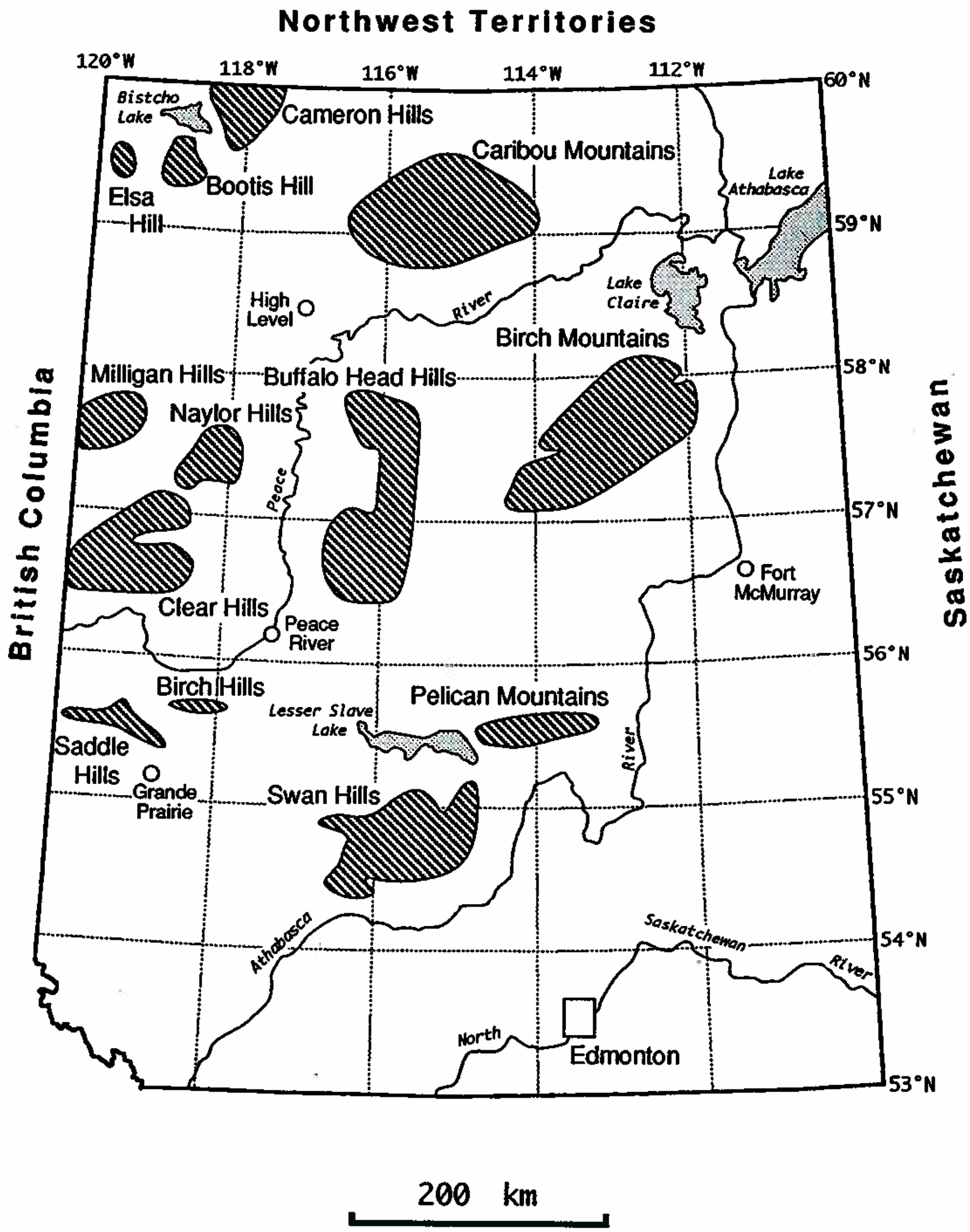


Figure 1.2. Location of major topographic features.

2 INDICATOR MINERAL GEOCHEMISTRY

2.1 PROCEDURES

The procedures being used for heavy mineral recovery and the chemical elements being measured are the same as those selected by Drs. Garrett and Thorleifson for the complementary Geological Survey of Canada MDA project on till mineralogy and geochemistry in the southern half of Alberta. Also the same laboratories are being used by both the GSC and AGS for sample processing.

Disaggregation and recovery of the different indicator mineral fractions, from each sample, was performed at the Saskatchewan Research Council (SRC), with microprobe analyses performed at CANMET during 1992 and the University of Saskatchewan during 1993. Swanson and Gent (1993) provide a summary of the processing and microprobe procedures at the SRC and the University of Saskatchewan. See also the subsequent introductory part of the indicator mineral analysis section for additional information on the analytical approach.

Till was the primary sediment sampled; however three samples of fluvial sediment were also collected during the sampling in the Bitumount map area of eastern Alberta (Figure 1.1).

2.1.1 Till

The mean weight of all the samples as collected, without drying, is 25.7 kg (Table 2.1; Figure 2.1). The samples were actually collected on a volume basis: that is enough till was collected to fill a 5 gallon (22.7 liter) pail. The exceptions were a few sites where the till overlay preglacial sand and gravel; here only 2.5 gallon samples were collected. Therefore the sample weight varied from 10.9 to 30.9 kg. (Figure 2.1). At the SRC lab the samples were initially screened and the 1.7mm to 0.25 mm fractions recovered. About 95 wt% of the sample is finer than 1.7 mm. The 1.7mm to 0.25 fractions were further processed to recover the middle and the heavy fractions which are the fractions of mineralogical interest.

Table 2.1 Indicator mineral sample locations and basic laboratory data from SRC lab.

Till samples

Sample ID#	Field Id#	LSD	Sec	Tp	Rge	Mer	Longitude	Latitude	NTS	Location	Yr	Sed	From(m)	To(m)	SampWt(kg)	>1.7(kg)	>1.7 (%)	<1.7(kg)	<1.7 (%)	Mag (g)	Mag (%)	Mid (g)	Mid (%)	Heavy(g)	Heavy(%)
268	NAT92-1	7	8	77	7	5	115.045494	55.655777	83O	Lesser Slave L	92	Till	2.0	2.3	26.75	0.23	0.86	26.52	99.14	64.23	0.240	Too Small		0.74	0.003
279	NAT92-2	11	35	83	9	5	115.311295	56.241127	84B	Cranberry L	92	Till	3.0	3.3	29.10	1.23	4.23	27.87	95.77	3.88	0.013	3.45	0.012	3.05	0.010
290	NAT92-3	9	6	94	7	5	115.104530	57.128601	84G	Wabasca R	92	Till	2.5	3.0	30.20	0.24	0.79	29.96	99.21	39.17	0.130	Too Small		0.40	0.001
296	NAT92-4	10	4	97	9	5	115.392570	57.388626	84G	Wabasca R	92	Till	3.3	3.5	28.10	1.07	3.81	27.03	96.19	3.27	0.012	3.63	0.013	2.34	0.008
297	NAT92-5	12	15	102	10	5	115.552650	57.855755	84G	Wadin L	92	Till	3.0	3.3	27.70	0.88	3.18	26.82	96.82	16.23	0.059	4.55	0.016	1.00	0.004
298	NAT92-6	13	8	110	15	5	116.482430	58.542141	84K	High Level E	92	Till	1.0	1.3	26.70	0.77	2.88	25.93	97.12	2.68	0.010	2.82	0.011	1.91	0.007
299	NAT92-7	4	35	110	4	5	114.554718	58.589458	84J	Wentzil R	92	Till	2.8	3.0	24.80	1.23	4.96	23.57	95.04	4.09	0.016	4.80	0.019	3.23	0.013
300	NAT92-8	14	18	110	9	5	115.496025	58.556770	84J	Beaver Cr	92	Till	2.0	2.2	28.10	0.59	2.10	27.51	97.90	42.49	0.151	.62	0.002	0.33	0.001
301	NAT92-9						116.740000	60.100000	85A	NWT Hay R	92	Till	2.0	2.2	27.30	1.10	4.03	26.20	95.97	6.61	0.024	5.68	0.021	2.55	0.009
269	NAT92-10	3	21	114	21	5	117.482651	58.907486	84K	Meander R	92	Till	3.5	3.8	21.90	1.41	6.44	20.49	93.56	2.82	0.013	5.88	0.027	1.93	0.009
270	NAT92-11	11	28	109	9	6	119.435425	58.494476	84L	Rainbow L	92	Till	2.0	2.5	19.90	0.81	4.07	19.09	95.93	1.80	0.009	2.78	0.014	1.47	0.007
271	NAT92-12	3	26	110	24	5	117.922272	58.573204	84K	High Level W	92	Till	1.3	1.5	21.75	1.15	5.29	20.60	94.71	11.87	0.055	6.69	0.031	2.76	0.013
272	NAT92-13	1	13	99	22	5	117.470474	57.573986	84F	Kemp R	92	Till	1.5	1.7	26.45	1.19	4.50	25.26	95.50	3.59	0.014	5.84	0.022	2.70	0.010
273	NAT92-14	6	8	95	22	5	117.542633	57.226784	84F	Hawk Hills	92	Till	2.5	2.8	25.15	0.37	1.47	24.78	98.53	21.99	0.087	5.61	0.022	1.17	0.005
274	NAT92-15	16	28	91	23	5	117.626968	56.930439	84C	Manning	92	Till	3.0	3.4	20.45	0.61	2.98	19.84	97.02	2.95	0.014	8.01	0.039	2.01	0.010
275	NAT92-16	16	24	86	25	5	117.797569	56.479240	84C	Smithmill	92	Till	1.0	1.3	24.65	0.46	1.87	24.19	98.13	1.60	0.006	4.70	0.019	1.96	0.008
276	NAT92-17	8	8	83	25	5	117.902939	56.179340	84C	Brownvale	92	Till	2.0	2.2	26.15	0.81	3.10	25.34	96.90	1.73	0.007	7.83	0.030	1.70	0.007
277	NAT92-18	9	19	84	12	6	119.869659	56.300076	84D	Boundary L	92	Till	1.5	1.7	25.35	1.67	6.59	23.68	93.41	2.08	0.008	10.31	0.041	2.05	0.008
278	NAT92-19	8	8	83	25	5	117.902969	56.179340	84C	Brownvale	92	Till	2.0	2.2	23.70	1.39	5.86	22.31	94.14	2.20	0.009	8.82	0.037	2.14	0.009
280	NAT92-20	3	22	86	19	5	116.914932	56.379333	84C	Peace R E	92	Till	1.2	1.5	30.20	1.20	3.97	29.00	96.03	2.12	0.007	4.98	0.016	3.92	0.013
281	NAT92-21	8	22	77	1	6	118.050995	55.685005	83M	Birch Hills	92	Till	2.5	2.8	23.40	0.37	1.58	23.03	98.42	0.89	0.004	4.52	0.019	1.33	0.006
282	NAT92-22	2	26	72	13	6	119.860760	55.257896	83M	Goodfare	92	Till	1.5	1.7	24.35	1.03	4.23	23.32	95.77	1.31	0.005	5.00	0.021	0.89	0.004
283	NAT92-23	12	28	71	21	5	117.177483	55.179489	83N	Valley View	92	Till	1.5	1.7	27.75	0.59	2.13	27.16	97.87	2.47	0.009	5.45	0.020	2.15	0.008
284	NAT92-24	13	15	95	7	4	111.057915	57.249889	74E	Keari L E	92	Till	2.0	2.2	26.85	0.60	2.23	26.25	97.77	1.47	0.005	2.89	0.011	2.03	0.008
285	NAT92-25	3	21	95	9	4	111.403374	57.249889	74E	Keari L W	92	Till	1.8	2.0	27.35	0.53	1.94	26.82	98.06	1.73	0.006	2.13	0.008	2.08	0.008
286	NAT92-26	1	33	78	6	4	110.861938	55.799088	73M	Chard	92	Till	3.0	3.2	24.30	0.59	2.43	23.71	97.57	0.88	0.004	2.42	0.010	1.96	0.008
287	NAT92-27	16	32	83	6	4	110.903915	56.246296	74D	Cheecham	92	Till	2.0	2.2	27.40	0.32	1.17	27.08	98.83	35.96	0.131	3.54	0.013	3.91	0.014
288	NAT92-28	5	6	82	12	4	111.877754	56.077339	74D	SW 1/4	92	Till	1.5	1.8	27.90	0.17	0.61	27.73	99.39	44.86	0.161	Too Small		0.59	0.002
289	NAT92-29	2	36	78	15	4	112.187798	55.797279	83P	Crow L	92	Till	3.0	3.5	23.40	0.83	3.55	22.57	96.45	1.31	0.006	2.43	0.010	2.63	0.011
291	NAT92-30	2	31	69	11	4	111.666733	55.009575	73M	Heart L	92	Till	1.5	1.8	26.55	0.40	1.51	26.15	98.49	31.57	0.119	12.41	0.047	9.31	0.035
292	NAT92-31	14	5	70	11	4	111.647591	55.038686	73M	Heart L	92	Till	4.0	5.0	27.30	1.14	4.18	26.16	95.82	5.41	0.020	5.82	0.021	8.45	0.031
293	NAT92-32	12	1	63	3	4	110.329117	54.422314	73L	Cold L	92	Till	2.0	2.5	28.10	1.63	5.80	26.47	94.20	7.54	0.027	5.52	0.020	7.18	0.026
294	NAT92-33	12	1	63	3	4	110.329137	54.422314	73L	Cold L	92	Till	3.5	4.0	24.00	0.97	4.04	23.03	95.96	7.79	0.032	10.38	0.043	19.30	0.080
295	NAT92-34	12	16	69	15	5	116.234718	54.977757	83K	Swan Hills	92	Till	3.0	4.0	27.90	0.34	1.22	27.56	98.78	48.13	0.173	Too Small		0.05	0.000
308	NAT93-35	12	26	72	4	6	118.502798	55.259612	83M	Kleskun Hill	93	Till	1.5	1.8	23.50	0.20	0.85	23.30	99.15			3.63	0.015	7.43	0.032
309	NAT93-36	4	25	74	6	6	118.791573	55.434174	83M	Saddle Hills.South	93	Till	2.5	2.8	22.50	0.95	4.22	21.55	95.78			3.43	0.015	3.36	0.015
310	NAT93-37	12	34	74	3	6	118.380879	55.455982	83M	Teepee Creek	93	Till	3.5	3.8	19.40	0.35	1.80	19.05	98.20			1.61	0.008	1.13	0.006
311	NAT93-38	16	36	79	9	6	119.256644	55.895966	83M	Grand Prairie	93	Till	1.5	1.8	23.30	0.40	1.72	22.90	98.28			1.78	0.008	3.07	0.013
312	NAT93-39	16	26	74	6	5	114.797688	55.444968	83 O	Martin Mtn	93	Till	1.0	1.3	25.70	0.40	1.56	25.30	98.44			1.87	0.007	2.77	0.011
313	NAT93-40	1	20	80	8	5	115.202941	55.943092	83 O	Utikuma Lake	93	Till	1.0	1.3	27.35	0.55	2.01	26.80	97.99			1.86	0.007	6.58	0.024
314	NAT93-41	7	19	81	9	5	115.391913	56.033980	84B	Utikuma Lake Reserve	93	Till	1.8	2.0	25.35	1.05	4.14	24.30	95.86			3.73	0.015	4.25	0.017
315	NAT93-42	5	31	77	13	5	116.012510	55.714038	83N	Utikuma N.E. Map Sheet	93	Till	2.0	2.3	23.50	0.75	3.19	22.75	96.81			3.14	0.013	3.94	0.017
316	NAT93-43	5	31	76	16	5	116.477531	55.626762	83N	Winagami Lake	93	Till	1.8	2.0	23.90	0.80	3.35	23.10	96.65			1.61	0.007	1.73	0.007
317	NAT93-44	15	12	79	20	5	116.981689	55.852193	83N	Kimiwan Lake(North of)	93	Till	1.0	1.3	21.50	0.60	2.79	20.90	97.21			5.55	0.026	5.01	0.023
318	NAT93-45	2	1	81	19	5	116.825499	55.986723	83N	Springburn	93	Till	1.5	1.8	22.45	0.65	2.90	21.80	97.10			1.69	0.008	4.62	0.021
319	NAT93-46	5	19	82	18	5	116.812466	56.121254	84C	Harmon Valley	93	Till	1.2	1.5	22.90	1.15	5.02	21.75	94.98			3.89	0.017	10.60	0.046
320	NAT93-47	4	3	82	10	6	119.485239	56.074121	84D	Clean Hills(south)	93	Till	1.2	1.5	25.05	0.25	1.00	24.80	99.00			.84	0.003	1.31	0.005
321	NAT93-48	9	6	79	11	6	119.700771	55.819606	83M	Saddle Hills West	93	Till	1.0	1.3	25.90	0.25	0.97	25.65	99.03			1.60	0.006	2.30	0.009
322	NAT93-49	11	8	97	6	6	118.883613	57.404592	84E	Hotchkiss Forestry Rd.	93	Till	1.2	1.5	30.00	2.00	6.67	28.00	93.33			4.85	0.016	3.22	0.011
323	NAT93-50	6	33	95	3	6	118.422845	57.284647	84E	Chinchaga Rd	93	Till	2.5	2.8	29.60	0.40	1.35	29.20	98.65			3.29	0.011	4.69	0.016
328	NAT93-51	9	16	72	4	5	114.541601	55.237706	83 O	Lesser Slave Lk	93	Till	3.1	3.2	24.65	1.05	4.26	23.60	95.74			1.15	0.005	3.17	0.013
329	NAT93-52	11	19	73	8	5	115.220233	55.339613	83 O	LesserSlave Lk	93	Till	3.0	3.2	20.65	0.45	2.18	20.20	97.82			2.38	0.012	1.32	0.006
330	NAT93-53	4	21	73	19	5	116.865597	55.332242	83N	Winagami	93	Till	2.5	3.0	20.90	0.60	2.87	20.30	97.13			1.67	0.008	2.06	0.010
331	NAT93-54	15	34	70	19	5	116.802771	55.110438	83N	Snipe Lake	93	Till	0.8	1.0	19.75	0.20	1.01	19.55	98.99			1.40	0.007	1.20	0.006

Sample ID#	Field id#	LSD	Sec	Tp	Rge	Mer	Longitude	Latitude	NTS	Location	Yr	Sed	From(m)	To(m)	SampWt(kg)	>1.7(kg)	>1.7 (%)	<1.7(kg)	<1.7 (%)	Mag (g)	Mag (%)	Mid (g)	Mid (%)	Heavy(g)	Heavy(%)
332	NAT93-55	16	8	85	5	6	118.740789	56.361331	84D	Clear Hills	93	Till	3.0	3.2	21.50	0.45	2.09	21.05	97.91			5.23	0.024	3.99	0.019
333	NAT93-56	5	2	86	7	6	118.997814	56.426774	84D	Clear Hills	93	Till	1.7	1.9	25.60	1.20	4.69	24.40	95.31			3.86	0.015	8.25	0.032
334	NAT93-57	4	35	87	7	6	119.006968	56.583099	84D	Clear Hills	93	Till	1.0	1.3	25.40	1.00	3.94	24.40	96.06			5.79	0.023	6.49	0.026
335	NAT93-58	3	34	88	7	6	119.026920	56.670345	84D	Clear Hills	93	Till	0.5	0.8	14.56	9.25	63.53	5.31	36.47			.36	0.002	0.29	0.002
336	NAT93-59	15	4	88	7	6	119.046873	56.608542	84D	Clear Hills	93	Till	2.5	2.7	21.85	0.55	2.52	21.30	97.48			4.63	0.021	5.24	0.024
337	NAT93-60	15	35	86	17	5	116.403975	56.508631	84C	Cadotte Lake	93	Till	3.0	3.3	28.15	1.00	3.55	27.15	96.45			2.98	0.011	8.68	0.031
338	NAT93-61	4	11	86	14	5	116.101513	56.452093	84C	Little Buffalo	93	Till	2.0	2.2	26.85	1.20	4.47	25.65	95.53			4.41	0.016	6.48	0.024
339	NAT93-62	10	14	86	12	5	115.772750	56.459370	84B	Peerless Lake	93	Till	3.0	3.2	28.30	0.95	3.36	27.35	96.64			2.42	0.009	6.40	0.023
340	NAT93-63	1	19	86	10	5	115.555767	56.470267	84B	Meandering River	93	Till	1.5	1.7	29.50	1.45	4.92	28.05	95.08			5.95	0.020	8.97	0.030
341	NAT93-64	1	25	88	8	5	115.118842	56.655675	84B	Peerless Lake	93	Till	2.0	2.2	26.05	2.00	7.68	24.05	92.32			4.40	0.017	6.04	0.023
342	NAT93-65	1	26	89	6	5	114.826878	56.742928	84B	Peerless Lake	93	Till	2.0	2.2	25.80	0.80	3.10	25.00	96.90			1.97	0.008	6.08	0.024
343	NAT93-66	14	29	103	19	5	117.105189	57.975252	84F	La Crete Ferry	93	Till	3.0	3.2	28.10	0.70	2.49	27.40	97.51			2.40	0.009	5.33	0.019
344	NAT93-67	15	25	110	5	5	114.512365	58.585885	84J	Wentzll River	93	Till	15.0	15.5	27.45	3.90	14.21	23.55	85.79			6.60	0.024	8.530	0.031
345	NAT93-68	8	33	75	26	5	117.956550	55.539506	83P	Pelican Mtn - 6824T	93	Till			12.50	0.30	2.40	12.20	97.60			.97	0.008	2.00	0.016
346	NAT93-69	13	6	96	4	6	118.646443	57.306452	84E	Chinchaga - 6815T	93	Till			10.90	0.35	3.21	10.55	96.79			1.87	0.017	1.85	0.017
347	NAT93-70	1	6	67	9	5	115.349313	54.764969	83J	Swan Hills - 3973T	93	Till													
348	NAT93-71	12	24	94	1	6	118.022858	57.171979	84E	Chinchaga Forestry Rd	93	Till	1.8	2.0	29.00	0.75	2.59	28.25	97.41			1.26	0.004	2.64	0.009
349	NAT93-72	1	2	94	24	5	117.727772	57.121012	84F	Chinchaga Forestry Rd	93	Till	1.2	1.5	26.65	1.10	4.13	25.55	95.87			5.30	0.020	6.13	0.023
350	NAT93-73	9	15	88	2	6	118.215513	56.633992	84D	Sulphur Lake	93	Till	1.5	1.8	29.25	0.85	2.91	28.40	97.09			2.41	0.008	2.77	0.009
351	NAT93-74	8	3	91	14	5	116.147238	56.862901	84C	Halg Lake	93	Till	1.5	1.8	29.75	1.15	3.87	28.60	96.13			2.00	0.007	3.83	0.013
352	NAT93-75	16	14	88	15	5	116.260155	56.659316	84C	Otter Lakes	93	Till	2.0	2.3	28.90	1.20	4.15	27.70	95.85			2.58	0.009	4.08	0.014
353	NAT93-76	13	20	90	6	5	115.244917	56.826557	84B	Loon River	93	Till	0.3	0.5	27.65	0.90	3.25	26.75	96.75			1.35	0.005	4.67	0.017
354	NAT93-77	14	20	94	7	5	115.089082	57.175534	84G	Wabasca Rd. South	93	Till	8.0	8.3	26.70	0.60	2.25	26.10	97.75			3.80	0.014	4.00	0.015
355	NAT93-78	12	25	99	9	5	115.335099	57.622666	84G	Senex Creek	93	Till	3.0	3.3	29.40	1.15	3.91	28.25	96.09			2.77	0.009	5.86	0.020
356	NAT93-79	4	27	103	14	5	116.257624	57.982514	84F	Buffalo Head Hills Tower	93	Till	10.0	10.5	26.90	1.30	4.83	25.60	95.17			3.44	0.013	3.21	0.012
358	NAT93-81	12	35	97	7	4	111.029191	57.462403	74E	Firebag River	93	Till	10.0	10.5	25.90	2.70	10.42	23.20	89.58			8.85	0.034	4.15	0.016
359	NAT93-82	3	20	96	3	4	110.454578	57.338768	74E	Firebag River	93	Till	3.0	3.5	30.75	1.85	6.02	28.90	93.98			2.06	0.007	7.10	0.023
360	NAT93-83	10	9	97	5	4	110.745265	57.404221	74E	Firebag River	93	Till	10.0	10.5	25.65	2.65	10.33	23.00	89.67			1.05	0.004	3.69	0.014
361	NAT93-84	5	2	100	8	4	111.202795	57.647831	74E	Firebag River	93	Till	6.0	6.5	28.20	0.75	2.66	27.45	97.34			2.14	0.008	1.83	0.006
363	NAT93-86	11	1	99	10	4	111.496257	57.564205	74E	Fort McKay	93	Till	5.0	5.5	22.20	0.75	3.38	21.45	96.62			1.44	0.006	0.98	0.004
365	NAT93-88	4	23	93	10	4	111.501796	57.076978	74E	Saline Lake	93	Till	1.2	1.5	29.90	17.55	58.70	12.35	41.30			12.60	0.042		0.000
366	NAT93-89	3	36	99	5	4	110.677291	57.629659	74E	Johnson Lake	93	Till	2.0	2.5	30.85	3.35	10.86	27.50	89.14			8.26	0.027	5.96	0.019
304	HL93-4	6	31	110	7	5	115.159492	58.593161	84J	Lawrence Crk-borehole	93	Till	6.9	10.2	26.40	1.70	6.44	24.70	93.56			1.87	0.007	2.87	0.011
306	HL93-8	10	16	114	21	5	117.469040	58.902088	84K	High Level-drillhole (BH)	93	Till	32.0	37.8	29.25	1.90	6.50	27.35	93.50			4.34	0.015	7.03	0.024
302	HL93-10	3	27	110	24	5	117.914994	58.574988	84K	High Level west-(BH)	93	Till	22.0	29.0	30.70	3.30	10.75	27.40	89.25			4.53	0.015	26.92	0.088
369	PR93-3	4	18	86	20	5	117.153552	56.452091	84C	Peace River - south (BH)	93	Till	16.1	31.7	30.15	1.95	6.47	28.20	93.53			5.08	0.017	11.89	0.039
370	PR93-6A	12	27	76	22	5	117.323608	55.615849	83N	Winagami - Peavine (BH)	93	Till	8.8	14.3	28.40	0.70	2.46	27.70	97.54			2.64	0.009	6.25	0.022
371	PR93-6B	12	27	76	22	5	117.330067	55.615853	83N	Winagami - Peavine (BH)	93	Till	40.2	45.1	29.00	1.00	3.45	28.00	96.55			4.58	0.016	8.72	0.030
367	PR93-10	4	14	81	26	5	117.959328	56.015816	84C	Peace River-south (BH)	93	Till	5.3	19.1	28.70	2.00	6.97	26.70	93.03			4.36	0.015	4.51	0.016
368	PR93-13	4	5	80	25	5	117.881133	55.899463	83N	Winagami - north (BH)	93	Till	36.6	41.8	30.80	1.35	4.38	29.45	95.62			3.92	0.013	12.19	0.040
Till samples														Mean	25.72	1.27	5.07	24.45	94.93	12.61	0.05	4.01	0.016	4.36	0.02
														Standard deviation	3.76	2.03	8.71	4.11	8.71	17.30	0.06	2.53	0.010	3.95	0.01
														Minumum	10.90	0.17	0.61	5.31	36.47	0.88	0.00	0.36	0.002	0.05	0.00
														Mixumum	30.85	17.55	63.53	29.96	99.39	64.23	0.24	12.60	0.047	26.92	0.09
														Count	93.00	93.00	93.00	93.00	93.00	34.00	34.00	89.00	89.00	92.00	93.00

Fluvial sand samples

Sample ID#	Field id#	LSD	Sec	Tp	Rge	Mer	Longitude	Latitude	NTS	Location	Yr	Sed	From(m)	To(m)	SampWt(kg)	>1.7(kg)	>1.7 (%)	<1.7(kg)	<1.7 (%)	Mag (g)	Mag (%)	Mid (g)	Mid (%)	Heavy(g)	Heavy(%)
357	NAT93-80	7	29	98	7	4	111.096795	57.531475	74E	Firebag River (<2 mm)	93	Fluvial			11.45	0.05	0.44	11.40	99.56			6.62	0.058	27.17	0.237
362	NAT93-85	11	25	99	7	4	111.004878	57.622381	74E	Marguerite Rr (<2mm)	93	Fluvial			14.00	0.05	0.36	13.95	99.64			11.57	0.083	15.67	0.112
364	NAT93-87	8	29	94	10	4	111.562086	57.182424	74E	Muskey River (<2mm)	93	Fluvial			11.95	0.05	0.42	11.90	99.58			11.74	0.098	36.47	0.305
														Mean	12.47	0.05	0.40	12.42	99.60			9.98	0.08	26.44	0.22
														Standard deviation	1.35	0.00	0.04	1.35	0.04			2.91	0.02	10.42	0.10
														Minumum	11.45	0.05	0.36	11.40	99.56			6.62	0.06	15.67	0.11
														Mixumum	14.00	0.05	0.44	13.95	99.64			11.74	0.10	36.47	0.31
														Count	3.00	3.00	3.00	3.00	3.00			3.00	3.00	3.00	3.00

The mids fraction from the magstream separation forms about 0.016 wt% of the sample or about 4 grams of each 26 kg sample. The range of fraction size is from 0.002 to 0.047 wt% (0.036 to 12.6 grams). The highest concentration of minerals in this fraction are in the samples from the southeastern portion of the area (Figure 2.2)

The heavy fraction from the magstream separation forms about 0.02 wt% of the sample or about 4.4 grams of each 26 kg sample (Figure 2.3). The range of fraction size is from 0.000 to 0.09 wt% (0.05 to 26.92 grams). The zero value samples (Table 2.1) are those in which the initial sample was too small for two runs on the magstream separator.

2.1.2 Fluvial Sediment:

The fluvial samples were handled differently. The < 2 mm fraction was recovered by using river water to wash the samples through metal screens. These samples are therefore smaller than the till samples (average 12.5 kg) however they generally yielded a higher proportion of mids and heavies (Table 2.1).

2.1.3 Grain Analysis

One set of possible indicator mineral grains were initially picked out from each sample by SRC staff. After the return of the samples fractions to ARC a second set of grains was selected by AGS staff. All these grains were sent to Geology Department at the University of Saskatchewan for analysis of their chemical composition utilizing an electron probe. The geochemical data from probe analysis is tabulated in Appendix 6.1. See also the subsequent introductory part of the indicator mineral analysis section for additional information on the analytical approach.

2.2 MINERALOGY

The following sections are modified slightly from similar section in the the open file report by Dufresne et al. (1994b). The authors suggest readers should obtain this open file report for additional background information on diamond potential throughout Alberta.

2.2.1 Introduction

All of the microprobe data released to date were processed using mineral identification programs written in QBASIC and provided by the SRC (Quirt 1992a,b; Gent 1993). The results to date were evaluated by using major and minor element X-Y scatter plots (Figures 2.11 to 2.27) of the sample data versus diamond inclusion compositions or compositions of minerals from other diatremes provided in Fipke (1990), or diamond inclusion fields illustrated on X-Y plots by Gurney (1984), McCandless and Gurney (1989), Fipke (1990), Gurney and Moore (1993), Griffin and Ryan (1993), Griffin et al. (In Press), and many others.

Based strictly on the mineral identification programs there appear to be many samples with pyropic garnets, clinopyroxenes, chromites and picroilmenites of potential interest with few discernible geographic patterns (Table 2.2 and Figures 2.4 to 2.10). This is well illustrated in Figure 2.4, which is a plot of the total number of potentially favorable diamond indicator minerals by site for Alberta to date. In order to determine if any meaningful geographic patterns exist, the data was classified based on the number of indicator minerals present (Table 2.2) and those samples with particular indicator minerals of excellent chemistry relative to diamondiferous source rocks (Figures 2.5 to 2.10). Because diamonds are regarded as fragments of disaggregated upper mantle peridotite or eclogite incorporated into kimberlite or lamproite magmas as xenocrysts, there are essentially three types of indicator minerals that may have meaning in low density regional surveys: (a) those that are indicative of kimberlites or lamproites, (b) those that are indicative of peridotite or eclogite, and (c) those that are indicative of **diamondiferous** peridotite or eclogite source rocks. The number of indicator minerals was quantified for each sample (Table 2.2) after favorable grains were selected based on X-Y scatter plots (Figures 2.11 to 2.27) and other discriminating elements such as manganese, potassium, nickel and zinc. Indicator minerals that are probably indicative of kimberlites or lamproites include high titanium G1 or G2 pyrope garnets and high magnesium ilmenites (picroilmenites) for kimberlites, and high magnesium (variable chromium) P3 and P4 chromites for lamproites (Bergman 1987; Mitchell 1989; Mitchell 1991; Mitchell and Bergman 1991; Scott Smith 1991; Griffin *et al. In Press*). Indicator minerals indicative of peridotite source rock include chromium rich G7, G9, G10 and G11

Table 2.2. Summary of anomalous indicator mineral data from till for northern Alberta arranged by ID#.

ID #	Sample#	Longitude °	Latitude °	NTS	Location Name	Lithology	Anomalous Samples	G1, G2	G7,9,10,11	Kimberlitic Garnets	G3, G4, G6	G5	Eclogitic Garnets	Chrome Diopsides	Chromites	Picro-ilmenites	Total Indicators	Other
268	NAT92-1	115.045494	55.655777	83O	L.Slave L	Till	92-1											1 Na -diopside
269	NAT92-10	117.482651	58.907486	84K	Meander R	Till	92-10				1		1				1	
270	NAT92-11	119.435425	58.494476	84L	Rainbow L	Till												
271	NAT92-12	117.922272	58.573204	84K	High Level W	Till												
272	NAT92-13	117.470474	57.573986	84F	Kemp R	Till	92-13											2 corundum
273	NAT92-14	117.542633	57.226784	84F	Hawk Hills	Till												
274	NAT92-15	117.626968	56.930439	84C	Manning	Till												
275	NAT92-16	117.797569	56.479240	84C	Smithmill	Till												
276	NAT92-17	117.902939	56.179340	84C	Brownvale	Till	92-17								1		1	
277	NAT92-18	119.869659	56.300076	84D	Boundary L	Till												
278	NAT92-19	117.902969	56.179340	84C	Brownvale	Till	92-19		1	1							1	
279	NAT92-2	115.311295	56.241127	84B	Cranberry L	Till	92-2		1	1							1	
280	NAT92-20	116.914932	56.379333	84C	Peace R E	Till												
281	NAT92-21	118.050995	55.685005	83M	Birch Hills	Till												
282	NAT92-22	119.880760	55.257896	83M	Goodfare	Till												
283	NAT92-23	117.177483	55.179489	83N	Valley View	Till	92-23		1	1							1	
284	NAT92-24	111.057915	57.249889	74E	Kearl L E	Till												
285	NAT92-25	111.403374	57.249889	74E	Kearl L W	Till	92-25					1	1				1	
286	NAT92-26	110.861938	55.799088	73M	Chard	Till												
287	NAT92-27	110.903915	56.246296	74D	Cheecham	Till	92-27								1		1	
288	NAT92-28	111.877754	56.077339	74D	SW 1/4	Till	92-28											1 jadeitic diopside
289	NAT92-29	112.187798	55.797279	83P	Crow L	Till												
290	NAT92-3	115.104530	57.128601	84G	Wabasca R	Till	92-3	1		1							1	
291	NAT92-30	111.666733	55.009575	73M	Heart L	Till	92-30								1		1	
292	NAT92-31	111.647591	55.038666	73M	Heart L	Till												
293	NAT92-32	110.329117	54.422314	73L	Cold L	Till	92-32		1	1							1	
294	NAT92-33	110.329137	54.422314	73L	Cold L	Till												
295	NAT92-34	116.234718	54.977757	83K	Swan Hills	Till	92-34											1 jadeitic diopside
296	NAT92-4	115.392570	57.388626	84G	Wabasca R	Till												
297	NAT92-5	115.552650	57.855755	84G	Wadlin L	Till	92-5								1		1	
298	NAT92-6	116.482430	58.542141	84K	High Level east	Till												
299	NAT92-7	114.554718	58.589458	84J	Wentzil R	Till												
300	NAT92-8	115.496025	58.556770	84J	Beaver Cr	Till												
301	NAT92-9	118.740000	60.100000	85A	NWT	Till												
302	HL93-10	117.914995	58.574983	84K	High Level west	Till												
303	HL93-11	117.427913	58.545908	84K	High Level west	Till												
304	HL93-4	115.159492	58.593159	84J	Lawrence Creek	Till												
305	HL93-6	116.599871	58.520458	84K	High Level east	Till												
306	HL93-8	117.469041	58.902094	84K	High Level north	Till												
307	HL93-9	117.237134	58.716729	84K	High Level north	Till												
308	NAT93-35	118.502798	55.259612	83M	Kleskun Hill	Till												
309	NAT93-36	118.791573	55.434174	83M	S. Saddle Hills	Till												
310	NAT93-37	118.380879	55.455982	83M	Teepee Creek	Till	93-37					4	4				4	1 jadeite
311	NAT93-38	119.256644	55.895966	83M	Grand Prairie	Till	93-38				1		1				1	
312	NAT93-39	114.797688	55.444968	83 O	Martin Mtn	Till												
313	NAT93-40	115.202941	55.943092	83 O	E. Utikuma Lake	Till												
314	NAT93-41	115.391913	56.033980	84B	N. Utikuma Lake	Till												
315	NAT93-42	116.012510	55.714038	83N	Salt Prairie	Till												
316	NAT93-43	116.477531	55.626762	83N	E. Winagami Lk	Till												
317	NAT93-44	116.981889	55.852193	83N	N. Kimiwan Lk	Till												
318	NAT93-45	116.825499	55.986723	83N	Springburn	Till	93-45		1	1		1	1				2	

ID #	Sample#	Longitude °	Latitude °	NTS	Location Name	Lithology	Anomalous Samples	G1, G2	G7,9,10,11	Kimberlitic Garnets	G3, G4, G6	G5	Eclogitic Garnets	Chrome Diopsides	Chromites	Picro-ilmenites	Total Indicators	Other
319	NAT93-46	116.812466	56.121254	84C	Harmon Valley	Till												
320	NAT93-47	119.485239	56.074121	84D	Silver Valley	Till												
321	NAT93-48	119.700771	55.819606	83M	Saddle Hills W.	Till												
322	NAT93-49	118.883613	57.404592	84E	Chinchaga R	Till												
323	NAT93-50	118.422845	57.284647	84E	Chinchaga Rd	Till												
324	NAG93-500	114.978950	55.339521	83O	Lesser Slave Lk	Till												
325	NAG93-501	115.342733	57.273683	84G	Wabasca River	Till												
326	NAG93-502	116.266790	56.659318	84C	Haig Lake	Till												
327	NAT93-503	116.326510	56.542986	84C	Golden Lake	Till												
328	NAT93-51	114.541601	55.237706	83 O	E. Lesser Sl. Lk	Till	93-51							1	1		2	
329	NAT93-52	115.220233	55.339513	83 O	S. LesserSl. Lk	Till												
330	NAT93-53	116.865597	55.332242	83N	N. Snipe Lake	Till	93-53		1	1							1	
331	NAT93-54	116.802771	55.110438	83N	S. Snipe Lake	Till												
332	NAT93-55	118.740789	56.361331	84D	Montagneuse R.	Till	93-55							1			1	
333	NAT93-56	118.997814	56.426774	84D	Clear Hills	Till												
334	NAT93-57	119.006968	56.583099	84D	Clear Hills	Till												
335	NAT93-58	119.026920	56.670345	84D	Clear Hills	Till												
336	NAT93-59	119.046873	56.608542	84D	Clear Hills	Till	93-59							1			1	
337	NAT93-60	116.403975	56.506631	84C	Cadotte Lake	Till												
338	NAT93-61	116.101513	56.452093	84C	Little Buffalo	Till												
339	NAT93-62	115.772750	56.459370	84B	Lubicon Lake	Till												
340	NAT93-63	115.555767	56.470267	84B	Loon Lake	Till												
341	NAT93-64	115.118842	56.655675	84B	Red Earth	Till												
342	NAT93-65	114.826878	56.742928	84B	Peerless Lake	Till												
343	NAT93-66	117.105189	57.975252	84F	La Crete Ferry	Till												
344	NAT93-67	114.512365	58.585885	84J	Wentzil River	Till												
345	NAT93-68	117.956550	55.539508	83P	Pelican Mtn	Till												
346	NAT93-69	118.646443	57.306452	84E	Chinchaga Rd	Till												
347	NAT93-70	115.349313	54.764969	83J	Swan Hills	Till												
348	NAT93-71	118.022858	57.171979	84E	Chinchaga Rd	Till	93-71											1 Na - diopside
349	NAT93-72	117.727772	57.121012	84F	Chinchaga Rd	Till												
350	NAT93-73	118.215513	56.833992	84D	Sulphur Lake	Till	93-73								2		2	
351	NAT93-74	116.147238	56.882901	84C	Haig Lake	Till	93-74				1	2	3				3	
352	NAT93-75	116.260155	56.659316	84C	Otter Lakes	Till	93-75		1	1							1	
353	NAT93-76	115.244917	56.826557	84B	Loon River	Till	93-76					2	2	1			3	
354	NAT93-77	115.089082	57.175534	84G	Wabasca River	Till												
355	NAT93-78	115.335099	57.622666	84G	Senex Creek	Till	93-78				2	2	4				4	
356	NAT93-79	116.257624	57.982514	84F	Buffalo Hd Hills	Till												
357	NAT93-80	111.096795	57.531475	74E	Firebag River	Riv sand												
358	NAT93-81	111.029191	57.462403	74E	Firebag River	Till												
359	NAT93-82	110.454578	57.338768	74E	Firebag River	Till	93-82							2			2	
360	NAT93-83	110.745265	57.404221	74E	Firebag River	Till	93-83				1		1	1			2	
361	NAT93-84	111.202795	57.647831	74E	Firebag River	Till												
362	NAT93-85	111.004878	57.622381	74E	Marguerite R	Riv sand	93-85				2	1	3				3	
363	NAT93-86	111.496257	57.564205	74E	Fort McKay	Till												
364	NAT93-87	111.562086	57.182424	74E	Muskey River	Riv sand	93-87					8	8				8	
365	NAT93-88	111.501796	57.076978	74E	Saline Lake	Till												
366	NAT93-89	110.677291	57.629659	74E	Johnson Lake	Till	93-89					1	1				1	
367	PR93-10	117.959329	56.015809	84C	Peace R south	Till	93-10							1			1	
368	PR93-13	117.881135	55.899470	83N	Winagami North	Till												
369	PR93-3	117.153553	56.452093	84C	Peace R south	Till	93-3		1	1	1		1				2	
370	PR93-6A	117.330067	55.615856	83N	Peavine	Till	93-6A				1		1				1	
371	PR93-6B	117.330097	55.615856	83N	Peavine	Till	93-6B		4	4		1	1				5	

pyrope garnets, chrome diopsides (>0.5 wt% Cr_2O_3) and P1 xenocryst chromites. Indicator minerals indicative of eclogite include low iron (<25 wt% total Fe as FeO), high magnesium (>6.5 wt% MgO) G3, G4, G5 and G6 almandine garnets (referred to as eclogitic garnets), low chromium, high sodium and high aluminum diopsides, and, in some cases, sodic diopside, jadeite, corundum and kyanite. Indicator minerals indicative of **diamondiferous peridotite** include subcalcic, high chromium G10 pyrope garnets and high magnesium (>11 wt% MgO), high chromium (>61 wt% Cr_2O_3) P1 xenocryst chromites. Indicator minerals used to identify **diamondiferous eclogite** include high sodium (>0.07 wt% Na_2O), high titanium, low iron and high magnesium G3, G4, G5 and G6 eclogitic garnets, and high potassium (>0.1 wt% K_2O) eclogitic clinopyroxenes (McCandless and Gurney 1989; Fipke 1990; Gurney and Moore 1993). Other elements that are used to help determine important varieties of certain minerals versus crustal or low temperature varieties include manganese in garnets, particularly eclogitic garnets, nickel in garnets and zinc in chromites (Griffin *et al.* 1992; Griffin and Ryan 1993; Griffin *et al. In Press)*. High manganese in garnet (>1.5 wt%) was used to eliminate crustal garnets even if they exhibited low iron and high magnesium. Chromites from other sources, such as those from the Troodos ophiolite complex, Cyprus (Greenbaum 1977) can exhibit diamond inclusion chemistry based on major elements with high chromium and magnesium; however, zinc concentrations tend to reequilibrate quite easily and increase as these types of rocks are subjected to lower temperatures with time (Griffin and Ryan 1993). Based on the aforementioned parameters, X-Y scatter plots were constructed consisting of (a) Cr_2O_3 vs CaO for high chromium (>2 wt% Cr_2O_3) G9, G10 and G11 peridotitic pyrope garnets (Figure 2.11), (b) FeO (total Fe) vs MgO, TiO_2 vs CaO and TiO_2 vs Na_2O for eclogitic G3, G4, G5 and G6 garnets (Figures 2.12 to 2.14), (c) Cr_2O_3 vs CaO for chrome (>0.5 wt% Cr_2O_3) diopsides (Figure 2.15), (d) Na_2O vs Al_2O_3 for low chromium diopsides (Figures 2.16), (e) FeO (total Fe) vs MgO, Cr_2O_3 vs MgO and Cr_2O_3 vs FeO (total Fe) for picroilmenites (Figures 2.17 to 2.19), and (f) Cr_2O_3 vs MgO, Cr_2O_3 vs Al_2O_3, Cr_2O_3 vs TiO_2 and TiO_2 vs Al_2O_3, Cr_2O_3 vs Ni, MgO vs Ni, TiO_2 vs Ni and Zn vs Ni for chromites (Figures and 2.20 to 2.27). Indicator anomaly maps have been prepared based on the number and types of indicator minerals present (Figures 2.4 to 2.9). Figure 2.10 is a summary anomaly map that depicts some of the better sample sites based on the abundance of indicator minerals (Figures 2.4 to 2.9), the quality of certain minerals such as garnets and chromites of diamond inclusion chemistry, and the presence of other potentially important minerals such as jadeite, olivine, kyanite and corundum, shown in conjunction with the regional geology of Alberta.

On Figure 1.1 and in Table 2.2, all the till sample sites in northern Alberta have been labelled with sequential numbers (ID#) from 268 to 371. In the following discussion, a reference to a specific sample site will comprise the sequential ID#s plus the actual sample number from the original survey source (in brackets); for example "312 (NAT93-39)".

2.2.2 Grain Analysis Results

Most of the surface samples were collected from road accessible sites; the exceptions were the samples from northeastern Alberta where a helicopter was used to reach less accessible sites in the Marguerite River and Firebag River areas. Therefore the sample distribution is not uniform through northern Alberta. However, during 1994 to 1995, further microprobe analysis of grains from previously collected samples as well as till sampling in some of the more remote areas, are planned.

At present, minerals indicative of kimberlites, such as G1 or G2 garnets and picroilmenites, are rare. However a few samples in the Peace River area contain G9 or G11 garnets and chrome diopsides which possibly are indicative of peridotitic source rocks. The most common and perhaps the most important group of indicator minerals that have been recovered from the northern Alberta tills, are the low iron and high magnesium G3 and G5 garnets. These may be indicative of eclogitic source rocks, and some of these could have been derived from rock formed within the diamond stability field based on a comparison of their chemical composition with that of diamond inclusion eclogitic garnets obtained from elsewhere in the world (Figures 2.12 to 2.14). No picroilmenites of major interest were recognized in the grains analysed so far (Figure 2.8)

Although the sample distribution in northern Alberta is irregular three geographic trends, based on the number and quality of eclogitic and other indicator minerals, have been recognized in northern Alberta. These include: (a) a southwesterly trend from just north of the townsite of Peace River to the Birch Hills northeast of Grande Prairie, (b) a southerly trend from the lower Wabasca River to the Loon River, and (c) a southwesterly trend in the Marguerite River to Fort Mackay area (Figure 2.10).

a) Peace River Trend: The Peace River to Birch Hills trend consists of several samples that contain eclogitic G3 and G5 garnets, peridotitic G9 and G11 garnets, chrome diopsides and a few anomalous chromites (Figures 2.5 to 2.10). Two eclogitic G3 garnets from till samples in the Peace River area may indicate that a high potential exists for diamondiferous eclogitic source rocks within that area (Figures 2.10 and 2.12 to 2.14). These samples came from auger core cut at sample site 369 (PR93-3) north of the townsite of Peace River, and core site 370 (PR93-6A) west of Winagami Lake near the Little Smoky River. (The notation " 369 (PR93-3)" refers to the site reference number 369, shown on Figure 1.1 and Table 2.2, and the actual sample number PR93-3, in this example, listed in Table 2.2). The composition of these two G3 garnets is well within the diamond inclusion field for eclogitic garnets on a plot of FeO (total Fe) vs MgO; near or within the diamond inclusion field for TiO_2 vs CaO; and they contain 0.07 and 0.05 wt% Na_2O, respectively (Figures 2.12 to 2.14). The till sample from site 369 (PR93-3) also yielded a G9 pyropic garnet. A second till sample (PR93-6B), collected from the base of the same auger core hole that recovered sample PR93-6A from the upper part, yielded a G5 eclogitic garnet and four G9 pyropic garnets. Whether these two samples (PR93-6A and PR93-6B) came from the same till or two separate till layers is presently unknown. Other indicator minerals of interest within the Peace River to Birch Hills trend include: (a) four G5 eclogitic garnets that plot within or near the diamond inclusion field for FeO (total Fe) vs MgO and for TiO_2 vs CaO, together with with a jadeitic diopside with 0.69 wt% K_2O recovered from till site 310 (NAT93-37) northeast of Grande Prairie near the Smoky River, (b) a G11 pyropic garnet and a high MgO eclogitic G5 garnet from till at site 318 (NAT93-45) southeast of Peace River, (c) a G9 pyropic garnet and an anomalous chromite from till at site 276 (NAT92-17) southwest of Peace River; and also (d) thirty-seven chrome diopsides from the Grimshaw pre-glacial gravel deposit west of Peace River (Edwards in press, and Dufresne and others 1994b) three of which were microprobed and plot within the diamond inclusion field for Cr_2O_3 vs CaO (Figures 2.5 to 2.7, 2.9 and 2.10).

Most of the anomalous till sites in the Peace River to Birch Hills trend are on or are close to either Monopros Ltd.'s Peace River mineral property or the Carmon Lake mineral property held by Consolidated Carina Resources

Corp. and Currie Rose Resources Inc. Hawkins (1994) and Consolidated Carina Resources Corp. (1993) reported that abundant G9 pyropic garnets and chrome diopsides, which plot within the diamond inclusion field, have been obtained from till samples that were collected from the Carmon Lake Property, The samples include those obtained from the upper portion of an oil well recently drilled by Shell Resources Ltd. Hawkins (1994) also stated that G1, G3 and G11 garnets were found and that the presence of kelphytic rims on some of the garnets indicates that they were likely derived from "*a nearby kimberlite source*" and that the results "*appear to confirm the presence of unmapped kimberlitic intrusions in the Peace River area*".

Based on the types of indicator minerals which have been obtained to date from the regional till surveys by government or reported on by industry, it is quite possible that alkaline intrusions with material indicative of eclogitic and peridotitic source rocks exist in the Peace River area. However if such intrusions are present, it is not yet certain whether they will be of kimberlitic or lamproitic composition, because few minerals, that are indicative of kimberlite or lamproite have been found relative to the number of grains that are indicative of eclogite and peridotite.

Generally the sites with favorable indicator minerals tend to exist 'down-ice' from the Shaftesbury, Dunvegan and Kaskapau Formations (Figure 2.10). Based on these preliminary data, the geographic distribution of indicator mineral sample sites in the Peace River Trend suggests that the alkaline intrusions are likely no older than the Early Cretaceous and are probably time equivalent with reactivation of the Peace River Arch during the middle to Late Cretaceous. Volcanics and tuffaceous units have been described as being interbedded with the Fish Scales Horizon within the Lower Shaftesbury Formation in the vicinity of the Peace River Arch (Bloch *et al.* 1993). This horizon is in turn approximately coeval with kimberlite intrusion in the Fort _ la Corne area, Saskatchewan (Lehnert-Thiel *et al.* 1992), the eruption of the alkaline Crowsnest volcanics in southwest Alberta (Folinsbee *et al.* 1957), and the approximate age of suggested meteorite impact in northern Alberta in the vicinity of the Steen River (Carrigy 1968).

Also possible is that the alkaline intrusions in northern Alberta may be as young as early Tertiary. This possibility is suggested by the age of the

Sweetgrass intrusions and the kimberlites in the Lac de Gras area, N.W.T. However this age seems less likely because of the previously discussed possible spatial relationship of the indicator minerals to the mainly Upper Cretaceous (Albian to Cenomanian) Shaftesbury Formation.

b) Wabasca River Trend: A second trend of anomalous indicator minerals is suggested by data from the north to south group of till sample sites in the lower Wabasca River, Red Earth, and Loon River area (Figure 2.10). This trend consists predominantly of G3 and G5 eclogitic garnets from sample sites 351 (NAT93-74), 353 (NAT93-76) and 355 (NAT93-78). These grains plot within or near the diamond inclusion field for FeO (total Fe) vs MgO and for TiO_2 vs CaO (Figures 2.6, 2.12 and 2.13). Other grains of interest include a high chrome (4.62 wt% Cr_2O_3) G7 grossular garnet from site 279 (NAT92-2) southwest of Peerless Lake, a high titanium G2 kimberlitic garnet from site 290 (NAT92-3) near the confluence of the Wabasca and Loon Rivers, and a chromite from site 297 (NAT92-5) near the Wabasca River east of the Buffalo Head Hills. Although most of the sites contain some favorable indicator minerals and lie in close proximity to the Shaftesbury Formation, the interpretation of the source of these anomalous diamond indicator grains is much more difficult in this area because north-central Alberta is commonly underlain by thick drift (Figure 7.4, drift thickness map, in Dufresne and other 1994b)

c) Fort Mackay Trend: In the Marguerite River to Fort Mackay area (NTS 74E) (Figure 2.10), five till samples and three river sediment samples which were collected in 1993 and have been processed and analyzed for diamond indicator minerals. Preliminary results for these samples are discussed in Dufresne and others (1994a). Also the following report will be updated when the additional samples collected during 1993 and 1994 are processed and analysed.

Based on the results of the grains probed to date, there are no grains indicative of either kimberlite, lamproite or peridotitic source rocks, with the possible exception of three chrome diopsides in tills from sample sites 359 (NAT93-82) and 360 (NAT93-83)(Figure 2.7). However, three G3 and ten G5 eclogitic garnets from till sample sites 285 (NAT92-25), 360 (NAT93-83) and 366 (NAT93-89), and from river sediment sample sites 362 (NAT93-85) and 364 (NAT93-87), were identified as having favorable chemistry because they plot within the diamond inclusion field for eclogitic garnets on X-Y scatter plots of FeO (total Fe) vs MgO and for TiO_2 vs CaO (Figures 2.6, 2.12 and 2.13). At least two of these eclogitic garnets have sufficient amounts of Na and Ti such that they border on the diamond inclusion field for eclogitic garnets on a plot of TiO_2 vs Na_2O (Figure 2.14). The lack of kimberlitic indicators in the samples which contain the eclogitic garnets indicates that these grains may not have been derived from kimberlites. The lack of lamproitic indicators, such as chromite, does not preclude the possibility for eclogite-bearing lamproites because lamproites tend to yield few diagnostic indicator minerals (Fipke 1990). The most interesting grain, in this area, is a G3 eclogitic garnet from till sample site 360 (NAT93-83) located along the Firebag River. The data from this garnet grain plot well within the diamond inclusion field for FeO (total Fe) vs MgO and for TiO_2 vs CaO, and borders on the diamond inclusion field for TiO2 vs Na_2O with 0.05 wt% Na_2O (Figures 2.6, 2.10 and 2.12 to 2.14). Glacially streamlined terrain near sample site 360 (NAT93-83) indicates the ice flowed toward the southwest (Bayrock, 1971) therefore the eclogitic garnet and associated chrome diopside from the site were likely derived from the northeast.

Other eclogitic garnets of interest from sample sites in the area include: (a) a G5 from till sample site 366 (NAT93-89), and two G3's and a G5 from fluvial sediment sample site 362 (NAT93-85), both of which are located along the Marguerite River, (b) a G5 from till sample site 285 (NAT92-25) east of the Muskeg River, and (c) seven G5 eclogitic garnets with greater than 11 wt% MgO and less than 26 wt% FeO (total Fe), one of which contains 0.06 wt% Na_2O, from fluvial sediment sample site 364 (NAT93-87) along the Muskeg River (Figures 2.6, and 2.12 to 2.14).

The interpretation of the possible source is more straight forward for those grains derived from tills than for those grains derived from the fluvial samples. For the surface till samples the predominant glacial flow and therefore transport direction was either southwest or south, depending on which till sheet the samples were collected from (Bayrock, 1971 and Dufresne and others, 1994a). However for the indicator minerals derived from the fluvial sediment samples, the interpretation is much more complicated because the indicator grains could be derived by erosion of one or more tills, glaciofluvial sediments or subcrops of the Cretaceous bedrock. Determining the possible source of origin for these anomalous fluvial indicator mineral grains in the Fort Mackay trend is beyond the scope of this report, but several of the eclogitic garnets have encouraging chemistry and may warrant followed up exploration.

d) Other Grains: Other indicator minerals that may be of interest, especially once further sampling is conducted, include: a) a G3 eclogitic garnet with excellent FeO-MgO chemistry from site 269 (NAT92-10) northwest of High Level near the Hay River (Figures 2.6, 2.12 and 2.13), b) a jadeitic diopside with 0.54 wt% K_2O from site 268 (NAT92-1) north of Lesser Slave Lake (Figure 2.10), c) a chromite from site 287 (NAT92-27) southeast of Fort McMurray that plots within the Argyle field of chromites for most of the major element plots (Figures 2.9, 2.10 and 2.20 to 2.27), d) an extremely high MgO chromite from site 291 (NAT92-30) northeast of Lac La Biche with otherwise poor chemistry (Figures 2.9, 2.10 and 2.20 to 2.27), and e) a high chromium (15.87 wt% Cr_2O_3) G7 uvarovite-grossular garnet from site 293 (NAT92-32) southwest of Cold Lake.

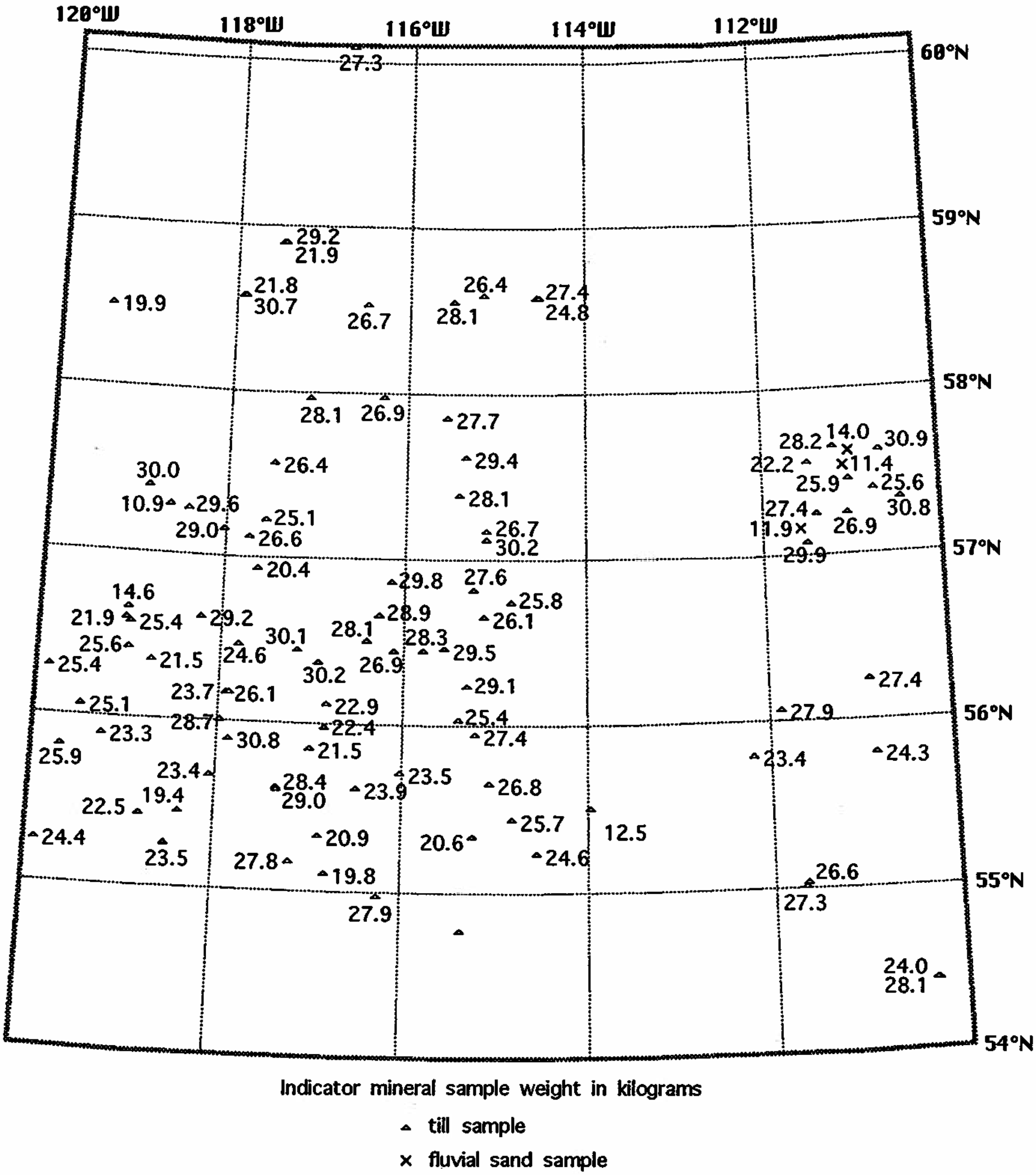


Figure 2.1. Map showing indicator mineral sample weight.

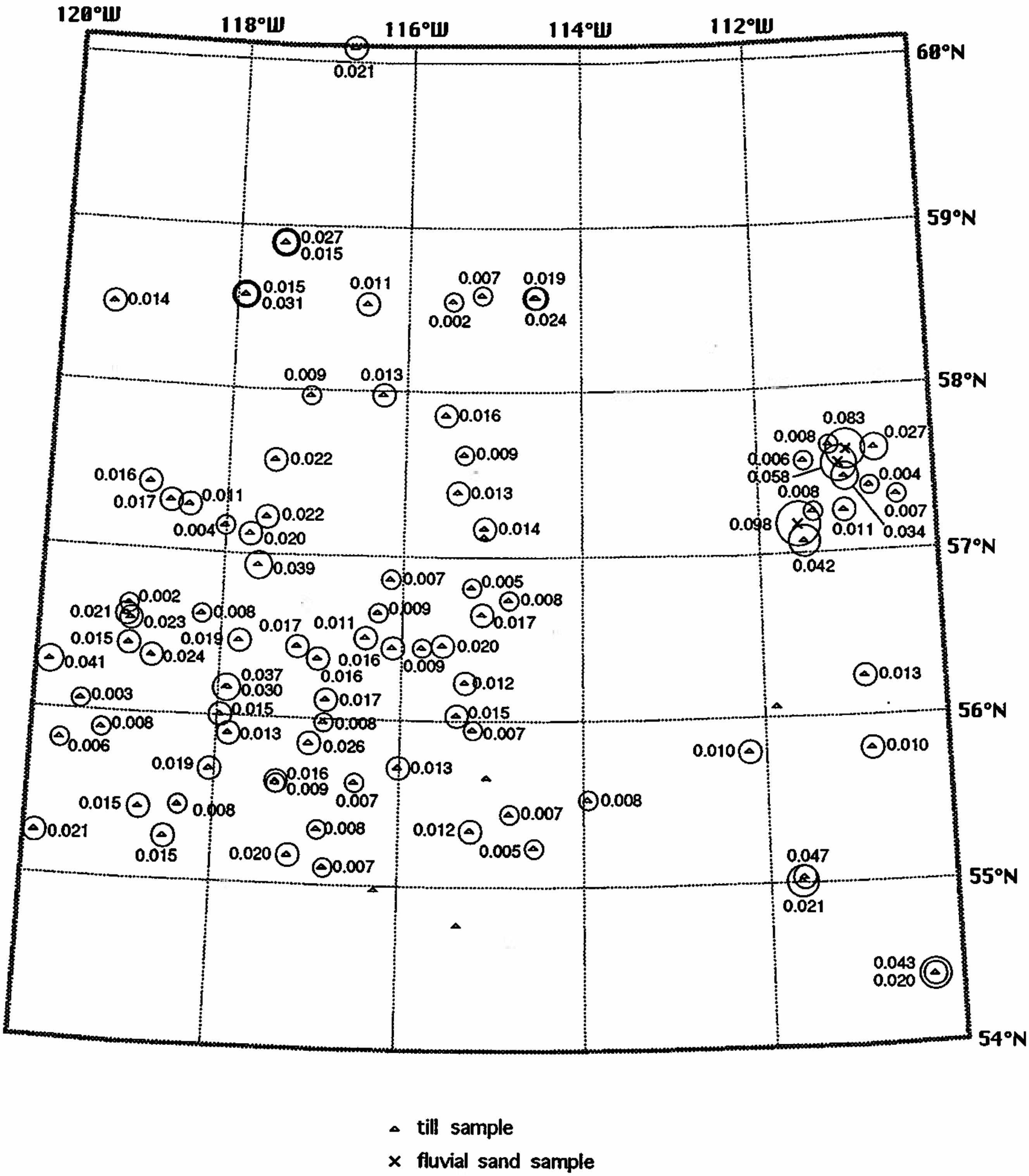


Figure 2.2. Map showing weight % of the "mids" fraction from indicator mineral sample.

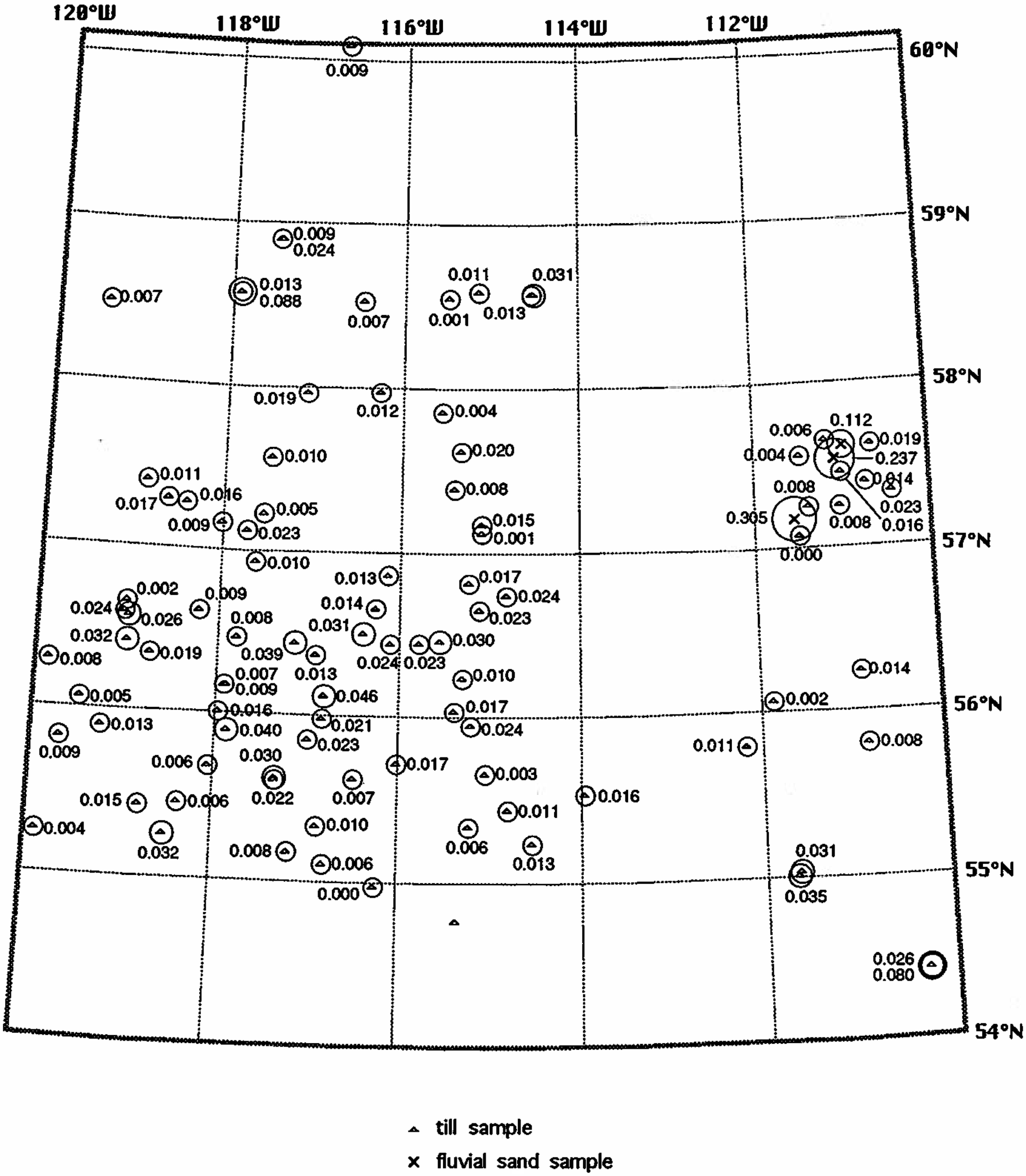


Figure 2.3. Map showing weight % of the "heavies" fraction from indicator mineral sample.

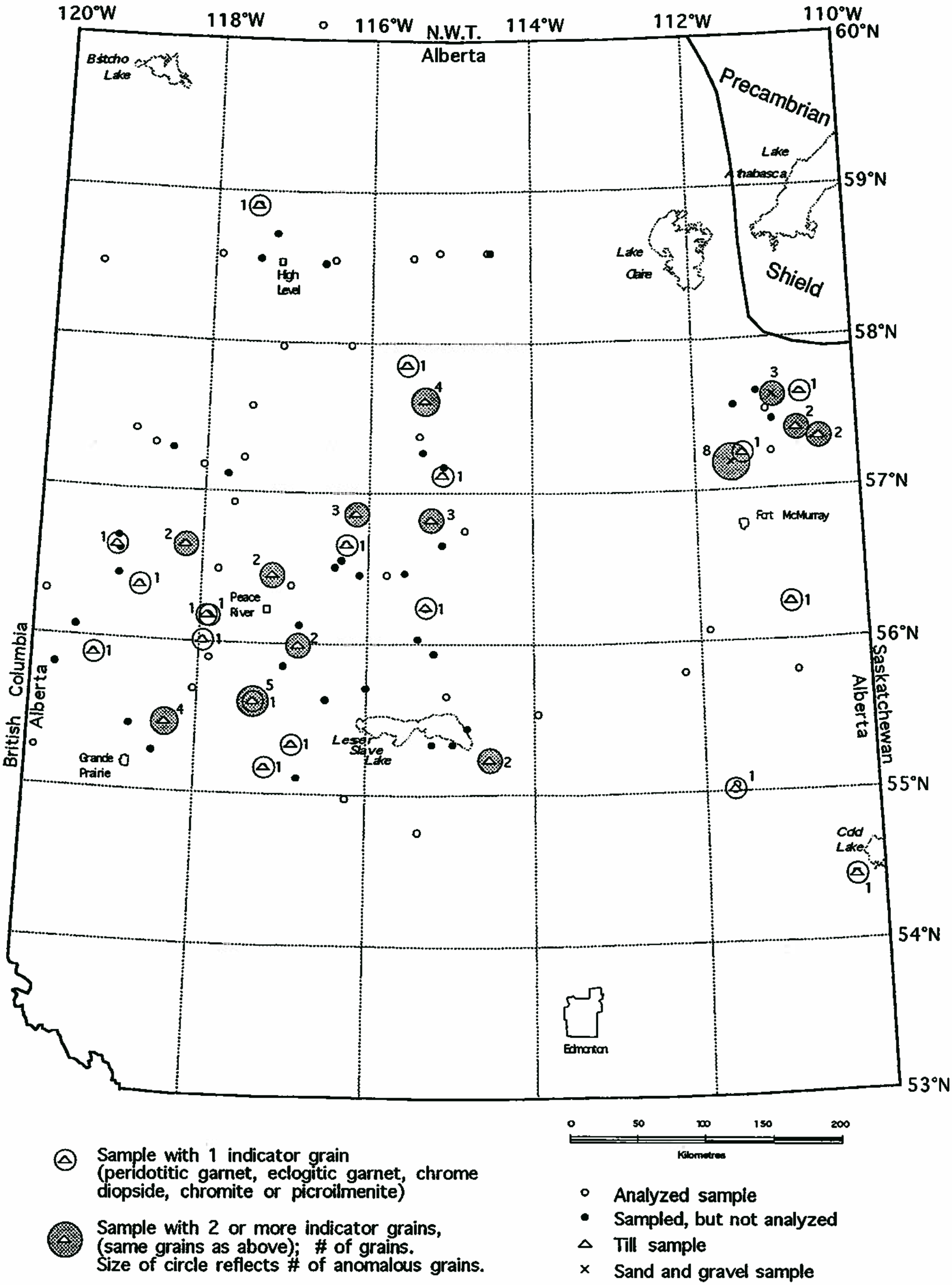


Figure 2.4. Total diamond Indicator mineral map.

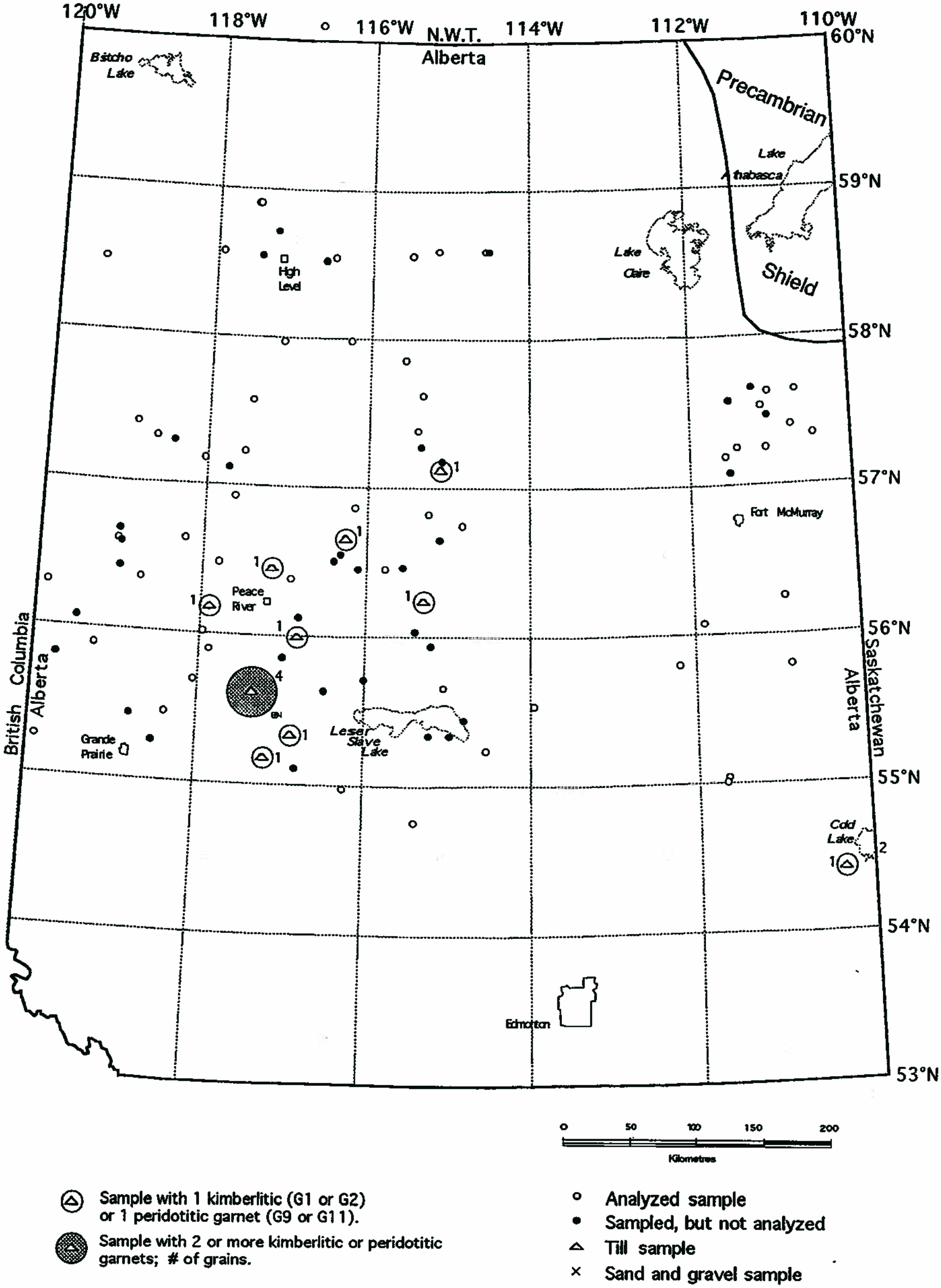


Figure 2.5. Indicator map of G1, G2, G7, G9, G10 and G11 kimberlitic garnets.

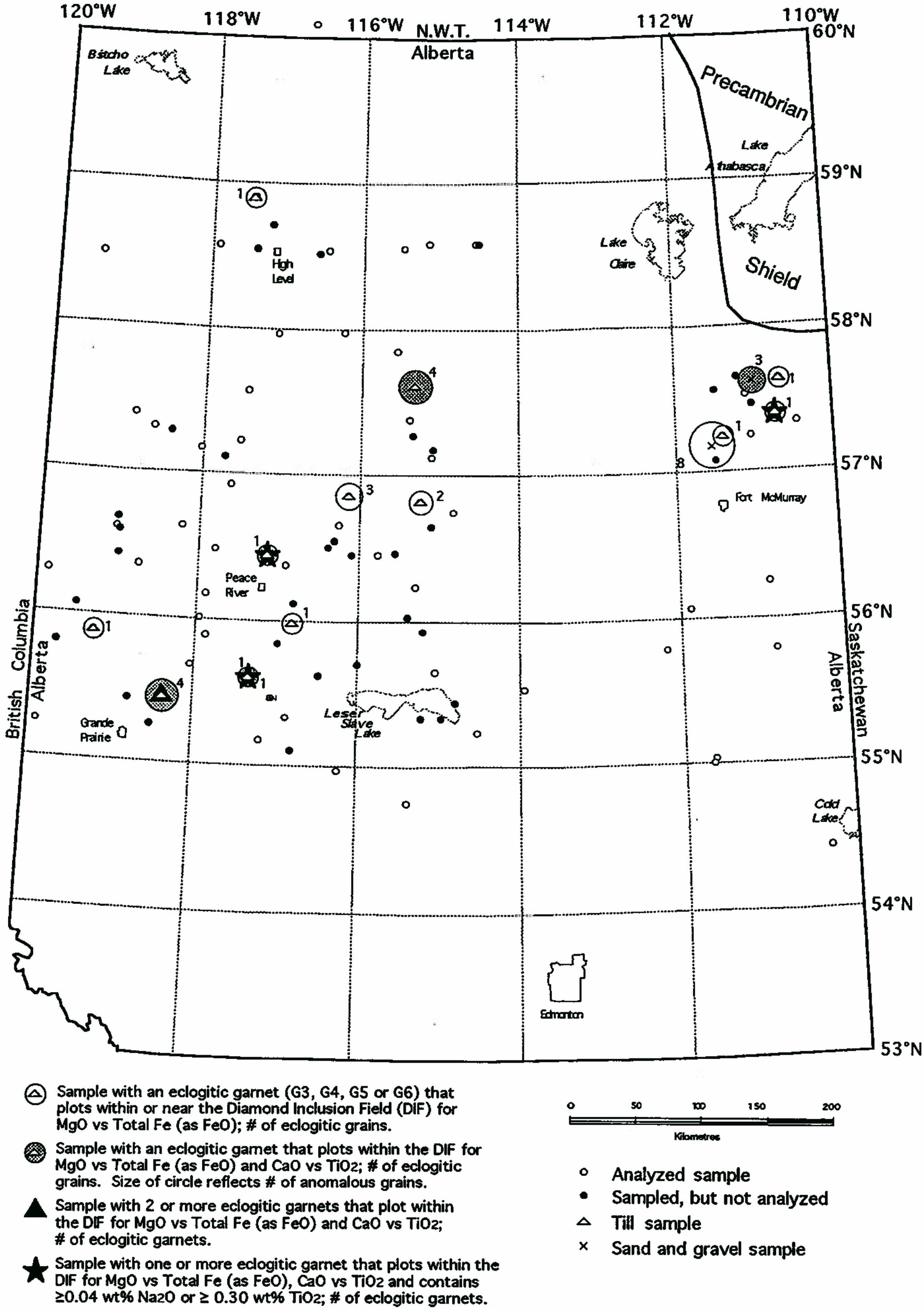


Figure 2.6. Indicator map of G3, G4, G5 and G6 eclogitic garnets.

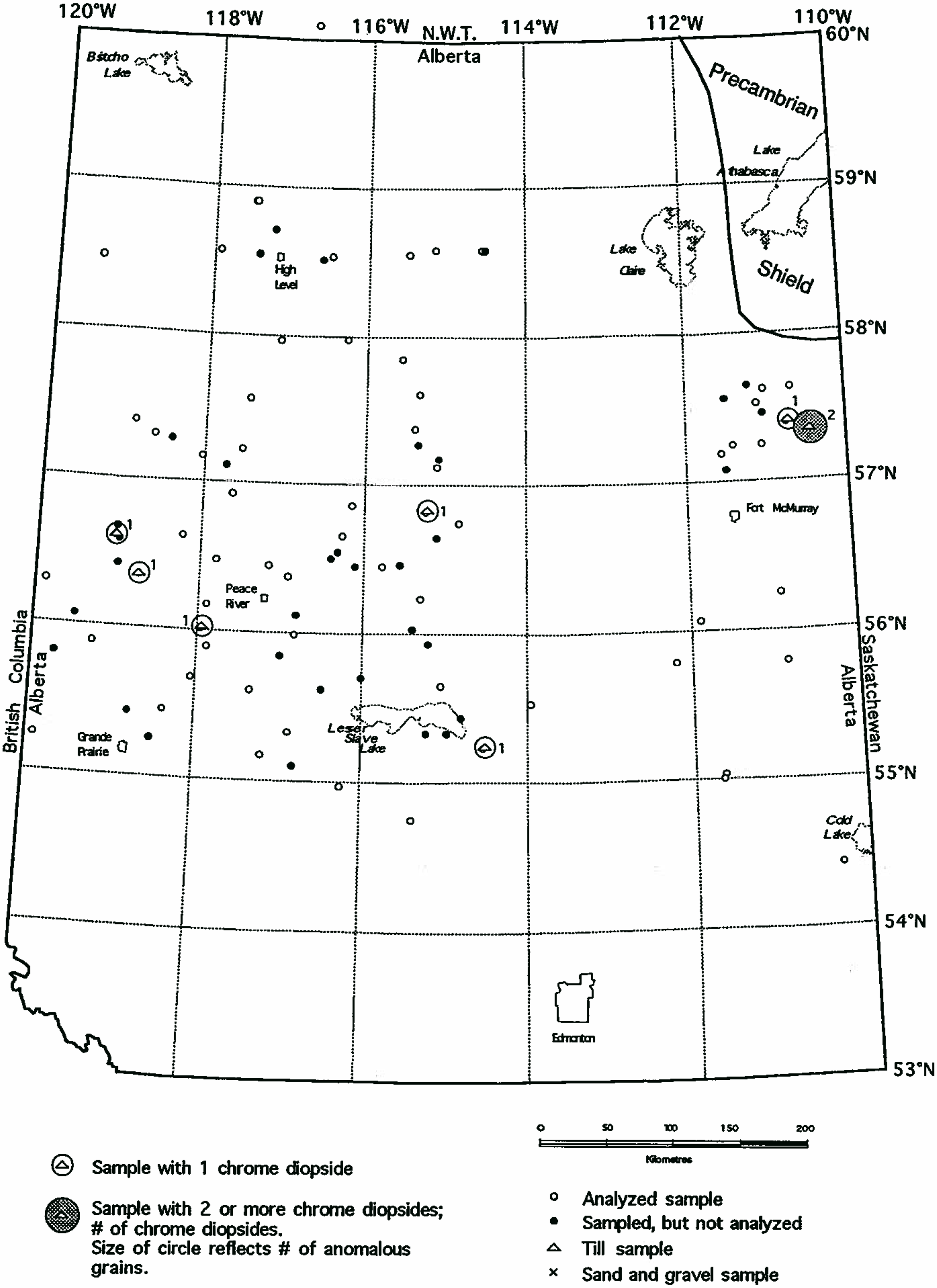


Figure 2.7. Indicator map of chrome diopsides with ≥0.5 wt% Cr_2O_3.

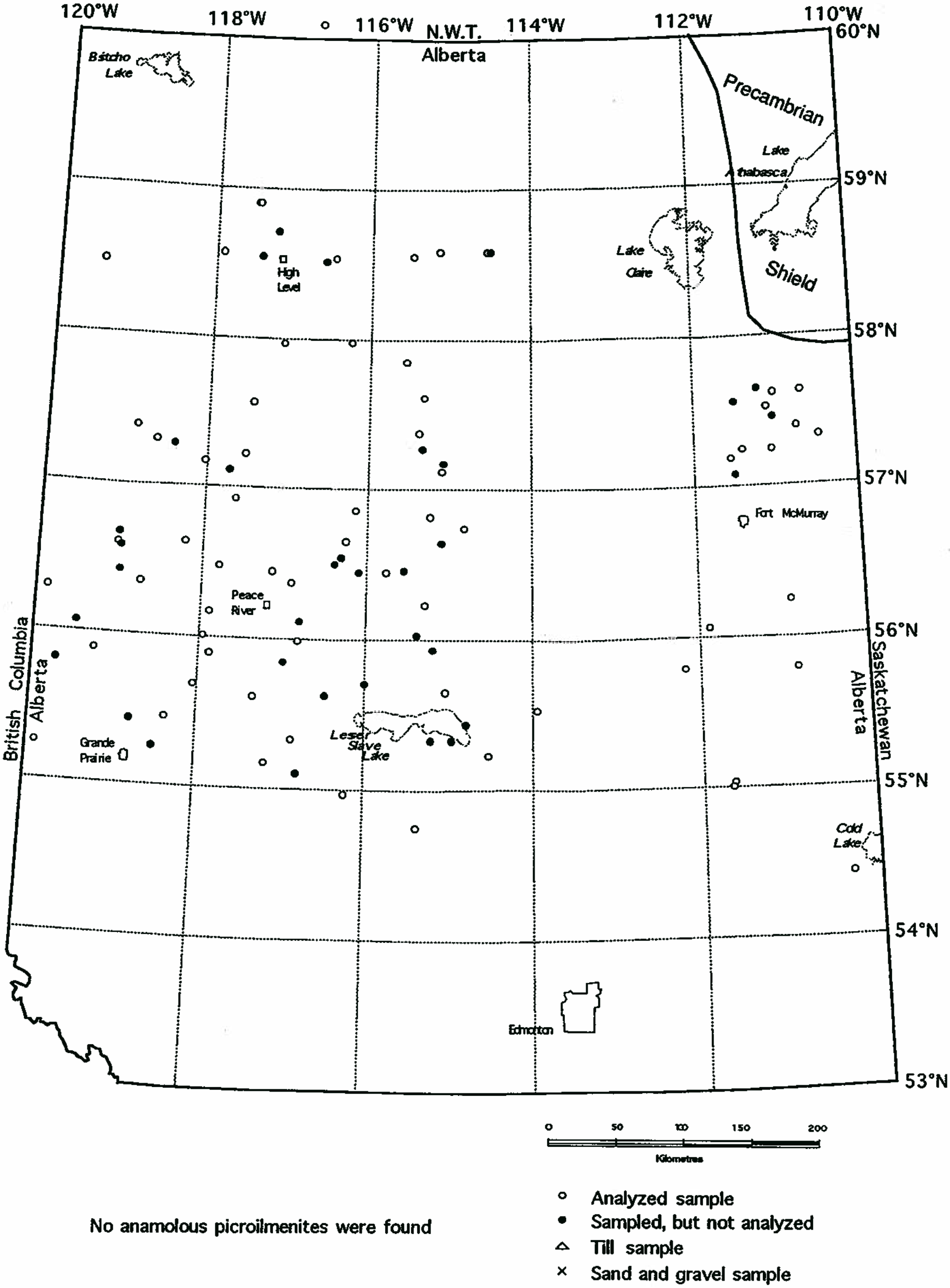


Figure 2.8. Indicator map of picroilmenites with <40 wt% total Fe as FeO and >10 wt% MgO.

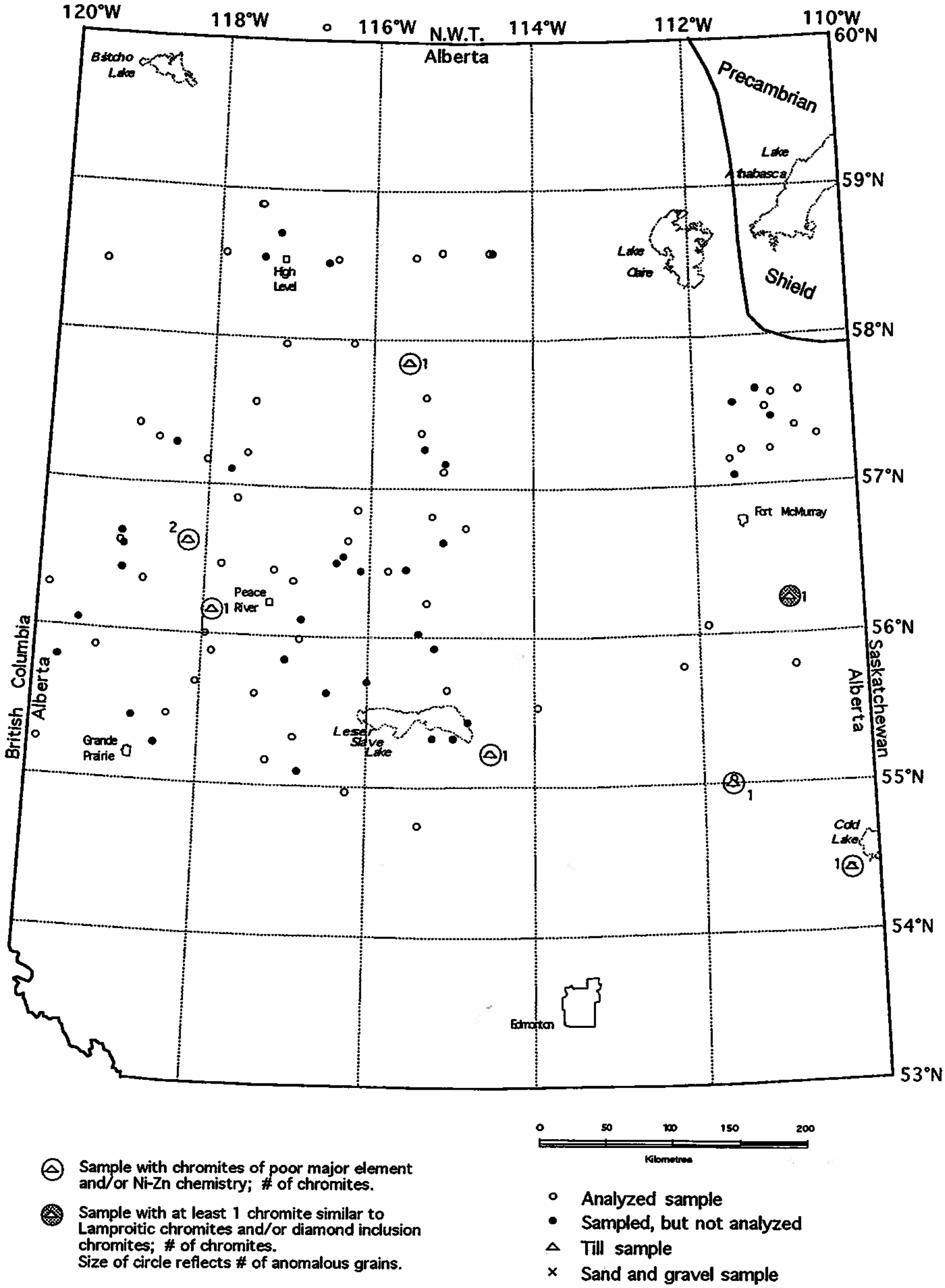
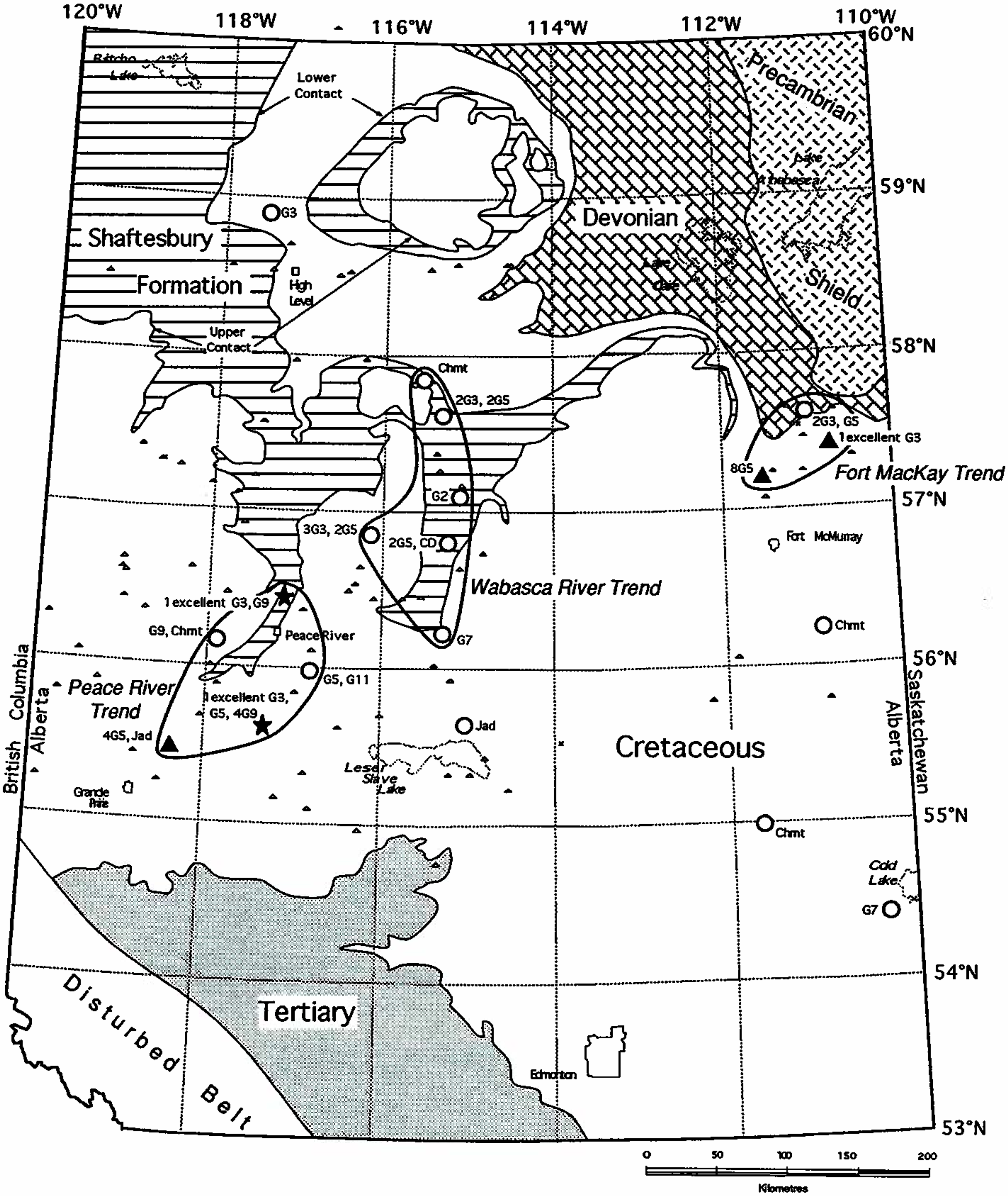


Figure 2.9. Indicator map of anomalous chromites.



★ Sample site with multiple diamond indicator minerals of high quality chemistry; requires follow-up exploration.

▲ Sample site with one or more diamond indicator minerals of good to high quality chemistry; requires follow-up exploration.

○ Sample site with one or more moderate quality diamond indicator minerals; may require follow-up exploration.

Abbreviations:

Chmt = Chromite
Jad = Jadeite
Ky = Kyanite
CD = Chrome Diopside
Pil = Picroilmenite
G1, G2, G3, G4, G5, G7, G9, G10 & G11 = Garnets

▵, × Sample sites (till, sand/gravel)

Figure 2.10. Diamond indicator mineral anomaly summary map.

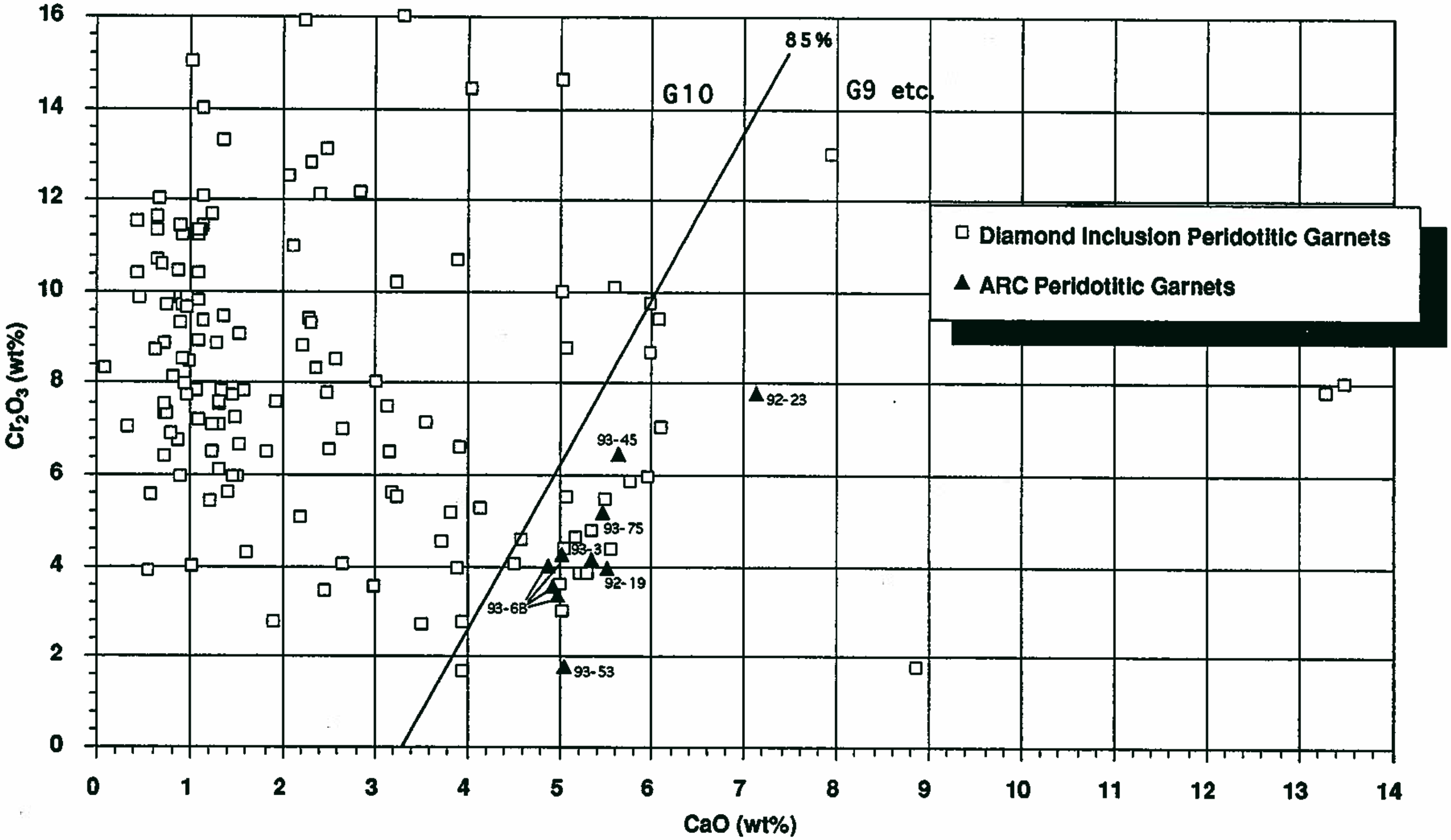


Figure 2.11. CaO vs Cr2O3 For Peridotitic Garnets From Northern Alberta Tills.

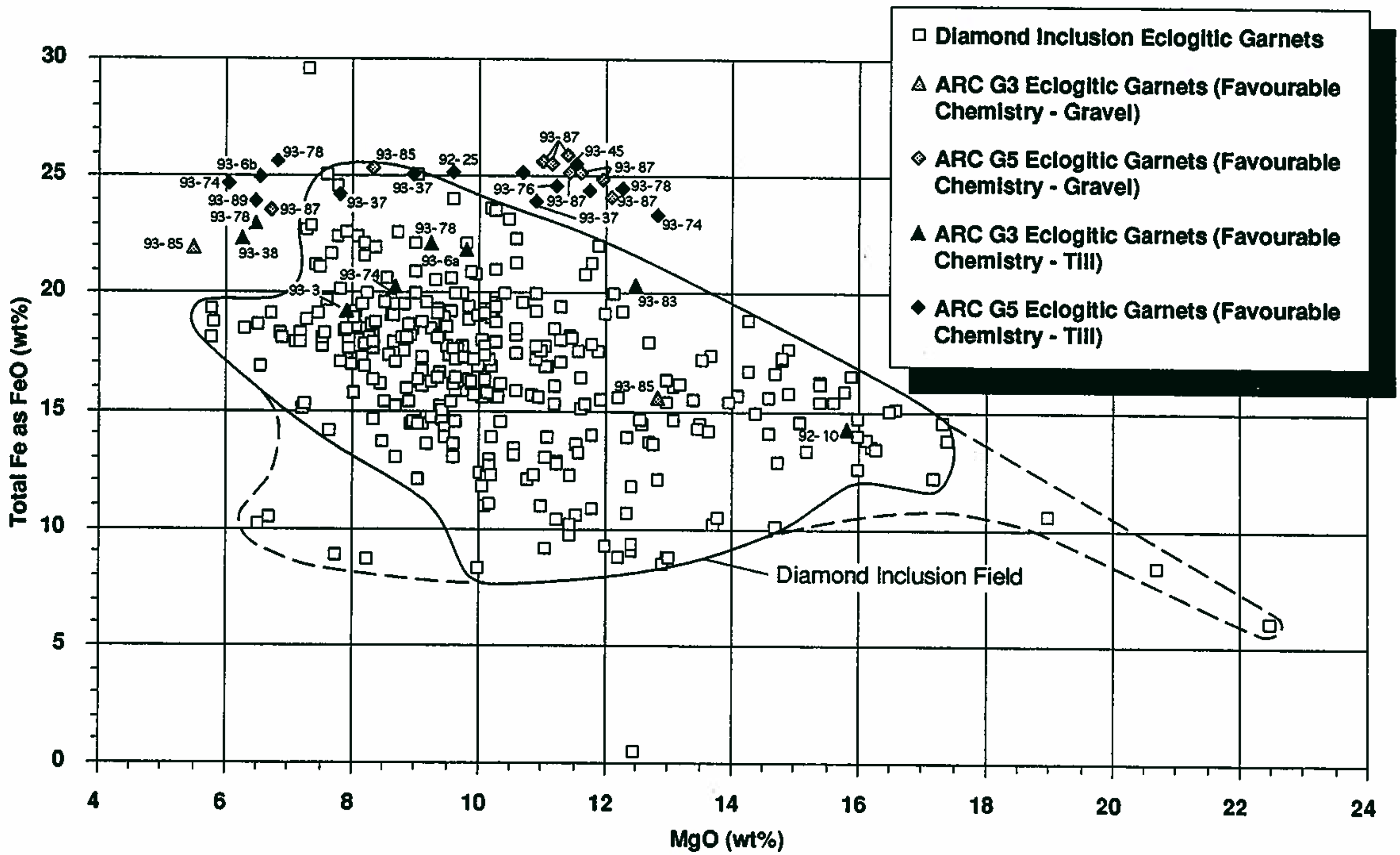


Figure 2.12. MgO vs FeO For Eclogitic Garnets From Northern Alberta Tills and Recent Gravel Deposits

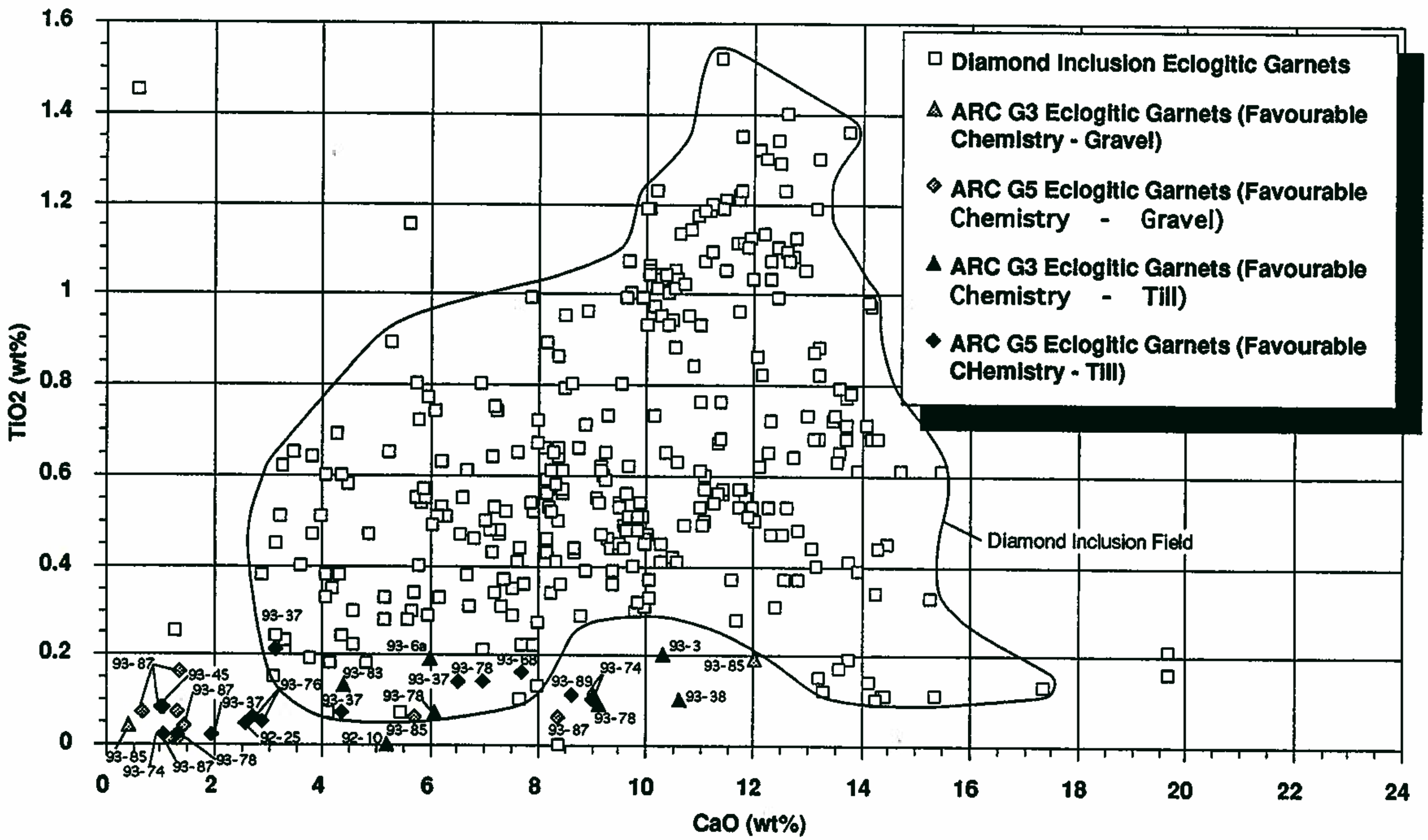


Figure 2.13. CaO vs TiO2 For Eclogitic Garnets From Northern Alberta Tills And Recent Gravel Deposits

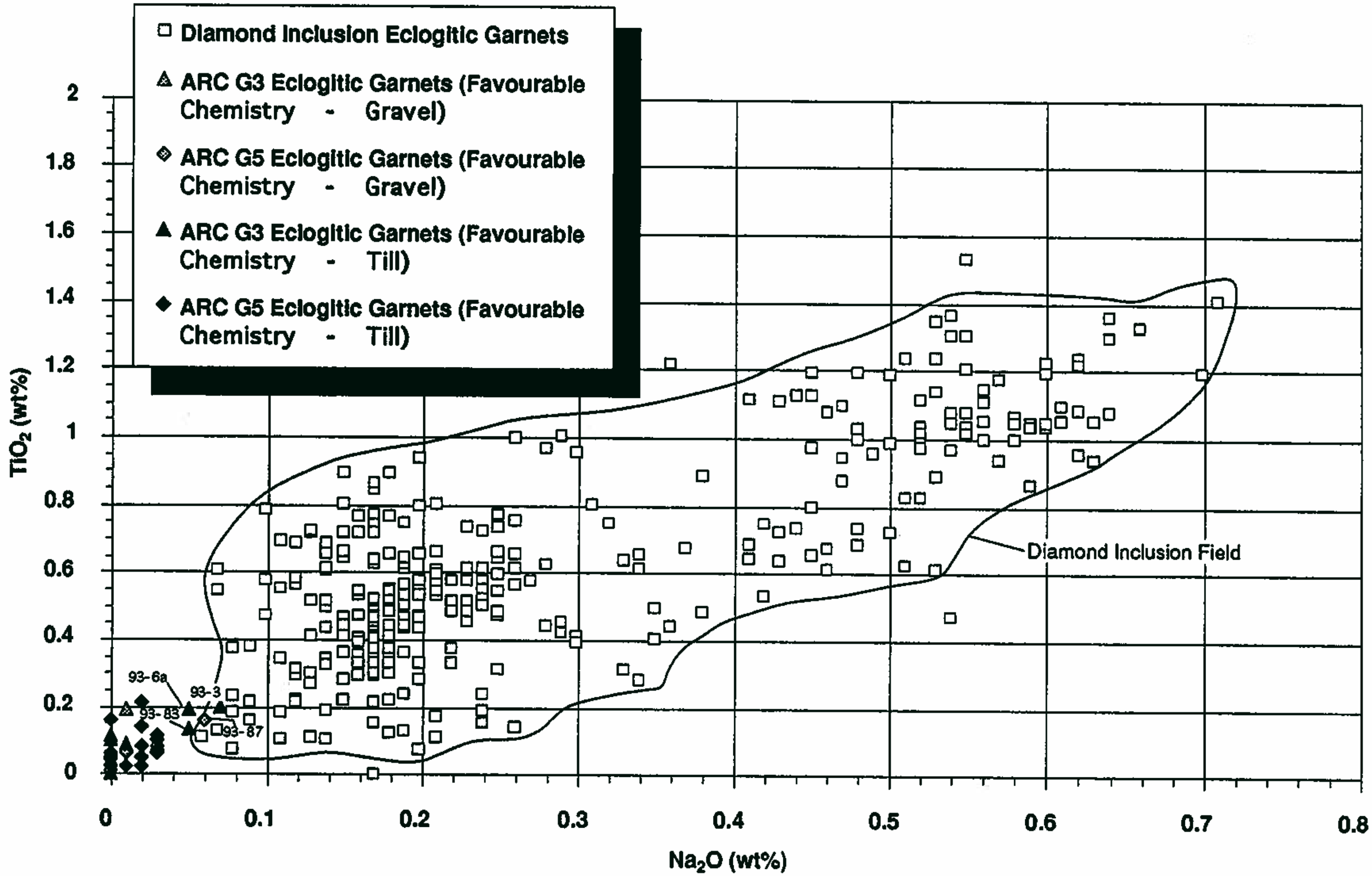


Figure 2.14. Na_2O vs TiO_2 For Eclogitic Garnets From Northern Alberta Tills And Recent Gravel Deposits

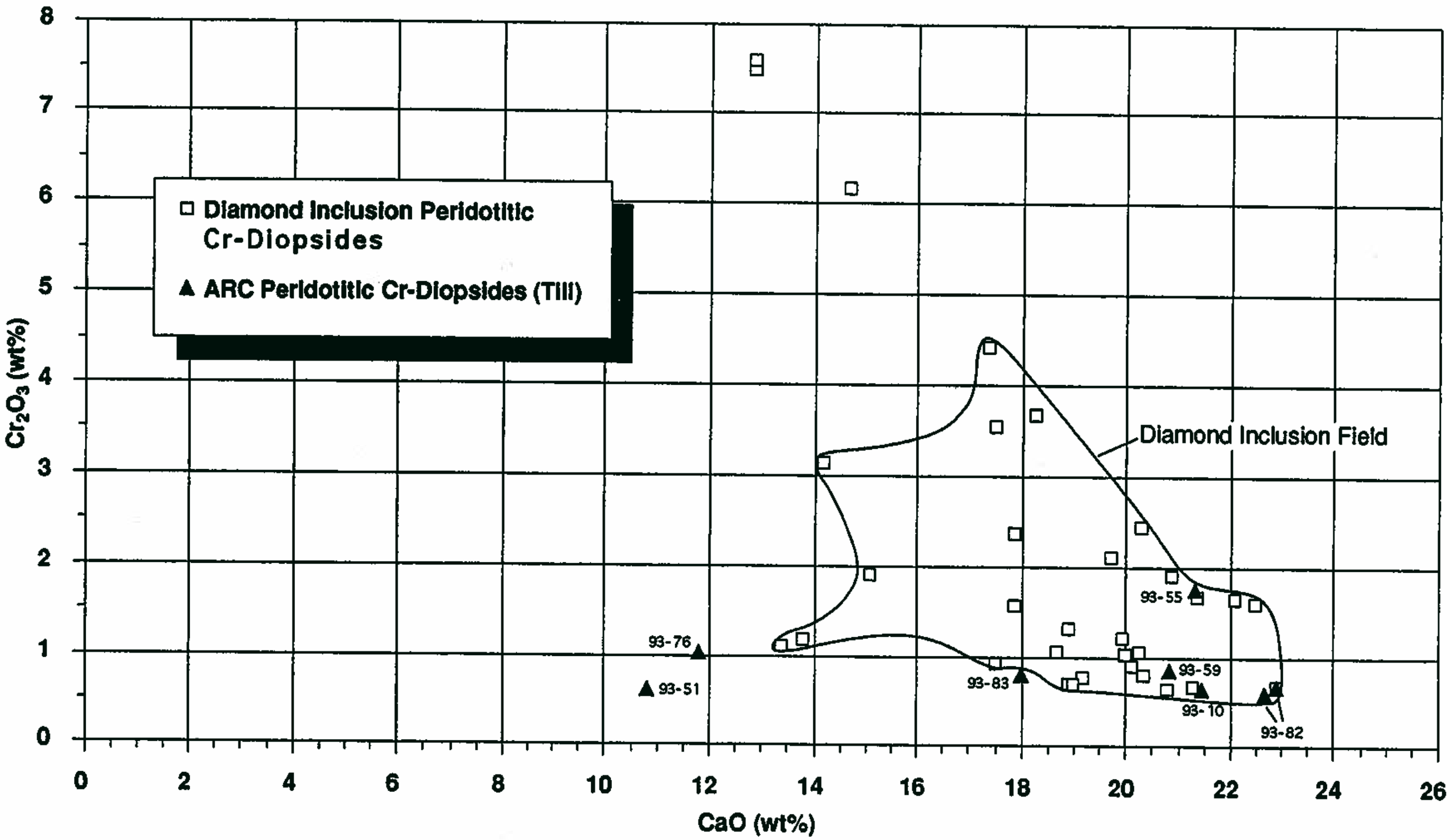


Figure 2.15. CaO vs Cr_2O_3 For Peridotitic Clinopyroxenes From Northern Alberta Tills

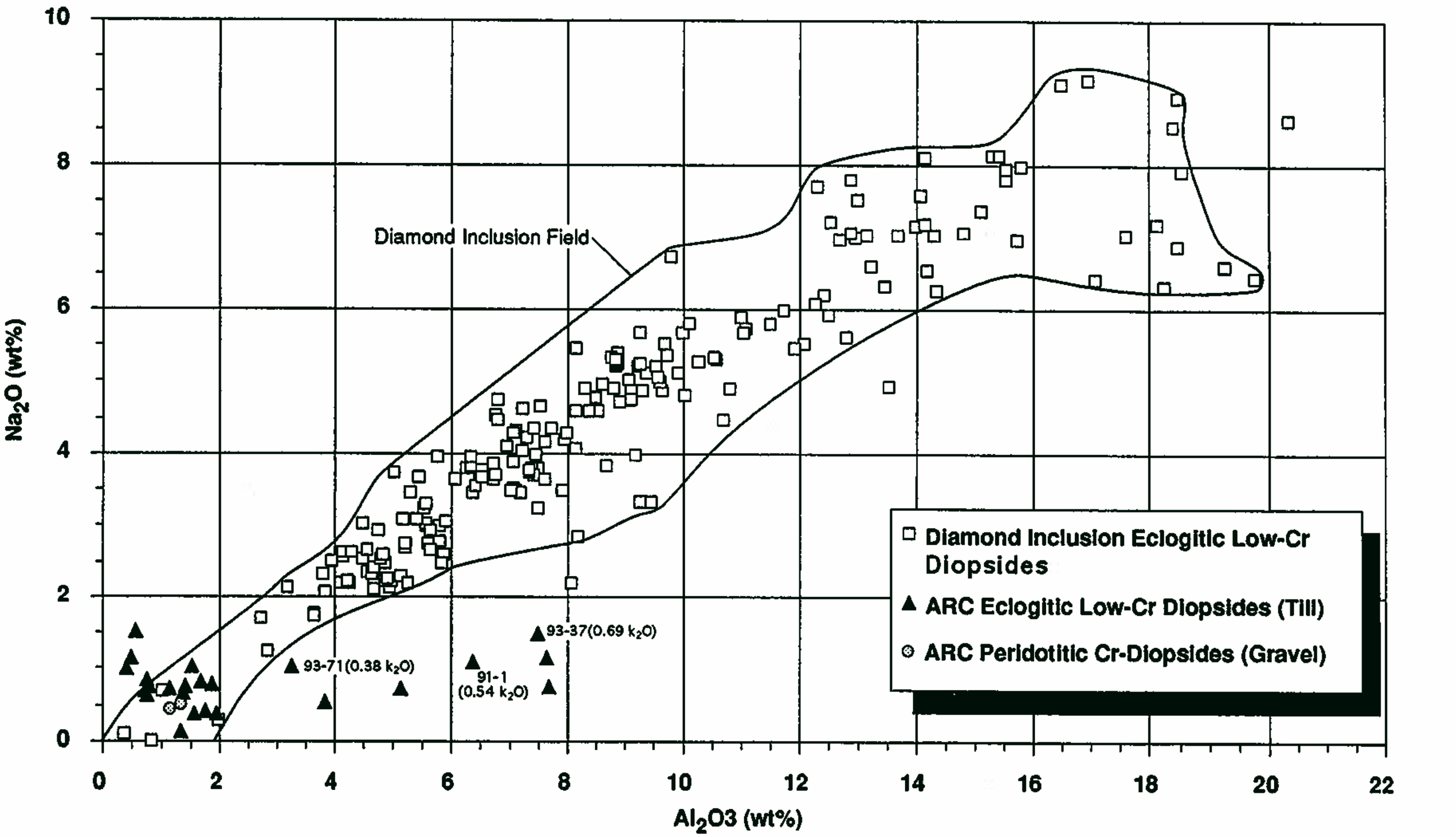


Figure 2.16. Al_2O_3 vs Na_2O For Eclogitic Clinopyroxenes From Northern Alberta Tills and Recent Gravel Deposits

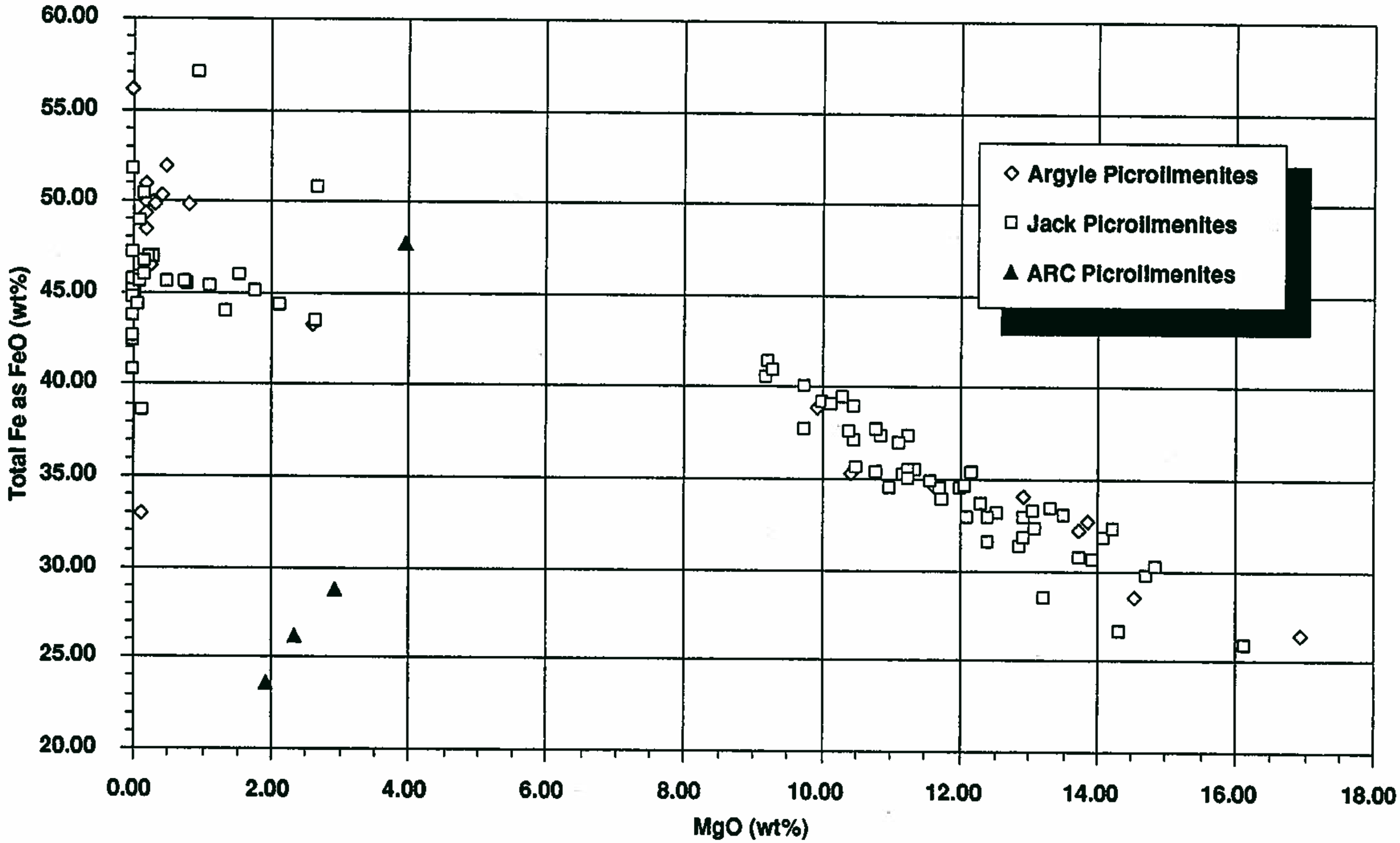


Figure 2.17. MgO vs FeO For Picroilmenites From Northern Alberta Tills

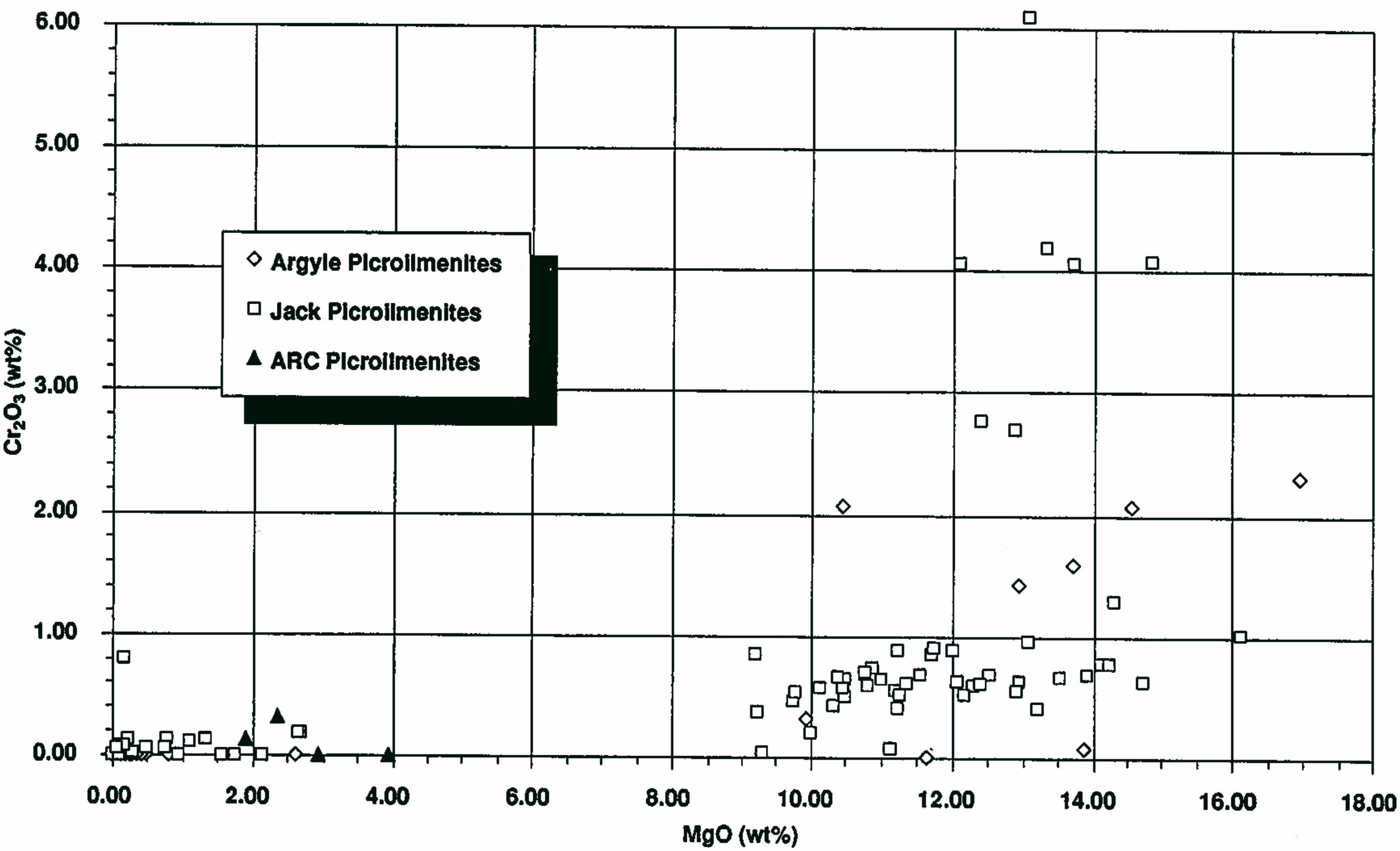


Figure 2.18. MgO vs Cr_2O_3 For Picroilmenites From Northern Alberta Tills

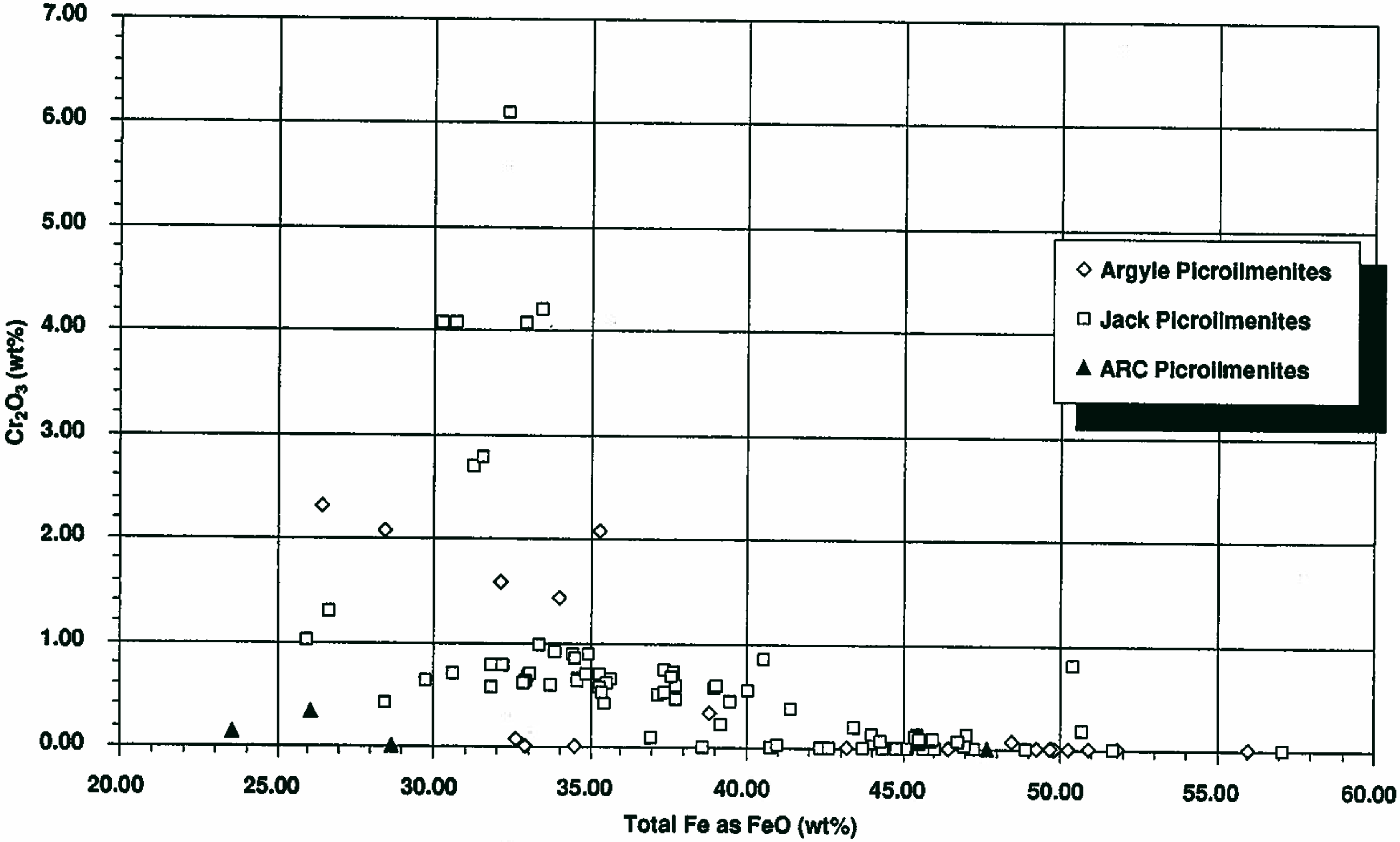


Figure 2.19. Total Fe (as FeO) vs Cr_2O_3 For Picroilmenites From Northern Alberta Tills

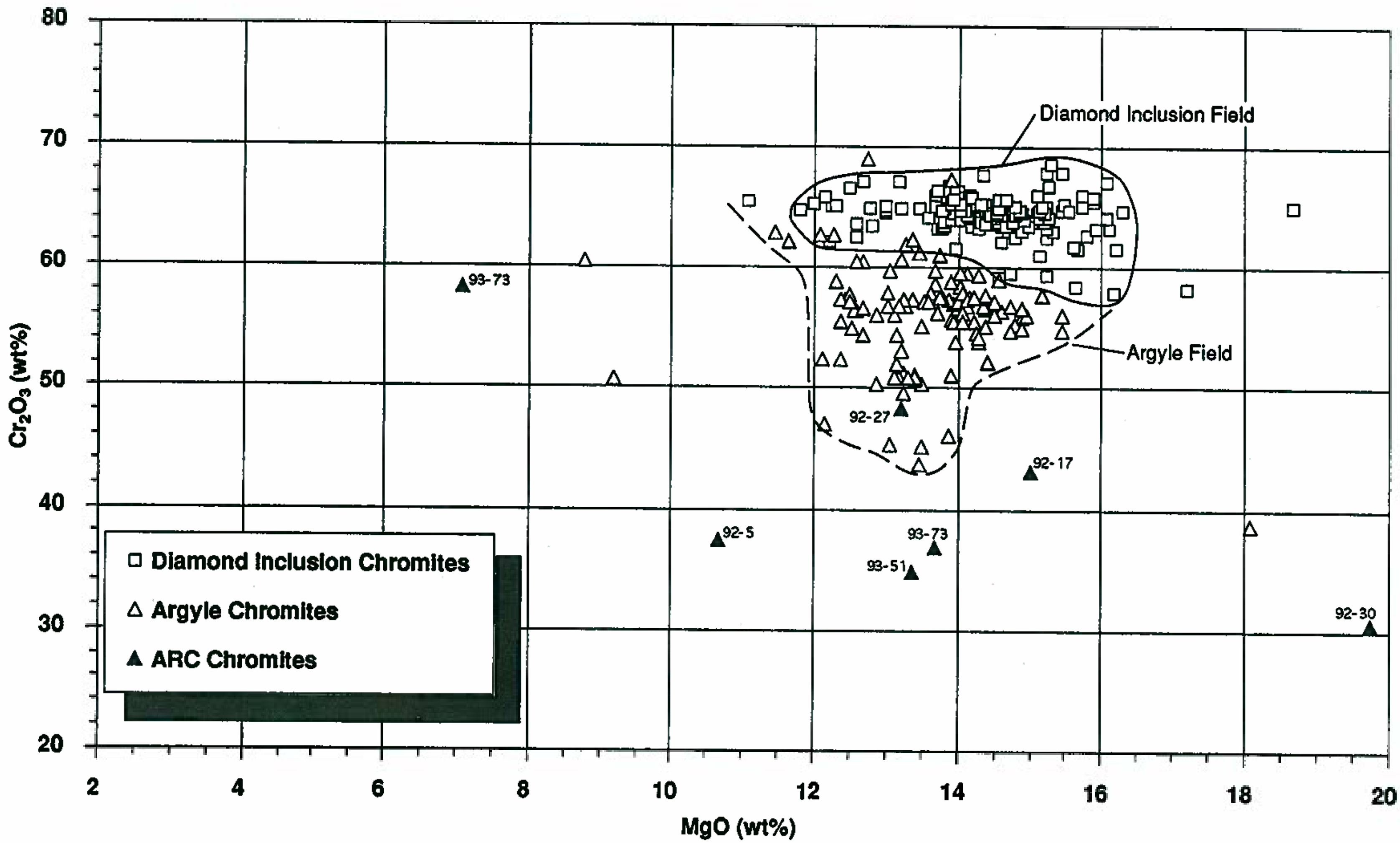


Figure 2.20. MgO vs Cr_2O_3 For Chromites From Northern Alberta Tills

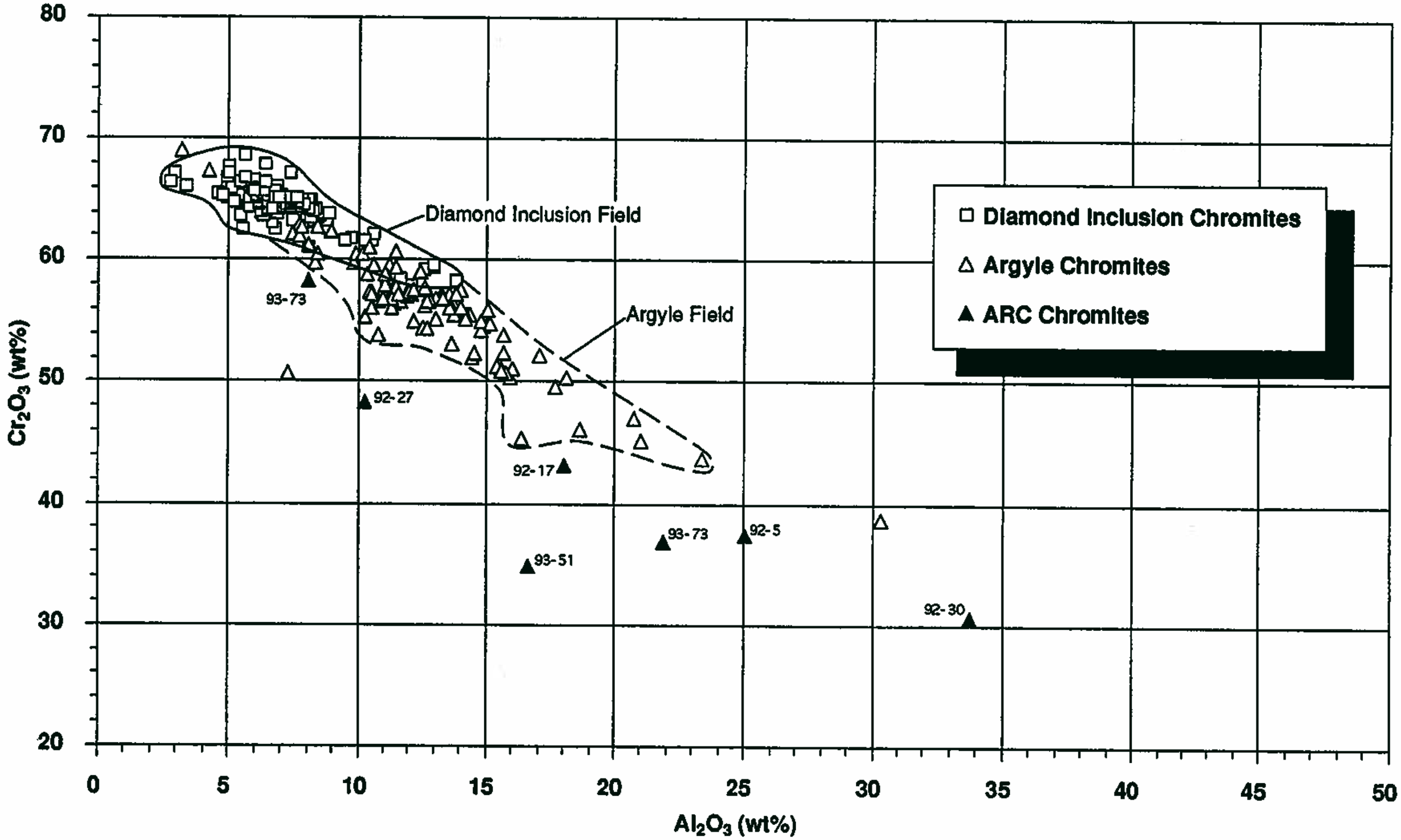


Figure 2.21. Al_2O_3 vs Cr_2O_3 For Chromites From Northern Alberta Tills

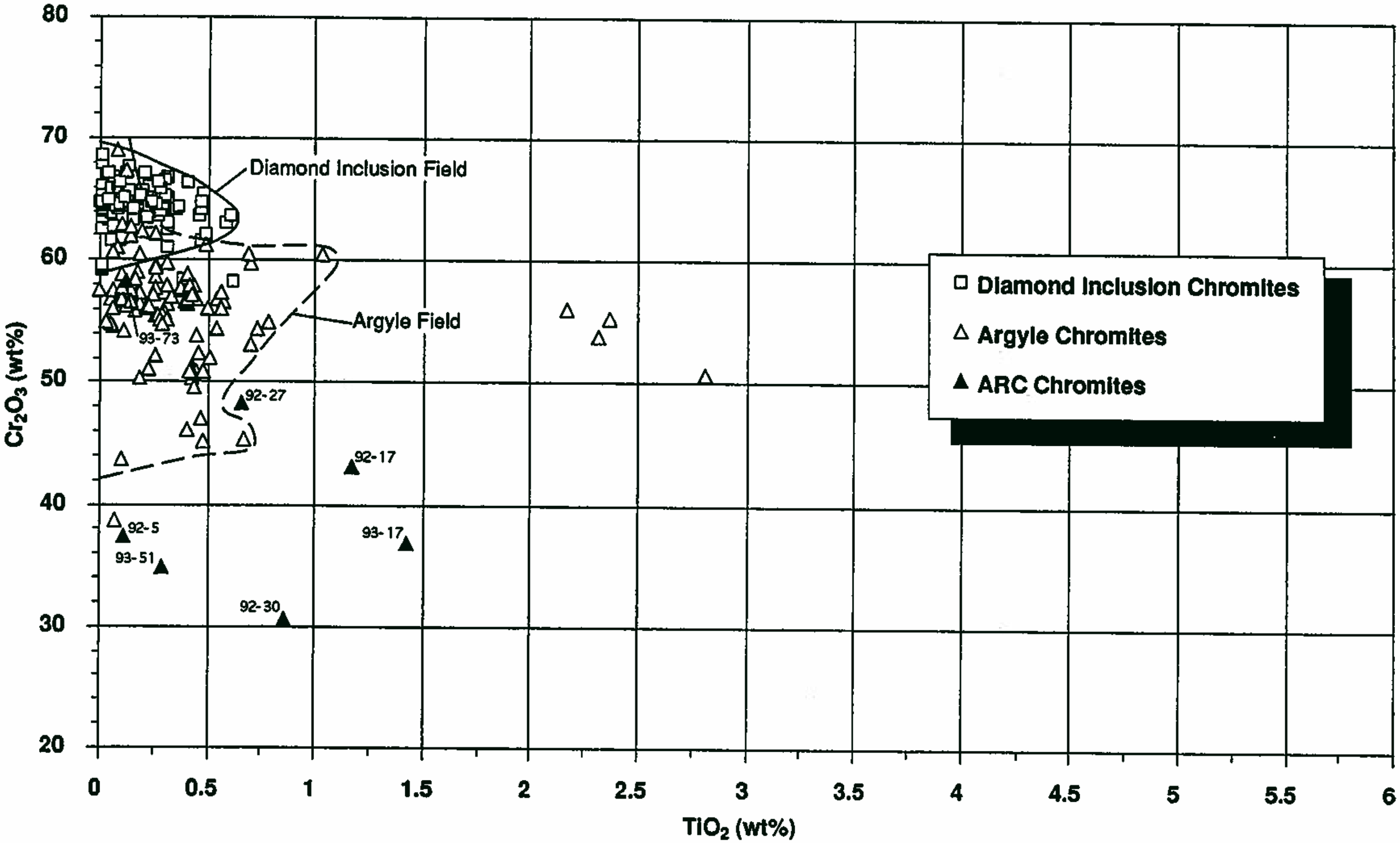


Figure 2.22. TiO_2 vs Cr_2O_3 For Chromites From Northern Alberta Tills

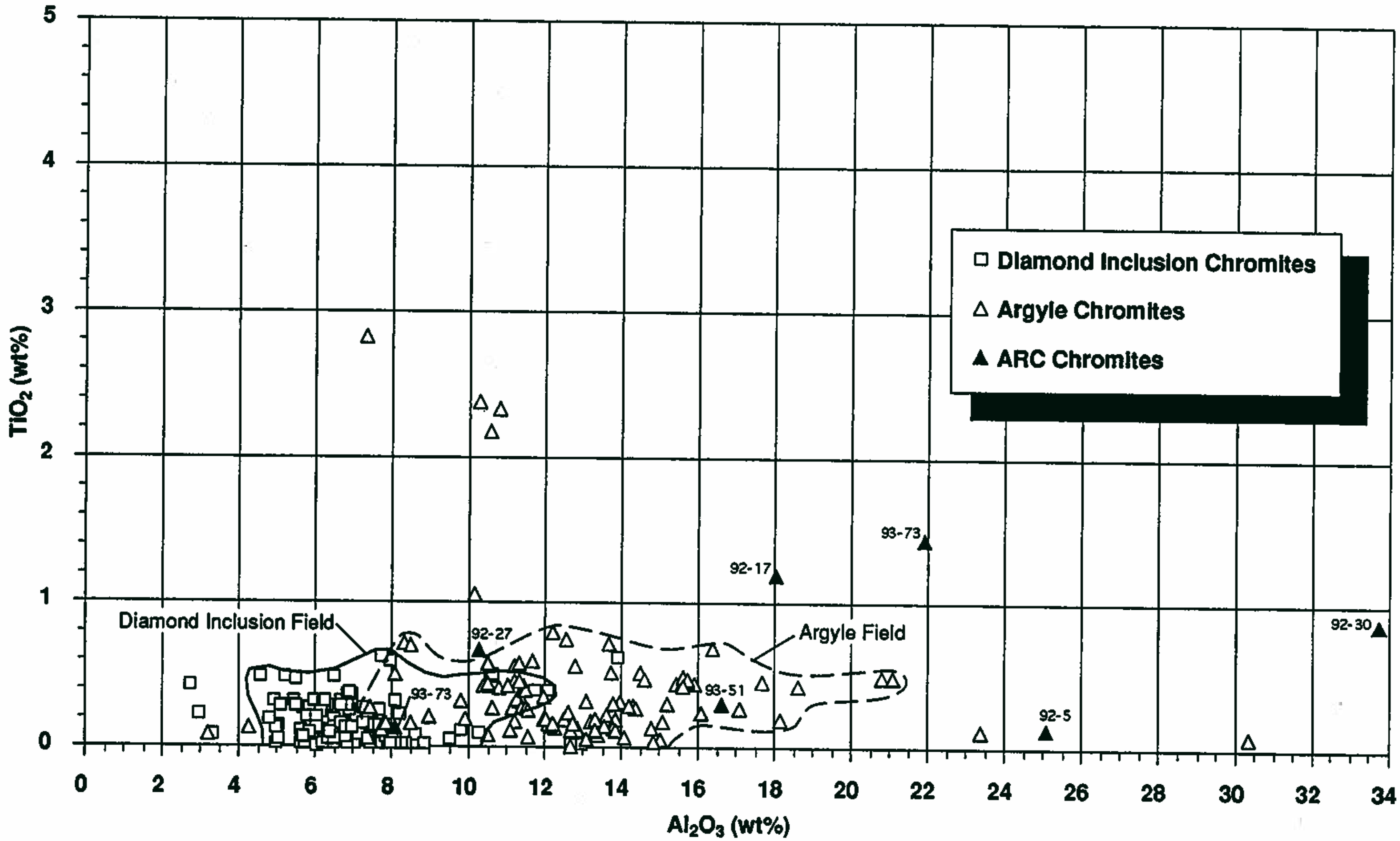


Figure 2.23 Al_2O_3 vs TiO_2 For Chromites From Northern Alberta Tills

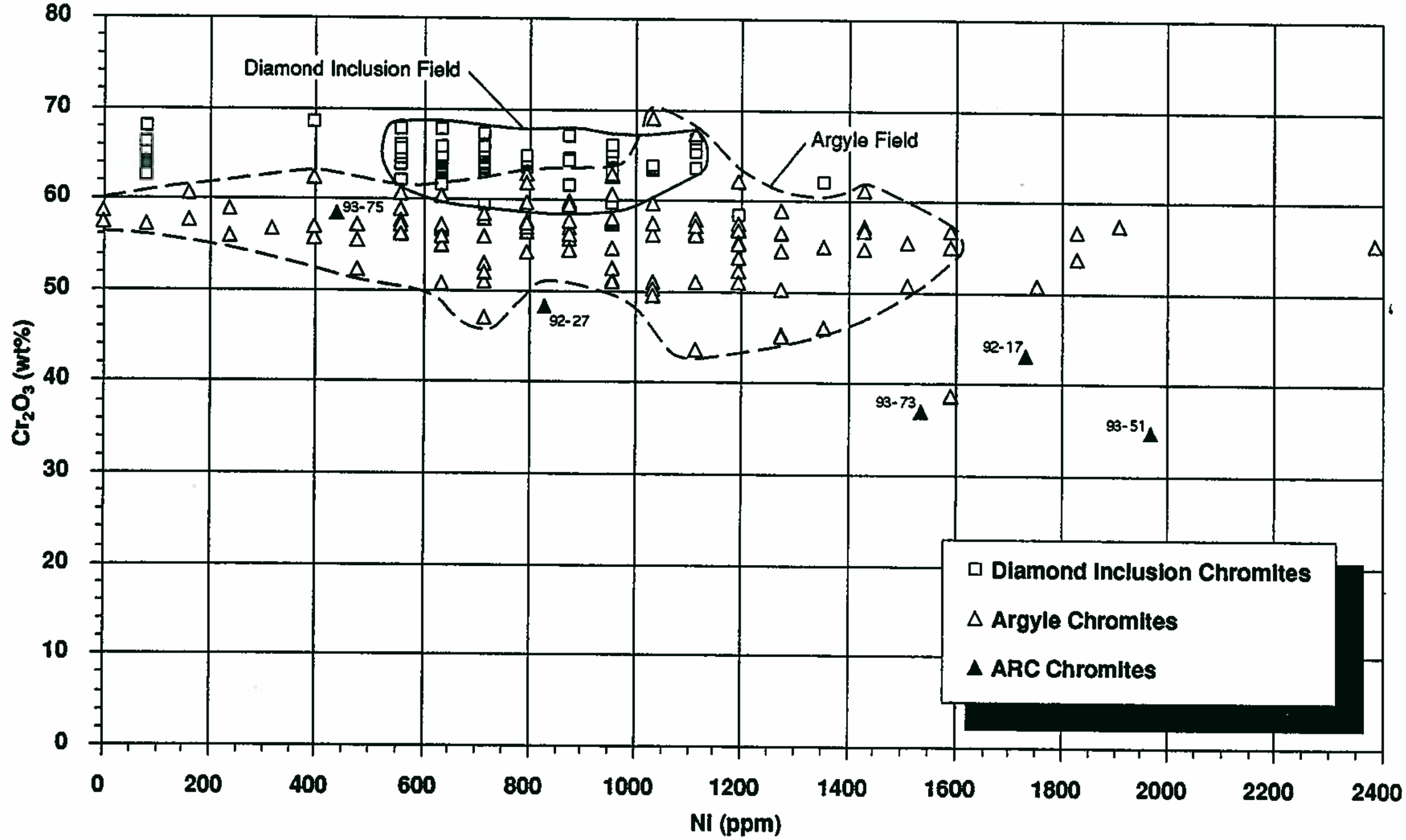


Figure 2.24. Ni vs Cr_2O_3 For Chromites From Northern Alberta Tills

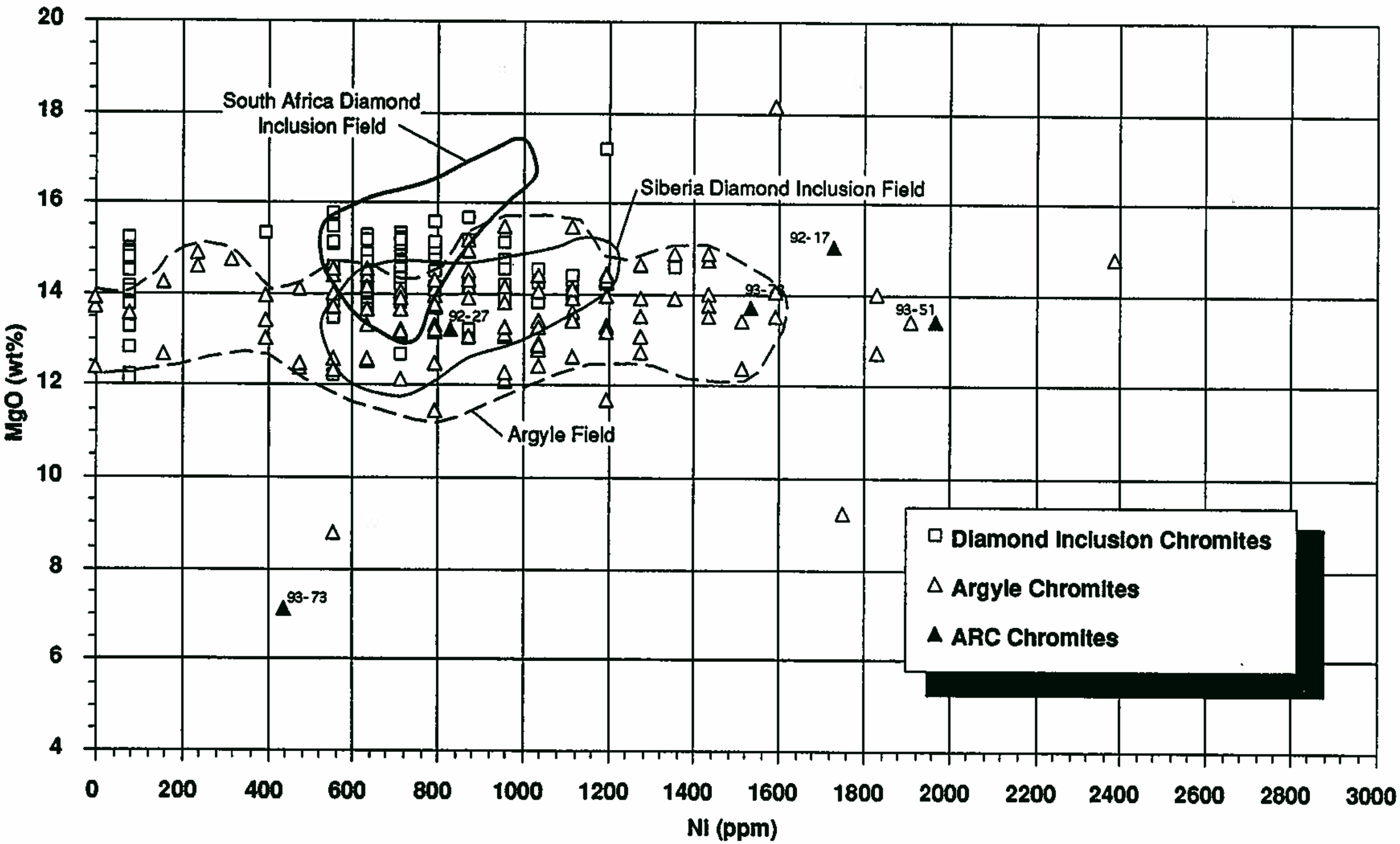


Figure 2.25. Ni vs MgO For Chromites From Northern Alberta Tills

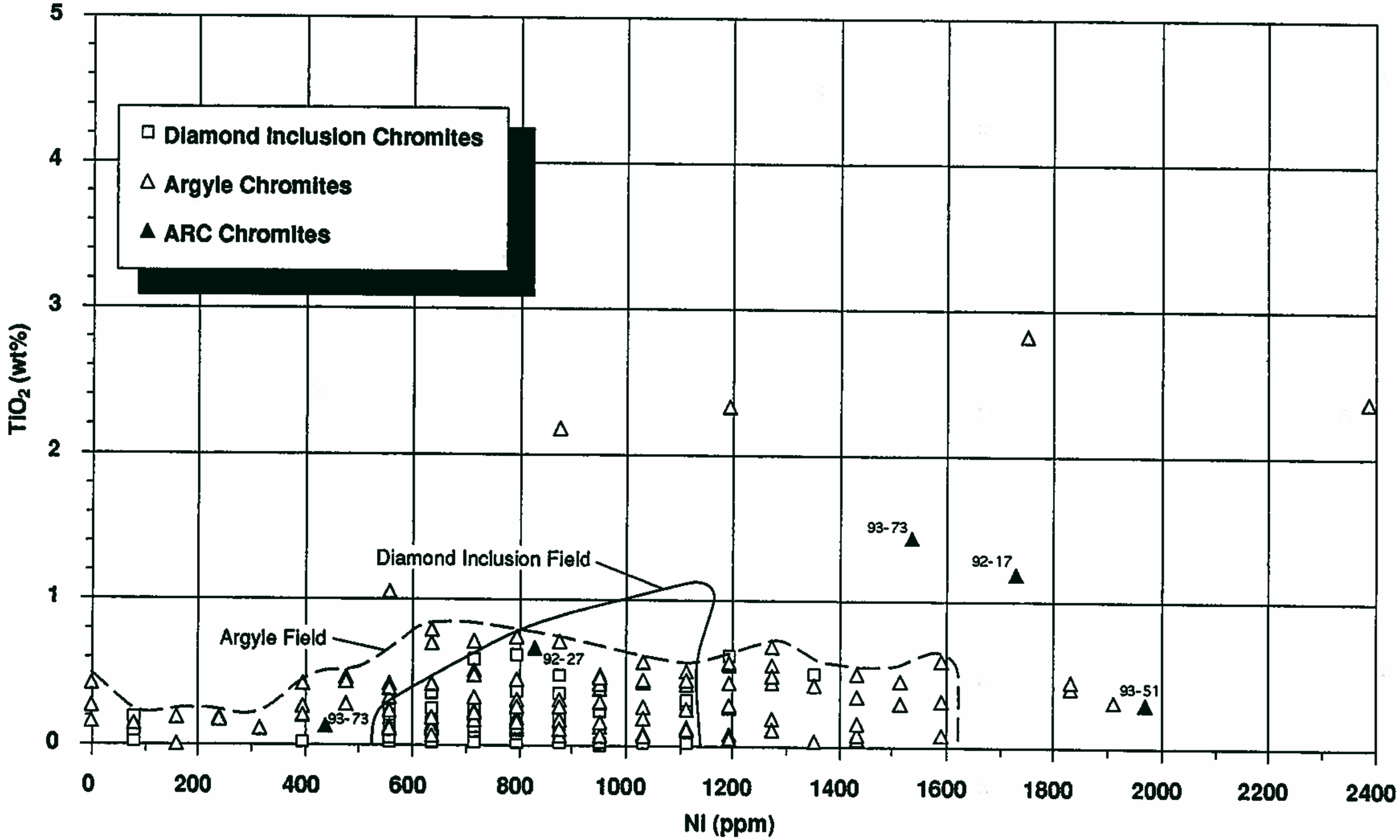


Figure 2.26. Ni vs TiO2 For Chromites From Northern Alberta Tills

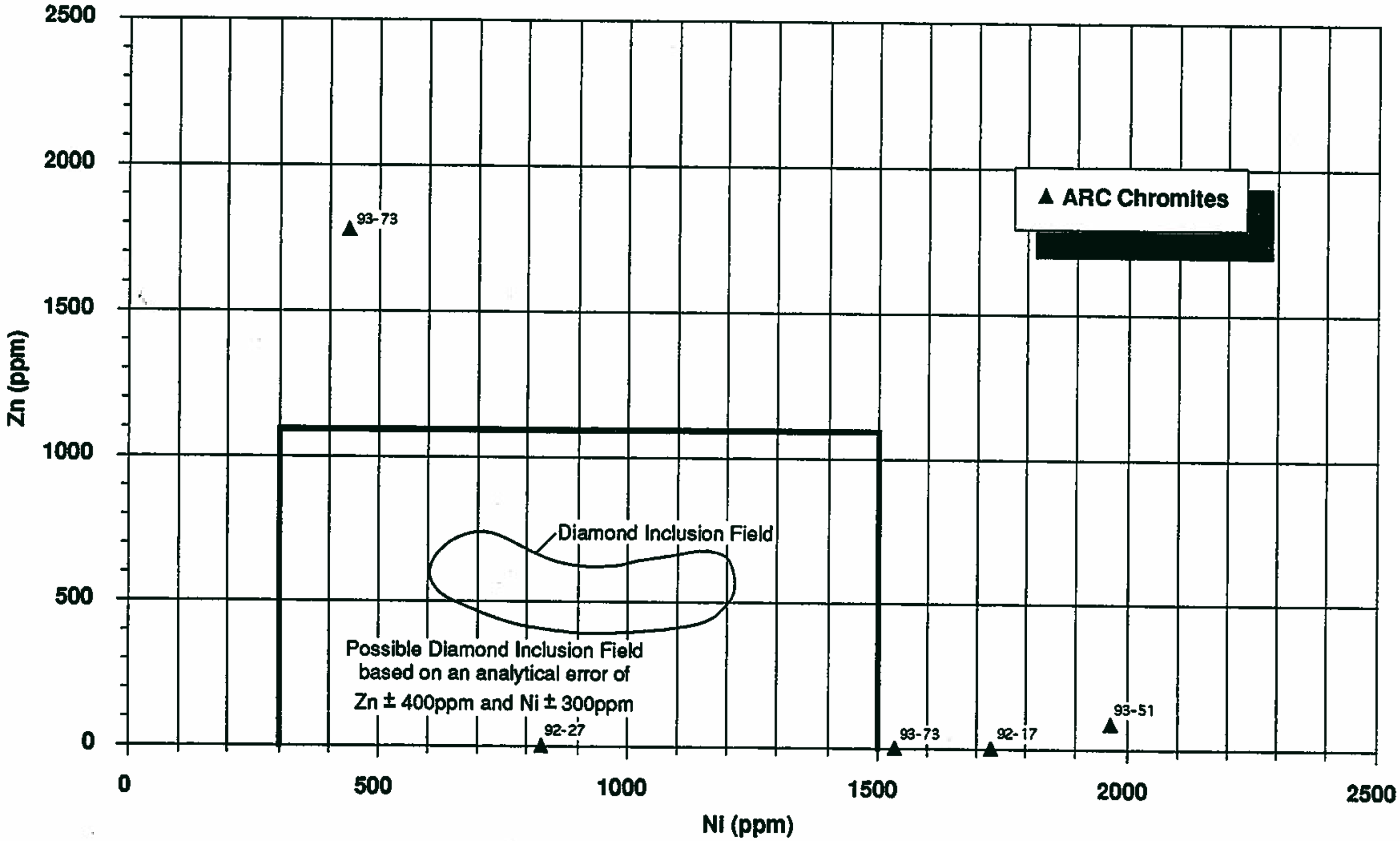


Figure 2.27. Ni vs Zn For Chromites From Northern Alberta Tills

3 TILL MATRIX GEOCHEMISTRY

3.1 PROCEDURES

The matrix fraction (<0.063 mm or <230 mesh) was recovered from the 2 to 3 kg set of samples for geochemical analysis. Each sample was air dried, gently disaggregated to avoid the crushing of rock and mineral grains, and was screened using 2.00 mm and 0.063 mm stainless steel sieves. About 50 grams of the <0.063 mm fraction was recovered from each sample. The remaining part was retained for possible future analysis. Most of the matrix samples were subdivided to provide a subset for atomic absorption (AA) and for neutron activation (NA). The exception were those samples that were collected during the previous years survey: these samples had been subjected to only the AA analyses by the time this report was written.

Prior to submission of the samples to the laboratories, the sample order was randomized and both duplicate and standard samples were inserted. Five percent of the samples submitted were duplicates and standards.

The AA analyses (flame atomic absorption spectrophotometry) were done by Barringer (Alberta) Laboratories, Ltd. Following total digestion of the sample a 1 gram aliquot of the <0.063 mm sample was decomposed with a fuming HF-HClO4-HNO3 mixture and heated to near dryness on a hot plate. The residue was taken into solution with concentrated HCl and, following dilution to a 1 M concentration analysed. The procedure determined the concentration of Silver (Ag), cadmium (Cd), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), vanadium (V), and zinc (Zn). Table 3.1 lists the detection limits.

The neutron activation analyses (NA) used subsamples of about 10 grams to determined the concentrations of silver (Ag), arsenic (As), gold (Au), barium (Ba), bromine (Br), cadmium (Cd), cerium (Ce), cobalt (Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), iridium (Ir), lanthanum (La), lutetium (Lu), molybdenum (Mo), sodium (Na), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), selenium (Se), samarium (Sm), tin (Sn), tantalum,(Ta), terbium (Tb), tellurium (Te), thorium (Th), tungsten (W), uranium (U), ytterbium (Yb), zinc (Zn), and,

Table 3.1. Detection limits of the elements analysed for.

Element Name	Symbol	Method	Detection Limit
silver	Ag	AA	0.2 ppm
cadmium	Cd	AA	0.2 ppm
cobalt	Co	AA	2 ppm
copper	Cu	AA	2 ppm
iron	Fe	AA	0.02%
manganese	Mn	AA	5 ppm
molybdenum	Mo	AA	2 ppm
nickel	Ni	AA	2 ppm
lead	Pb	AA	2 ppm
vanadium	V	AA	5 ppm
zinc	Zn	AA	2 ppm.
silver	Ag	NA	2 ppm
arsenic	As	NA	0.5 ppm
gold	Au	NA	2 ppb
barium	Ba	NA	50 ppm
bromine	Br	NA	0.5 ppm
cadmium	Cd	NA	5 ppm
cerium	Ce	NA	5 ppm
cobalt	Co	NA	5 ppm
chromium	Cr	NA	20 ppm
cesium	Cs	NA	0.5 ppm
europium	Eu	NA	1 ppm
iron	Fe	NA	0.20%
hafnium	Hf	NA	1 ppm
iridium	Ir	NA	50 ppm
lanthanum	La	NA	2 ppm
lutetium	Lu	NA	0.2 ppm
molybdenum	Mo	NA	1ppm
sodium	Na	NA	0.02%
nickel	Ni	NA	10 ppm
rubidium	Rb	NA	5 ppm
antimony	Sb	NA	0.1 ppm
scandium	Sc	NA	0.2 ppm
selenium	Se	NA	5 ppm
samarium	Sm	NA	0.1 ppm
tin	Sn	NA	100 ppm
tantalum	Ta	NA	0.5 ppm
terbium	Tb	NA	0.5 ppm
tellurium	Te	NA	10 ppm
thorium	Th	NA	0.2 ppm
tungsten	W	NA	1 ppm
uranium	U	NA	0.2 ppm
ytterbium	Yb	NA	1 ppm
zinc	Zn	NA	100 ppm
zirconium	Zr	NA	200 ppm
AA	Flame Atomic Absorption Spectrophotometry Analysis		
NA	Neutron Activation Analysis		

zirconium (Zr). Each sample was encapsulated by Becquerel Laboratories, Inc., sealed and irradiated with neutron flux monitors in a 2 megawatt (MW) pool type reactor. Following a 7 day decay period the gamma radiation from the samples was counted for approximately 500 seconds using a high resolution Ge detector system. Table 3.1 lists the detection limits.

The analytical procedures and the chemical elements being measured are the same as those selected by Drs. Garrett and Thorleifson for the complementary Geological Survey of Canada MDA project on till mineralogy and geochemistry in the southern half of Alberta. The same laboratories are being used by both the GSC and AGS.

Also an estimate of total amount of carbonate in the matrix of each sample, was obtained in the field by recording the reaction of the sample to dilute HCl.

3.2 SURFACE SAMPLES

3.2.1 Introduction

The following comments are from a preliminary examination of the data. A more comprehensive analysis will occur after the completion of the sampling, which will be done during the next fiscal year 1994-95.

Data on the composition of the surface till samples, and the shallowest till sample from each of the core holes, were gathered in the field and later from the laboratory geochemical analyses. The results from the geochemical analyses are shown in Appendix 6.2 and Figures 3.1 to 3.85. Figure 3.1 shows the concentration range for each element in histogram format. Summary data such as the average, maximum, minimum, and the 95^{th} and 75^{th} percentile values are shown in Table 3.2. The areal distribution data for each element are shown in a series of bubble plot maps (Figures 3.2 to 3.81): the first shows, for each analytical method, the concentrations for the entire data set and the second shows only the values equal to or greater than the 75^{th} percentile.

Table 3.2. Geochemical data, summary statistics for each element.

Element	Analysis	Units	Detection Limit	Min	Min Calculated	Max	Range	Mean	Median	Midrange	StdDev	95th%ile	75th%ile	#Samples
Ag	NA	ppm	2	2	1	5	4	1.07	1	3	0.406	1	1	119
Ag	AA	ppm	0.2	0.2	0.1	2	1.9	0.27	0.2	1.05	0.221	0.6	0.3	155
As	NA	ppm	0.5	3.2	3.2	27	23.8	14.448	15	15.1	3.56	19	16	119
Au	NA	ppb	2	2	1	25	24	5.03	4	13	4.167	14	6	119
Ba	NA	ppm	50	240	240	1800	1560	930	940	1020	261.196	1300	1100	119
Br	NA	ppm	0.5	0.5	0.25	12	11.75	2.34	2.2	6.13	1.45	4.7	2.8	119
Cd	NA	ppm	5	5	2.5	2.5	0	2.5	2.5	2.5	0	2.5	2.5	119
Cd	AA	ppm	0.2	0.2	0.1	2	1.9	0.21	0.2	1.05	0.184	0.5	0.2	155
Ce	NA	ppm	5	42	42	290	248	67.56	64	166	22.248	82	70	119
Co	NA	ppm	5	5	2.5	28	25.5	13.61	14	15.25	4.28	22	16	119
Co	AA	ppm	2	3	3	18	15	9.53	9	10.5	2.404	14	11	155
Cr	NA	ppm	20	34	34	130	96	91.19	95	82	19.662	120	100	119
Cs	NA	ppm	0.5	1.2	1.2	7.8	6.6	5.22	5.3	4.5	1.256	7	5.9	119
Cu	AA	ppm	2	10	10	47	37	30.96	31	28.5	6.612	41.2	35	155
Eu	NA	ppm	1	1	0.5	3	2.5	0.99	1	1.75	0.421	2	1	119
Fe	NA	%	0.20	1.4	1.4	5.8	4.4	3.33	3.3	3.6	0.688	4.5	3.6	119
Fe	AA	%	0.02	1.50	1.50	6.10	4.60	3.06	3.10	3.80	0.48	3.70	3.30	155
Hf	NA	ppm	1	2	2	13	11	6.2	6	7.5	1.685	10	7	119
Ir	NA	ppb	50	50	25	25	0	25	25	25	0	25	25	119
La	NA	ppm	2	22	22	110	88	38.17	37	66	8.251	48	40	119
Lu	NA	ppm	0.2	0.2	0.1	0.6	0.5	0.18	0.1	0.35	0.106	0.4	0.3	119
Mn	AA	ppm	5	94	94	940	846	280.23	263	517	108.22	461.4	340	155
Mo	NA	ppm	1	1	0.5	4	3.5	0.77	0.5	2.25	0.562	2	1	119
Mo	AA	ppm	2	2	2	8	6	5.05	5	5	1.191	7	6	155
Na	NA	%	0.02	0.14	0.14	2.4	2.26	0.56	0.54	1.27	0.209	0.77	0.61	119
Ni	NA	ppm	10	10	5	87	82	41.39	41	46	15.86	67	51	119
Ni	AA	ppm	2	11	11	52	41	31.99	32	31.5	6.869	44.2	36	155
Pb	AA	ppm	2	10	10	24	14	16.46	17	17	2.257	20	18	155
Rb	NA	ppm	5	36	36	140	104	106.23	110	88	19.139	130	120	119
Sb	NA	ppm	0.1	0.3	0.3	2.8	2.5	1.15	1.1	1.55	0.358	1.7	1.3	119
Sc	NA	ppm	0.2	4.8	4.8	24	19.2	13.2	13	14.4	2.597	17	15	119
Se	NA	ppm	5	5	2.5	2.5	0	2.5	2.5	2.5	0	2.5	2.5	119
Sm	NA	ppm	0.1	3.7	3.7	12.1	8.4	6.39	6.2	7.9	1.134	9.2	6.5	119
Sn	NA	ppm	100	100	50	50	0	50	50	50	0	50	50	119
Ta	NA	ppm	0.5	0.6	0.6	1.9	1.3	1.13	1.1	1.25	0.182	1.5	1.2	119
Tb	NA	ppm	0.5	0.5	0.25	1.6	1.35	0.81	0.8	0.92	0.2	1.3	0.9	118
Te	NA	ppm	10	10	5	5	0	5	5	5	0	5	5	119
Th	NA	ppm	0.2	7.1	7.1	39.8	32.7	11.85	12	23.45	2.884	14	12	119
U	NA	ppm	0.2	1.6	1.6	7.2	5.6	3.89	3.8	4.4	0.868	5.3	4.4	119
V	AA	ppm	5	47	47	214	167	151.25	155	130.5	30.695	196.4	173	155
W	NA	ppm	1	1	0.5	2	1.5	0.84	1	1.25	0.281	1	1	119
Yb	NA	ppm	1	1	1	5	4	2.73	3	3	0.646	4	3	119
Zn	NA	ppm	100	100	50	240	190	105.97	110	145	45.367	180	140	119
Zn	AA	ppm	2	19	19	202	183	102.95	106	110.5	24.803	138.8	116	155
Zr	NA	ppm	200	100	100	570	470	281.68	310	335	123.166	490	360	119

Also an estimate of the carbonate and silt content of each sample are shown as bubble plot maps in Figures 3.82 and 3.83 respectively.

The study region can be grouped into ten subareas for discussion purposes: Grand Prairie, Clear Hills, Winagami, Peace River, Manning, High Level, Peerless Lake, Slave Lake, Bitumount, and Winefred Lake (Figure 3.84).

3.2.2 Variations: Individual Elements and Matrix Carbonate Content And Texture

The range of concentration for each element is shown in Figure 3.1 and Table 3.2. The summary data in Table 3.2 were prepared by assigning each site where the concentration was below the detection limit, a value of one-half of the detection limit prior to calculating the variables shown in the table. Following is a brief discussion of the data for each element

Ag: silver, as determined by AA, varies from 2 ppm to below the detection limit of 0.2 ppm and averages 0.27 ppm (Figure 3.1, and Table 3.2 for each element in this section). Silver is found throughout the area, with the higher concentrations in the west half and the highest Ag in till north of Grand Prairie and south of High Level (Figures 3.2 to 3.35 and 3.84).

As: arsenic, as determined by NA, varies from 3.2 ppm to 27 ppm and averages 14.4 ppm. Arsenic is found in till throughout Northern Alberta with the higher concentrations in the western and northern portions of the area. (Figures 3.6 and 3.7).

Au: gold, as determined by NA, varies from 25 ppb to below the detection limit of 2 ppb ppm and averages 5.03 ppb. Gold is found throughout the area, with the higher concentrations in the western and central portion. The highest values are in the Clear Hills (Figures 3.8 and 3.8).

Ba: barium, as determined by NA, varies from 1800 ppm to 240 ppm and averages 930 ppm. Barium is found throughout northern Alberta, with the higher concentrations in the western half (Figures 3.10 and 3.11).

Br: bromine, as determined by NA, varies from 12 ppm to below the detection limit of 0.5 ppm and averages 2.34 ppm. Bromine is found throughout the area, with the higher concentrations being north of Fort McMurray, west of High Level and within the Peace River subarea (Figures 3.12 and 3.13).

Cd: cadmium, as determined by AA, varies from 2 ppm to below the detection limit of 0.2 ppm and averages 0.21 ppm; many sites are below the detection limit. Cadmium is confined primarily to the west half of the study area, with the higher concentrations in the Peace River subarea (Figures 3.14 and 3.15).

Ce: cerium, as determined by NA, varies from 42 ppm to 290 ppm and averages about 67.6 ppm. Cerium is found throughout the area, with the higher concentrations in the Clear Hills and Peace River subareas (Figures 3.16 and 3.17).

Co: cobalt, as determined by AA, varies from 3 to 18 ppm and averages 9.53 ppm. Cobalt is found throughout the area, with the higher concentrations being in the west half (Figures 3.18 to 3.21).

Cr: chromium, as determined by NA, varies from 34 ppm to 130 ppm and averages about 91.2 ppm. Chromium is found throughout the area, with the higher concentrations in the Clear Hills, Winagami, and Peace River areas (Figures 3.22 and 3.23).

Cs: cesium as determined by NA, varies from 1.2 to 7.8 ppm and averages about 5.2 ppm. This element is found throughout the area, with the higher concentrations in the Clear Hills, Winagami, and Peace River areas (Figures 3.24 and 3.25).

Cu: copper, as determined by NA, varies from 10 to 47 ppm and averages about 31 ppm. Copper is found throughout the area, with the higher concentrations in the Clear Hills, Winagami, Peace River and the High Level areas (Figures 3.26 and 3.27).

Eu: europium, as determined by NA, varies from 0.5 ppm to 3 ppm and averages 0.99 ppm. Europium is found throughout the area, with the higher concentrations in the Peace River and Winagami subareas. There is also one high value in the Clear Hills and southeast of Peace River respectively (Figures 3.28 and 3.29).

Fe: iron, as determined by AA, varies from 1.5 % to 6.1% and averages 3.06%.. Iron is found throughout the area, with local higher concentrations in most areas and the highest in the Bitumount subarea north of Fort McMurray (Figures 3.30 to 3.33 and 3.84).

Hf: hafnium, as determined by NA, varies from 2 ppm to 13 ppm and averages 6.2 ppm. The distribution of hafnium in northern Alberta contrasts with that of most of the other elements. Although hafnium is detectable throughout the area, the highest concentrations in the Bitumount area as well as the Peerless Lake and Slave Lake areas (Figures 3.34. 3.35 and 3.84).

Ir: iridium, as determined by NA, is below the detection limit of 50 ppb throughout northern Alberta.

La: lanthanum, as determined by NA, varies from 22 ppm to 110 ppm and averages about 38.2 ppm. Lanthanum is found throughout the area, with the higher concentrations in the west and central portions of the area (Figures 3.36 and 3.37).

Lu: lutetium, as determined by NA, varies from below the detection limit of 0.2 ppm to 0.6 ppm and averages 0.18 ppm (Figure 3.1 and Table 3.2). Lutetium is found throughout the area, with the higher concentrations in the central and west central portions of the area (Figures 3.38 and 3.39).

Mn: manganese, as determined by AA, varies from 94 ppm to 940 ppm and averages 280 ppm Manganese is found throughout the area, however the higher concentrations are found in the Bitumount and Winagami subareas as well as the central and west central portions of the region (Figures 3.40 and 3.41).

Mo: molybdenum, as determined by AA, varies from 2 ppm to 8 ppm and averages about 5 ppm. Molybdenum is found throughout the area, with the higher concentrations in the west-central portions of the area (Figures 3.42 to 3.45).

Na: sodium, as determined by NA, varies from 0.14 % to 2.4 % and averages 0.56 %.. Sodium is found throughout the area, with the higher concentrations in the Peace River, Winagami, and Grand Prairie subareas (Figures 3.46 and 3.47).

Ni: nickel, as determined by AA, varies from 11 ppm to 52 ppm and averages about 32 ppm. Nickel is found throughout the area, with the higher concentrations in the west half (Figures 3.48 to 3.52).

Pb: lead, as determined by AA, varies from 10 ppm to 24 ppm and averages about 16.5 ppm. Lead is found throughout the area, with the higher concentrations in the western half of the area and the Bitumount subarea (Figures 3.52 and 3.53).

Rb: rubidium, as determined by NA, varies from 36 to 140 ppm and averages about 106 ppm. Rubidium is found throughout the area, however the higher concentrations are confined to the Clear Hills, Peace River and Winagami subareas (Figures 3.54 and 3.55).

Sb: antimony, as determined by NA, varies from 0.3 ppm to 2.8 ppm and averages about 1.2 ppm. Antimony is found throughout the area, with the higher concentrations in the Clear Hills and Peace River subareas (Figures 3.56 and 3.57).

Sc: scandium, as determined by NA, varies from 4.8 to 24 ppm and averages 13.2 ppm. Scandium is found throughout the area, with the higher concentrations primarily in the Clear Hills, Peace River, and Winagami subareas (Figures 3.58 and 3.59). Two sites with higher values are also found in the Slave Lake subarea (Figure 3.84).

Se: selenium, as determined by NA, was below the detection limit of 5 ppm throughout the area.

Sm: samarium, as determined by NA, varies 3.7 ppm to 12.1 ppm and averages 6.4 ppm. Samarium is found throughout the area, with the higher concentrations in the Slave Lake, Clear Hills, Peace River, and Winagami subareas (Figures 3.60 and 3.61).

Sn: tin, as determined by NA, is below the detection limit of 100 ppm throughout the area.

Ta: tantalum, as determined by NA, varies from 0.6 ppm to 1.9 ppm and averages about 1.1 ppm. Tantalum is found throughout the area, with the higher concentrations in the Slave Lake, Clear Hills, Peace River, and

Winagami subareas (Figures 3.62, 3.63 and 3.84).

Tb: terbium, as determined by NA, varies from below the detection limit of 0.5 ppm to 1.6 ppm and averages 0.81 ppm. Terbium is found throughout the area, with the higher concentrations mainly in the Clear Hills, Peace River and Slave Lake subareas (Figures 3.64 and 3.65).

Te: tellurium, as determined by NA, is below the detection limit of 10 ppm throughout the region

Th: thorium, as determined by NA, varies from 7.1 ppm to 39.8 ppm and averages 11.85 ppm. Thorium is found throughout the area, with the higher concentrations in the Clear Hills, Peace River, and High Level subareas (Figures 3.66 and 3.67).

U: uranium, as determined by NA, varies from 1.2 ppm to 7.2 ppm and averages about 3.9 ppm. Uranium is found throughout the area, with the higher concentrations in the Winagami, Peace River and the High Level subareas (Figures 3.68 and 3.69).

V: vanadium, as determined by AA, varies from 47 ppm to 214 ppm and averages about 151 ppm. Vanadium is found throughout the area, with the higher concentrations in the Winagami, Peace River and High Level subareas, and one site in the Slave Lake subarea. (Figures 3.70, 3.71 and 3.84).

W: tungsten, as determined by NA, varies from below the detection limit of 1 ppm to 2 ppm. Tungsten concentrations are low throughout the region with the higher values only in the Peace, and Winagami subareas (Figures 3.72 and 3.73).

Yb: ytterbium, as determined by NA, varies from the detection limit of 1 ppm to 5 ppm and averages about 2.7 ppm. Ytterbium is found throughout the area, with the higher concentrations mainly in the Clear Hills and Peace River subareas and one site in the Slave Lake subarea (Figures 3.74 and 3.75).

Zn: zinc, as determined by AA, varies from 19 ppm to 202 ppm and averages about 103 ppm. Zinc is found throughout the area, with the higher concentrations in the west half (Figures 3.76 to 3.79).

Zr: zirconium, as determined by NA, varies from below the detection limit of 200 ppm to 570 ppm and averages about 281 ppm. Zirconium is found throughout the area, with the higher concentrations mainly in the western half of the area; two high values are also present in the Bitumount subarea (Figures 3.80 and 3.81).

Carbonate & Texture: The surface samples indicate there are two till types in Northern Alberta: (1) a calcareous till which reacts strongly to dilute HCl, and (2) a noncalcareous till which reacts slightly or not at all (Figure 3.82). The carbonate-rich till is confined to the area north, east and south of the Buffalo Head Hills (Figure 1.2). This carbonate rich till generally also has a higher proportion of silt, based on field estimates (Figure 3.83). This correlation with texture suggests the higher carbonate content may be the result of the higher silt content because slit is the terminal mode for limestone. (The terminal mode is the grain size to which glaciers preferentially comminute or grind any particular mineral during long distance transport).

3.2.3 Regional Distribution

The distribution of each element, and the till matrix carbonate and silt content, (Figures 3.2 to 3.83) does not vary uniformly throughout the region: however in general the concentrations of most increases towards the west. The samples, with concentrations greater than or equal to the 75^{th} percentile, have been grouped into ten subareas: Grand Prairie, Clear Hills, Winagami, Peace River, Manning, High Level, Peerless Lake, Slave Lake, Bitumount, and Winefred Lake. (Figure 3.84). The analytical results from samples with $\geq 75^{th}$ percentile concentration within each subarea were grouped based on the following classification:

1 = Many samples (>4) in area, and widespread distribution.
2 = More than 4 samples in the subarea.
3 = 2 to 4 samples in the subarea.
4 = 1 to 2 samples in the subarea.

The results of this classification are shown in Tables 3.3 and 3.4.

Table 3.3. Classification by element for concentrations ≥ 75 percentile.

Grand Prairie		Clear Hills		Winagami		Peace River		Manning		High Level		Slave Lake		Peerless		Bitumount		Winefred	
As	4	Ag	1	Ag	1	Ag	1	Cd	4	Fe	2	Ag	3	Au	2	Hf	2	Cd	4
Au	4	Ce	1	Cd	1	As	1	Cu	4	Ni	2	Au	3	Cd	3	Ag	4	Co	4
Cd	4	Ni	1	Cu	1	Au	1	Fe	4	Pb	2	Na	3	Hf	3	Au	4	Fe	4
Cr	4	Pb	1	Mn	1	Ba	1	Ni	4	U	2	Zn	3	Ag	4	Br	4	Mn	4
Na	4	V	1	Ni	1	Ce	1	Pb	4	Zn	2	Zr	3	As	4	Fe	4	Mo	4
Ni	4	Zn	1	Sm	1	Cd	1	Zn	4	Ag	3	As	4	Fe	4	Mn	4	Ag	
Sb	4	As	2	Th	1	Cr	1	Ag		As	3	Br	4	Mn	4	Pb	4	As	
Sc	4	Cr	2	V	1	Cu	1	As		La	3	Co	4	Mo	4	Zr	4	Au	
Tb	4	Cs	2	Zr	1	Fe	1	Au		Sm	3	Eu	4	Pb	4	As		Ba	
Zr	4	Cu	2	As	2	La	1	Ba		V	3	Fe	4	Zr	4	Ba		Br	
Co	3	Fe	2	Br	2	Mn	1	Br		Zr	3	Hf	4	Ba		Cd		Ce	
Cu	3	La	2	Ce	2	Mo	1	Ce		Au	4	La	4	Br		Ce		Cr	
Mn	3	Sb	2	Co	2	Ni	1	Co		Ba	4	Lu	4	Ce		Cr		Cs	
Ag		Sc	2	Cr	2	Pb	1	Cr		Br	4	Mn	4	Cr		Cs		Cu	
Ba		Sm	2	Cs	2	Sb	1	Cs		Cd	4	Sc	4	Cs		Cu		Eu	
Br		Ta	2	Fe	2	Sm	1	Eu		Co	4	Sm	4	Cu		Eu		Hf	
Ce		Tb	2	La	2	Ta	1	Hf		Cu	4	Ta	4	Eu		La		La	
Cs		Th	2	Lu	2	Tb	1	La		Mn	4	Tb	4	Lu		Lu		Lu	
Eu		Au	3	Mo	2	U	1	Lu		Mo	4	Th	4	Na		Mo		Na	
Fe		Ba	3	Na	2	V	1	Mn		Sb	4	V	4	Ni		Na		Ni	
Hf		Co	3	Pb	2	Zn	1	Mo		Th	4	Yb	4	Rb		Ni		Pb	
La		Mn	3	Rb	2	Zr	1	Na		Ce		Ba		Sb		Rb		Rb	
Lu		U	3	Sc	2	Br	2	Rb		Cr		Cd		Sc		Sb		Sb	
Mo		Yb	3	Ta	2	Co	2	Sb		Cs		Ce		Sm		Sc		Sc	
Pb		Zr	3	U	2	Eu	2	Sc		Eu		Cr		Ta		Sm		Sm	
Rb		Cd	4	Au	3	Na	2	Sm		Hf		Cs		Tb		Ta		Ta	
Sm		Eu	4	Eu	3	Rb	2	Ta		Lu		Cu		Th		Tb		Tb	
Ta		Hf	4	Ba	4	Th	2	Tb		Na		La		U		Th		Th	
Th		Lu	4	Hf	4	Cs	3	Th		Rb		Mo		V		U		U	
U		Mo	4	W	4	Hf	3	U		Sc		Ni		W		V		V	
V		Na	4	Zn	4	Sc	3	V		Ta		Pb		Yb		W		W	
W		Rb	4	Ce		Yb	3	W		Tb		Rb		Zn		Yb		Yb	
Yb		Br		Sb		Lu	4	Yb		W		Sb				Zn		Zn	
Zn		Ce		Tb		W	4	Zr		Yb		U						Zr	
		W		Yb		Ce						W							

1 = many sites and widespread distribution (more than 4 samples in the subarea)
2 = many sites (4 or more samples in the subarea)
3 = moderate (2-4 samples in the subarea)
4 = few sites (1-2 samples in the subarea)
1+ = widespread distribution and "lots more" than 4 sites

Table 3.4. Classification by subarea for concentrations ≥ 75 percentile.

	Grand Prairie	Clear Hills	Winagami	Peace River	Manning	High Level	Slave Lake	Peerless	Bitumount	Winefred
Ag*\AA\ppm		1 *	1	1		3 *	3 *	4 *	4	
Ag*\NA\ppm	Data not used; non-optimal method									
As*\NA\ppm	4	2 *	2	1 *		3 *	4 *	4		
Au*\NA\ppb	4	3 *	3 *	1 *		4	3	2 *	4	
Ba*\NA\ppm		3 *	4	1 *		4				
Br*\NA\ppm			2 *	2 *		4 *	4		4 *	
Cd*\AA\ppm	4	4 *	1	1 *	4	4		3		4
Ce*\NA\ppm		1 *	2	1 *		2	4 *	4	4	
Co*\AA\ppm	3 *	3 *	2 *	2 *		4 *	4			4
Co*\NA\ppm	Data not used; non-optimal method									
Cr*\NA\ppm	4	2 *	2 *	1 *						
Cs*\NA\ppm		2 *	2 *	3 *						
Cu*\AA\ppm	3	2 *	1 *	1 *	4	4 *				
Eu*\NA\ppm		4 *	3 *	2 *			4 *			
Fe*\AA\%		2 *	2 *	1 *	4 *	2	4 *	4	4 *	4
Fe*\NA\%	Data not used; non-optimal method									
Hf*\NA\ppm		4 *	4	3 *			4 *	3 *	2 *	
La*\NA\ppm		2 *	2	1 *		3	4 *			
Lu*\NA\ppm		4 *	2 *	4 *			4 *			
Mn*\AA\ppm	3 *	3	1	1 *		4	4 *	4 *	4 *	4 *
Mo*\AA\ppm		4 *	2 *	1 *		4 *		4 *		4
Mo*\NA\ppm	Data not used; non-optimal method									
Na\NA\%	4 *	4 *	2 *	2 *			3			
Ni*\AA\ppm	4	1 *	1 *	1 *	4	2 *				
Ni*\NA\ppm	Data not used; non-optimal method									
Pb*\AA\ppm		1 *	2	1 *	4 *	2 *		4	4 *	
Rb*\NA\ppm		4 *	2 *	2 *						
Sb*\NA\ppm	4	2 *		1 *		4				
Sc*\NA\ppm	4	2 *	2 *	3 *			4			
Sm*\NA\ppm		2 *	1	1 *		3	4 *			
Ta*\NA\ppm		2 *	2	1 *			4			
Tb*\NA\ppm	4	2 *		1 *			4 *			
Th*\NA\ppm		2 *	1	2 *		4 *	4			
U*\NA\ppm		3	2 *	1 *		2 *				
V*\AA\ppm		1 *	1 *	1		3 *	4			
W*\NA\ppm			4 *	4 *						
Yb*\NA\ppm		3 *		3 *			4 *			
Zn*\AA\ppm		1 *	4	1 *	4	2 *	3 *			
Zn*\NA\ppm	Data not used; nonoptimal method									
Zr*\NA\ppm	4	3 *	1	1 *		3	3 *	4*	4	

1 = many sites and widespread distribution (>4 samples)
2 = many sites (4 or more samples in the subarea)
3 = moderate (2-4 samples in the subarea)
4 = few sites (1-2 samples in the subarea)
1+ = widespread distribution and "lots more" than 4 sites
* = subarea with vaues ≥ 95%ile

The three subareas with the greatest number of sites, that is the Clear Hills, Winagami, and Peace River subareas, also contain the greatest number of 1 and 2 class sites and the greatest number of elements with concentrations ≥ to 75 percentile.

The Clear Hills subarea has class 1 and 2 concentrations of Ag, As, Ce, Cr, Cs, Cu, Fe, La, Ni, Pb, Sb, Sc, Sm, Ta, Tb, Th, V, and Zn, and class 3 and 4 concentrations of Au, Ba, Co, Cd, Eu, Hf, Lu, Mn, Mo, Na, Rb, U, Yb, and Zr, The Winagami subarea has class 1 and 2 concentrations of Ag, As, Br, Cd, Ce, Co, Cr, Cs, Cu, Fe, La, Lu, Mn, Mo, Na, Ni, Pb, Rb, Sc, Sm, Ta, Th, U, V, and Zr, and class 3 and 4 concentrations of Au, Ba, Eu, Hf, W, and Zn. The Peace River subarea has class 1 and 2 concentrations of Ag, As, Au, Ba, Br, Ca, Cd, Ce, Co, Cr, Cu, Eu, Fe, La, Mn, Mo, Na, Ni, Pb, Rb, Sb, Sm, Ta, Tb, Th, U, V, Zn, and Zr, and class 3 and 4 concentrations of Cs, Hf, Lu, Sc, Yb, and W.

High Level subarea has class 2 concentrations of Fe, Ni, Pb, U, and Zn, and class 3 and 4 concentrations of Ag, As, Au, Ba, Br, Cd, Co, Cu,La, Mn, Mo, Sb, Sm, Th, V, and Zr. Peerless Lake subarea has class 2 concentrations of Au, class 3 concentrations of Cd and Hf, and class 4 concentrations of Ag, As, Fe, Mn, Mo, Pb, and Zr.

The remaining areas have class 3 or 4 concentrations with the exception of the Bitumount subarea which has a class 2 concentration of Hf and class 4 concentrations of Ag, Au, Br, Fe, Mn, Pb, and Zr. The Slave Lake subarea has class 3 concentrations of Ag, Au, Na, Zn, and Zr, and class 4 concentrations of As, Br, Co, Eu, Fe, Hf, La, Lu, Mn, Sc, Sm, Ta, Tb, Th, V, and Yb. The Grand Prairie subarea has class 3 concentrations of Co, Cu, and Mn, and class 4 concentrations of As, Au, Cd, Cr, Na, Ni, Sb, Sc, Tb, and Zr.

The Manning and Winefred Lake subareas contain very few sample sites which contributes to their low classification numbers. The Winefred Lake subarea has class 4 concentrations of Cd, Co, Fe, Mn, and Mo and Manning has class 4 concentrations of Cd, Cu, Fe, Ni, Pb, and Zn.

3.3 CORE HOLE SAMPLES

Six auger cores were cut in the High Level-Fort Vermilion area as part of this project; and an additional fourteen augered in the Peace River and Winagami map areas as part of this and a surficial geology and Quaternary stratigraphy project (MDA project # M93-04-35). Geochemistry was run on samples from some of these holes. The results from core samples of the geochemical analyses are presented in Appendix 6.3.

The preliminary analysis of samples from the core holes, drilled in the High Level-Fort Vermilion shows that the downhole changes in concentration varies from element to element. Figure 3.85, for example, shows the data from test hole HL93-8 which was drilled in the High Level region. The chemical variations in this hole (Figure 3.85) can be grouped into three patterns a) a concentration "spike" at about 17 m, with little change in concentration above and below the spike; b) a change in concentration above and below the spike; and c) little consistent change in concentration over the sampled interval; that is there is neither a concentration spike nor a change in concentration above or below the spike.

One or more of the above three patterns are present in data from all of the other core holes that were analysed. Presently the authors do not recognize one or more consistent patterns that can be correlated from hole to hole. This may be the result of the holes being many kilometers apart, or other factors.

The downhole variations in geochemistry may be due to the presence of different till layers, the proximity to bedrock or both. Additional sampling and analysis which is scheduled for next year will help to better understand these chemical variations.

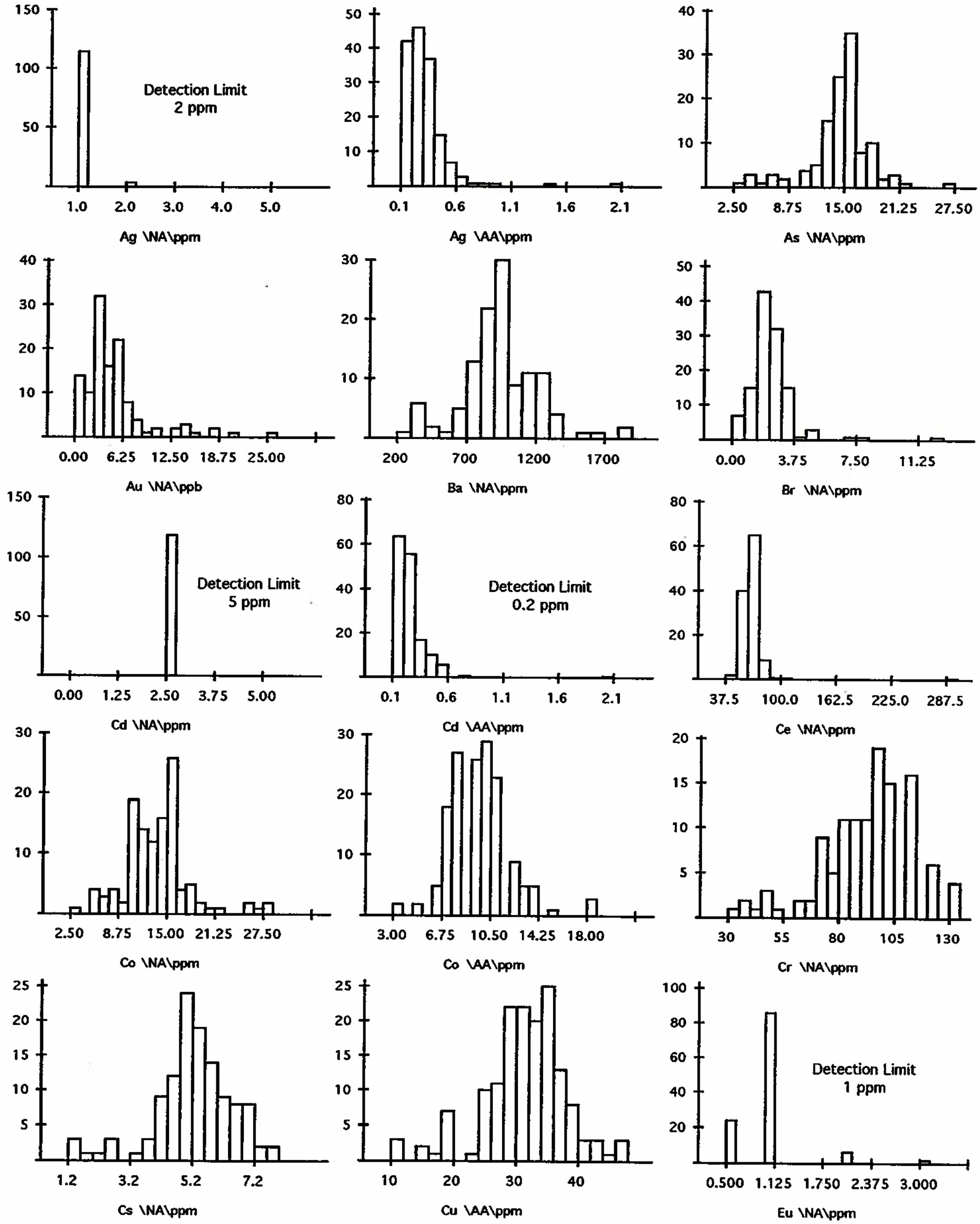


Figure 3.1. Histograms showing variations in concentration of each element.

(continued on following 2 pages)

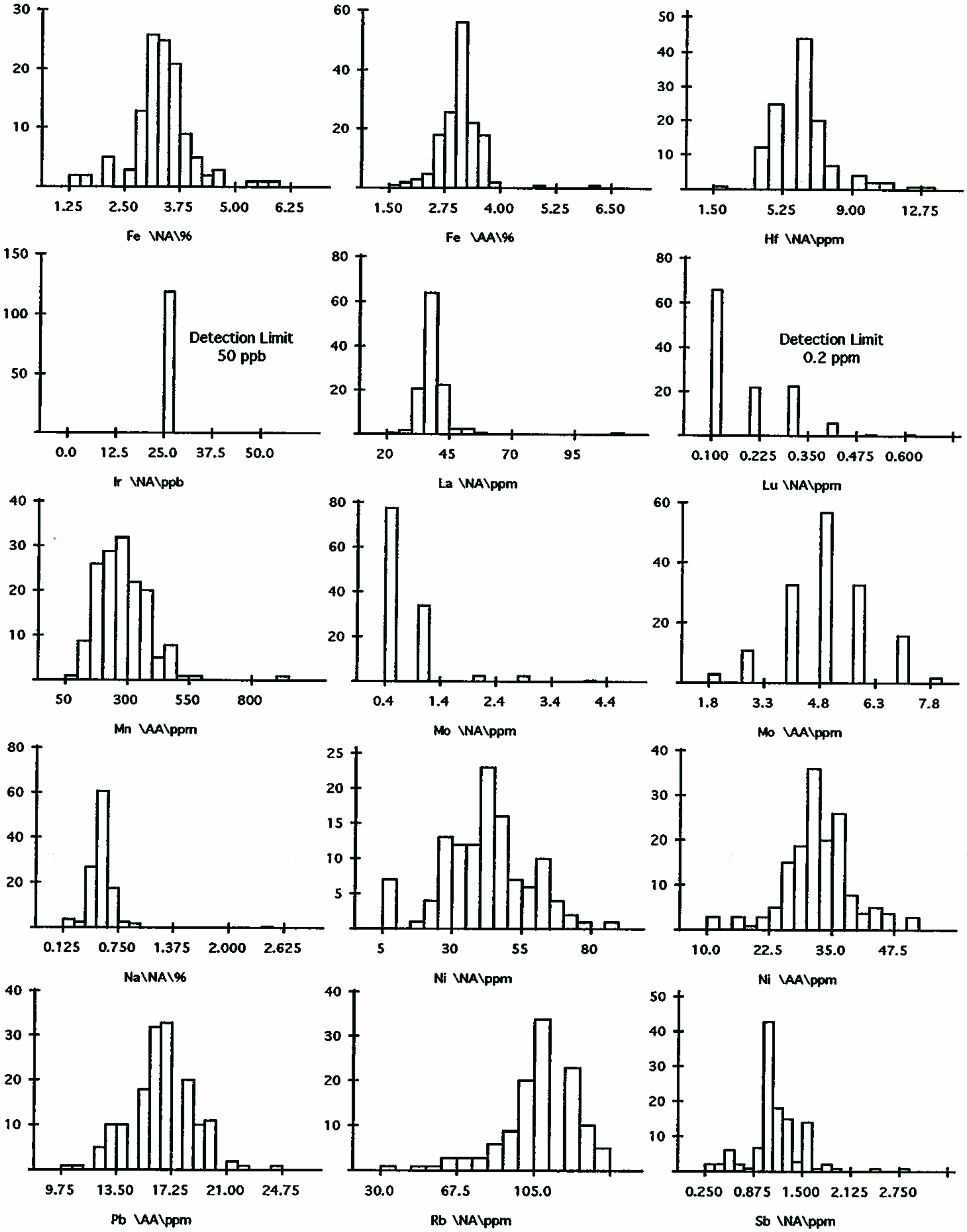


Figure 3.1 (continued). Histograms showing variations in concentration of each element.

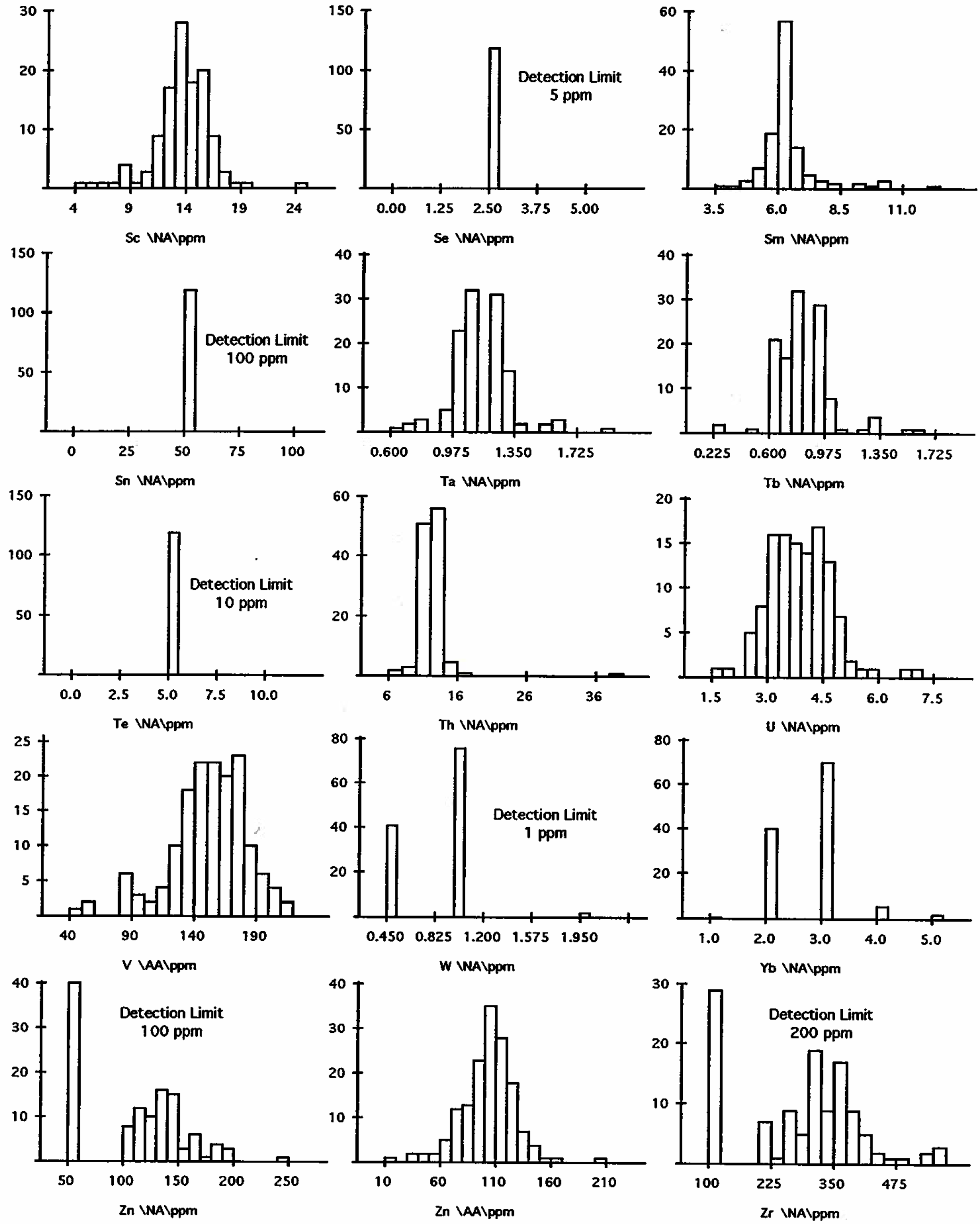


Figure 3.1 (continued). Histograms showing variations in concentration of each element.

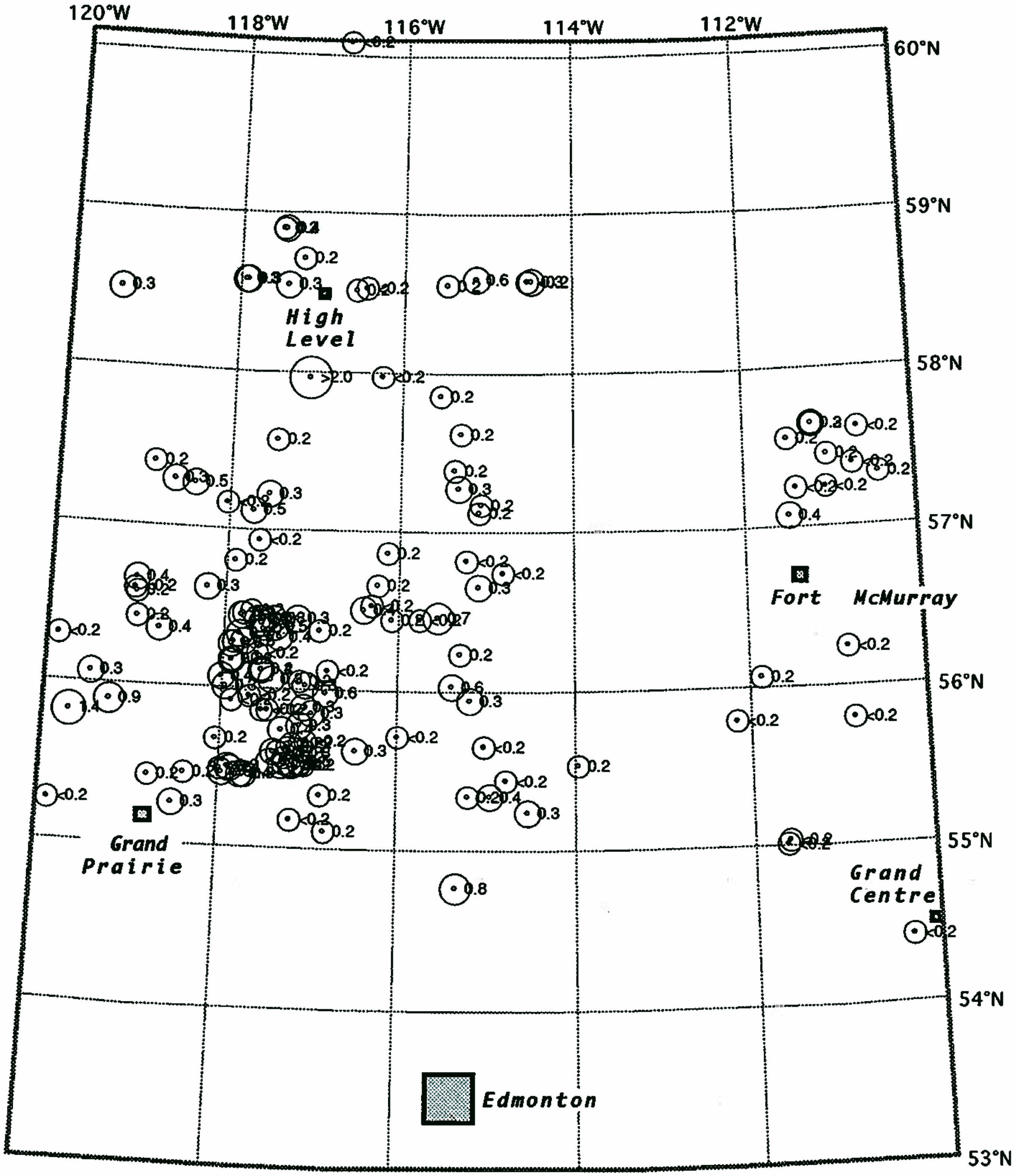


Figure 3.2. Silver concentration (ppm) from AA , for all shallow data.

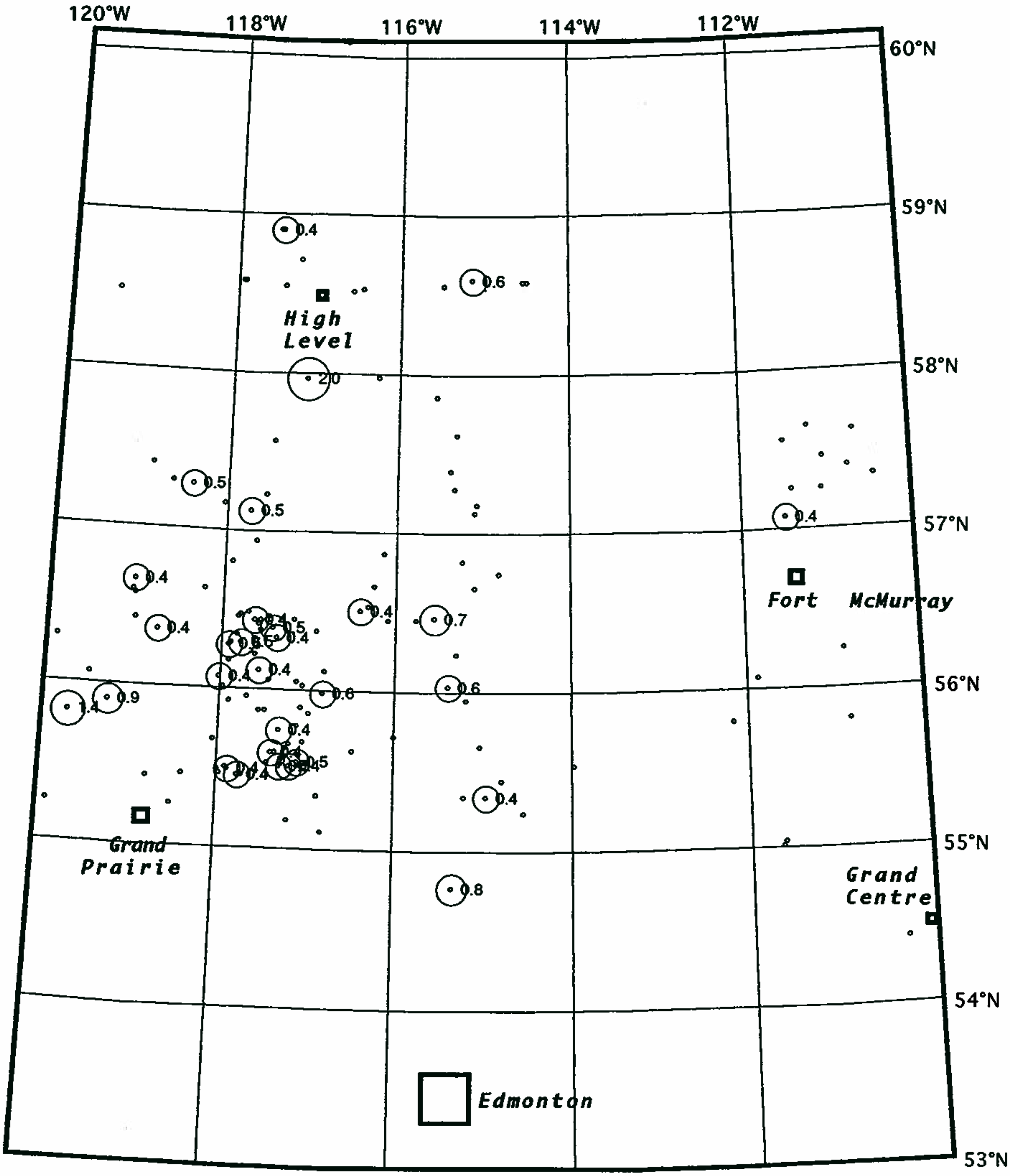


Figure 3.3. Silver concentration (ppm) from AA, ≥ 75%ile.

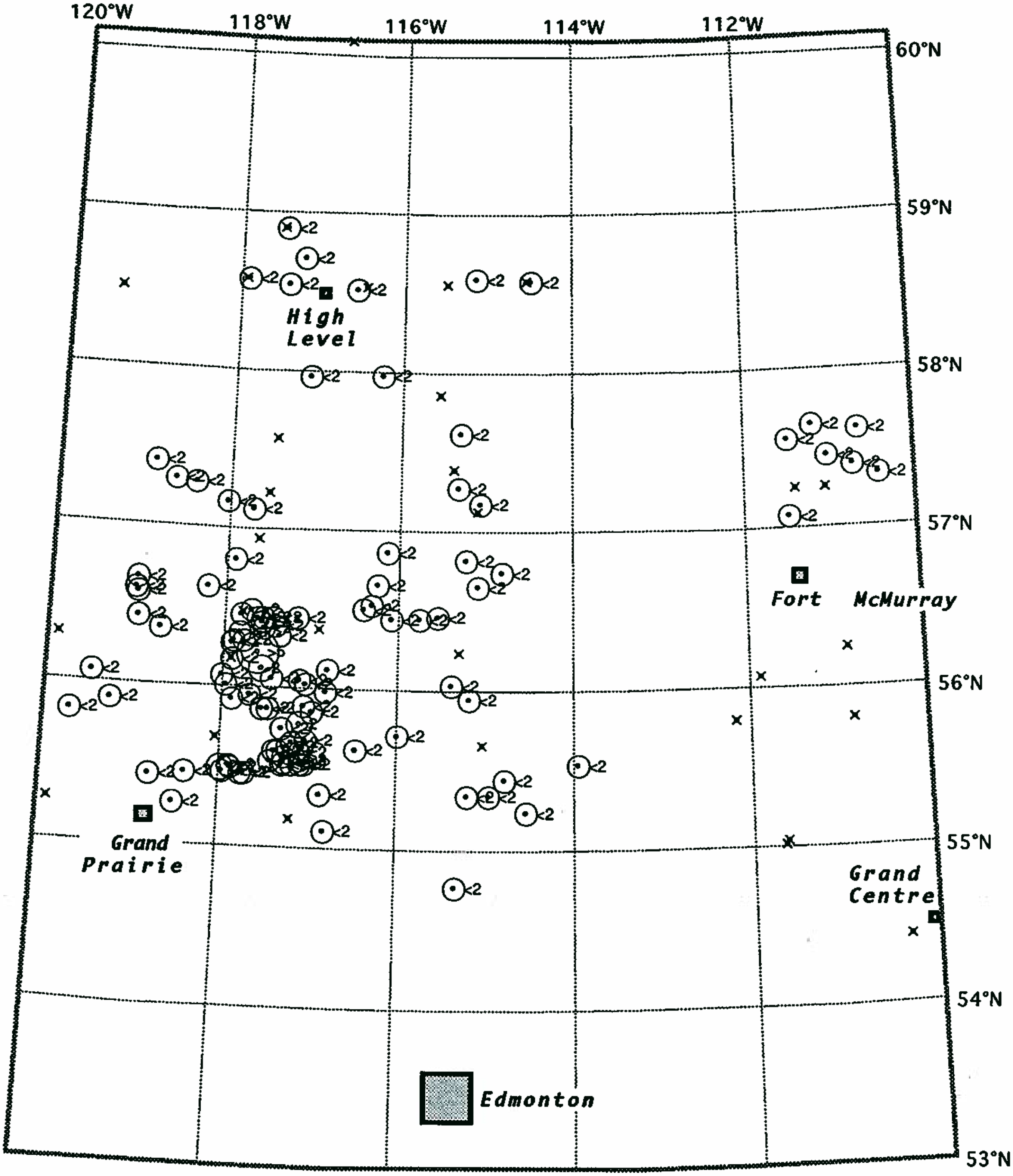


Figure 3.4. Silver concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

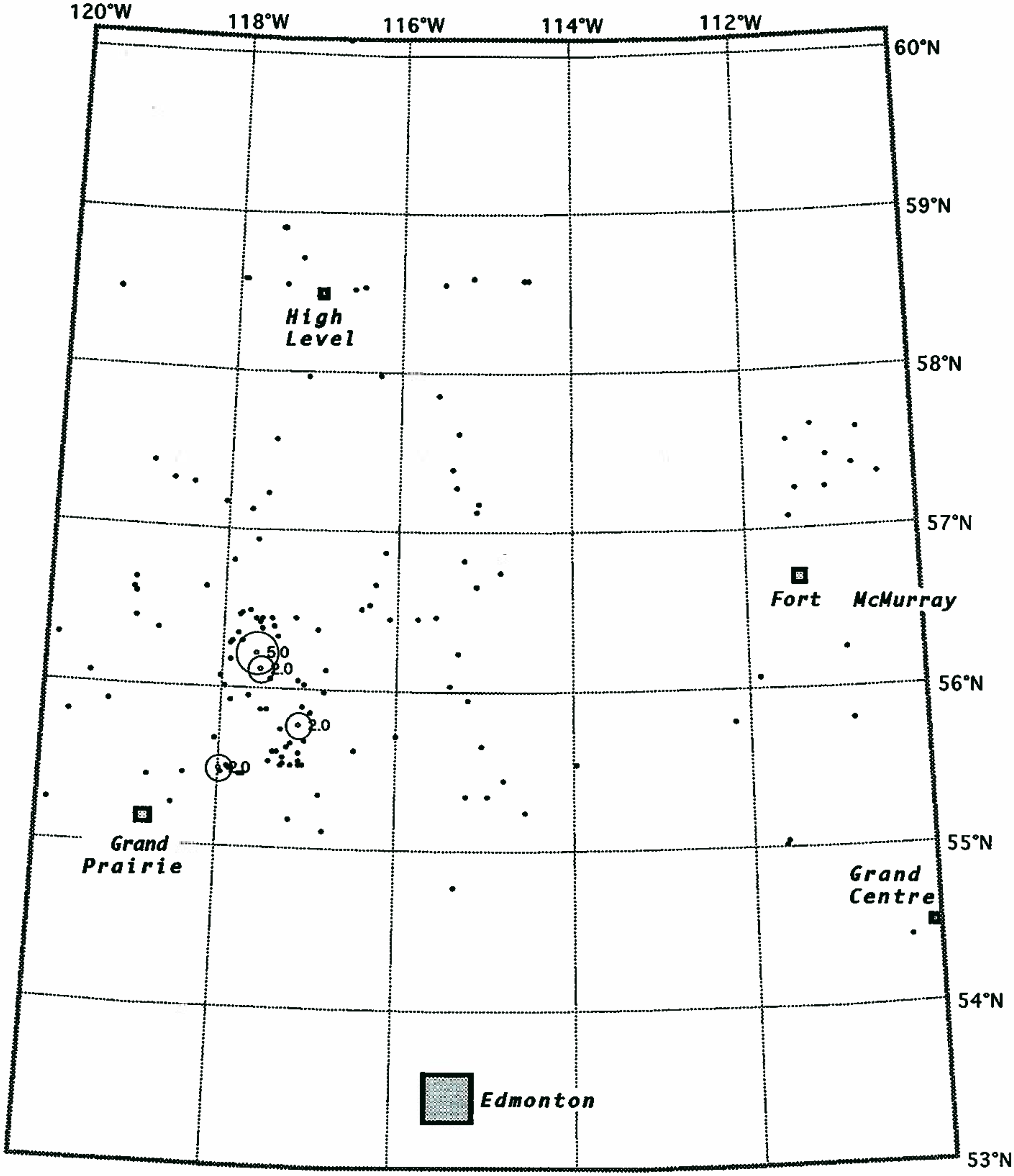


Figure 3.5. Silver concentration (ppm) from NA, ≥ 75%ile.

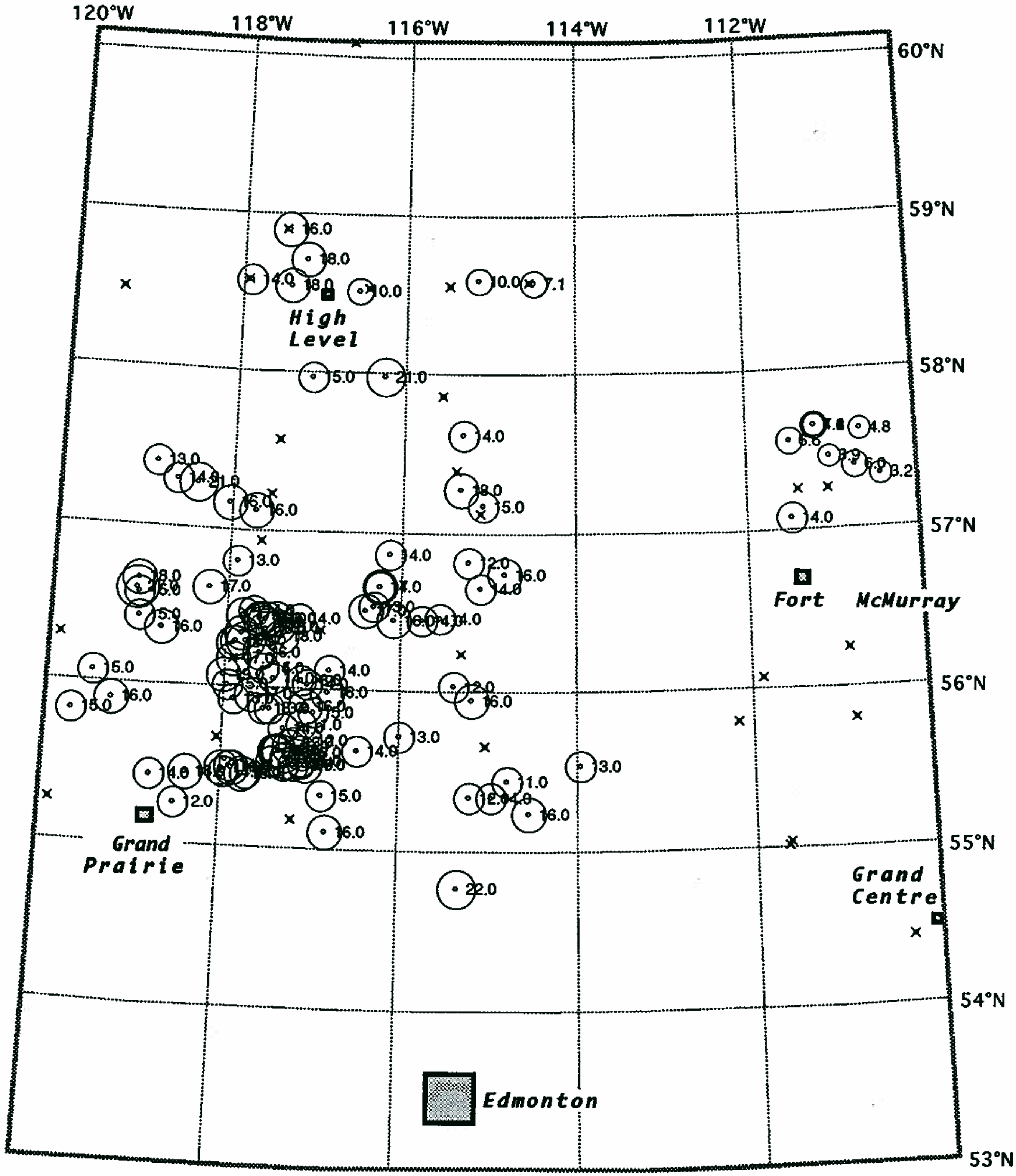


Figure 3.6. Arsenic concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

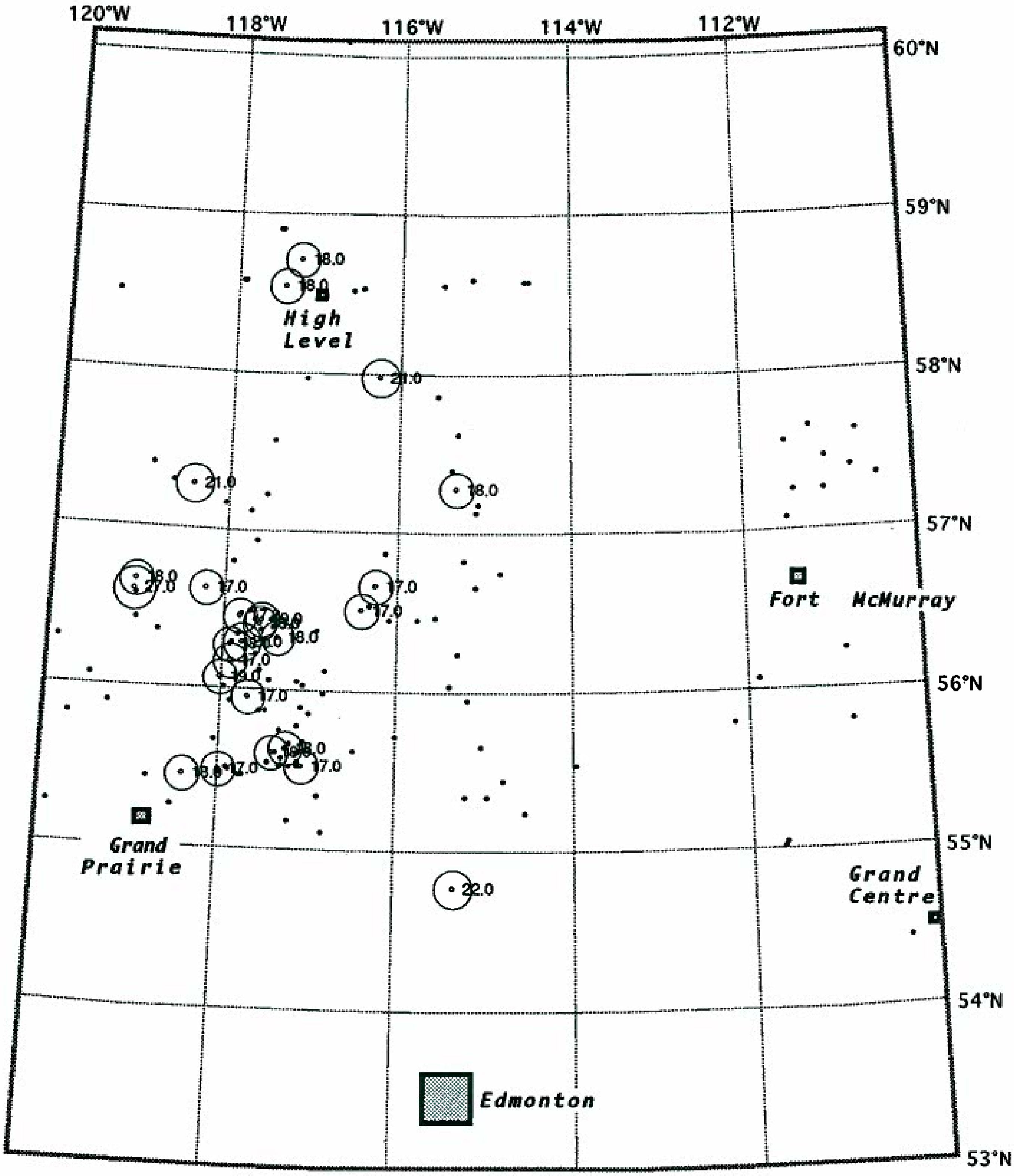


Figure 3.7. Arsenic concentration (ppm) from NA, ≥ 75%ile.

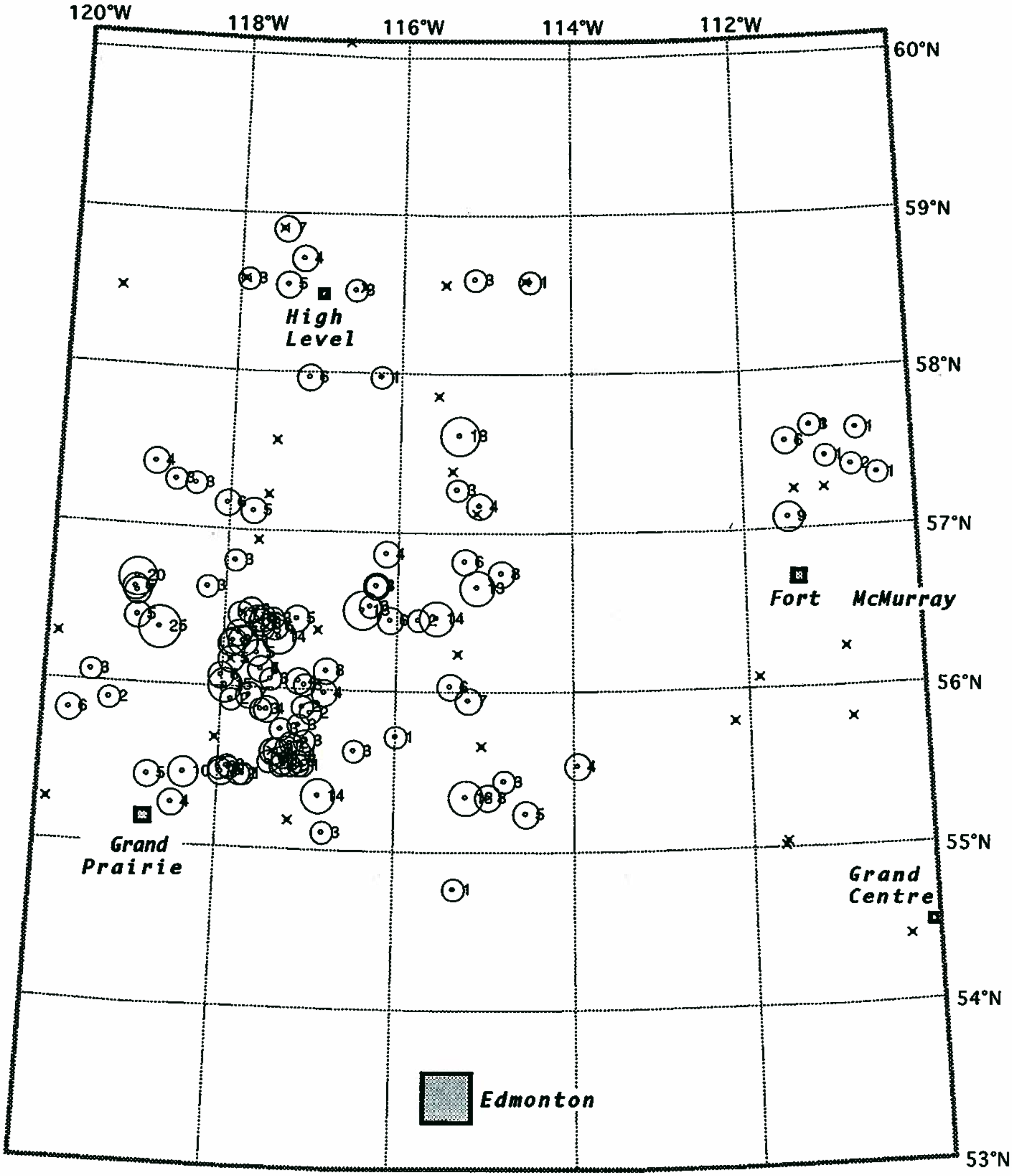


Figure 3.8. Gold concentration (ppb) from NA for all shallow data.
(x = sample not yet analysed)

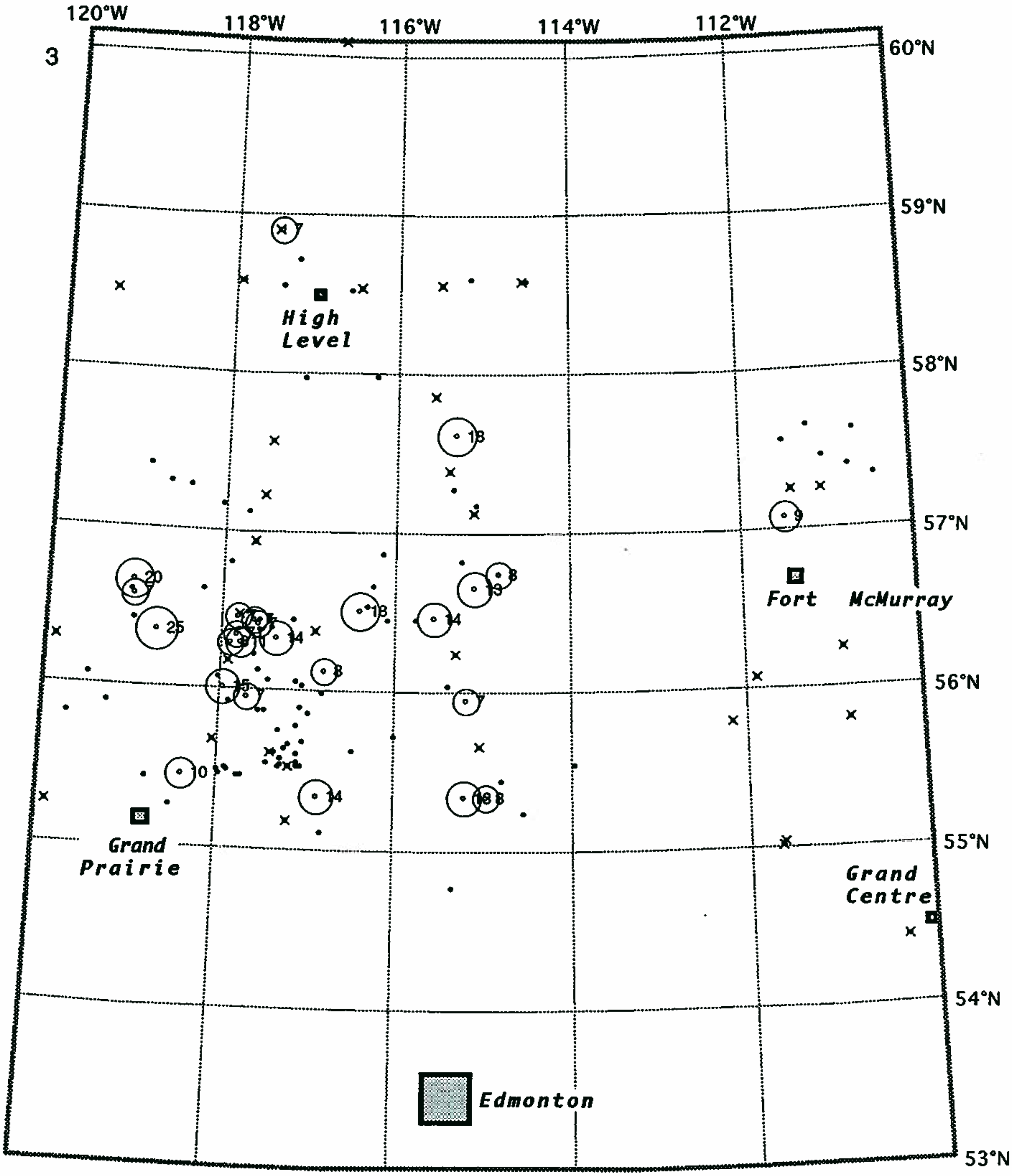


Figure 3.9. Gold concentration (ppb) from NA, ≥ 75%ile.

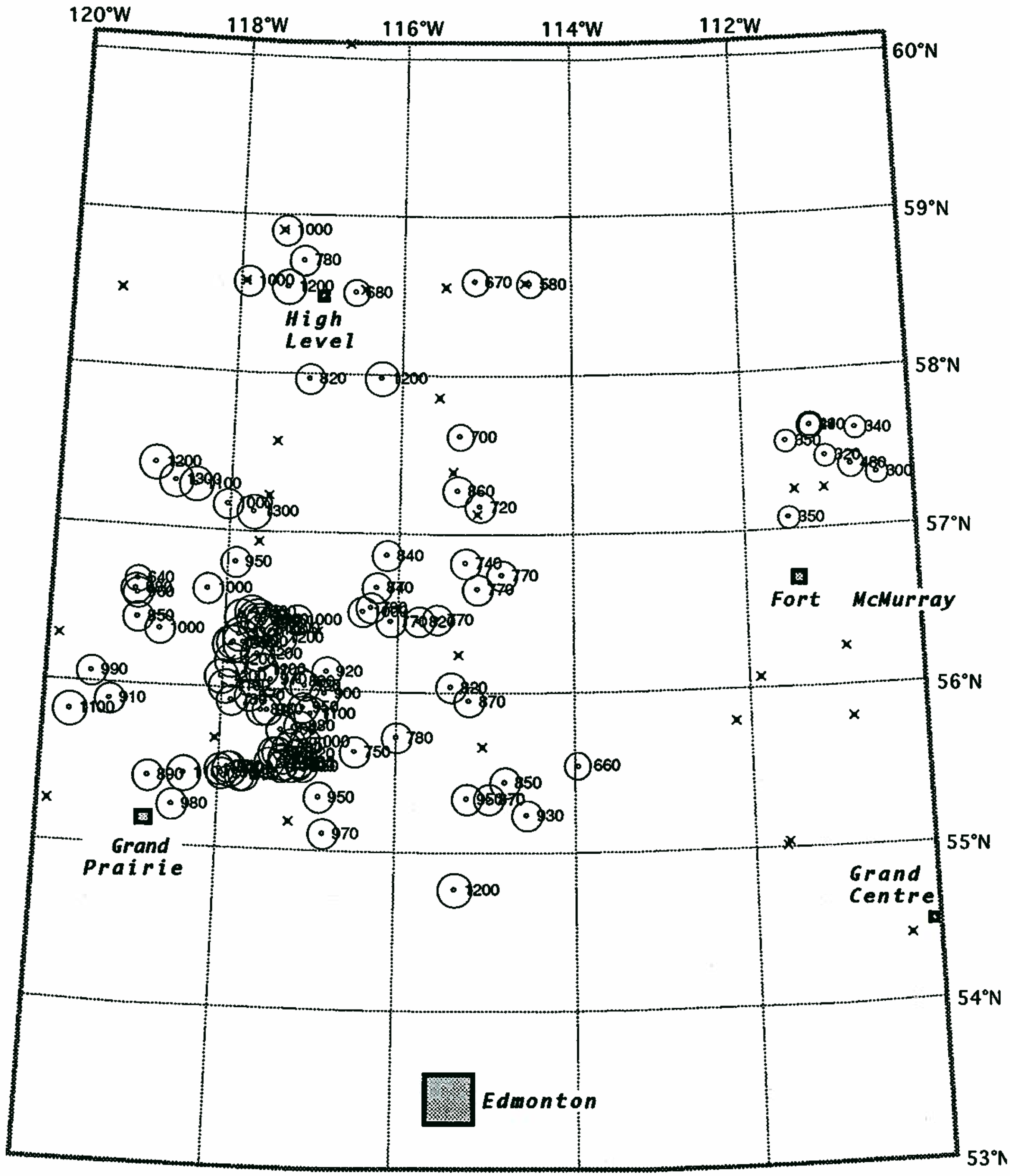


Figure 3.10. Barium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

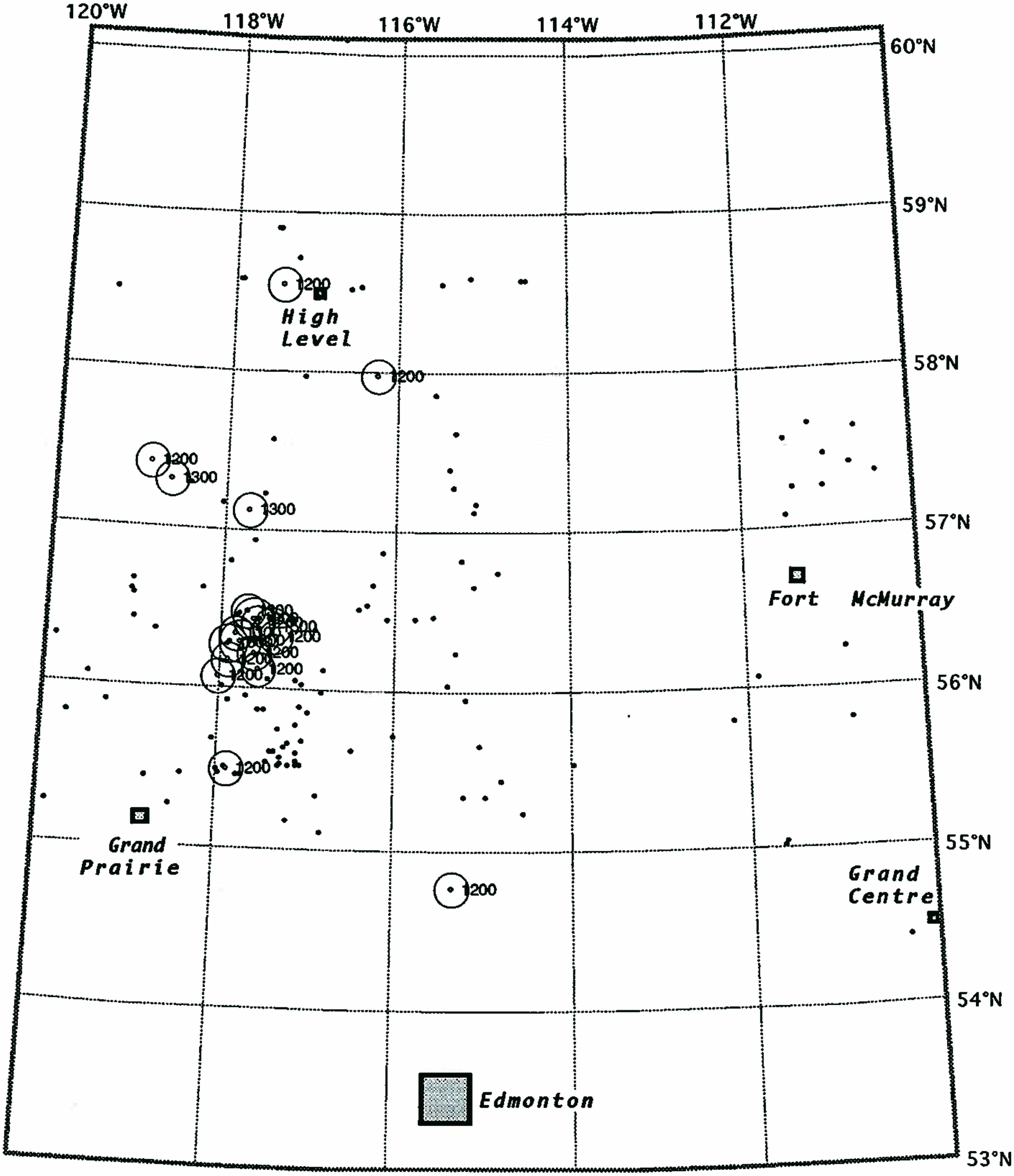


Figure 3.11. Barium concentration (ppm) from NA, ≥ 75%ile.

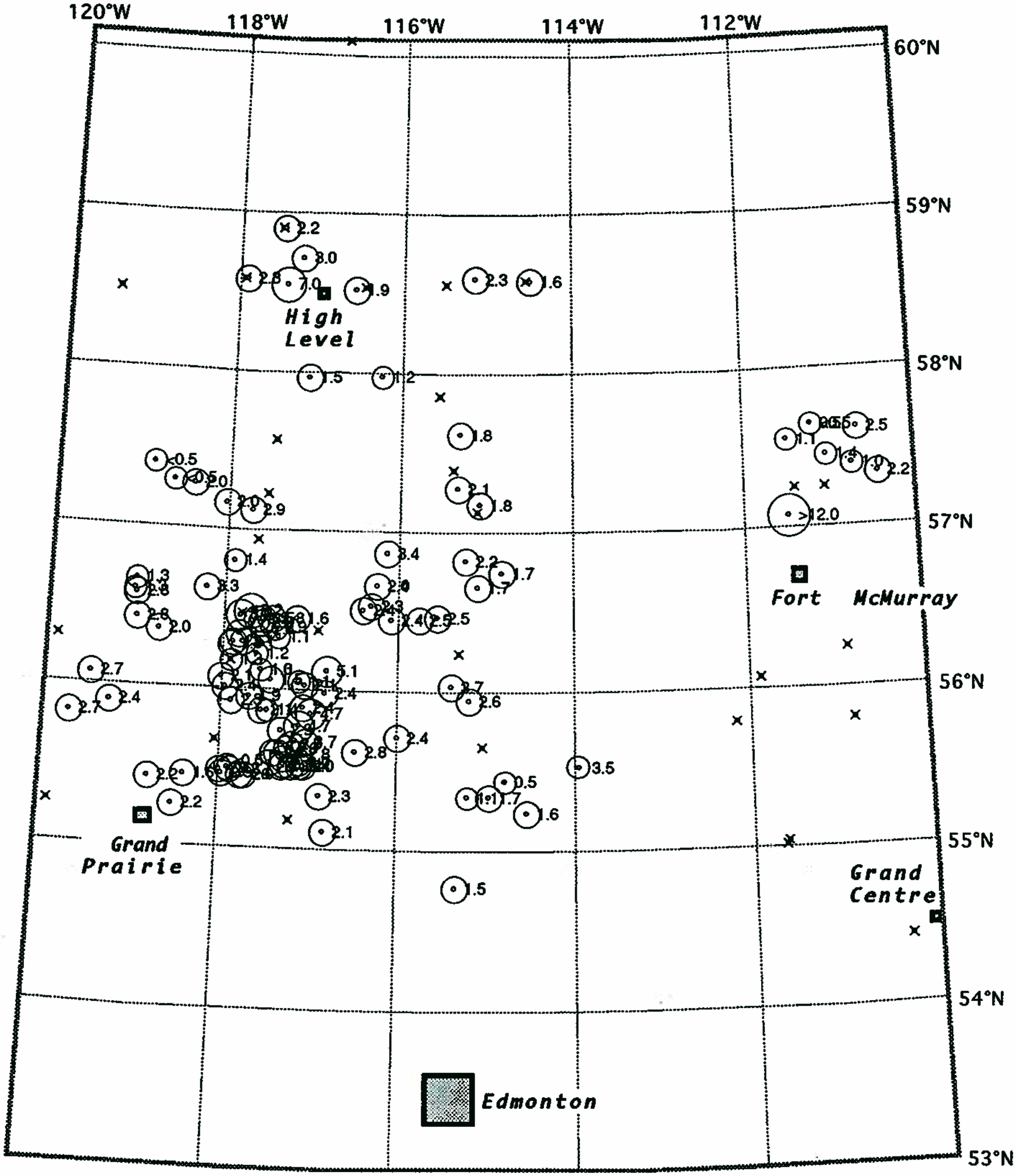


Figure 3.12. Bromine concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

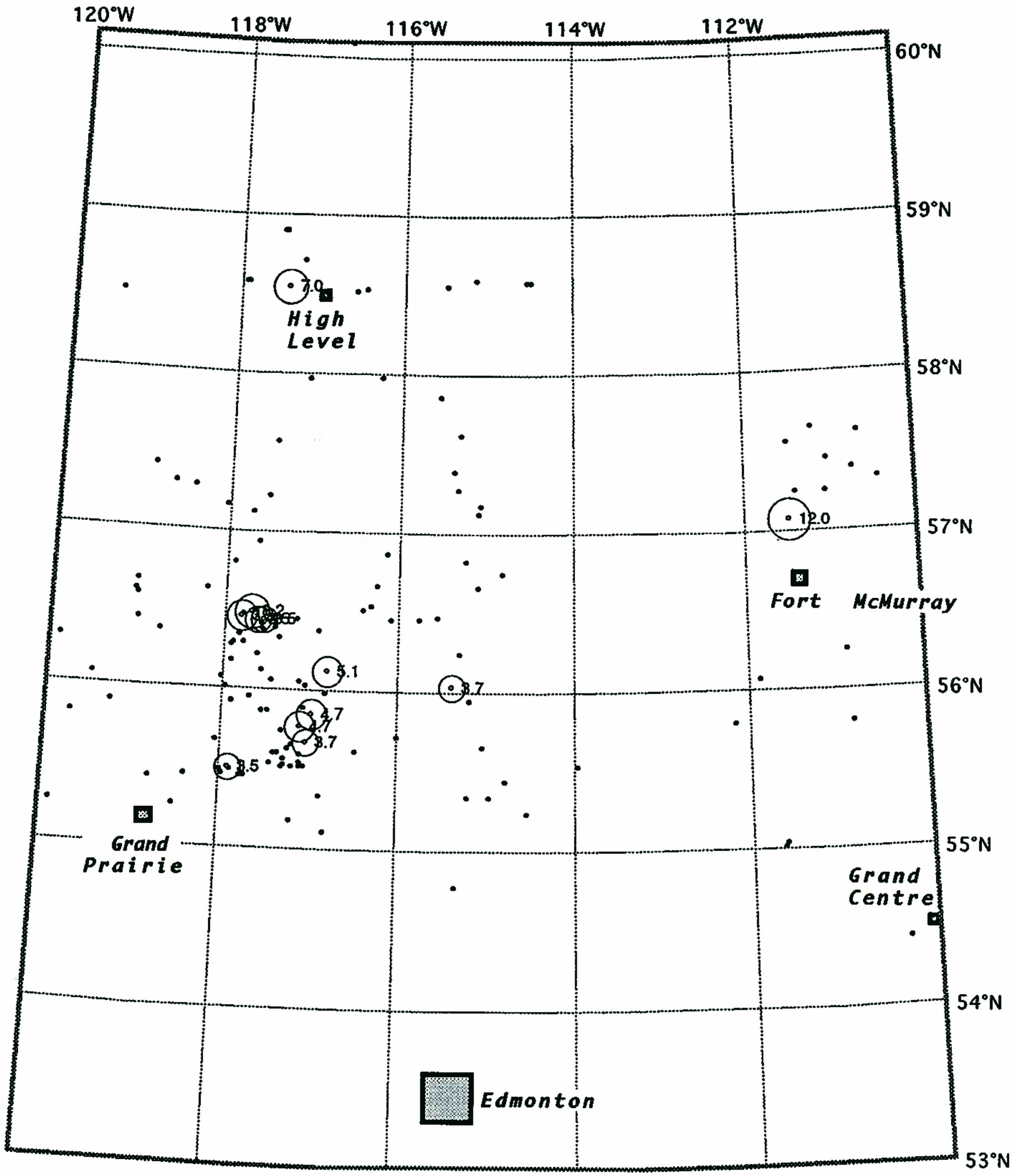


Figure 3.13. Bromine concentration (ppm) from NA, ≥ 75%ile.

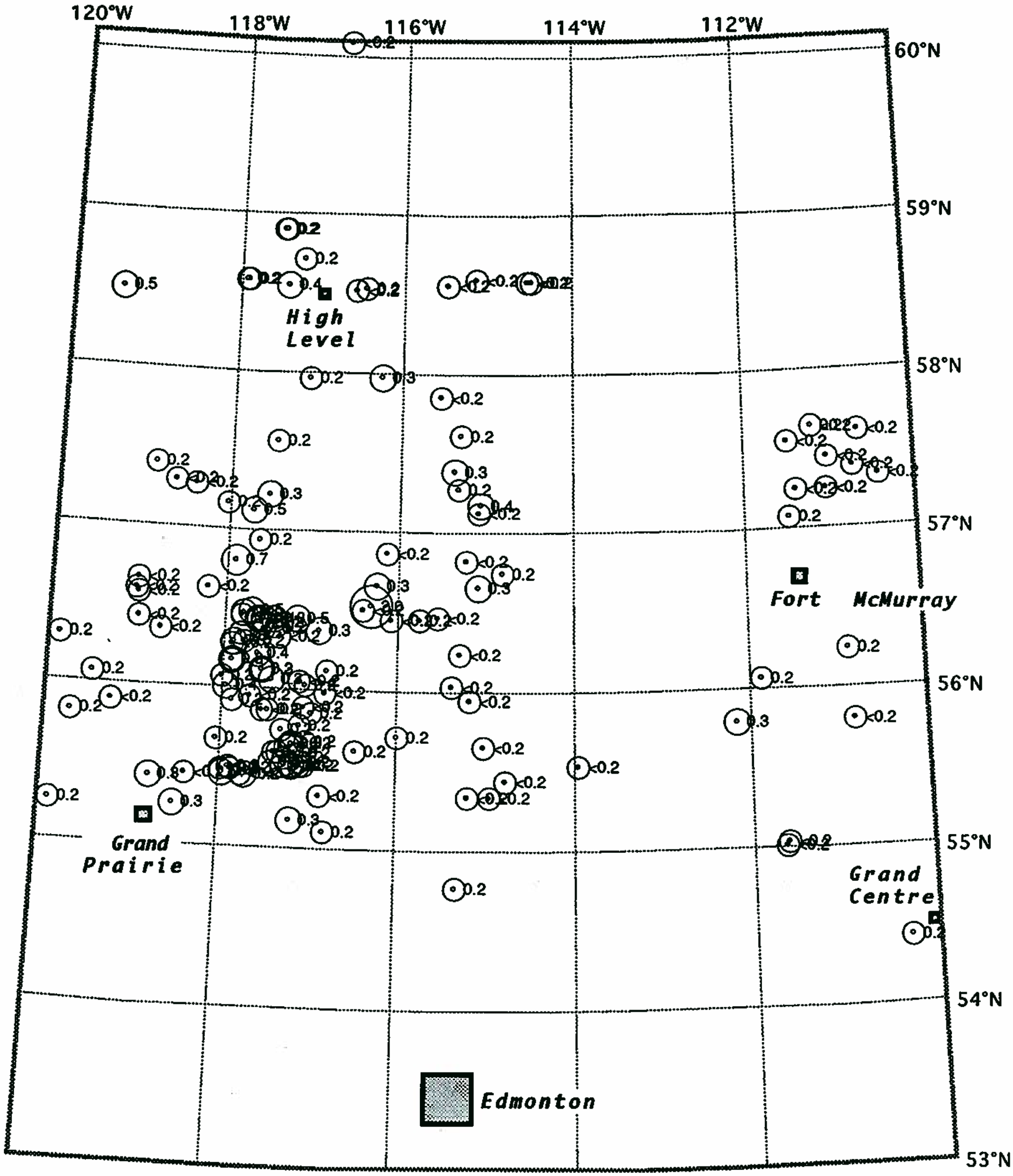


Figure 3.14. Cadmium concentration (ppm) from AA for all shallow data.

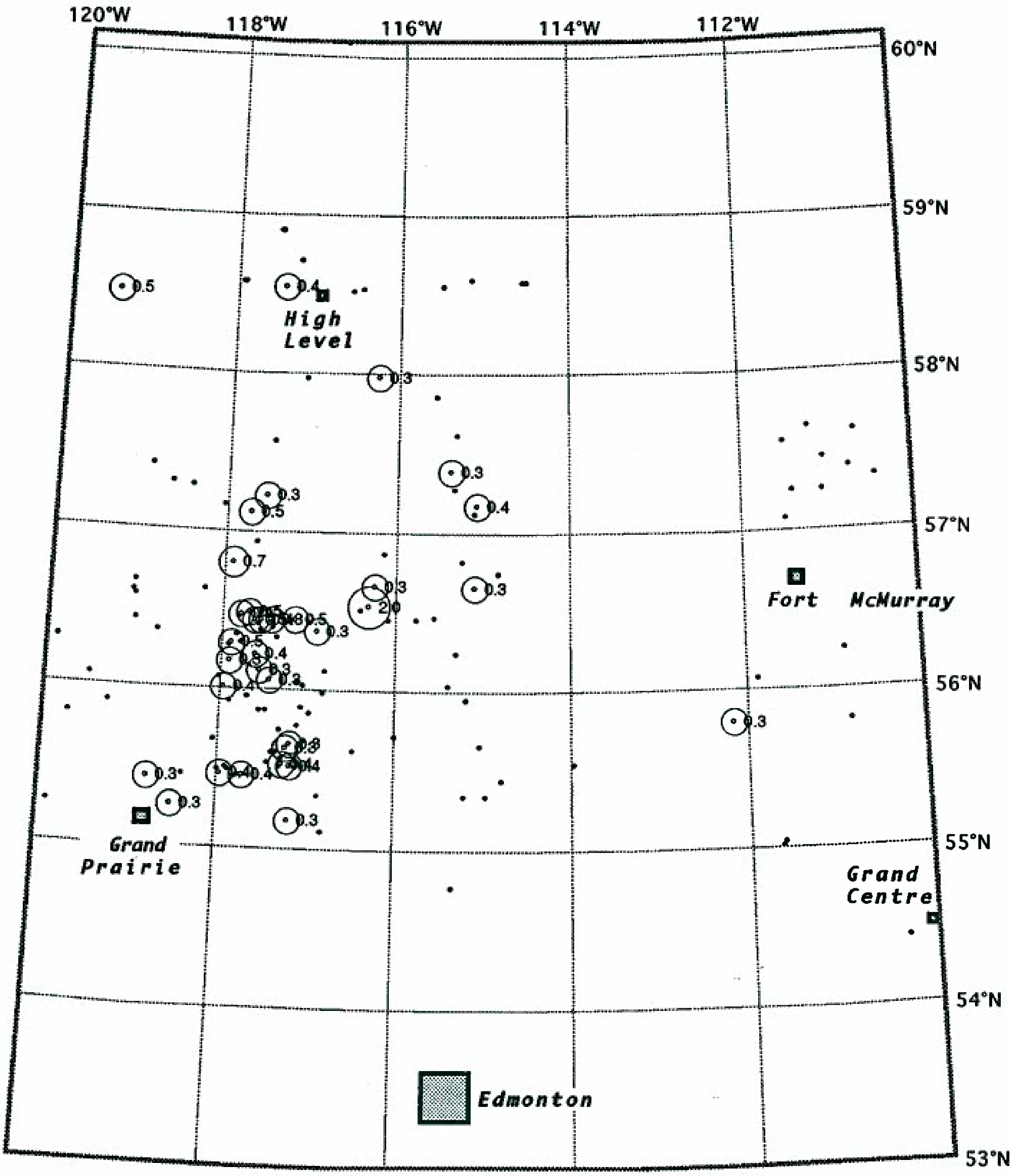


Figure 3.15. Cadmium concentration (ppm) from AA, ≥ 75%ile.

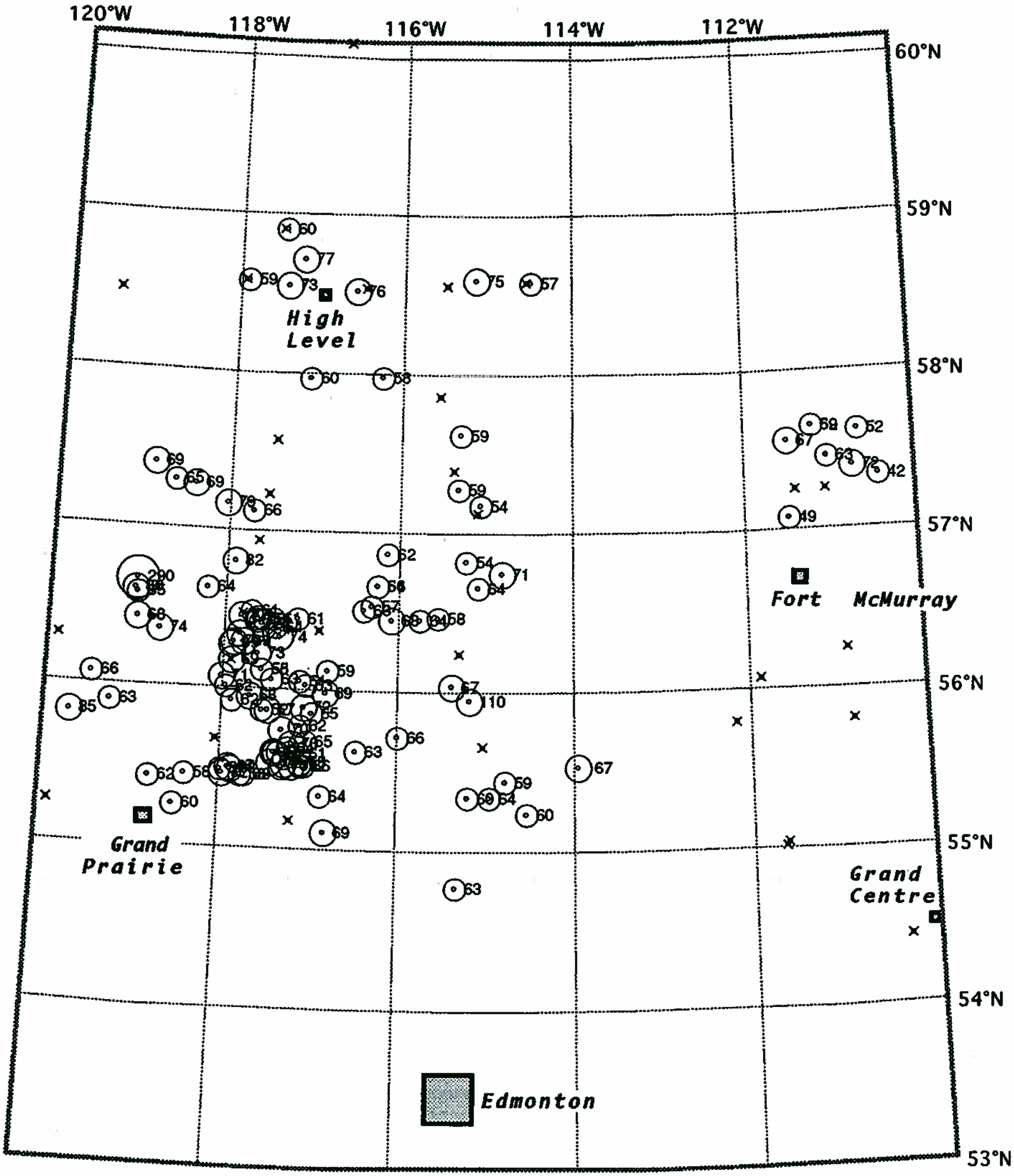


Figure 3.16. Cerium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

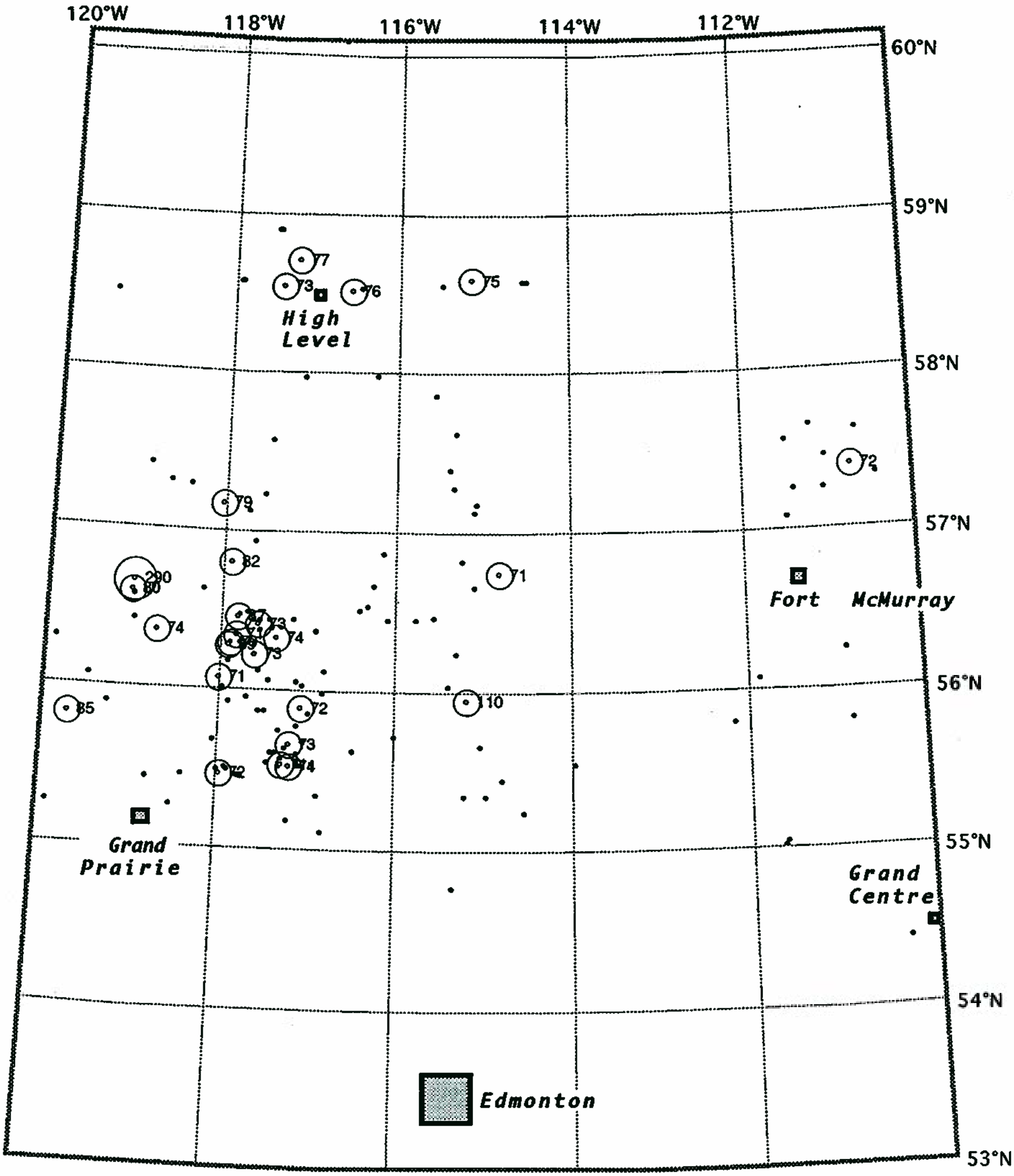


Figure 3.17. Cerium concentration (ppm) from NA, ≥ 75%ile.

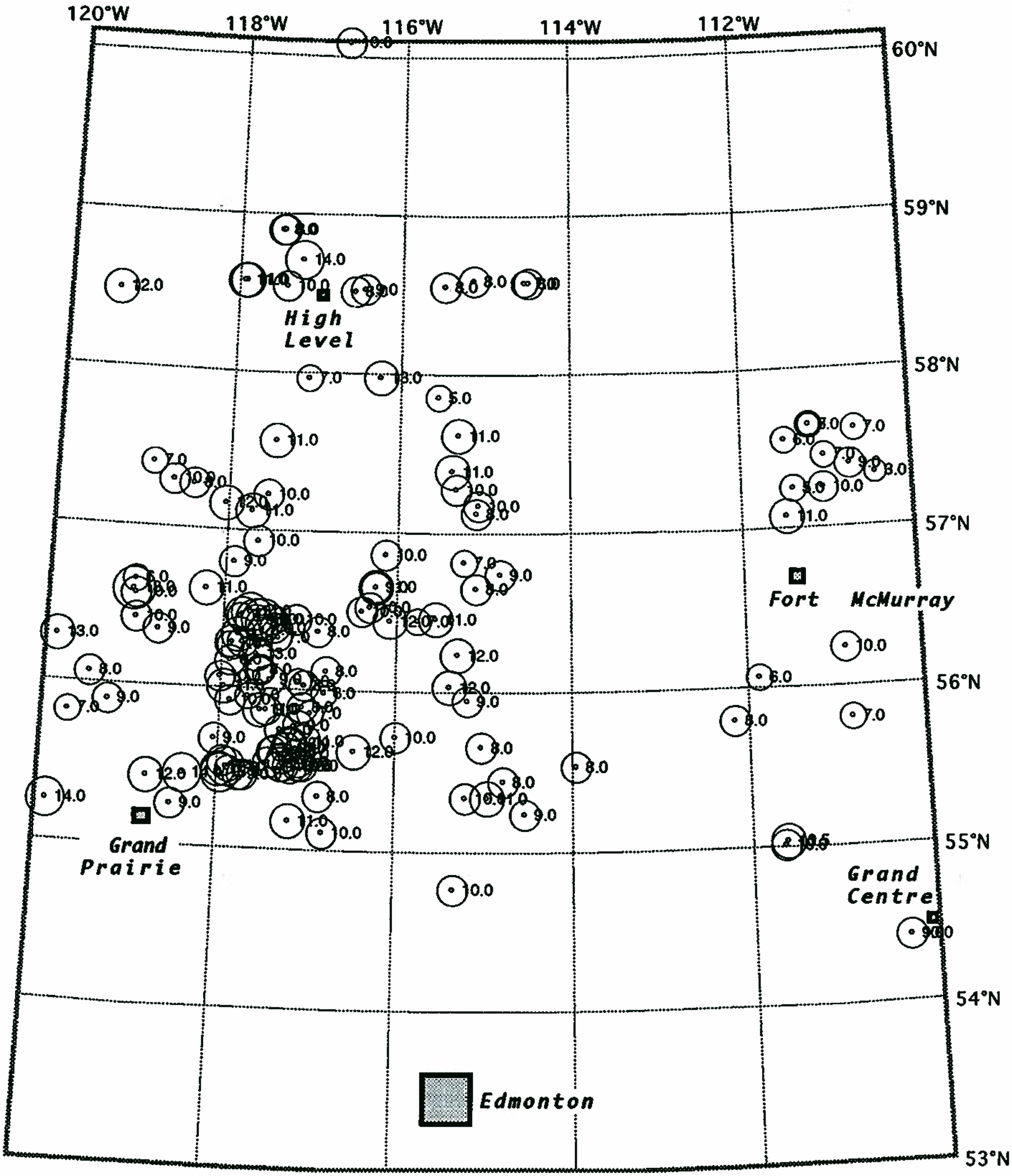


Figure 3.18. Cobalt concentration (ppm) from AA for all shallow data.

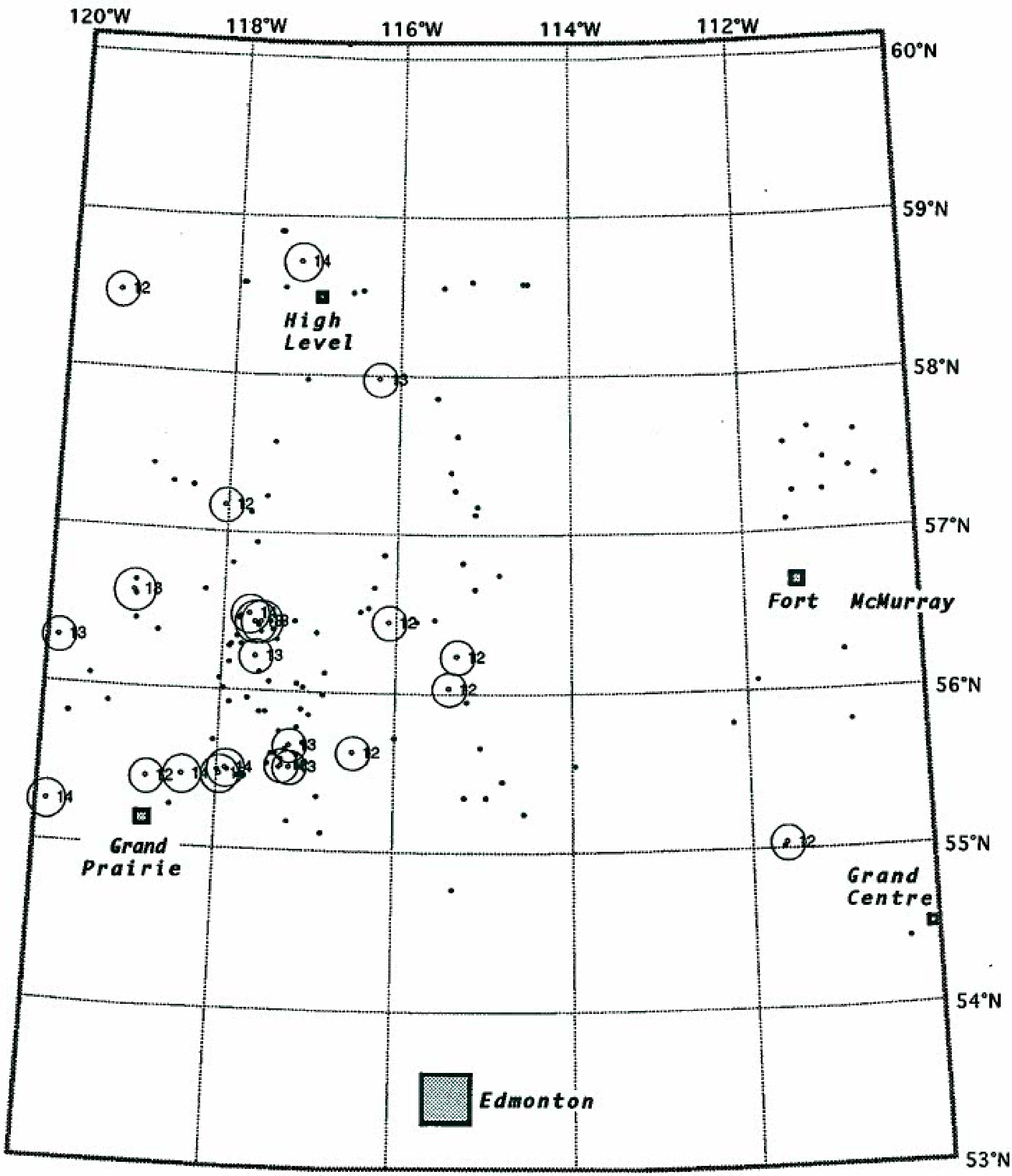


Figure 3.19. Cobalt concentration (ppm) from AA, ≥ 75%ile.

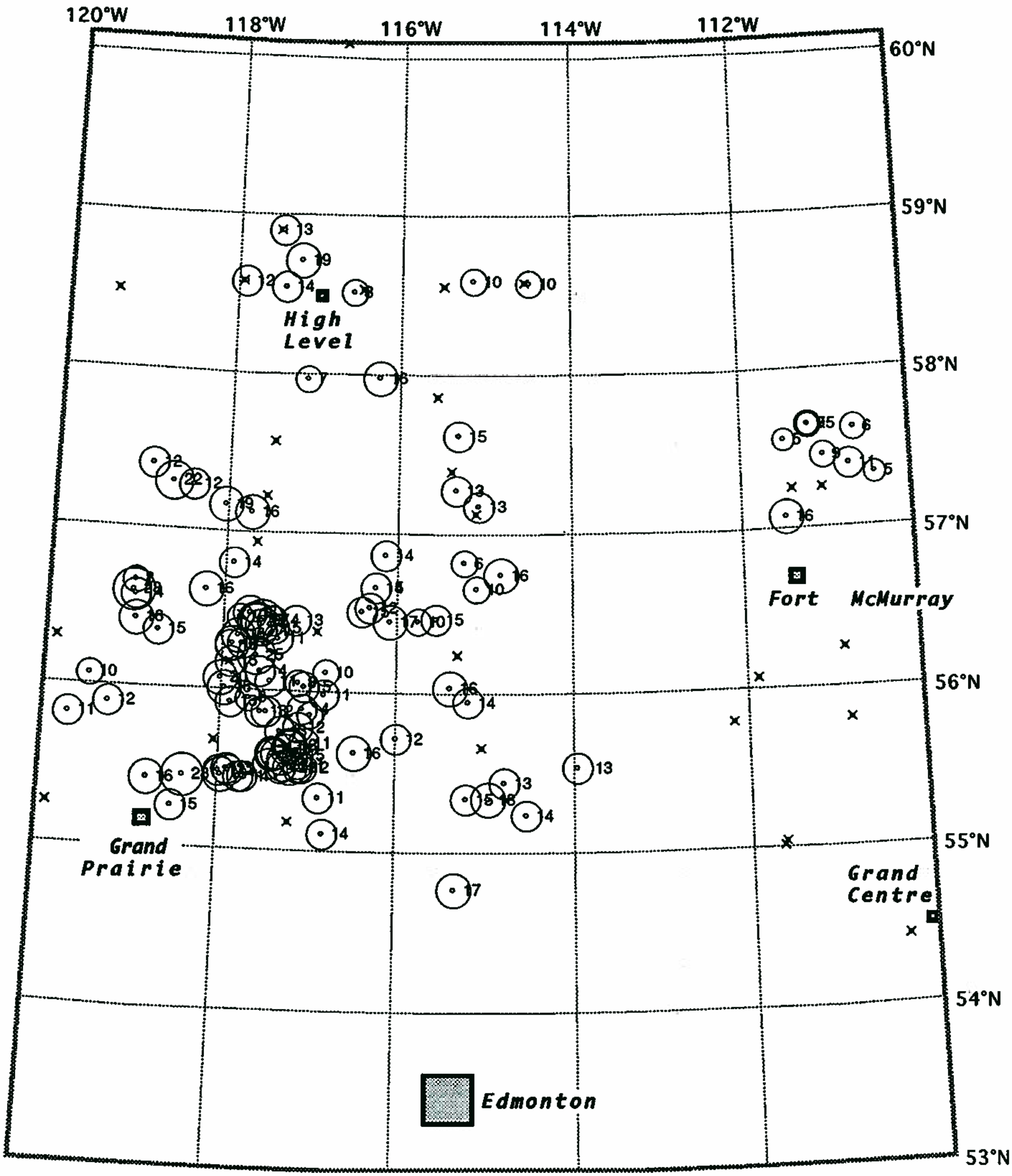


Figure 3.20. Cobalt concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

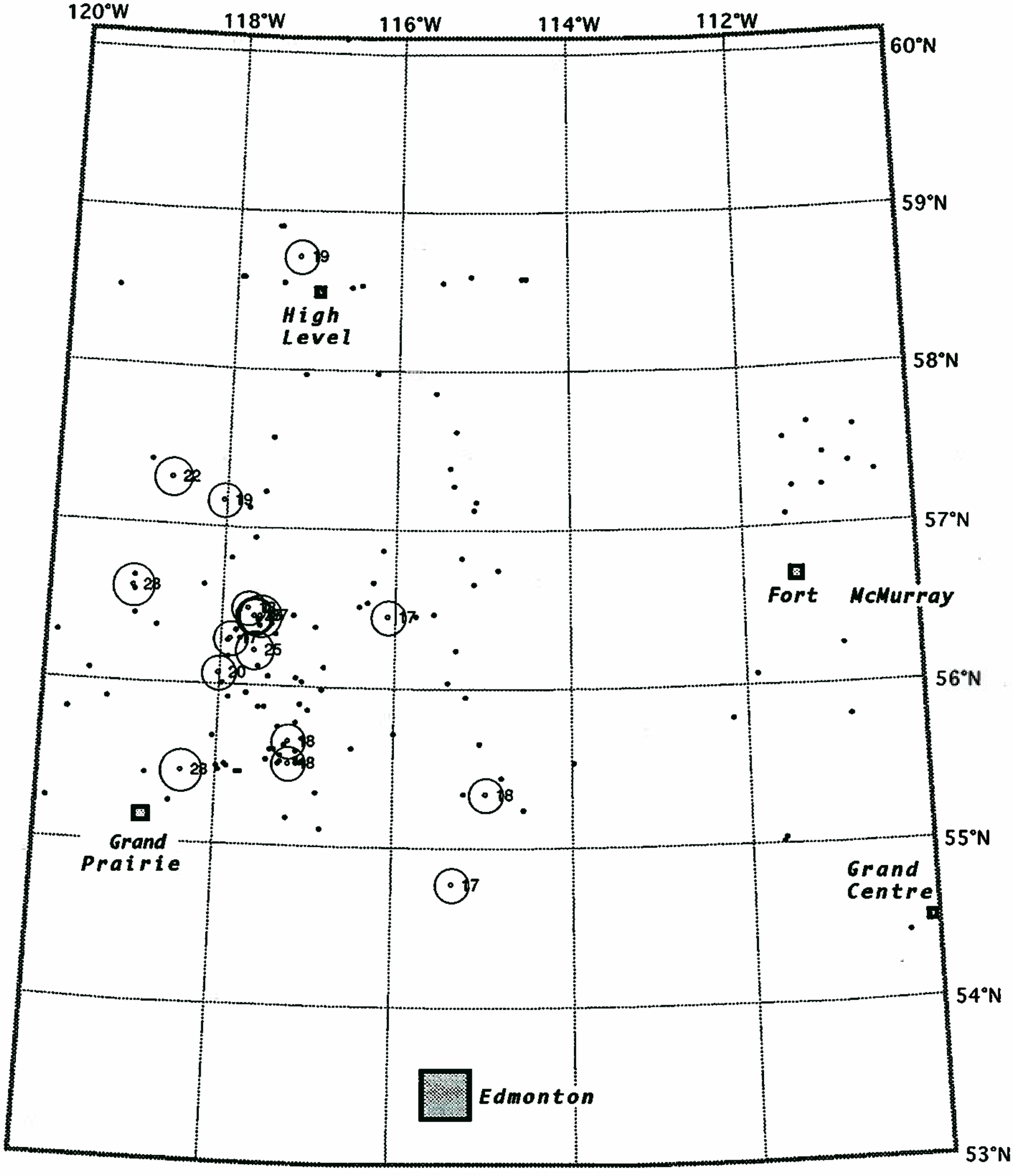


Figure 3.21. Cobalt concentration (ppm) from NA, ≥ 75%ile.

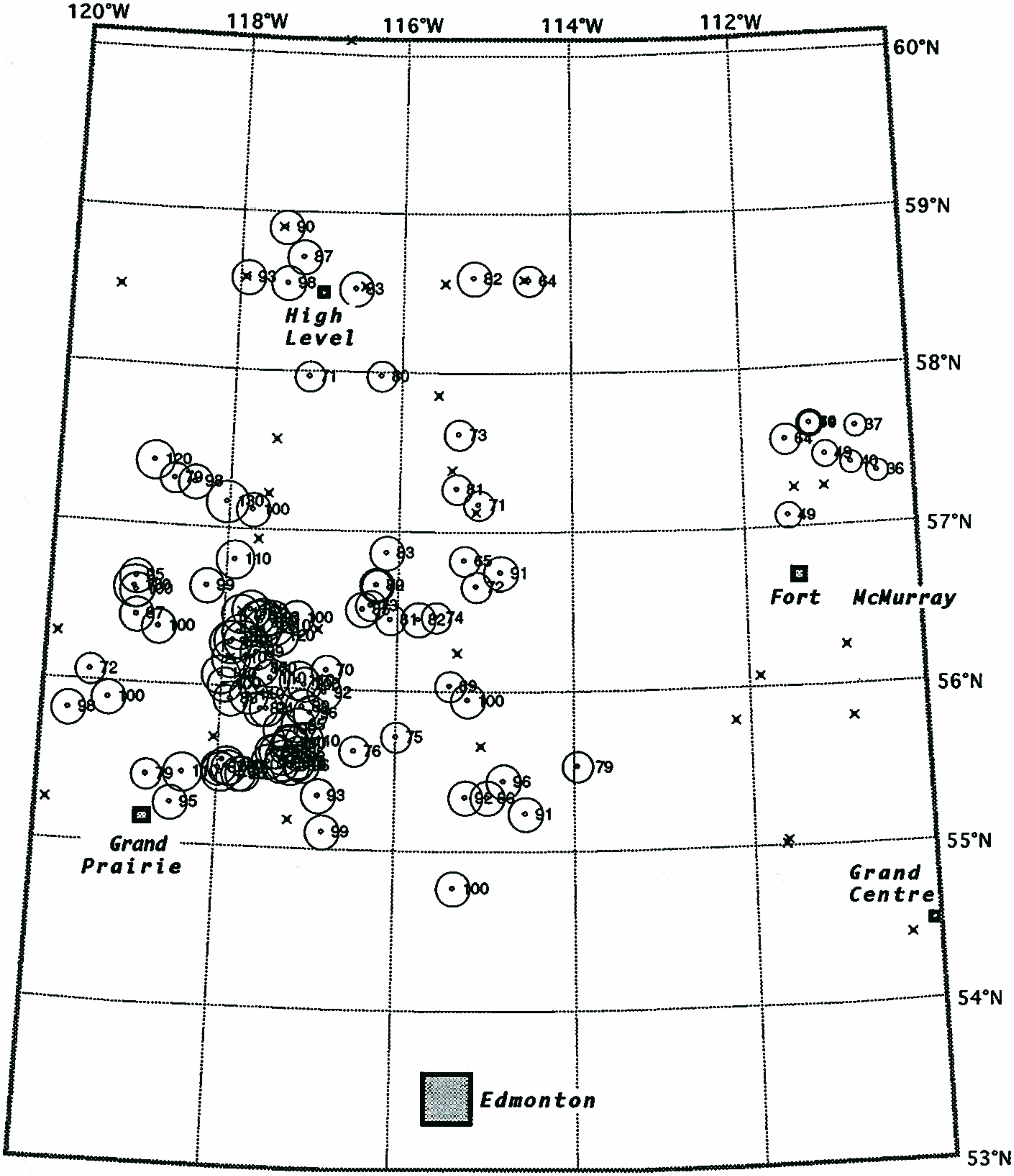


Figure 3.22. Chromium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

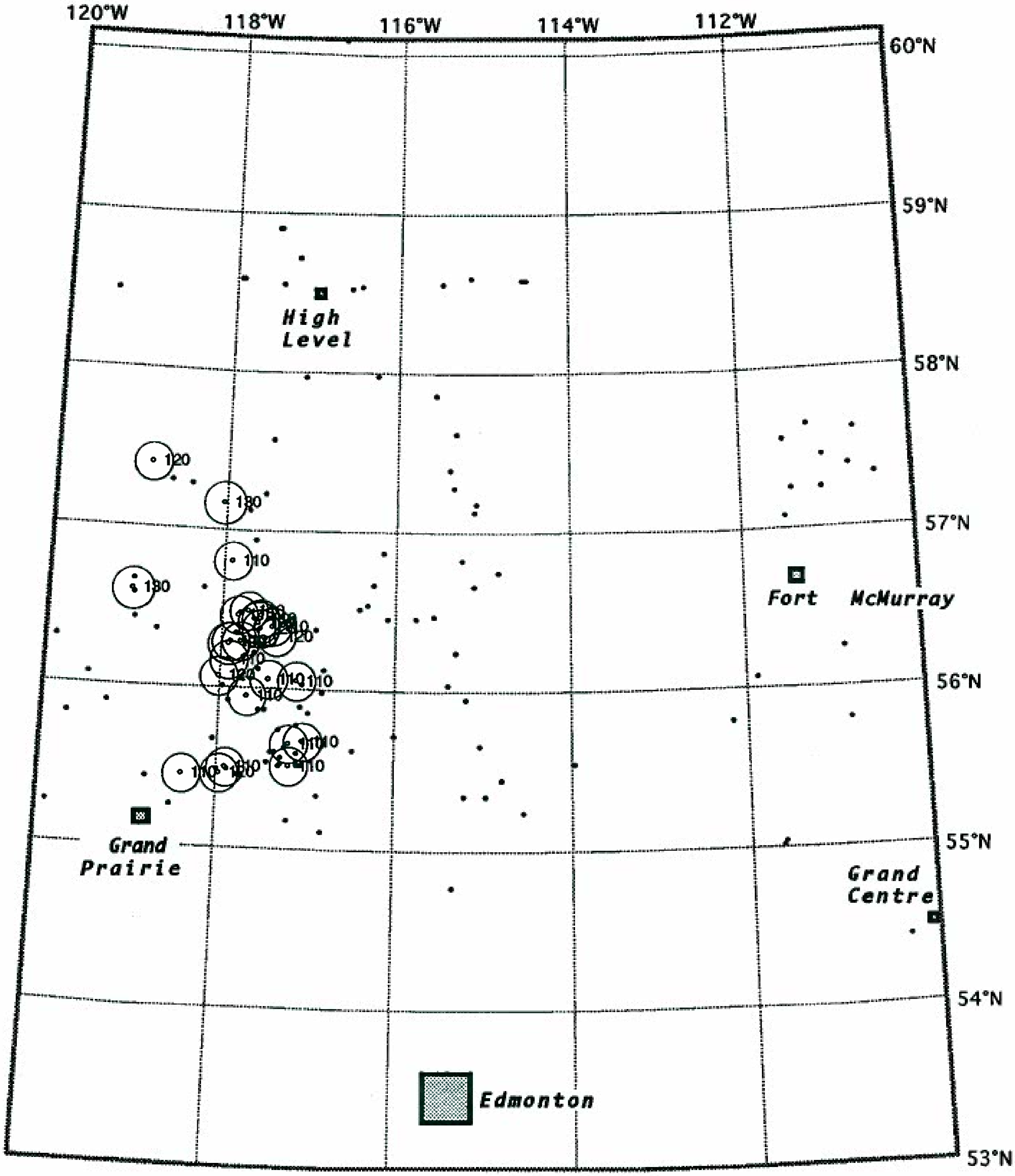


Figure 3.23. Chromium concentration (ppm) from NA, ≥ 75%ile.

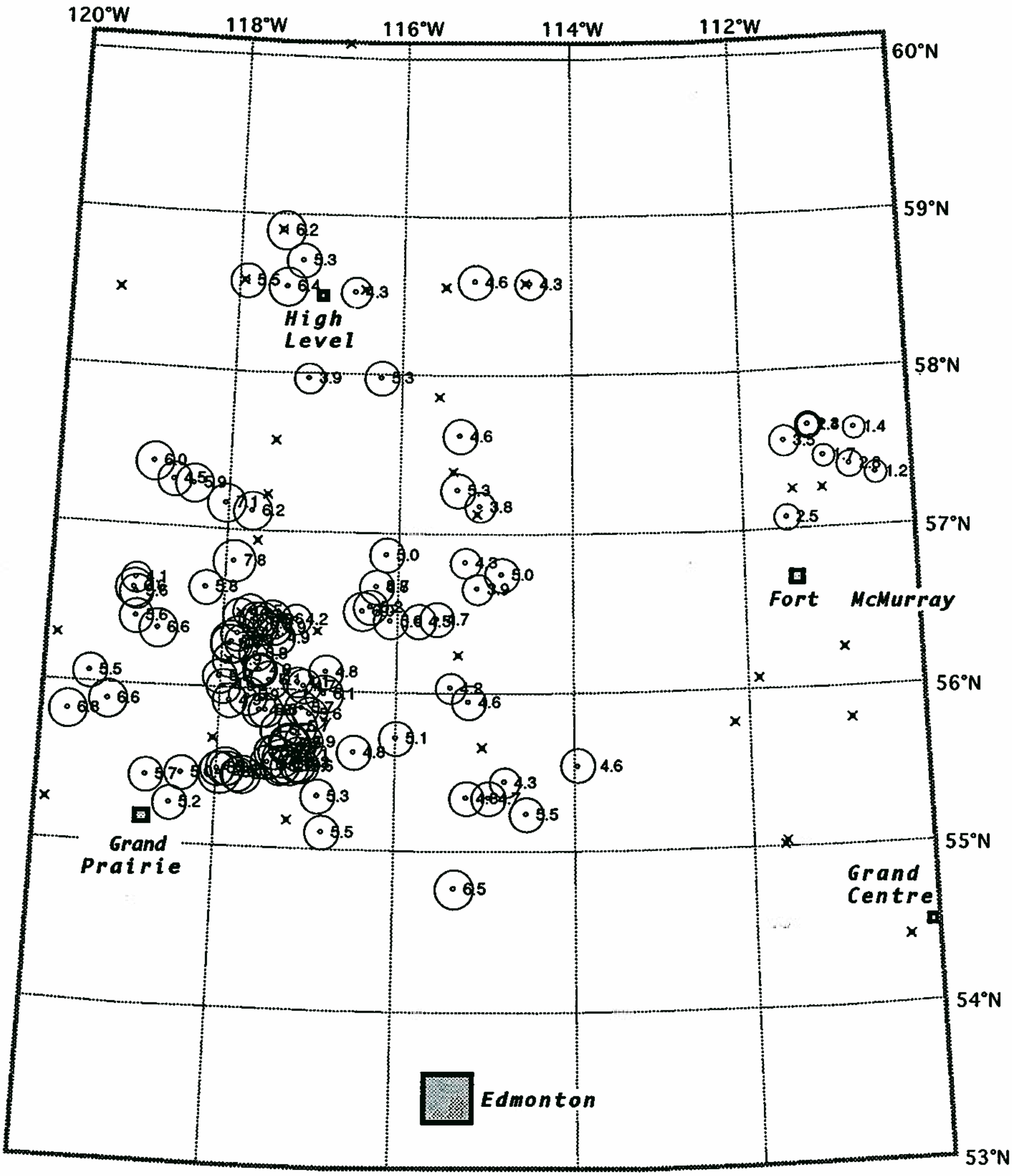


Figure 3.24. Cesium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

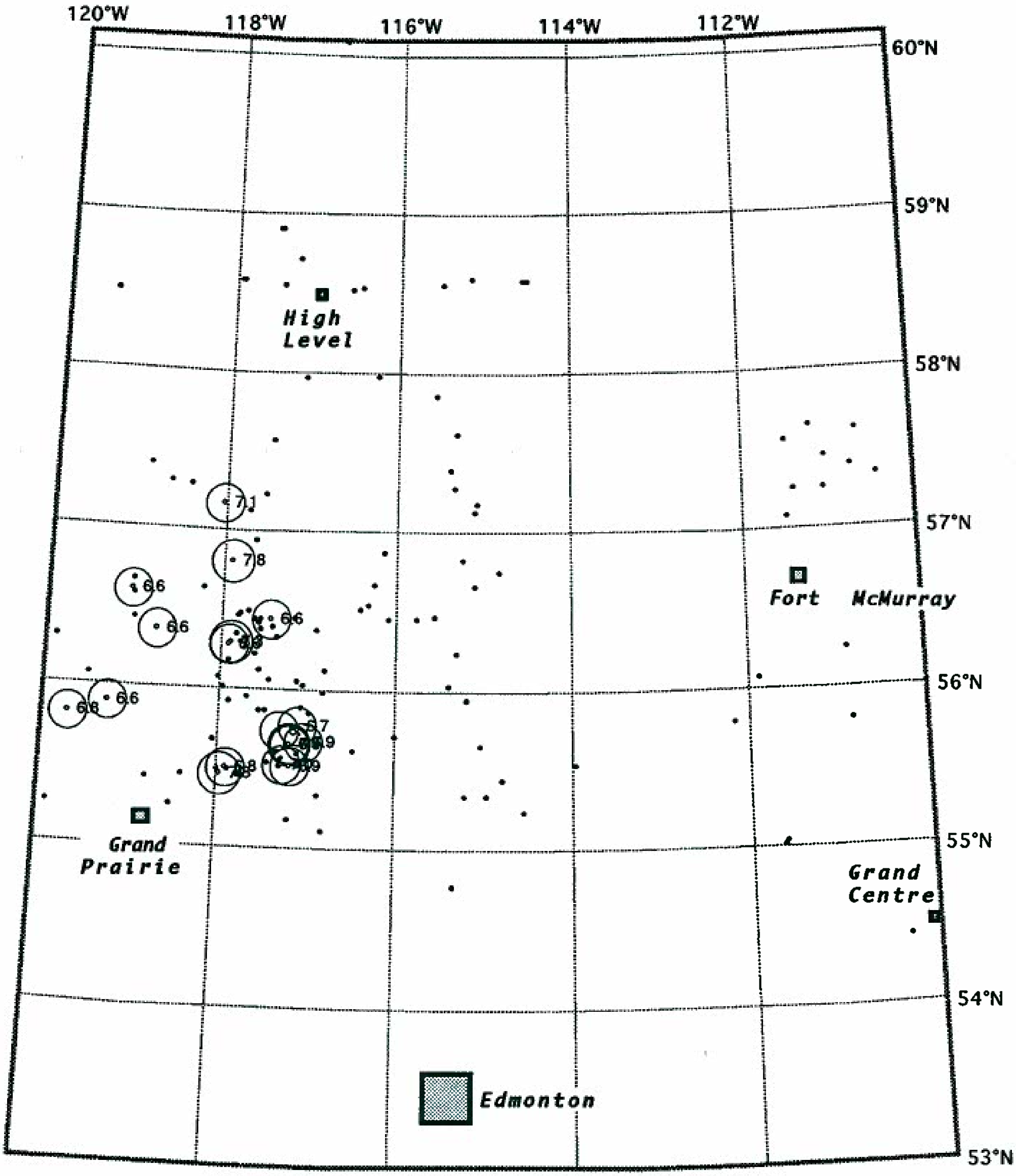


Figure 3.25. Cesium concentration (ppm) from NA, ≥ 75%ile.

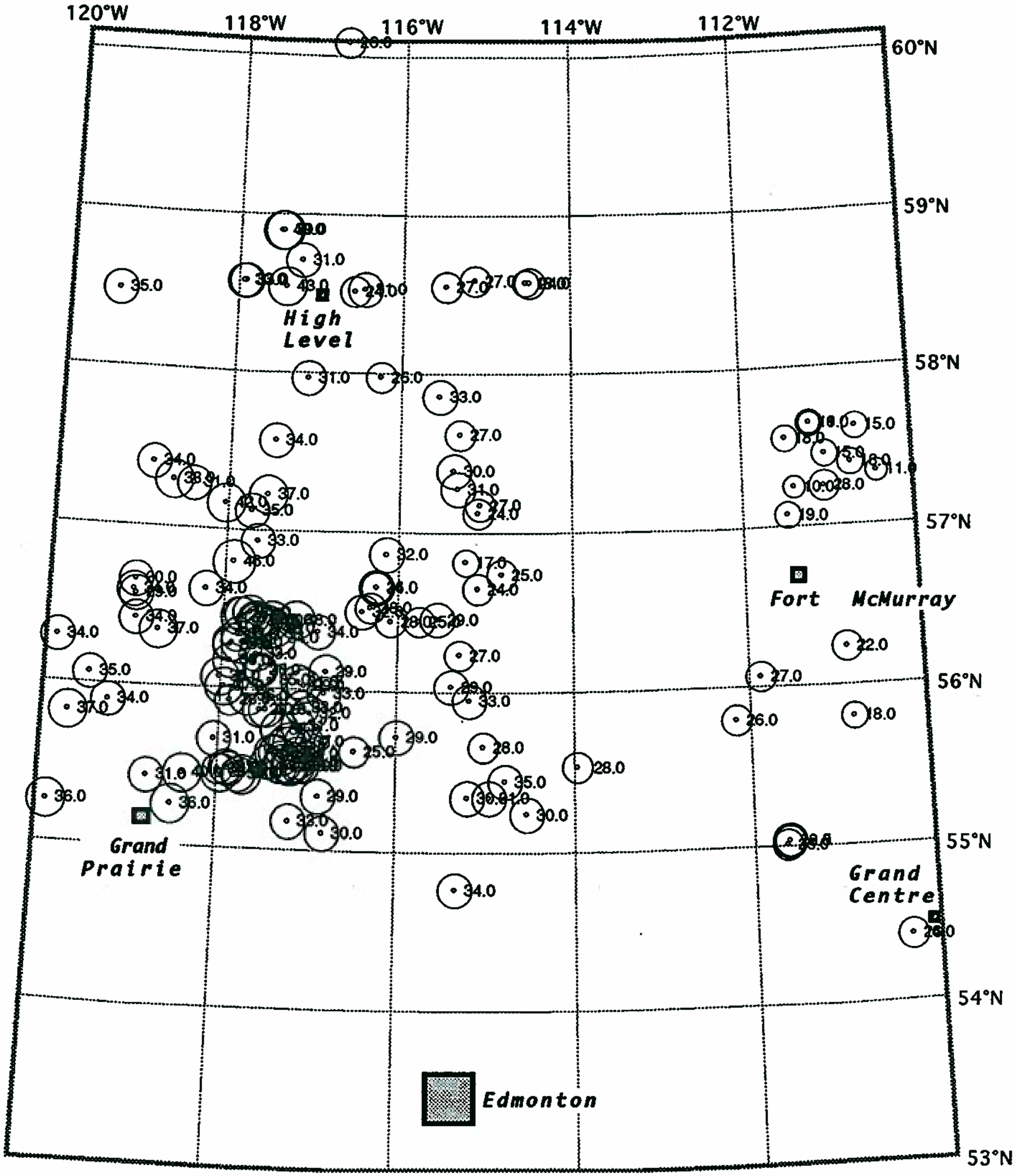


Figure 3.26. Copper concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

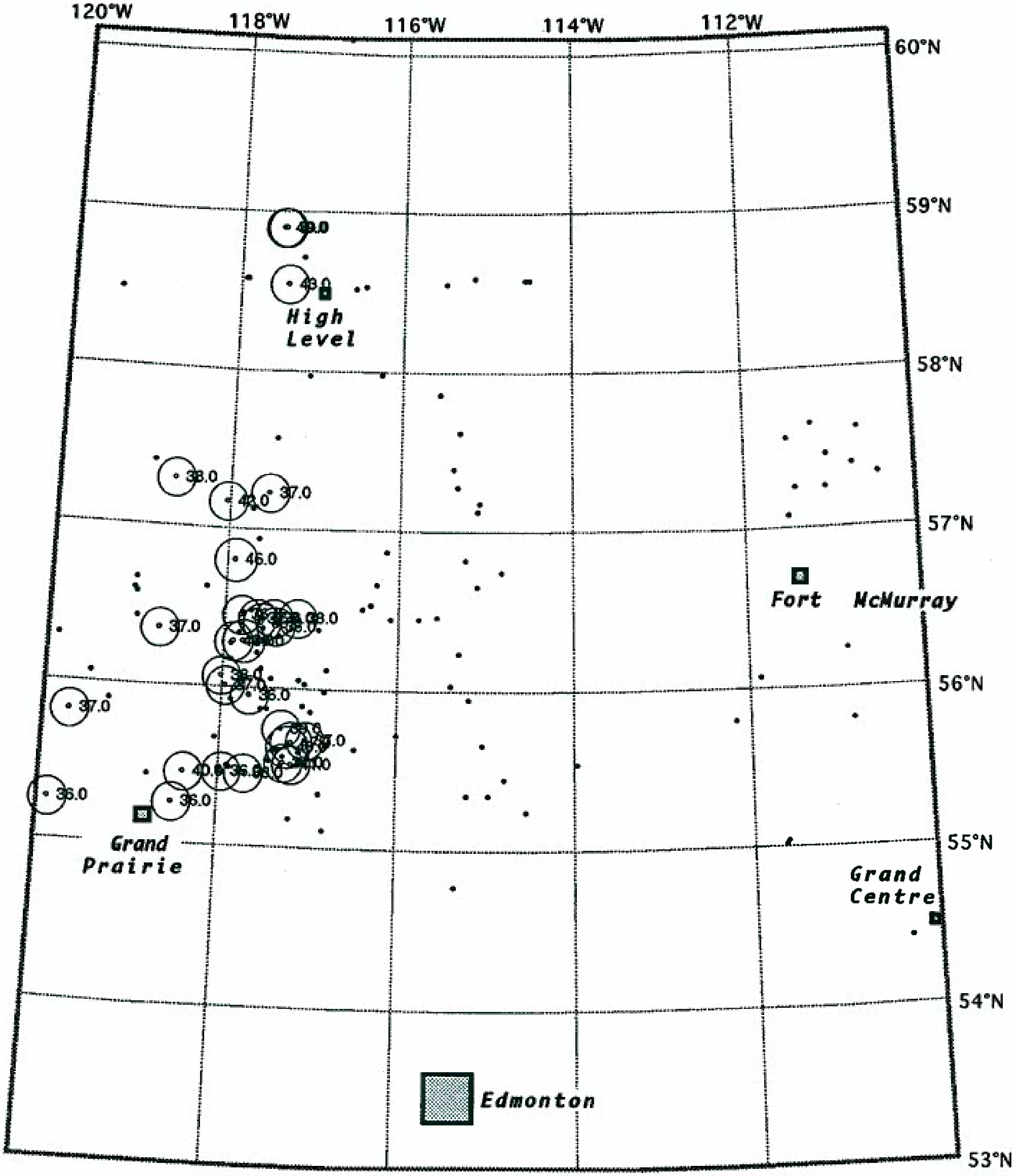


Figure 3.27. Copper concentration (ppm) from NA, ≥ 75%ile.

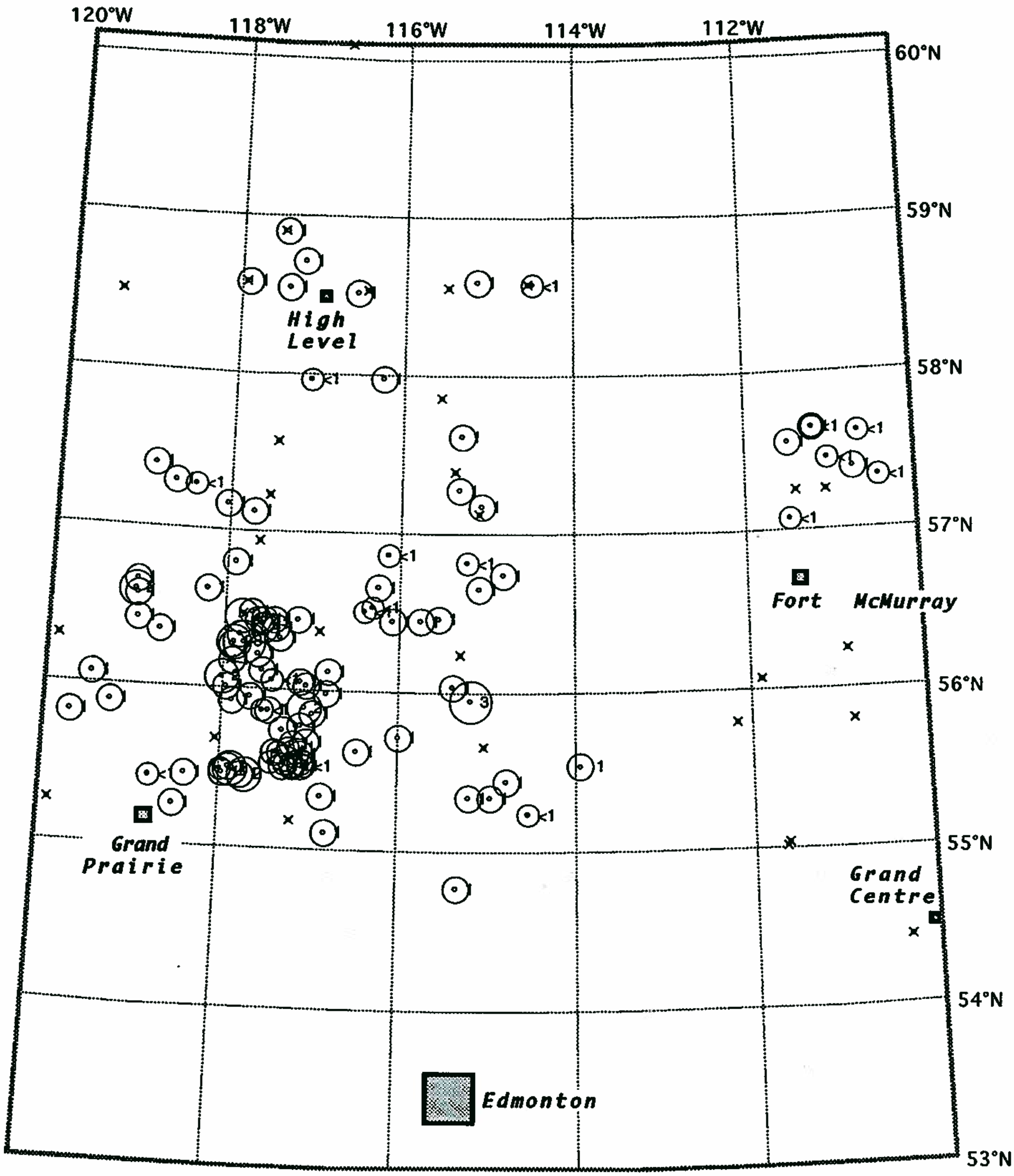


Figure 3.28. Europium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

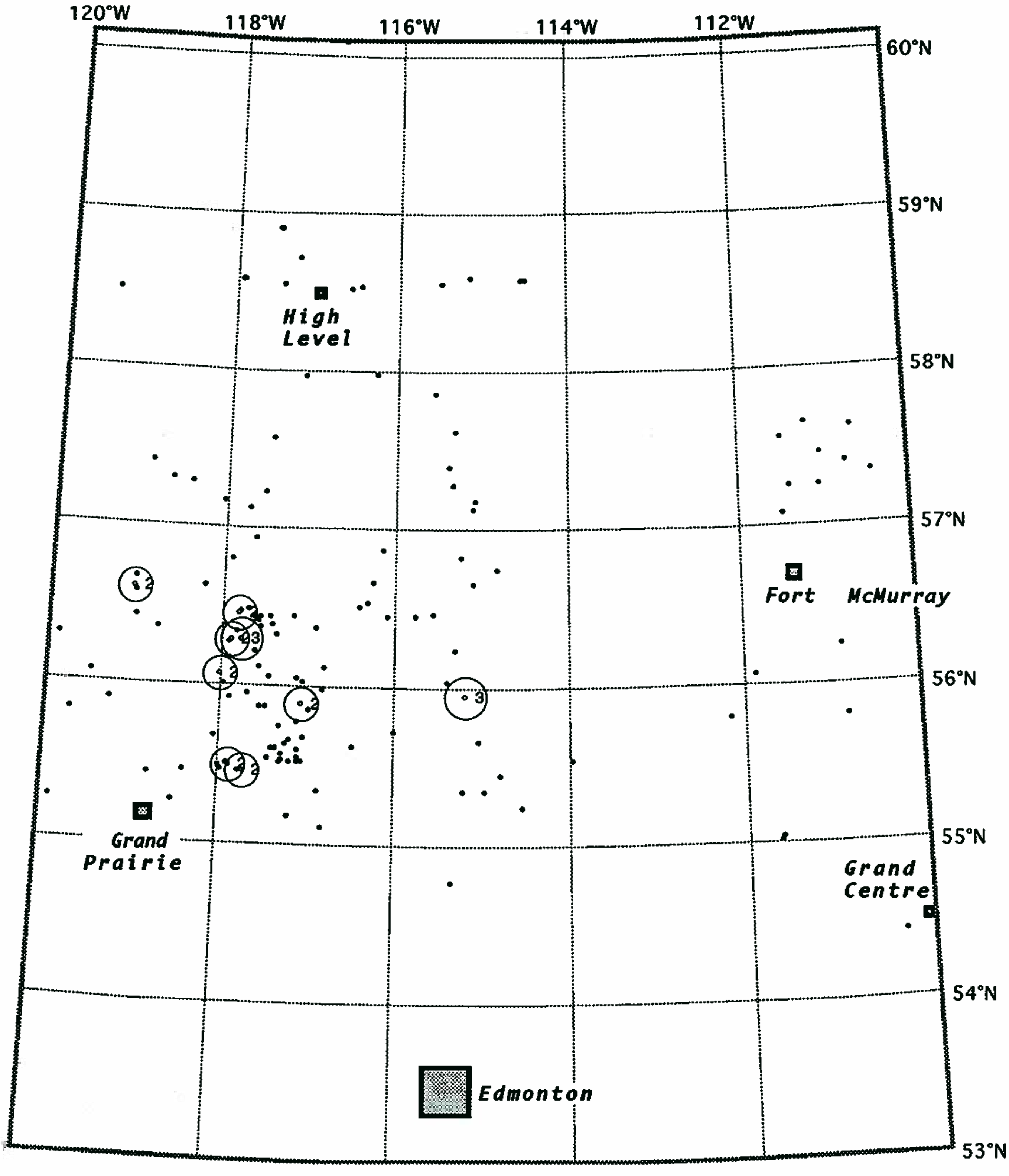


Figure 3.29. Europium concentration (ppm) from NA, ≥ 75%ile.

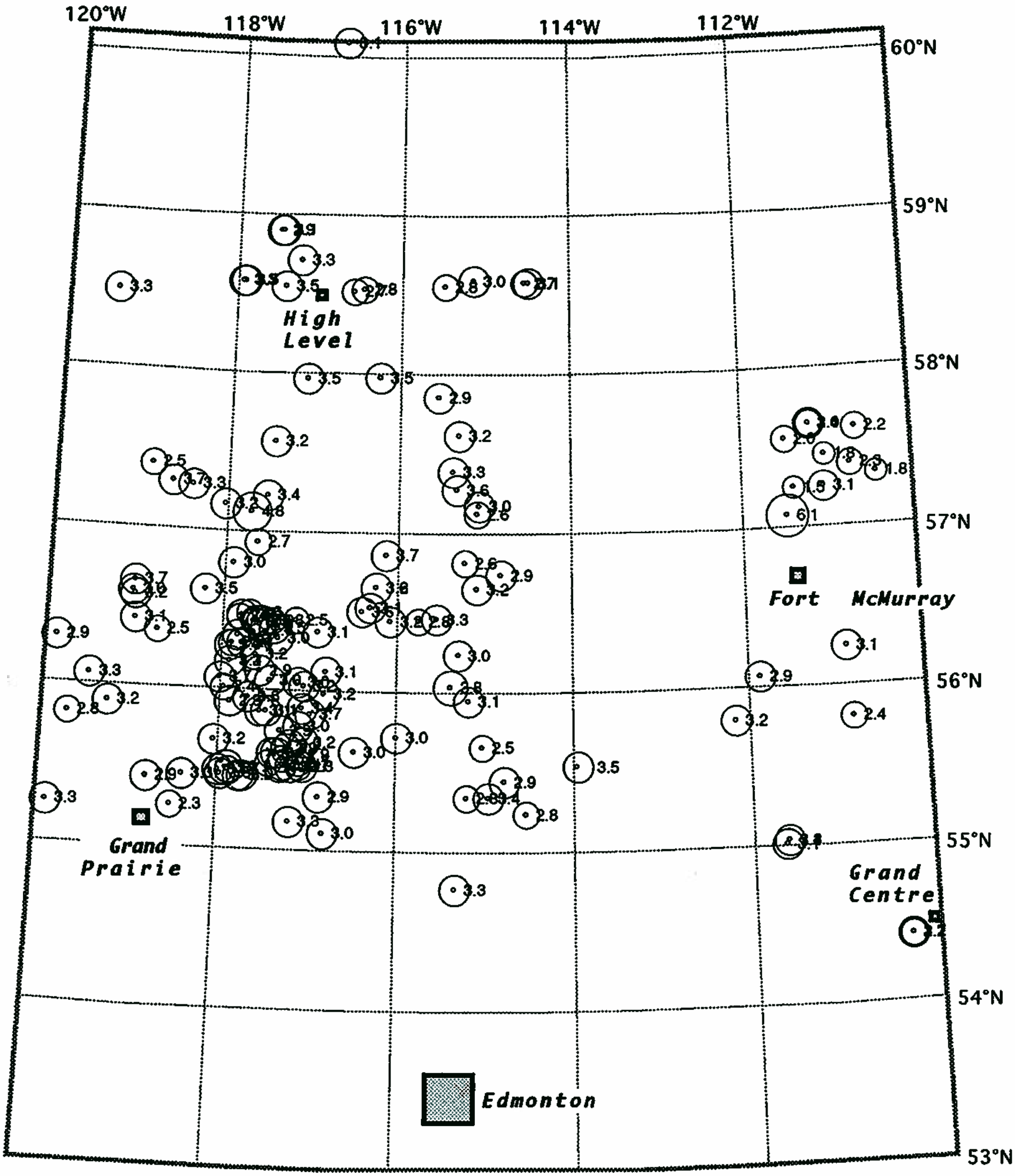


Figure 3.30. Iron concentration (%) from AA for all shallow data.

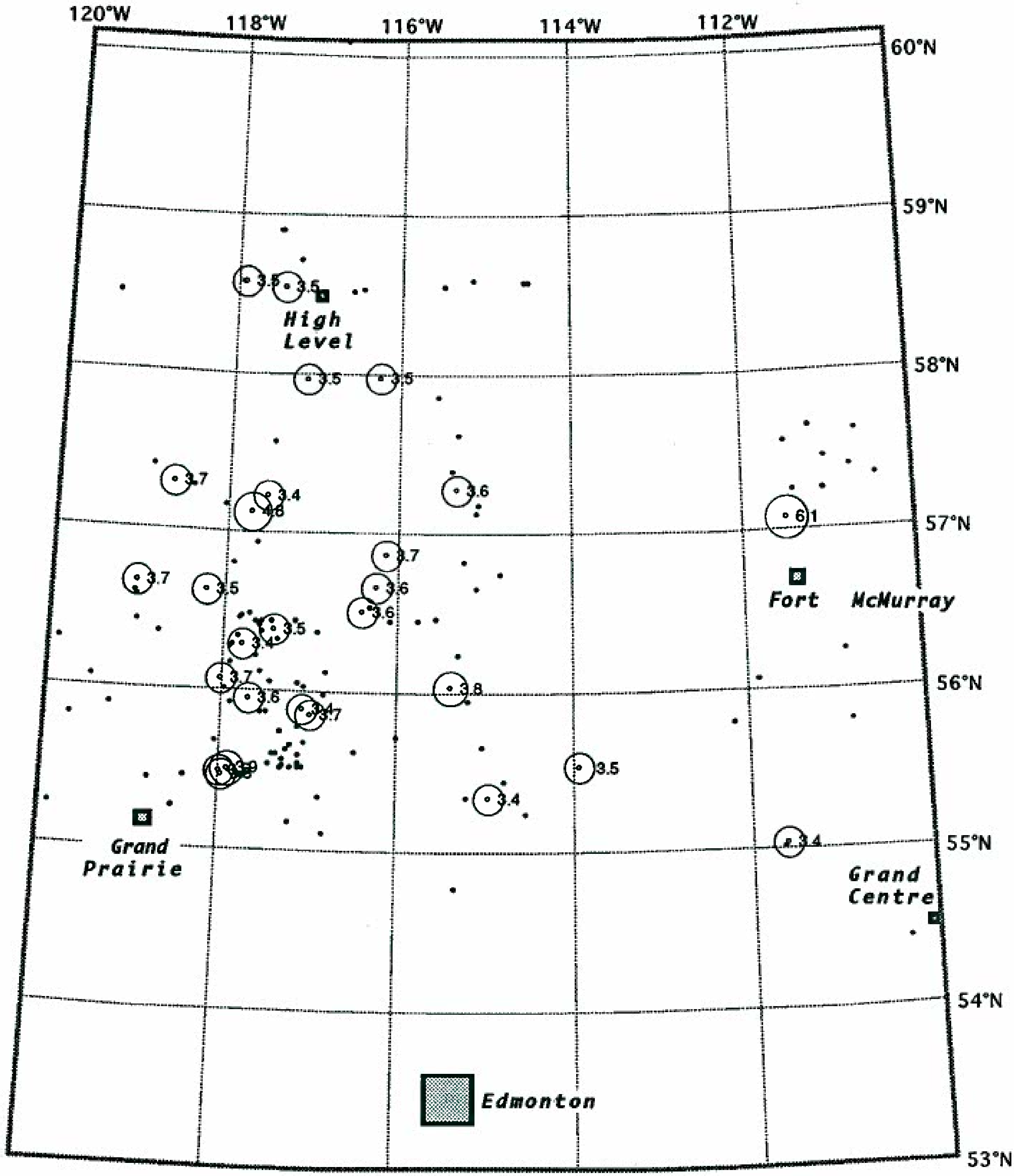


Figure 3.31. Iron concentration (%) from AA, ≥ 75%ile.

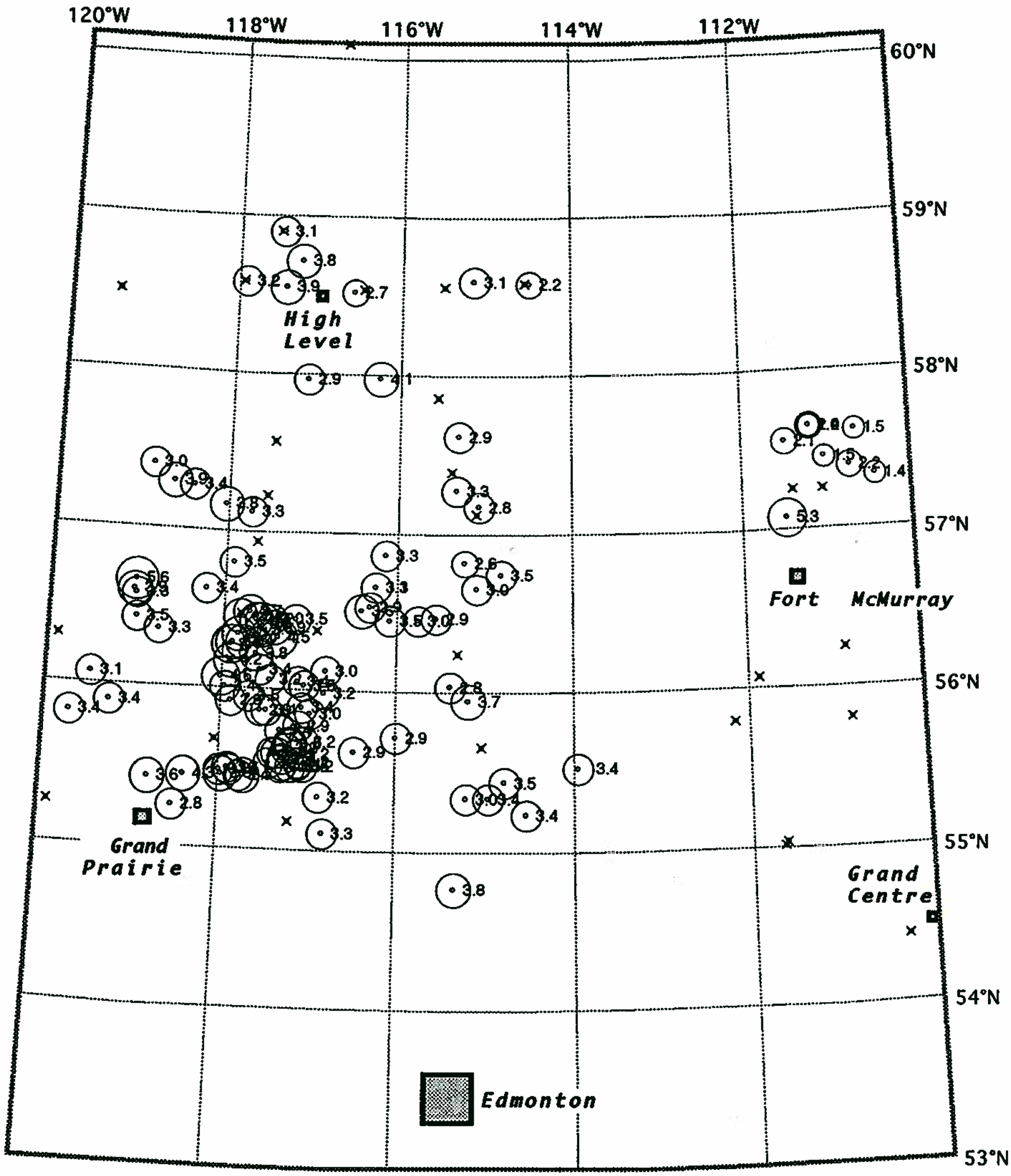


Figure 3.32. Iron concentration (%) from NA for all shallow data.
(x = sample not yet analysed)

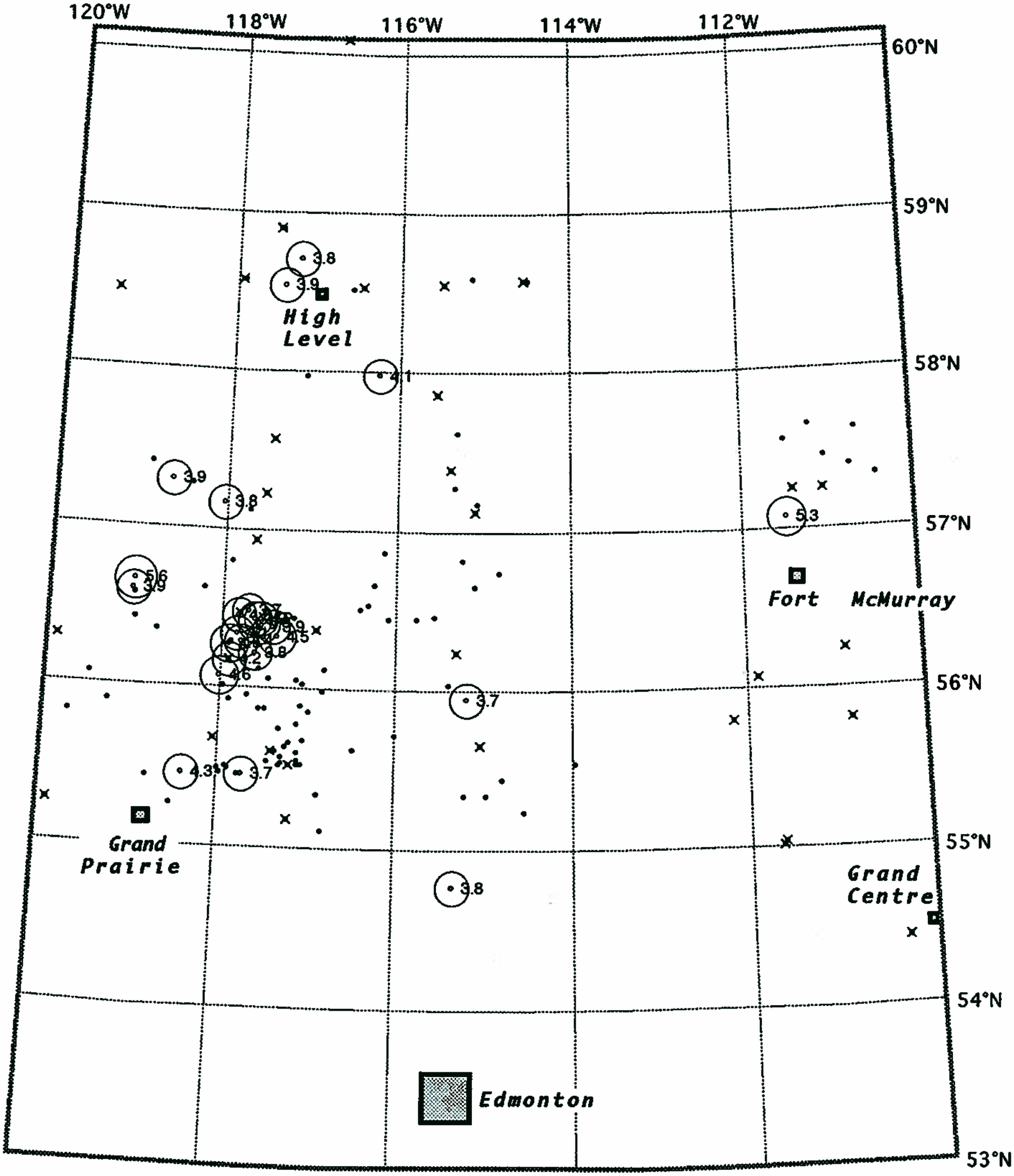


Figure 3.33. Iron concentration (%) from NA, ≥ 75%ile.

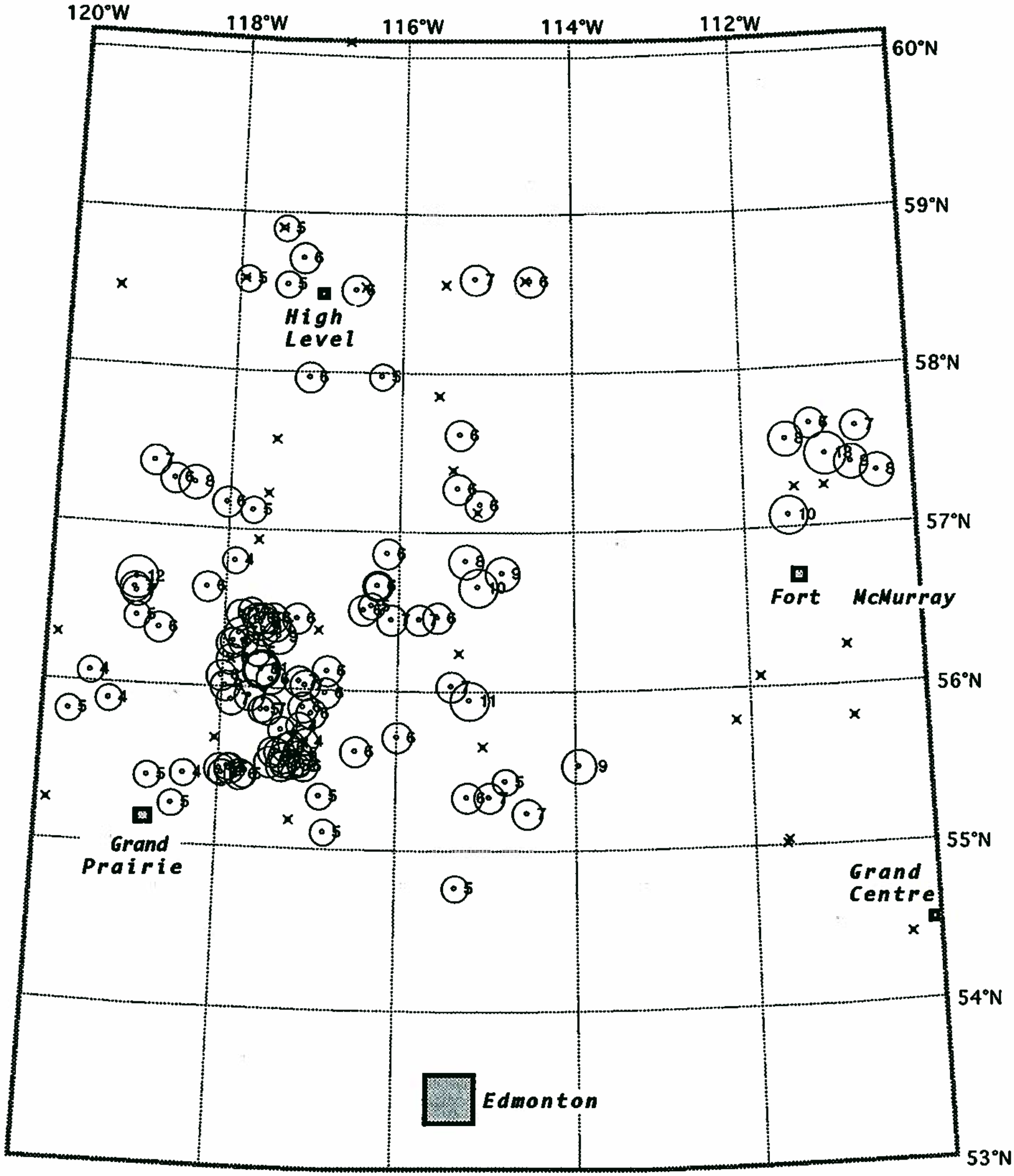


Figure 3.34. Hafnium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

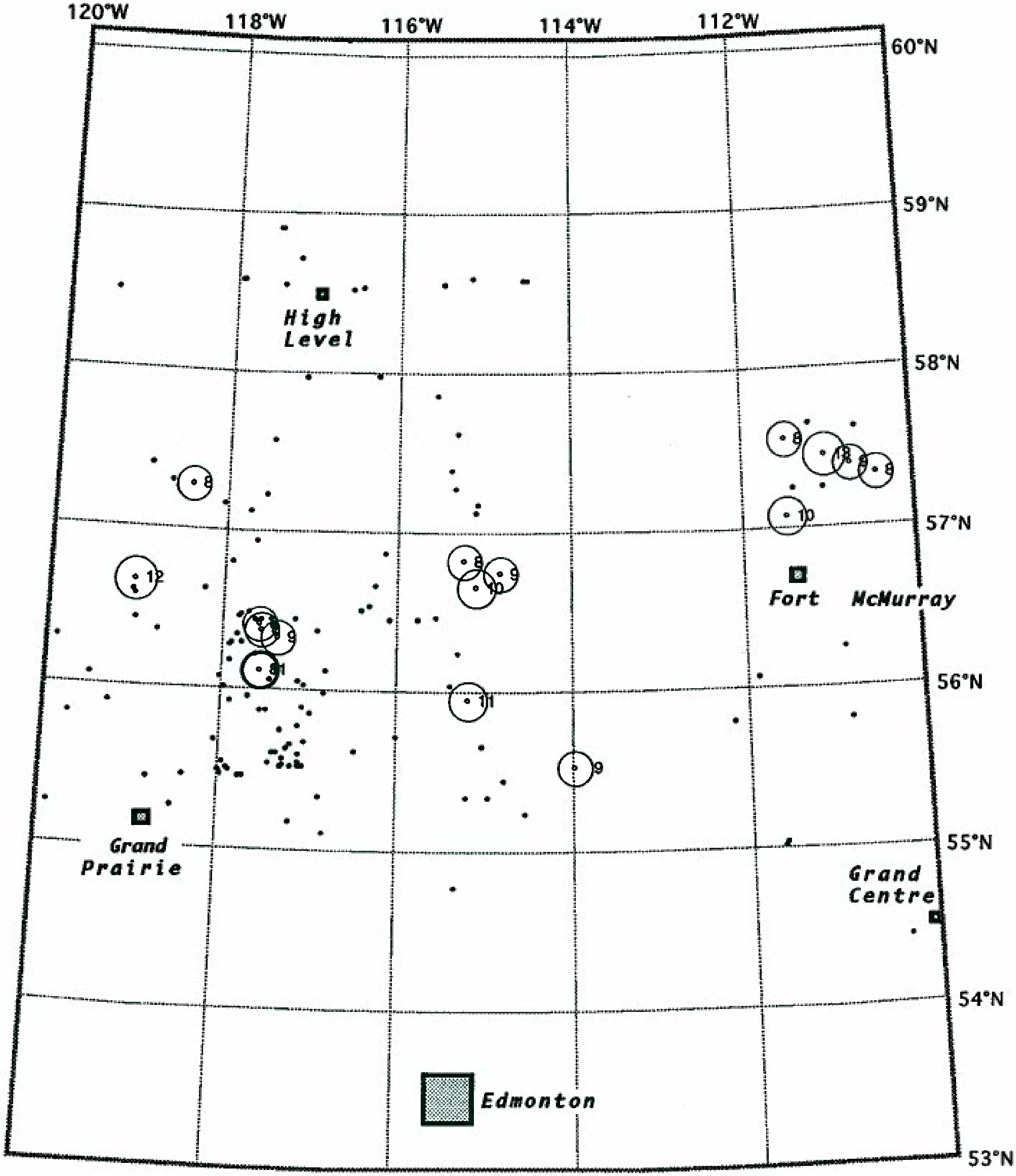


Figure 3.35. Hafnium concentration (ppm) from NA, ≥ 75%ile.

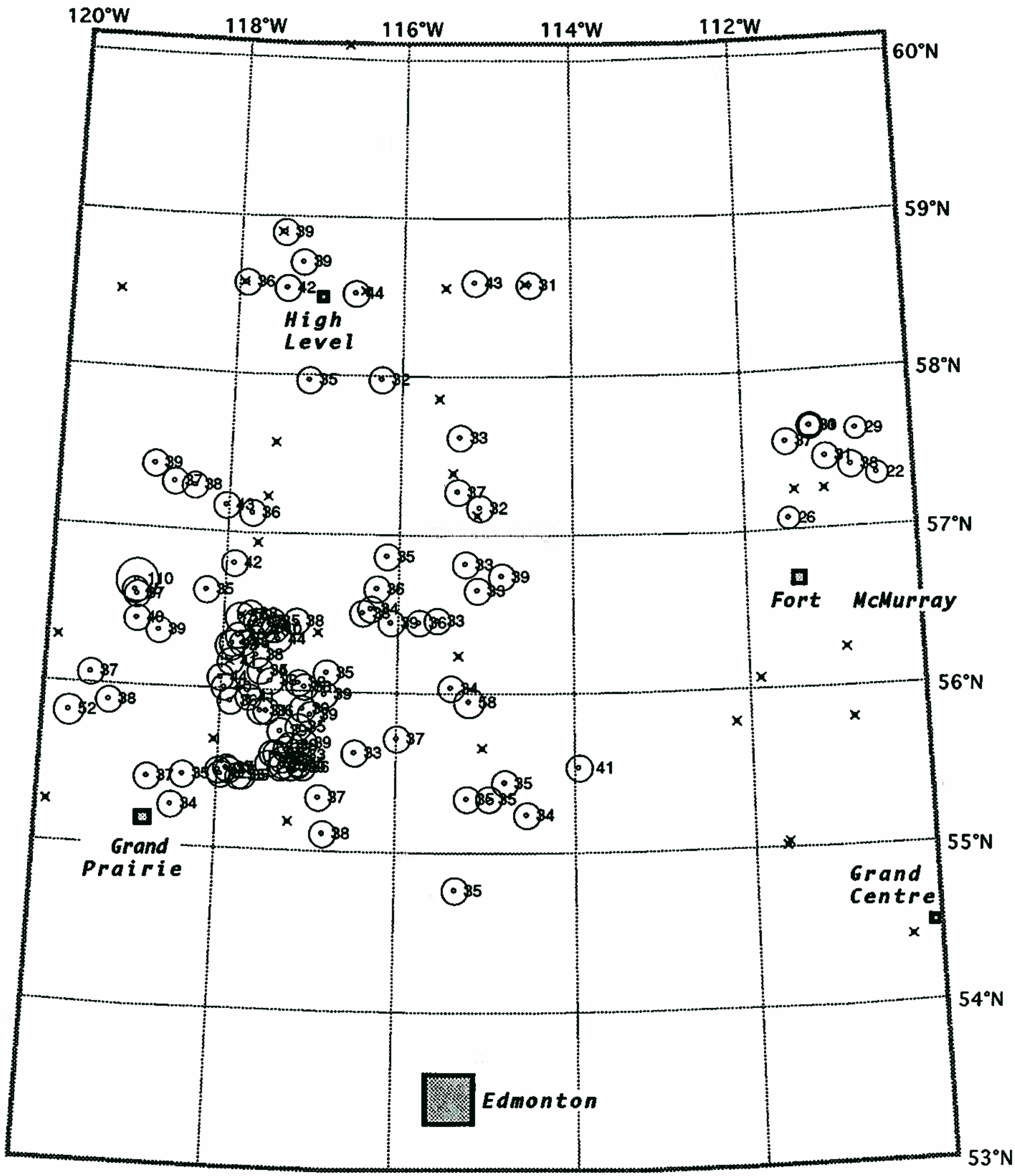


Figure 3.36. Lanthanum concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

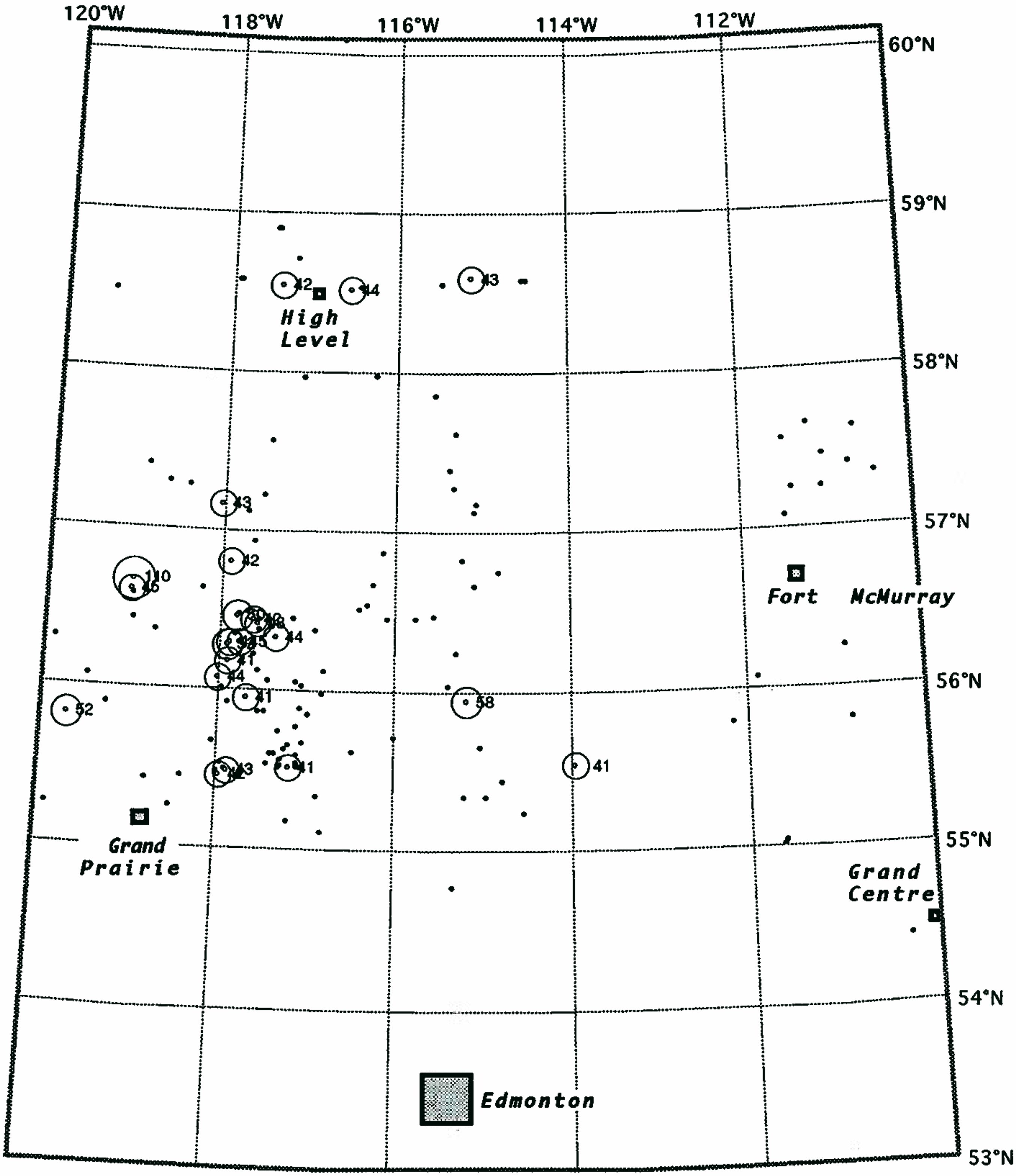


Figure 3.37. Lanthanum concentration (ppm) from NA, ≥ 75%ile.

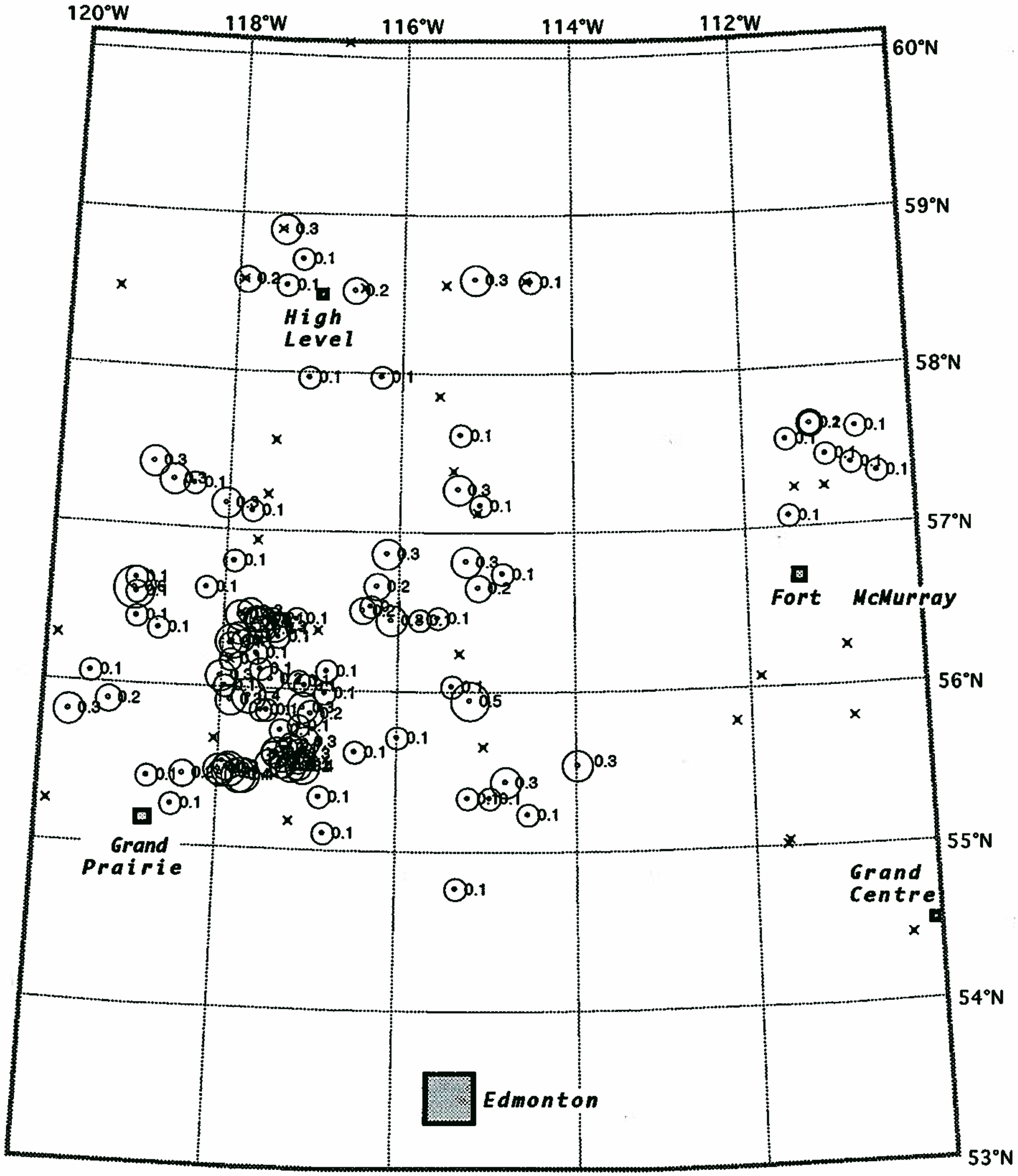


Figure 3.38. Lutetium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

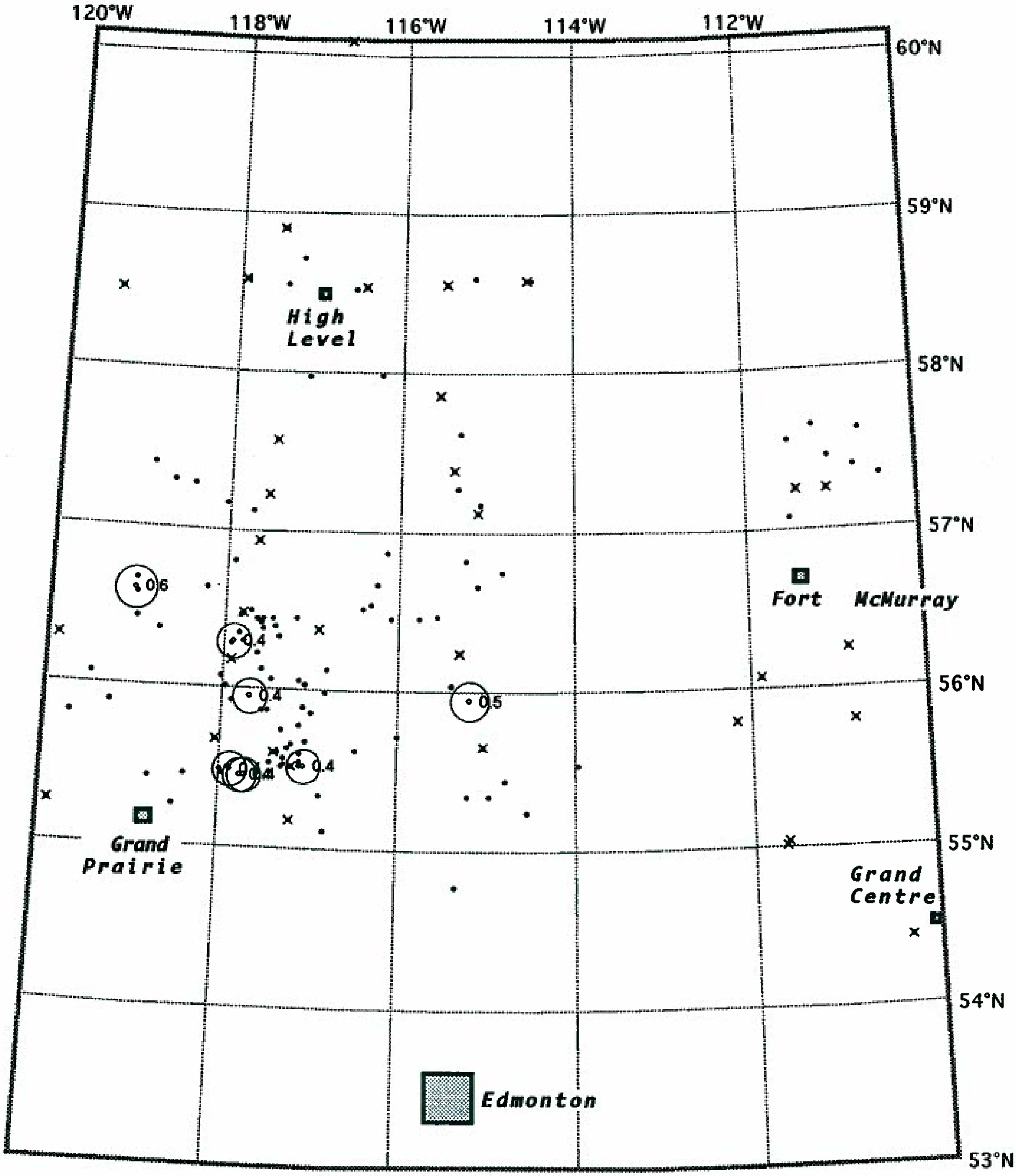


Figure 3.39. Lutetium concentration (ppm) from NA, ≥ 75%ile.

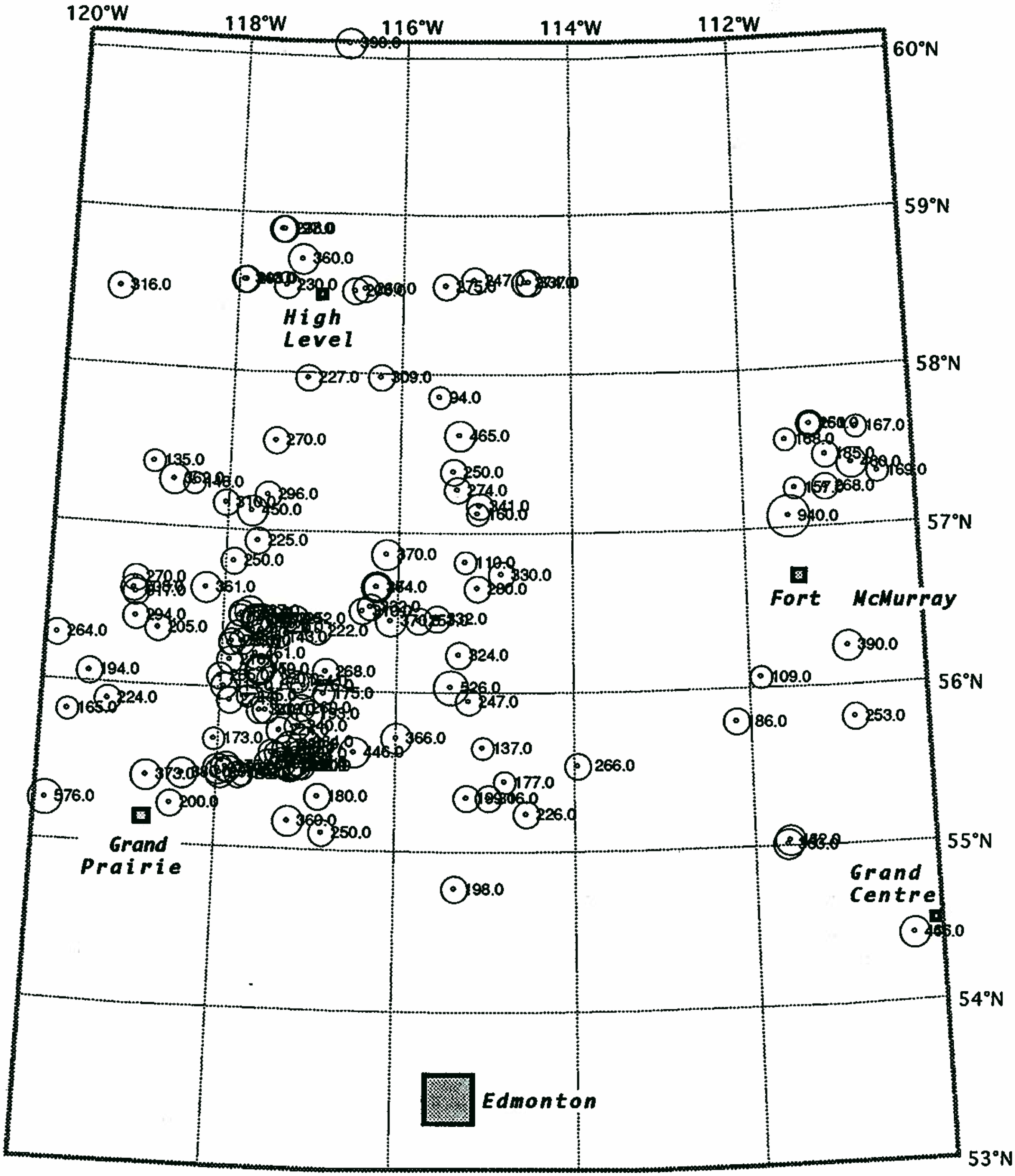


Figure 3.40. Manganese concentration (ppm) from AA for all shallow data.

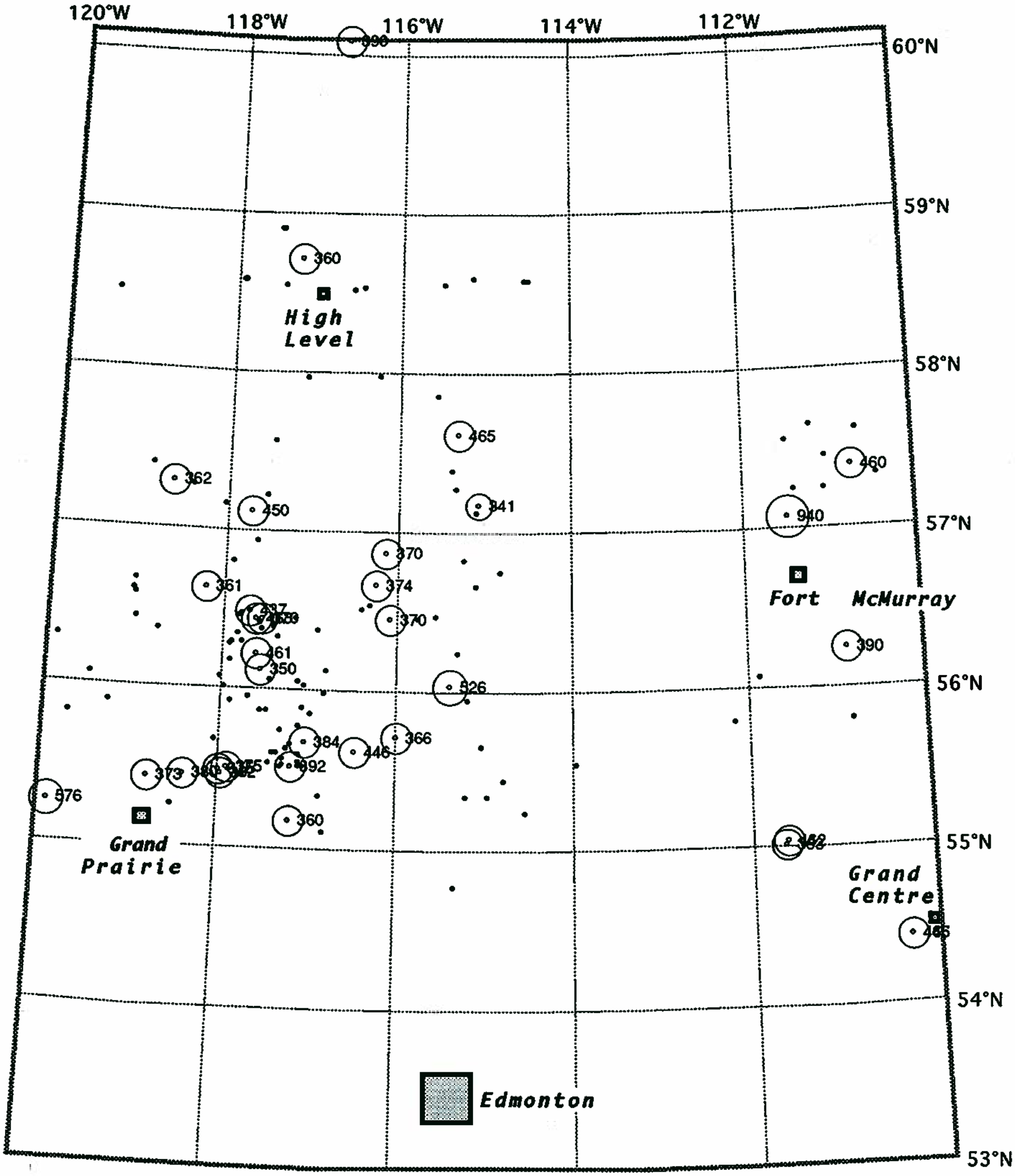


Figure 3.41 Manganese concentration (ppm) from AA, ≥ 75%ile.

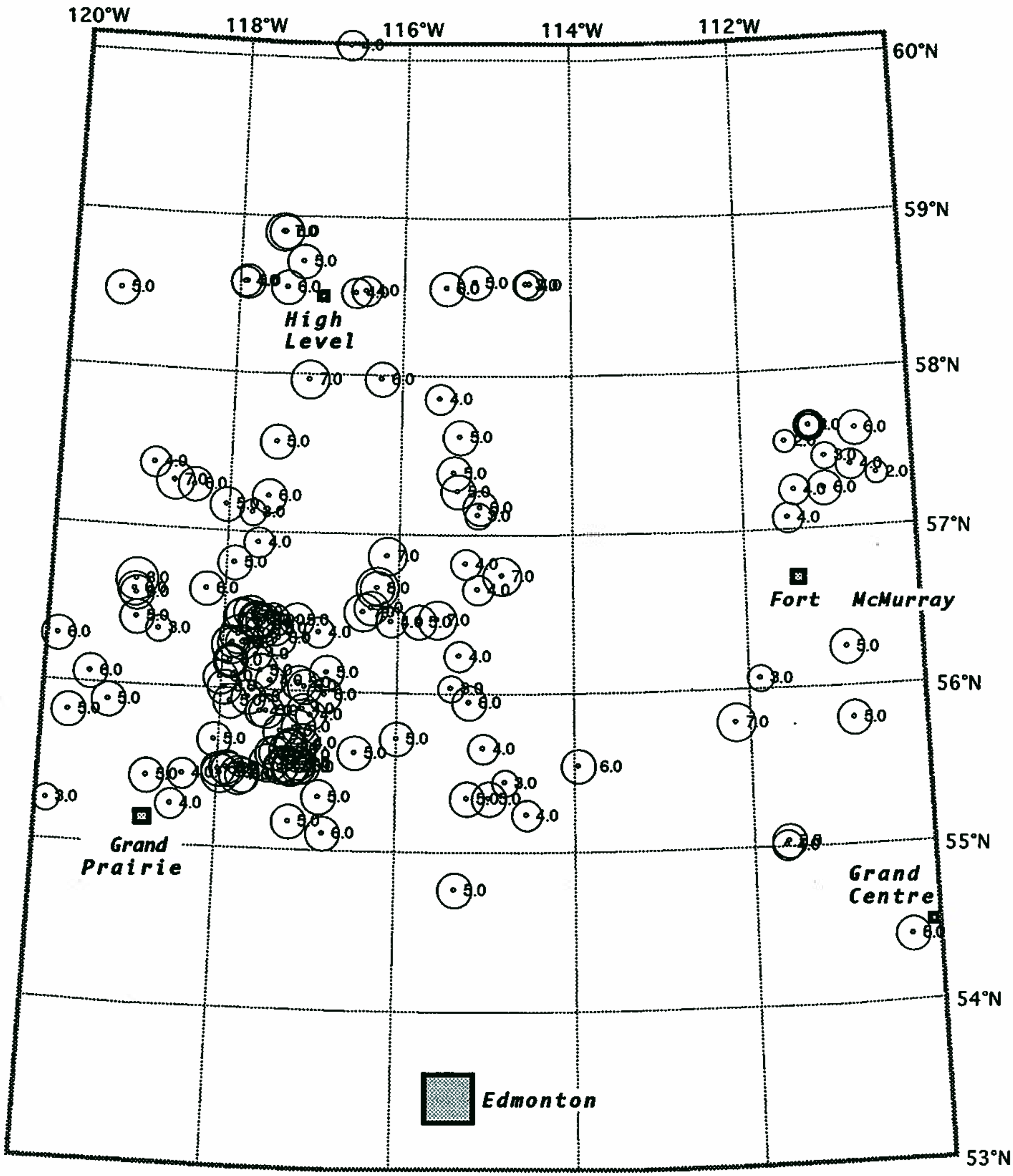


Figure 3.42. Molybdenum concentration (ppm) from AA for all shallow data.

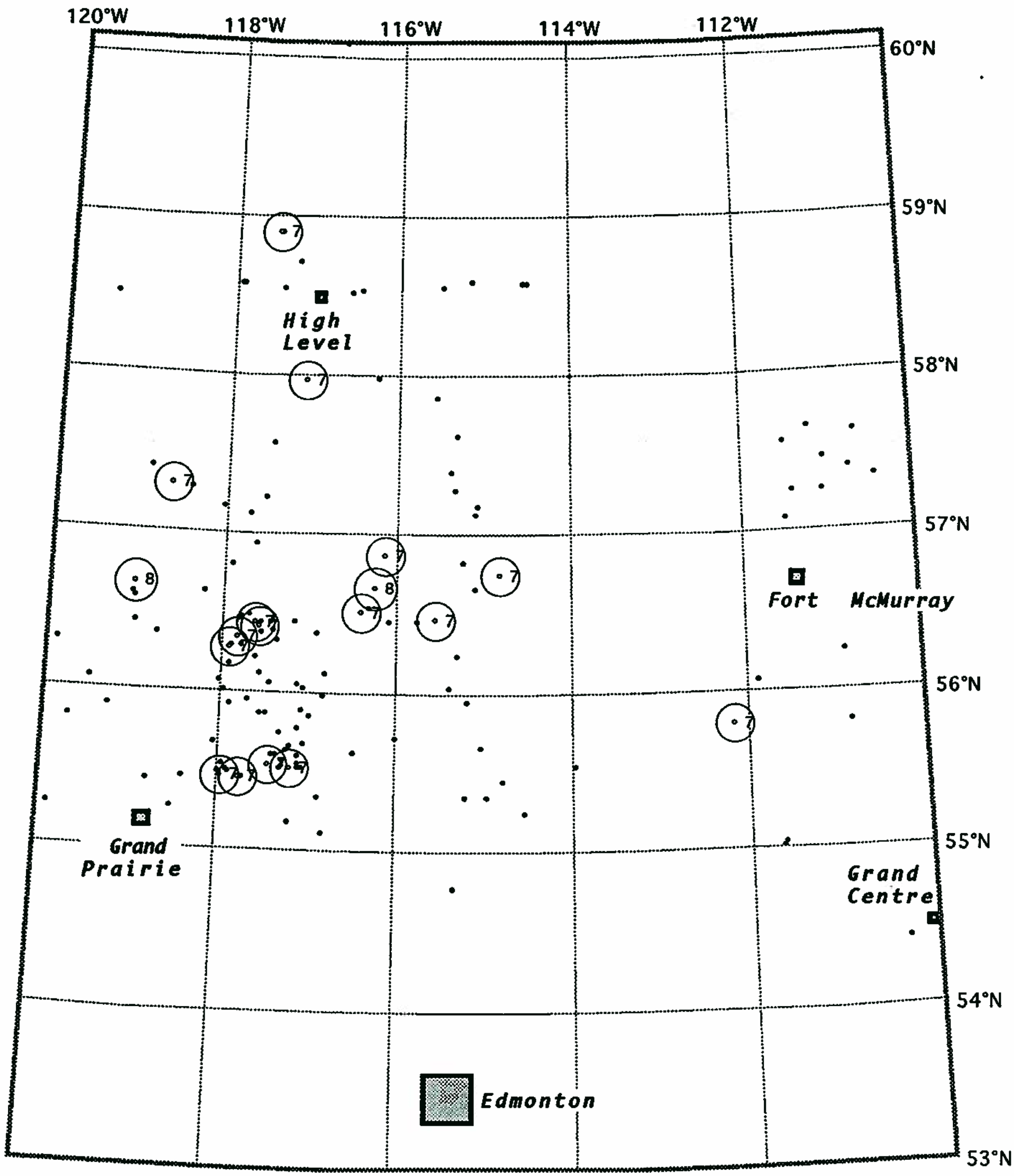


Figure 3.43. Molybdenum concentration (ppm) from AA, ≥ 75%ile.

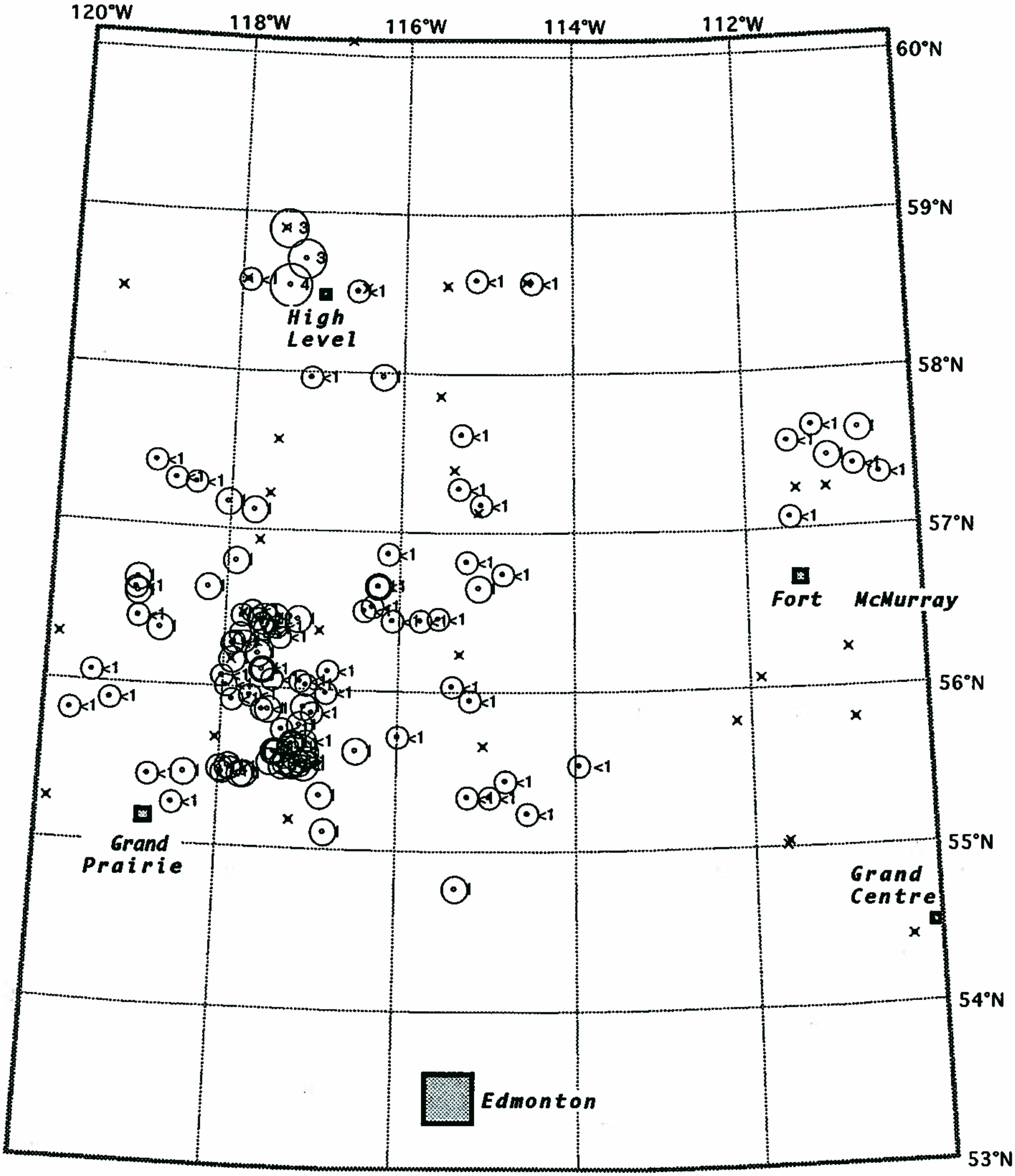


Figure 3.44. Molybdenum concentration (ppm) from NA for all shallow data. (x = sample not yet analysed)

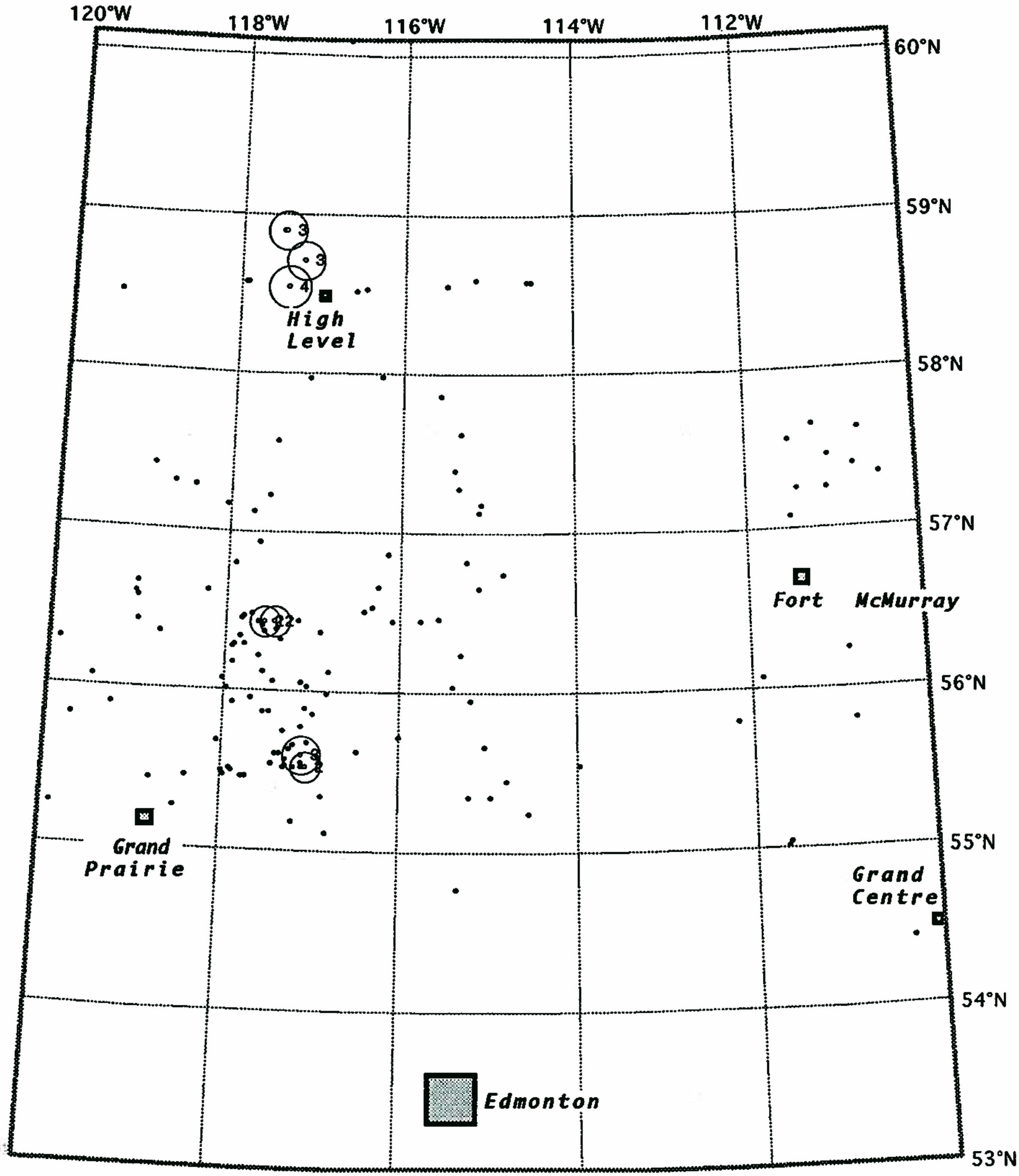


Figure 3.45. Molybdenum concentration (ppm) from NA, ≥ 75%ile.

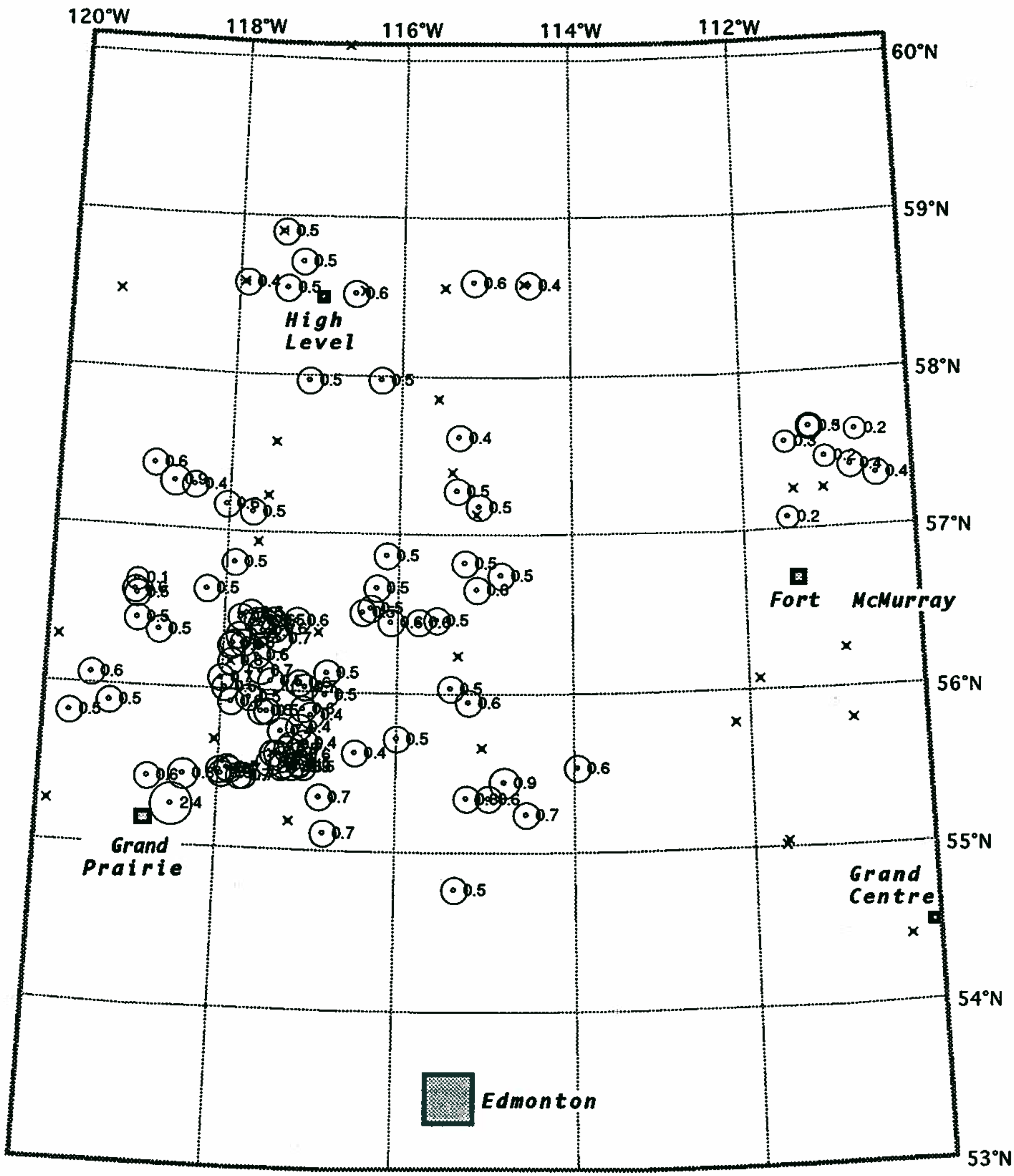


Figure 3.46. Sodium concentration (%) from NA for all shallow data.
(x = sample not yet analysed)

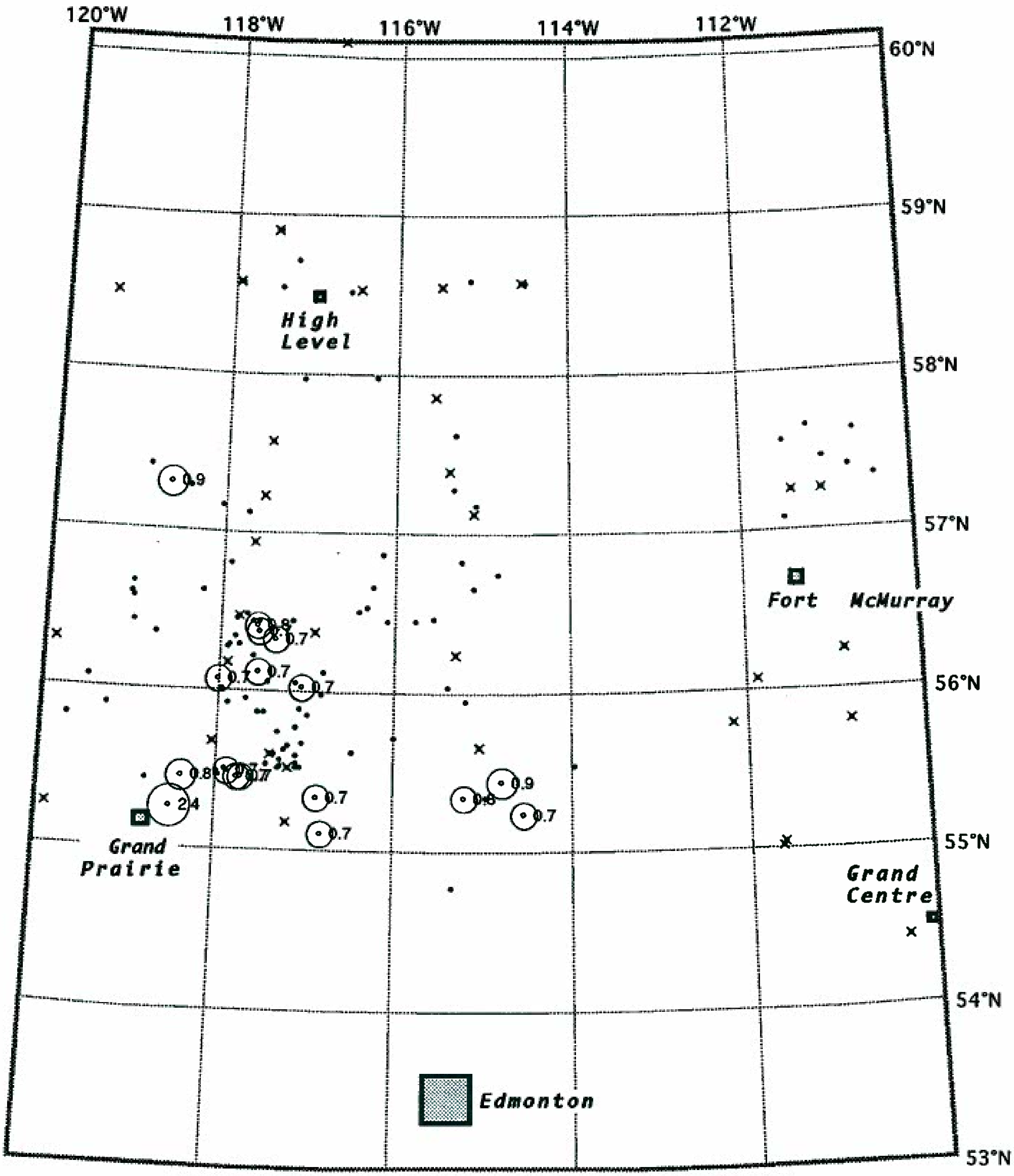


Figure 3.47. Sodium concentration (%) from NA, ≥ 75%ile.

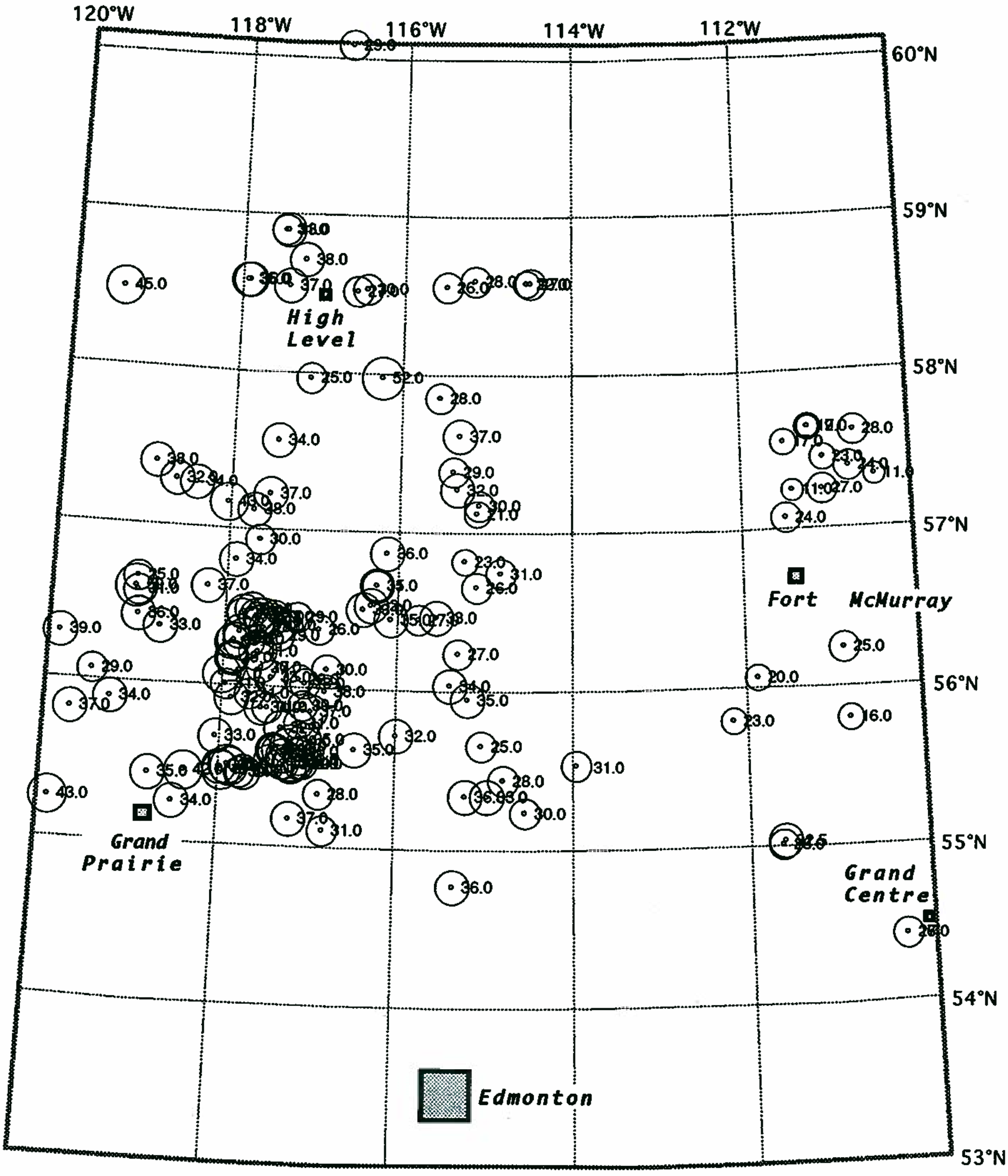


Figure 3.48. Nickel concentration (ppm) from AA for all shallow data.

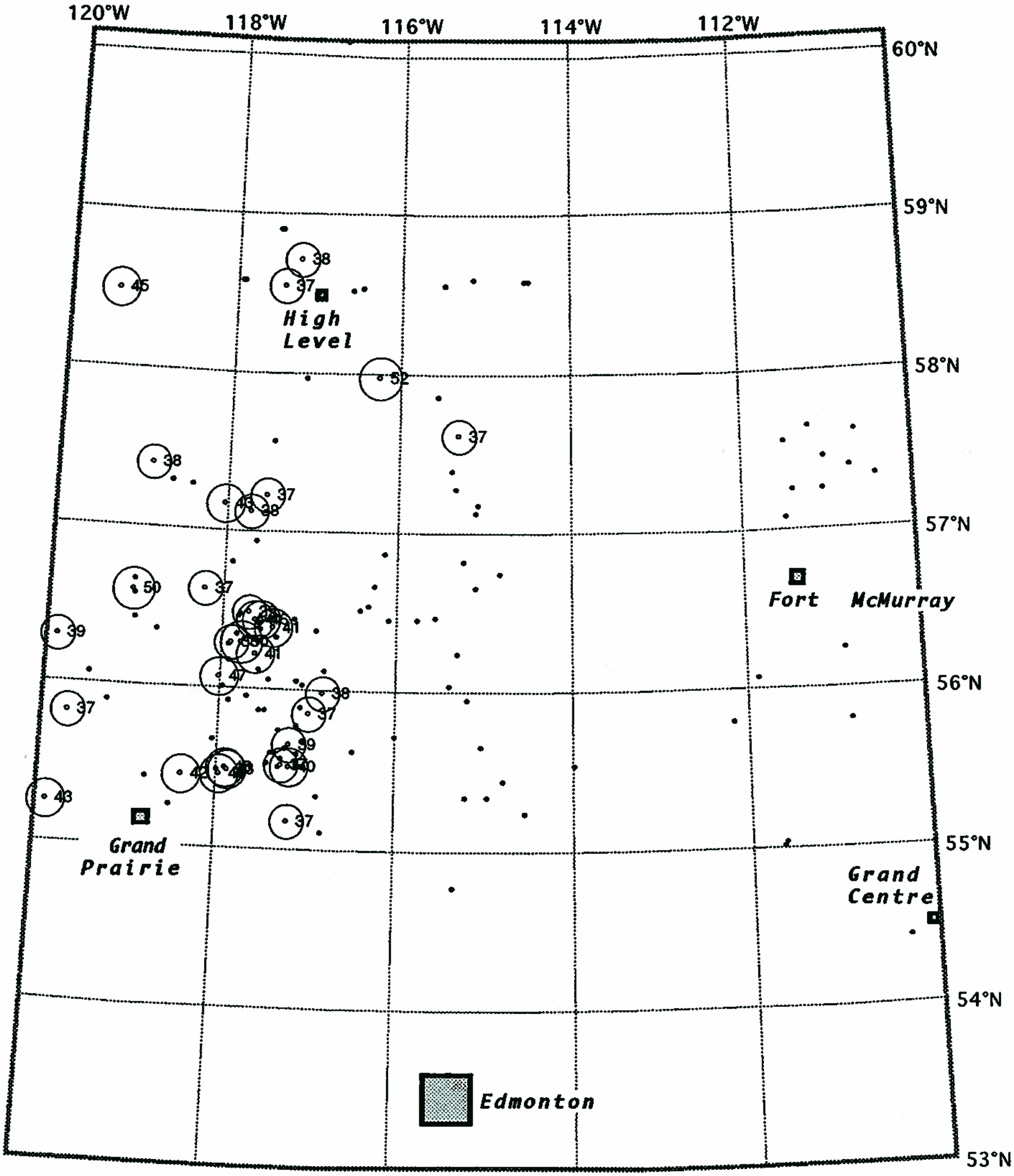


Figure 3.49. Nickel concentration (ppm) from AA, ≥ 75%ile.

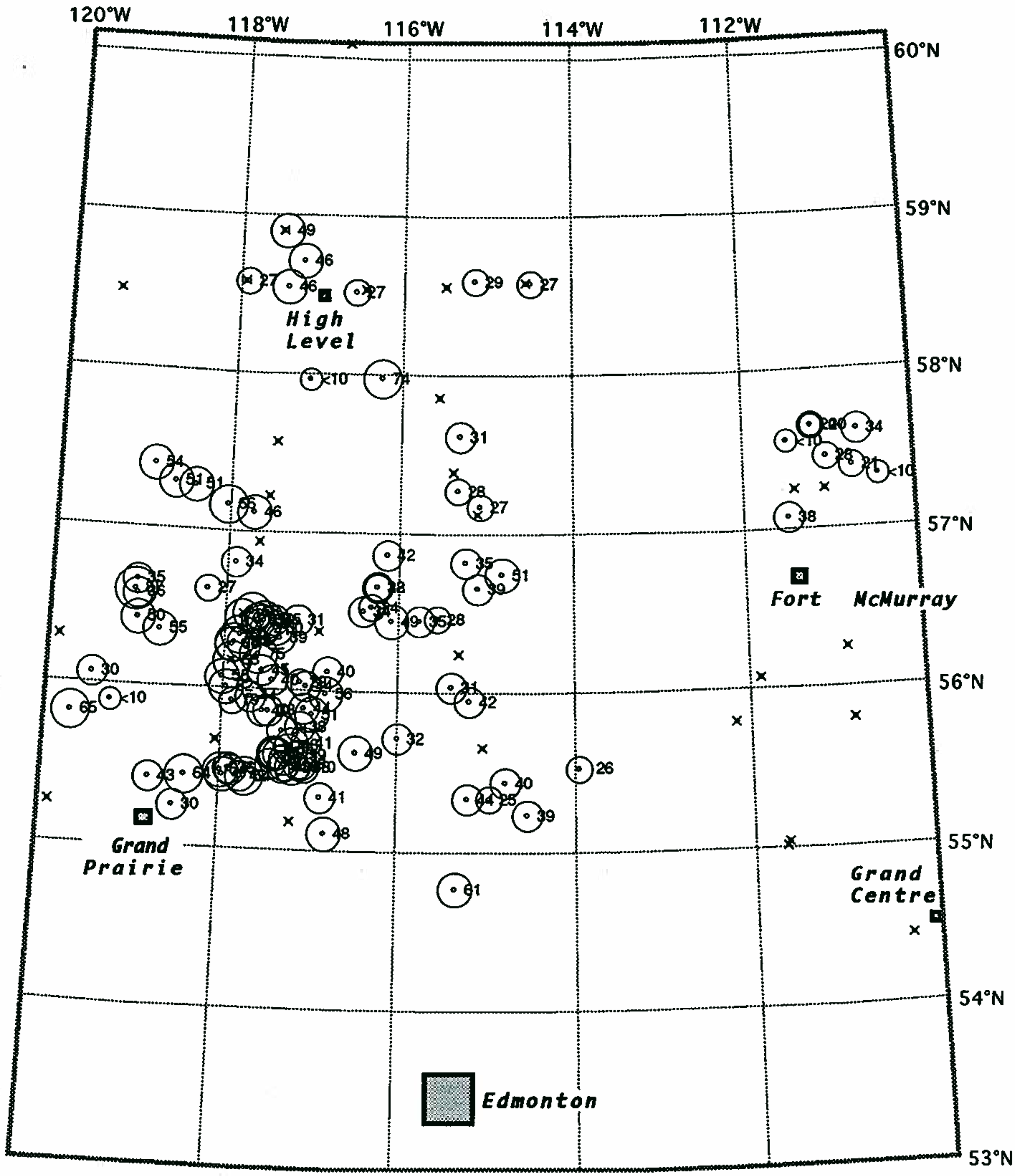


Figure 3.50. Nickel concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

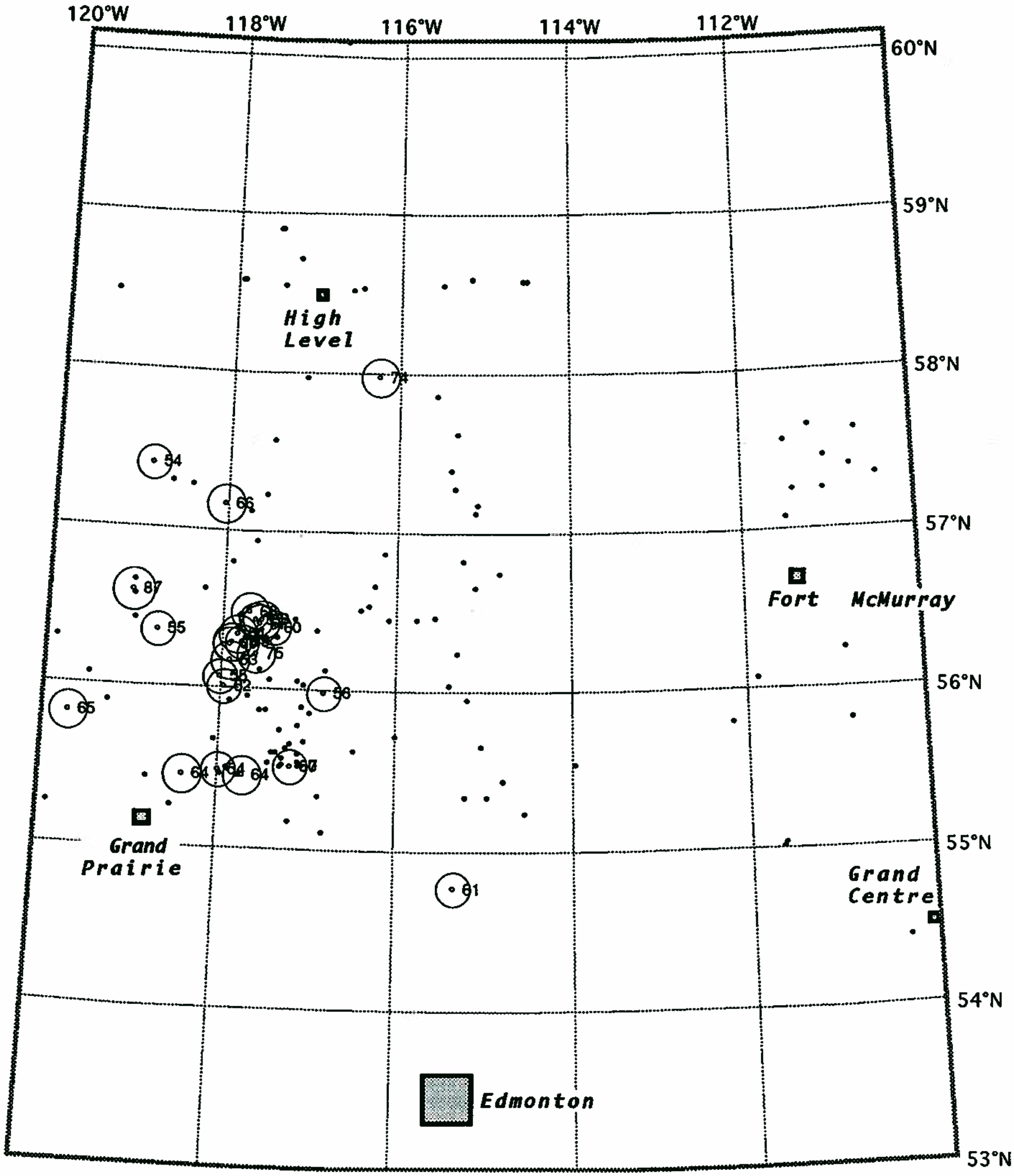


Figure 3.51. Nickel concentration (ppm) from NA, ≥ 75%ile.

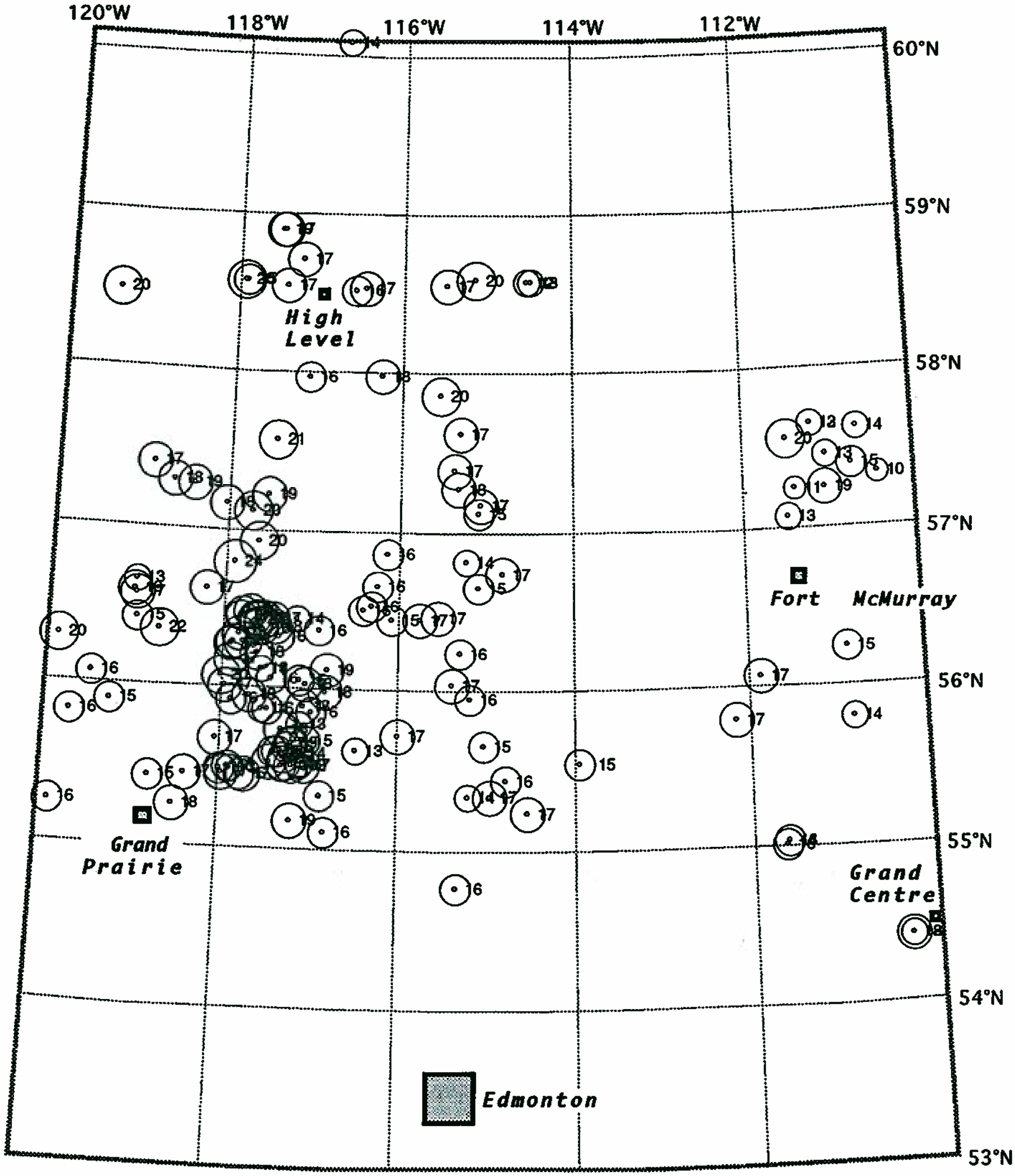


Figure 3.52. Lead concentration (ppm) from AA for all shallow data.

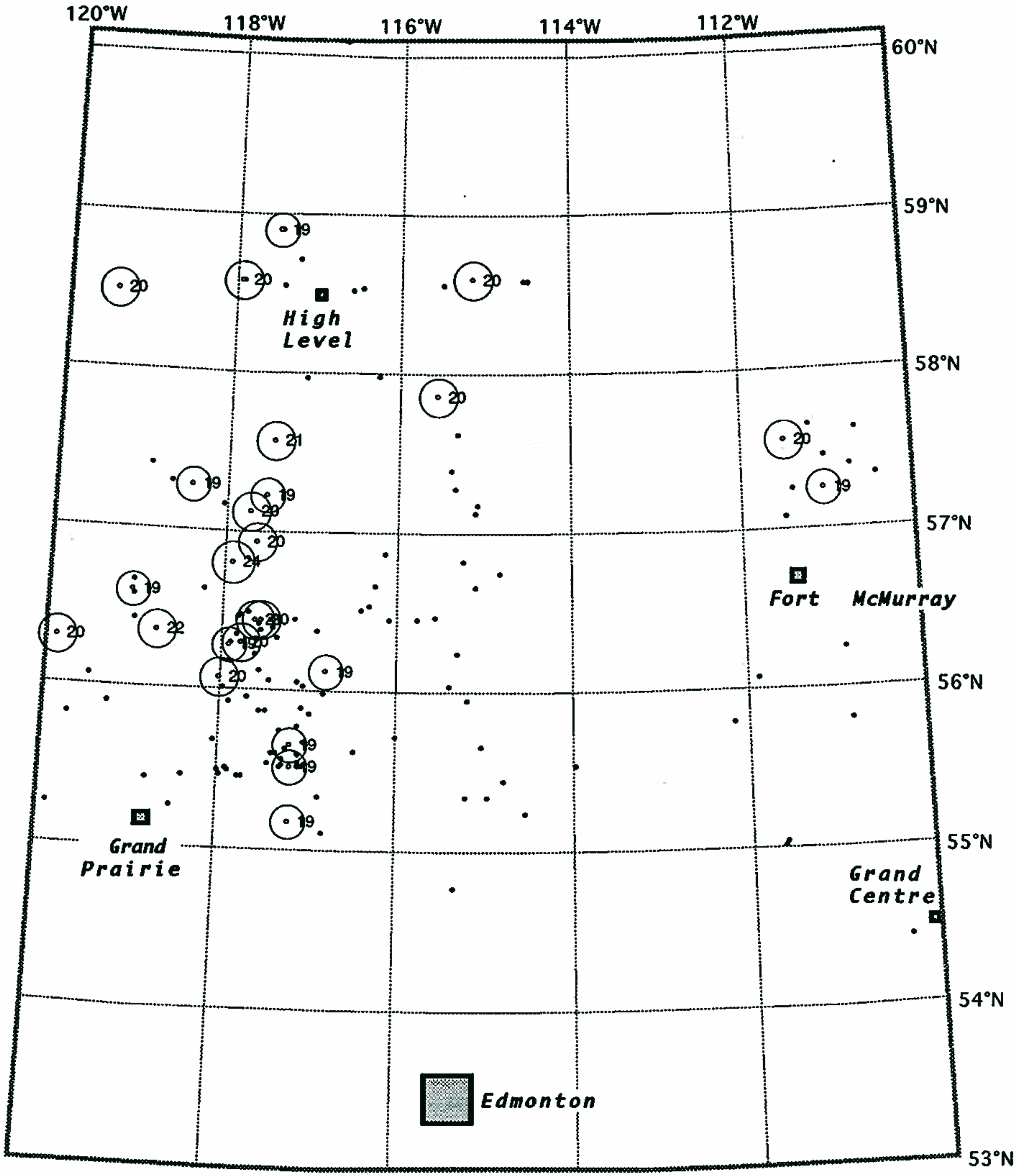


Figure 3.53. Lead concentration (ppm) from AA, ≥ 75%ile.

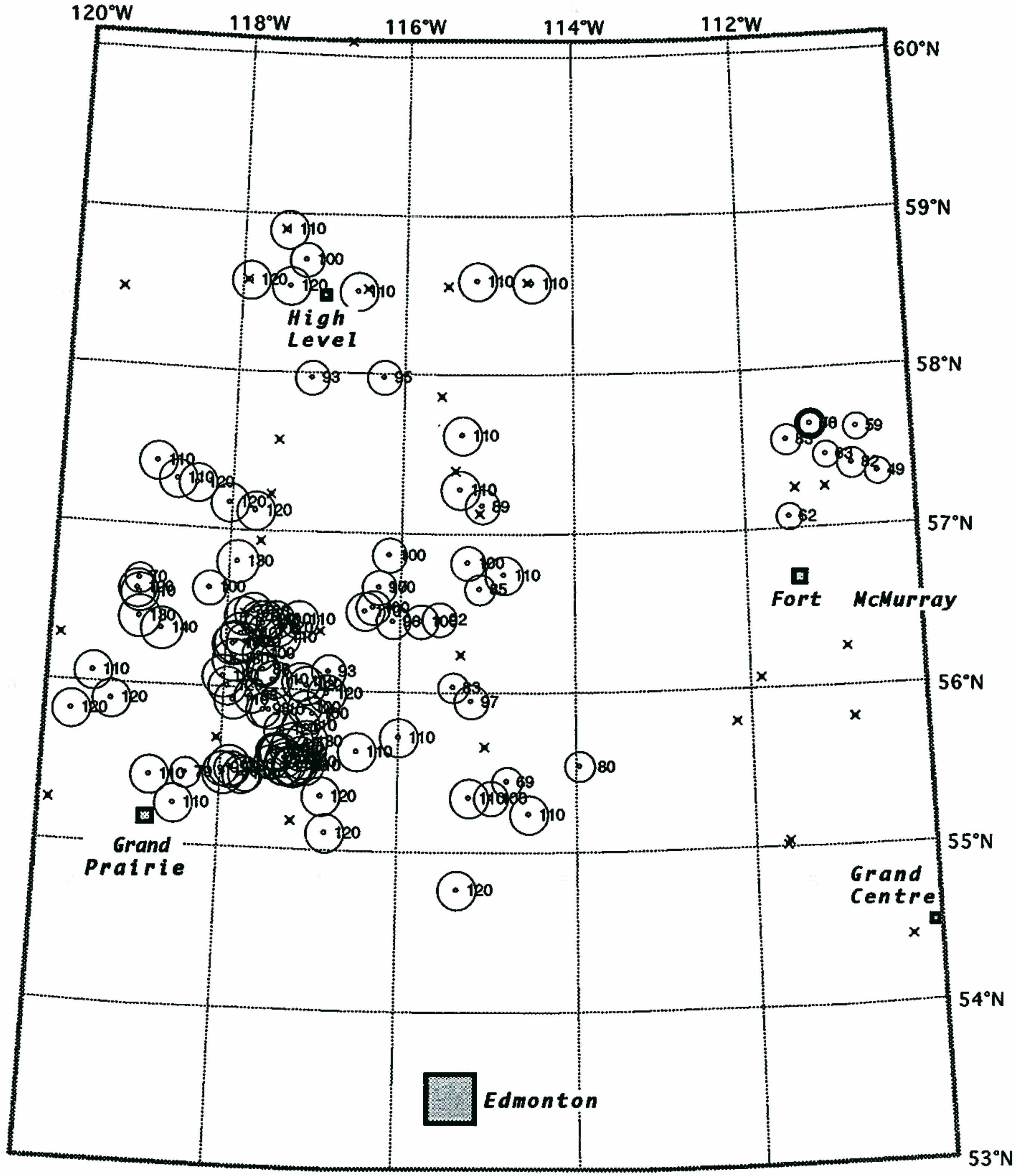


Figure 3.54. Rubidium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

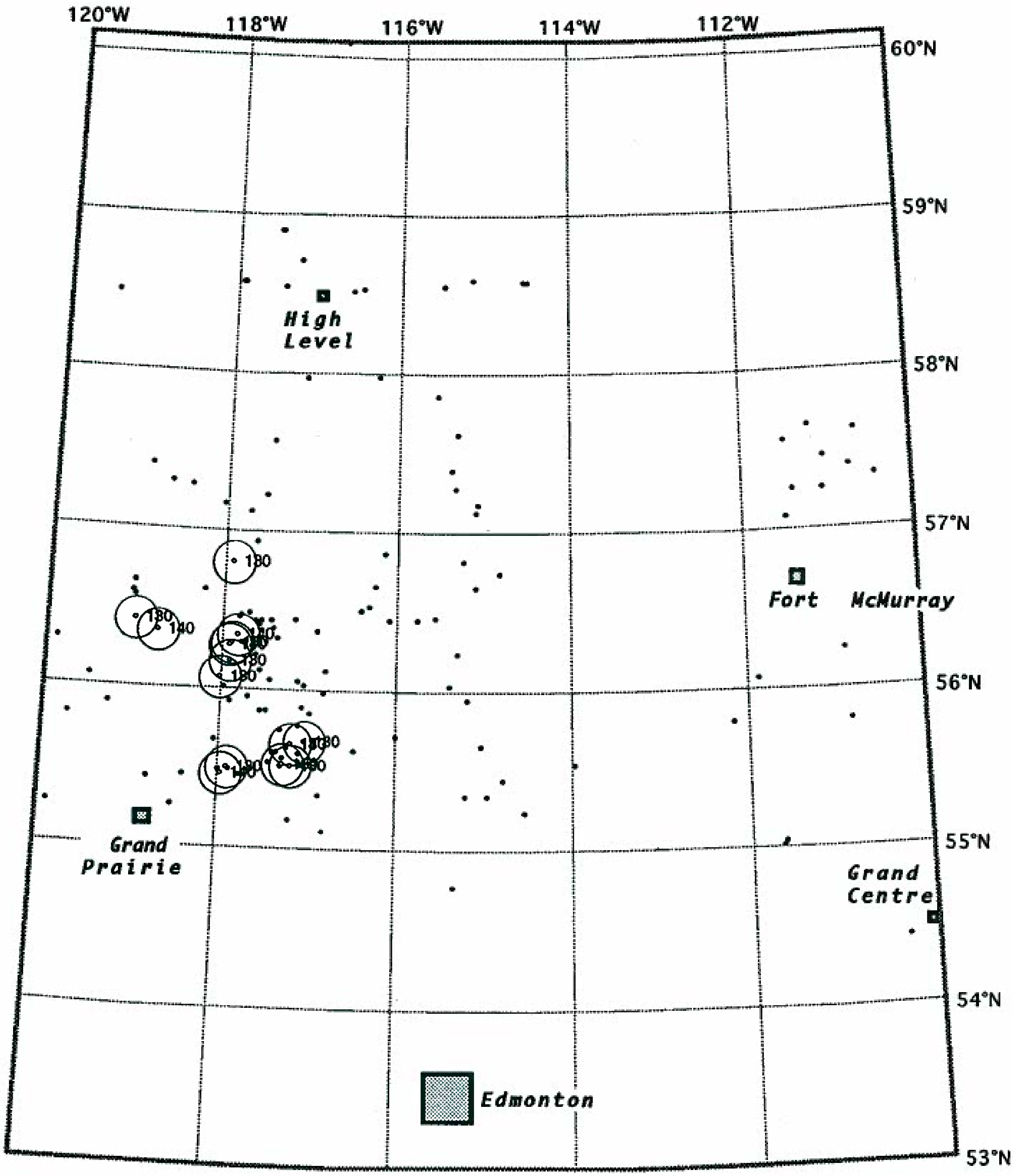


Figure 3.55. Rubidium concentration (ppm) from NA, ≥ 75%ile.

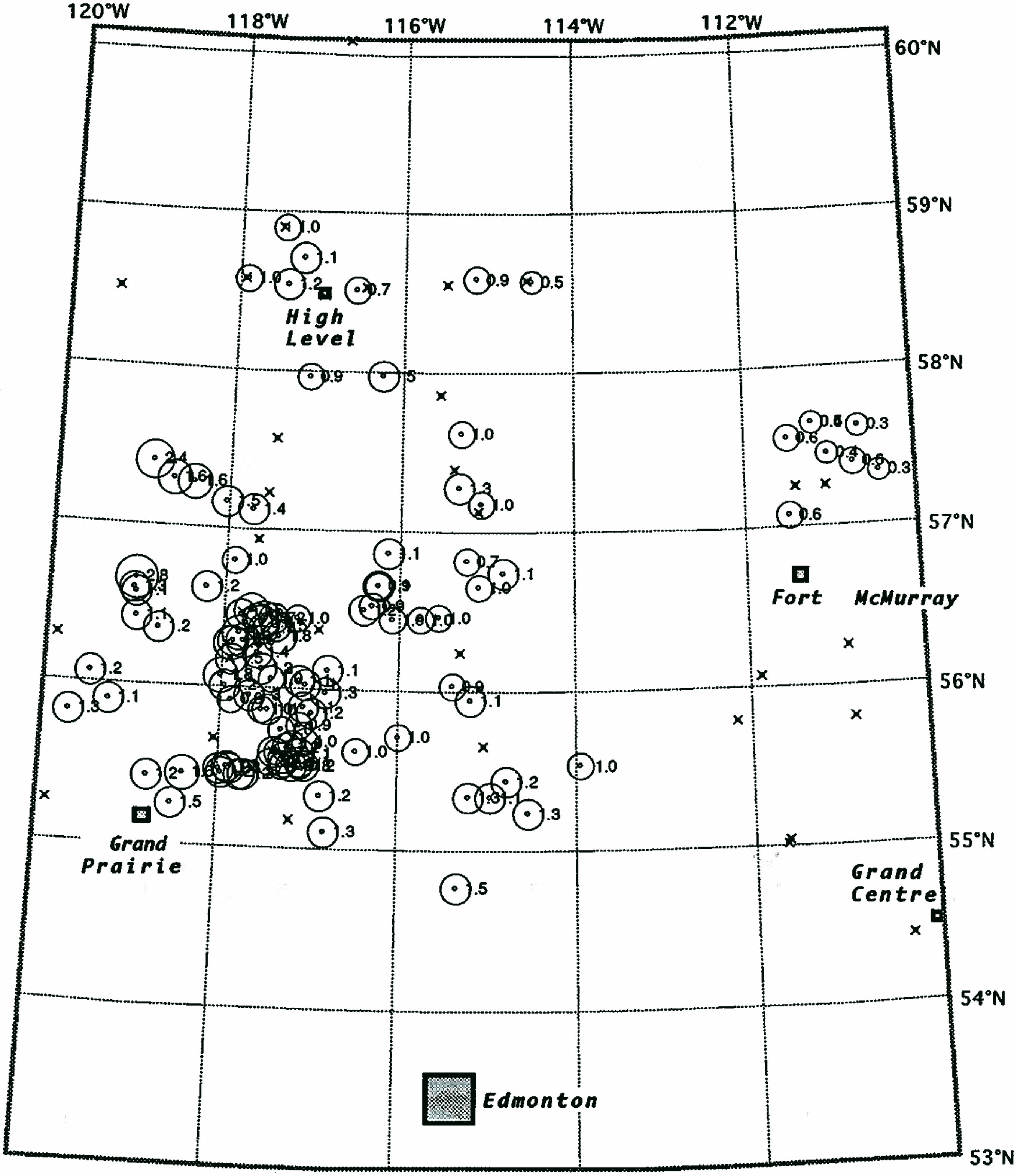


Figure 3.56. Antimony concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

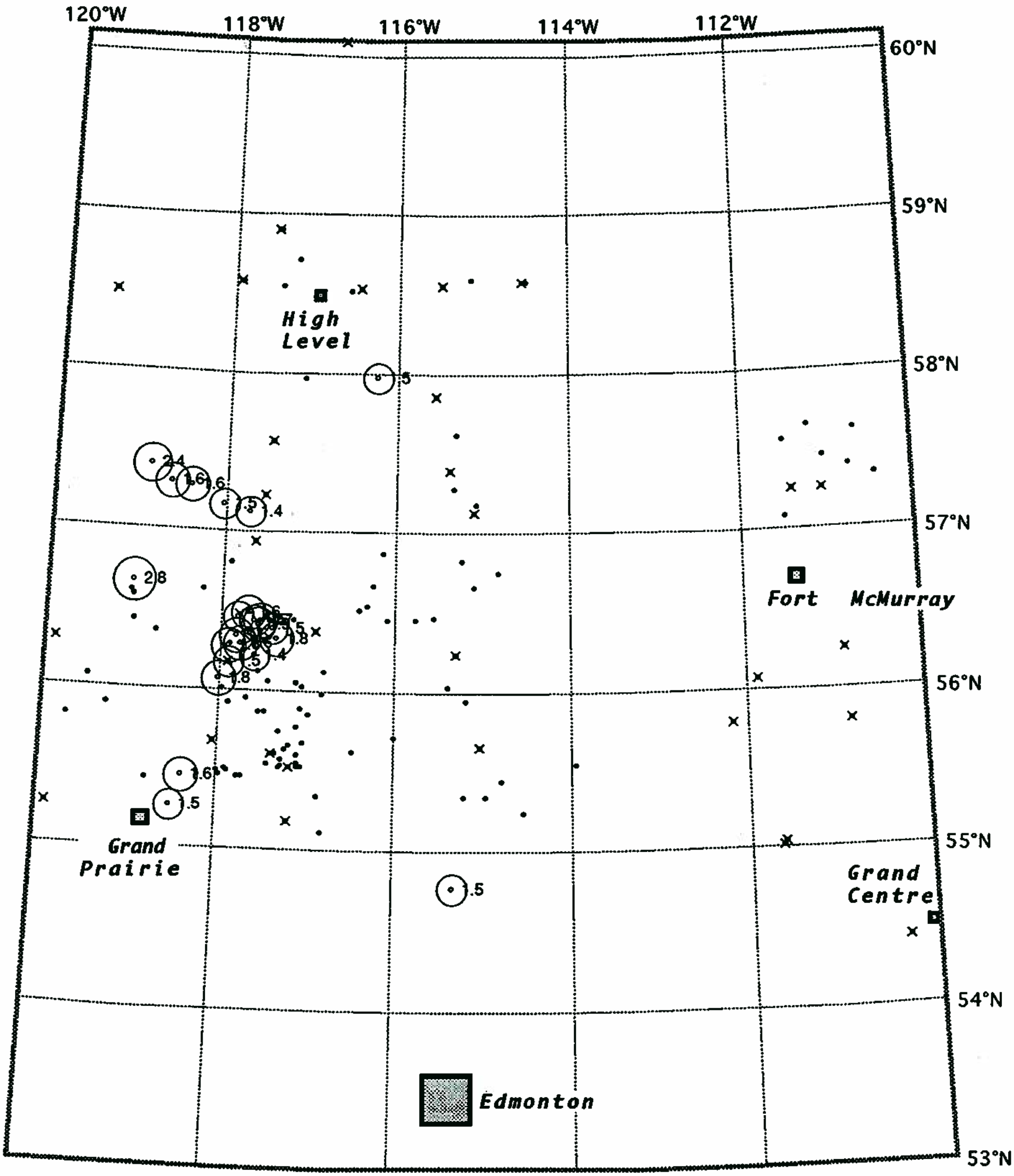


Figure 3.57. Antimony concentration (ppm) from NA, ≥ 75%ile.

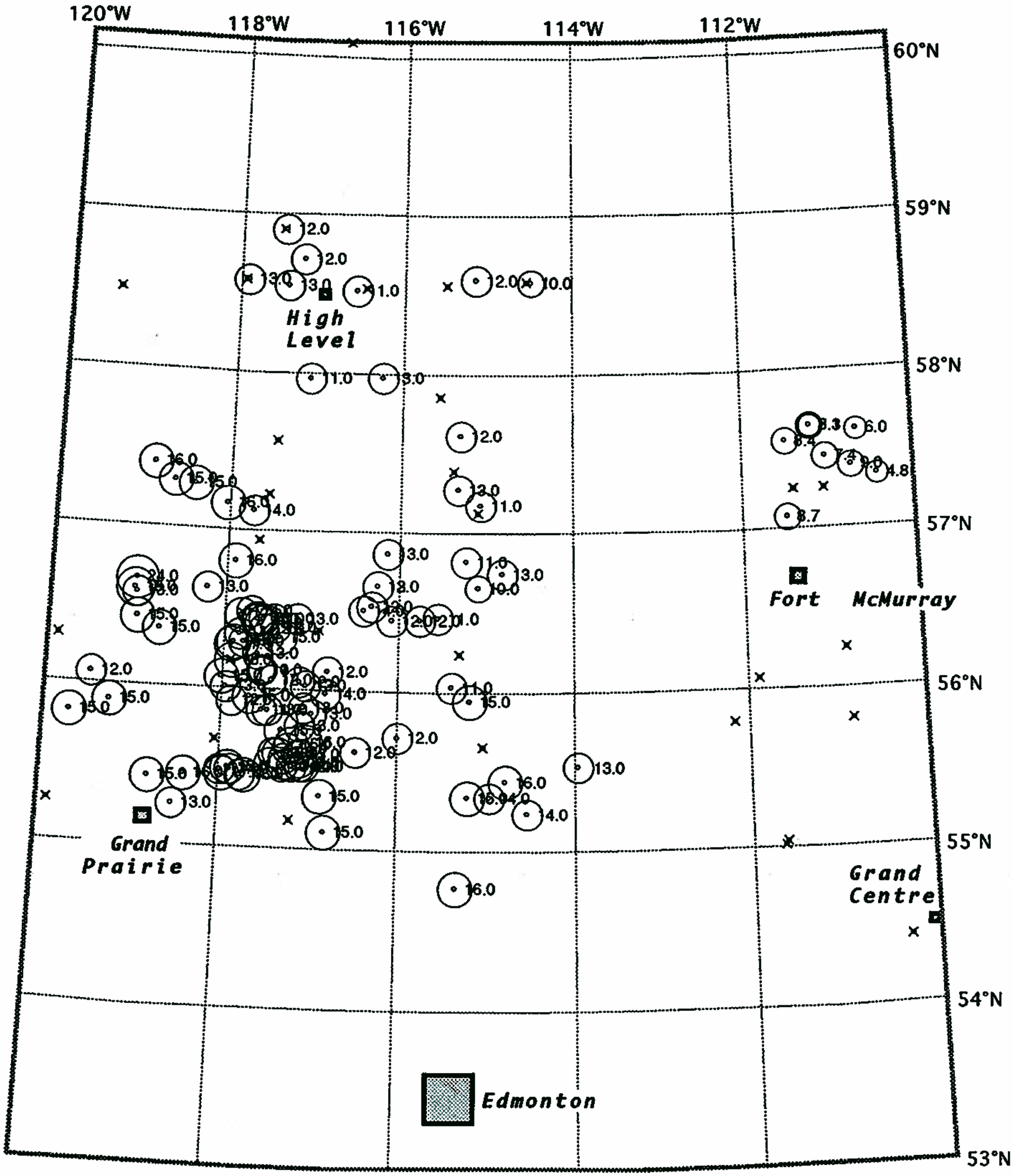


Figure 3.58 Scandium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

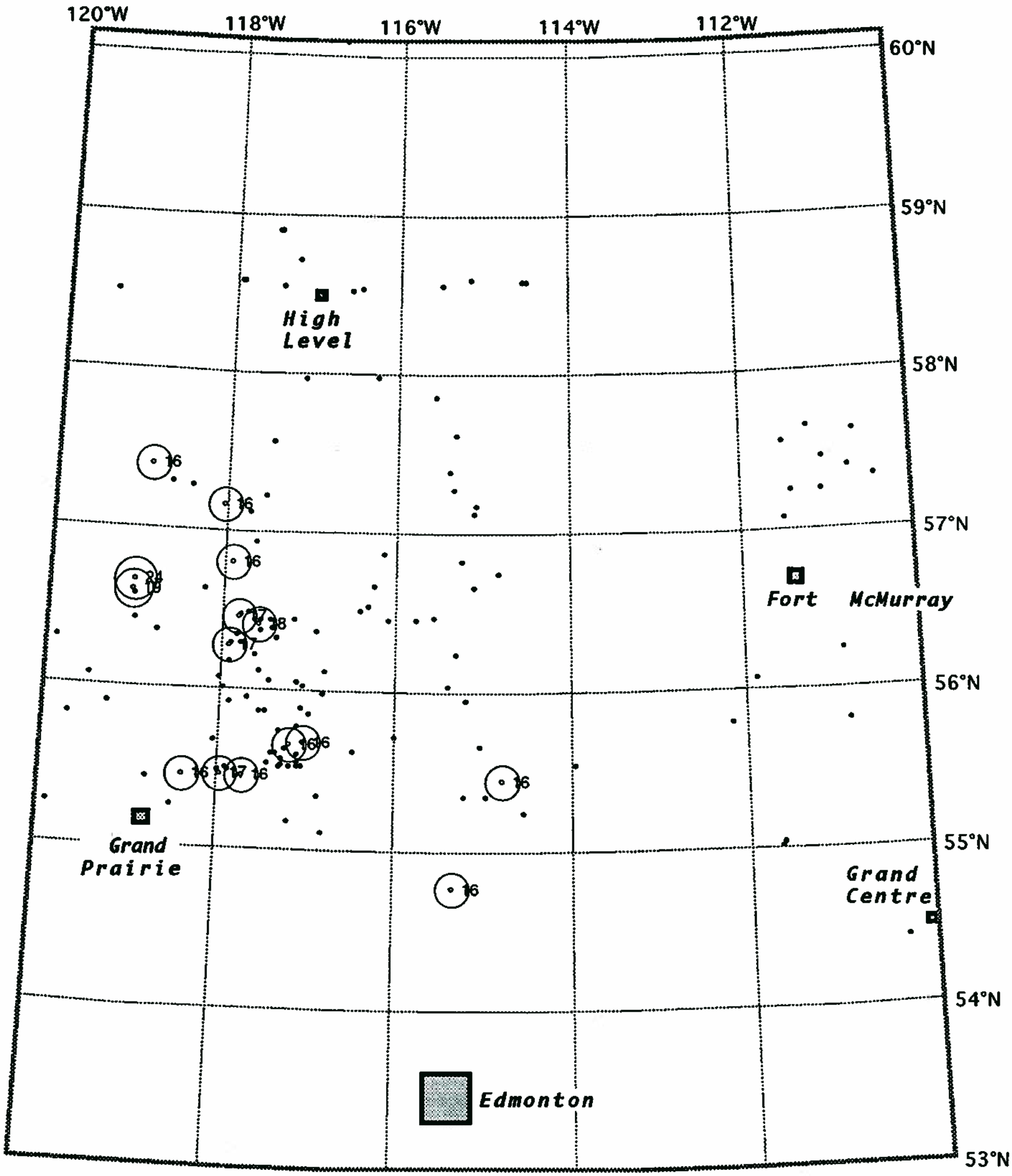


Figure 3.59. Scandium concentration (ppm) from NA, ≥ 75%ile.

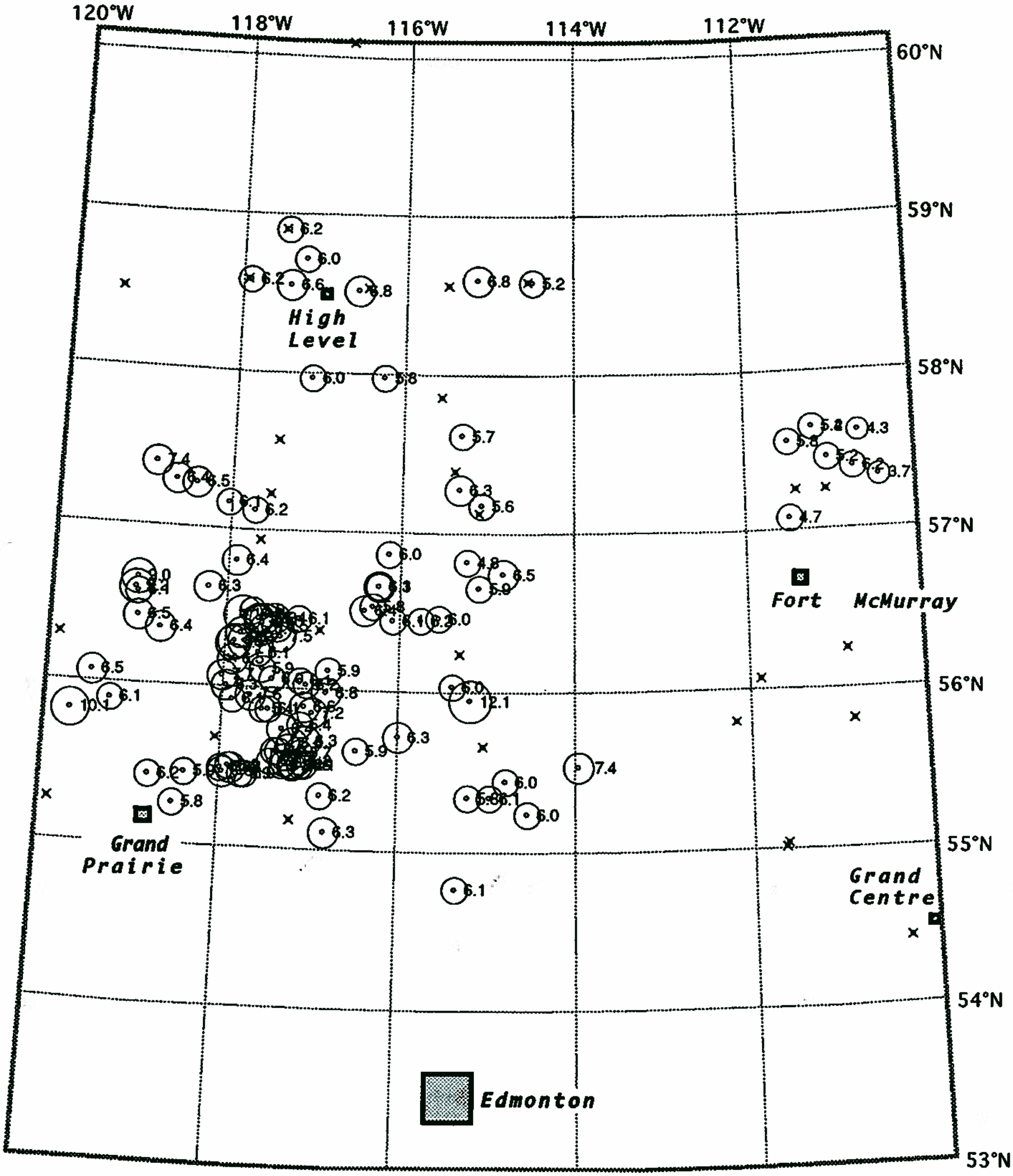


Figure 3.60. Samarium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

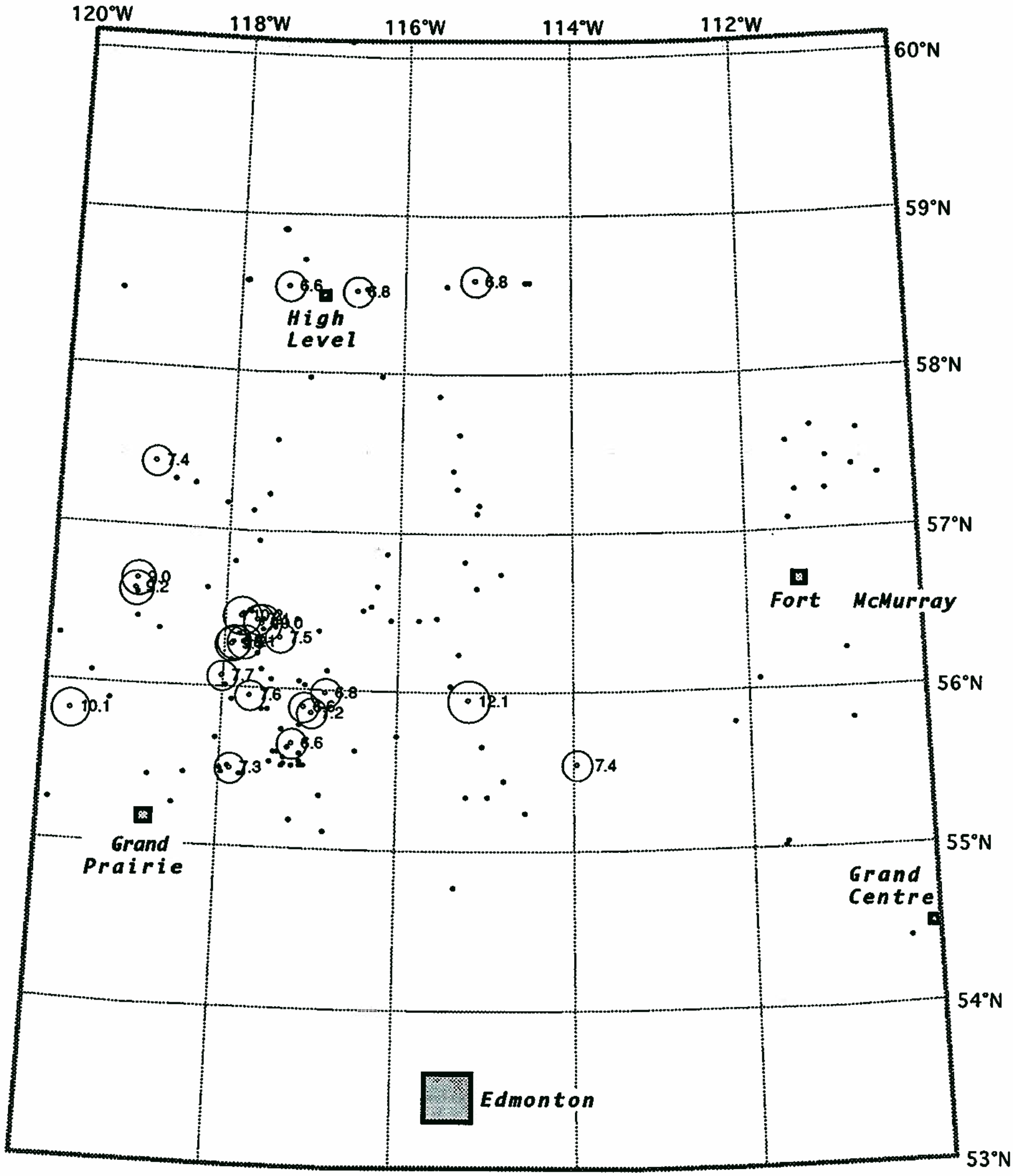


Figure 3.61. Samarium concentration (ppm) from NA, ≥ 75%ile.

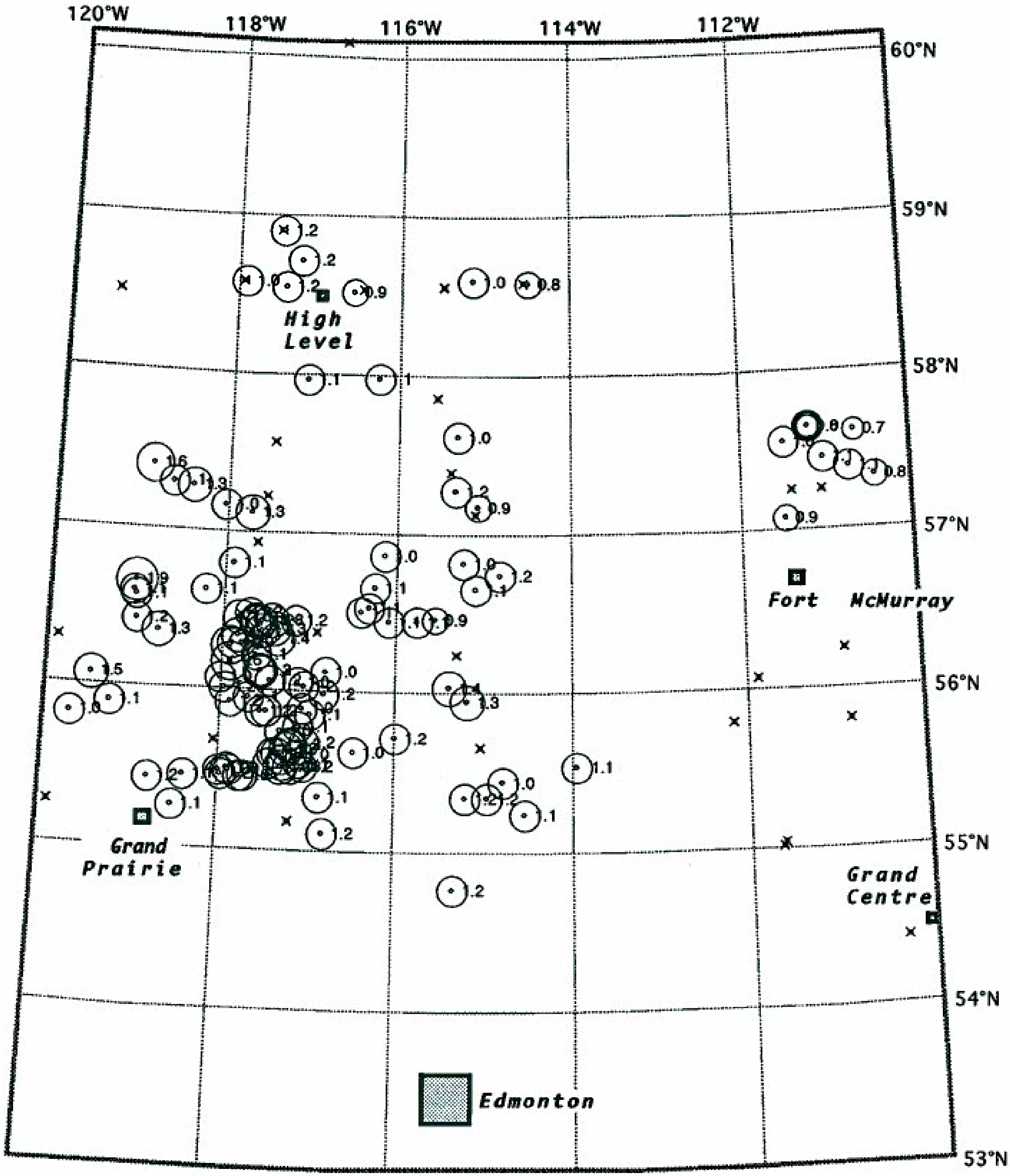


Figure 3.62. Tantalum concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

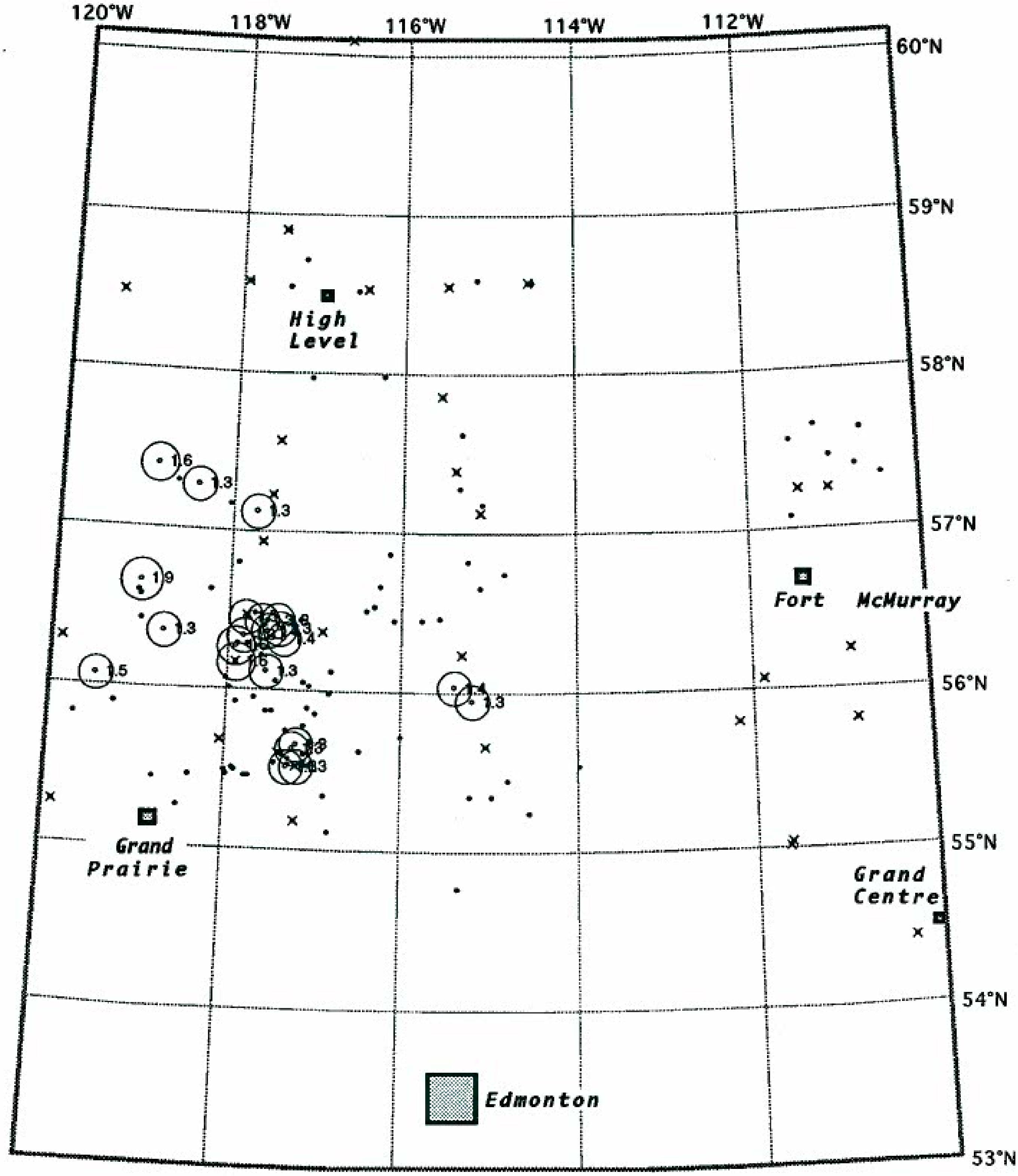


Figure 3.63. Tantalum concentration (ppm) from NA, ≥ 75%ile.

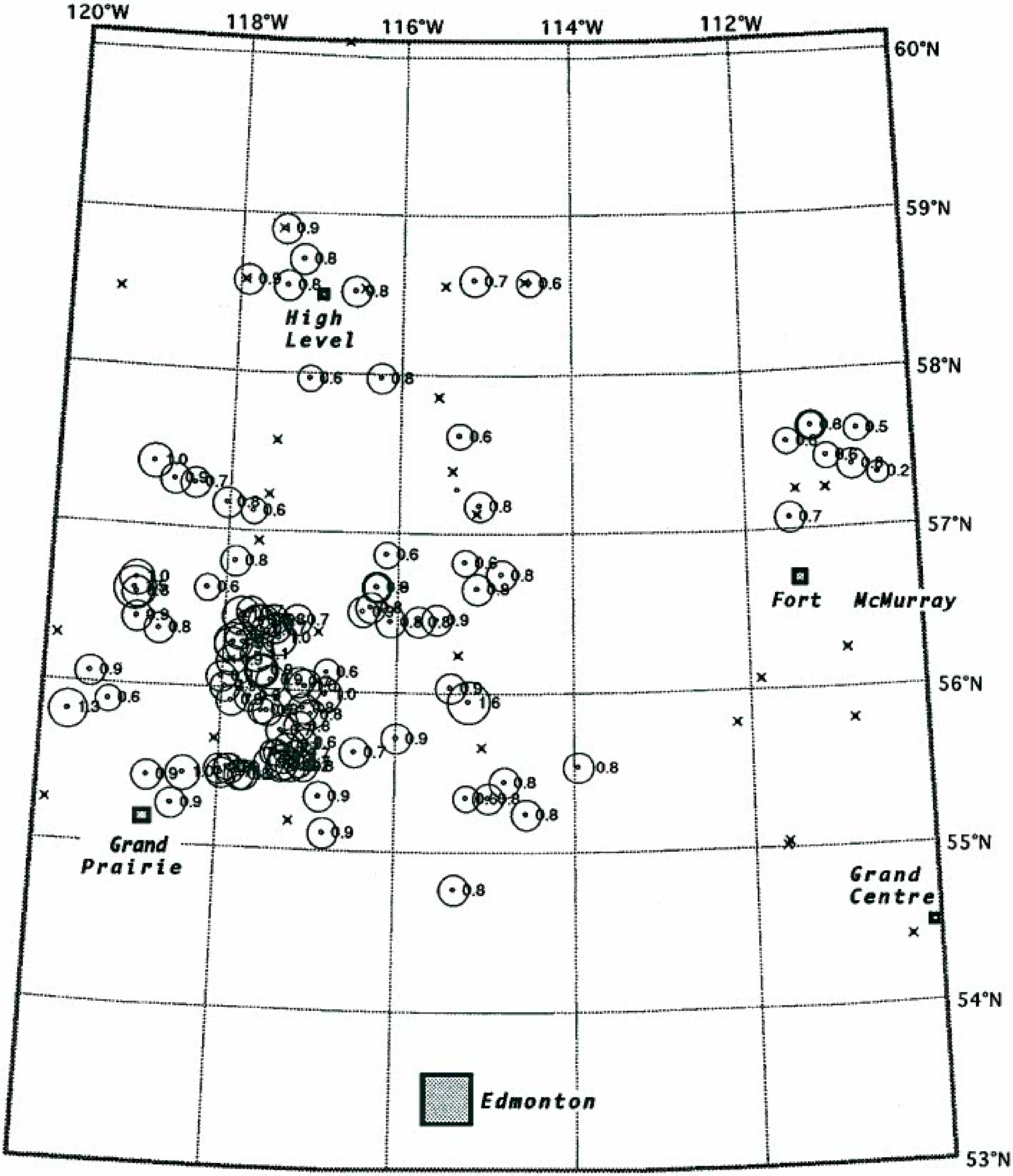


Figure 3.64. Terbium concentration (ppm) from NA for all shallow data
(x = sample not yet analysed)

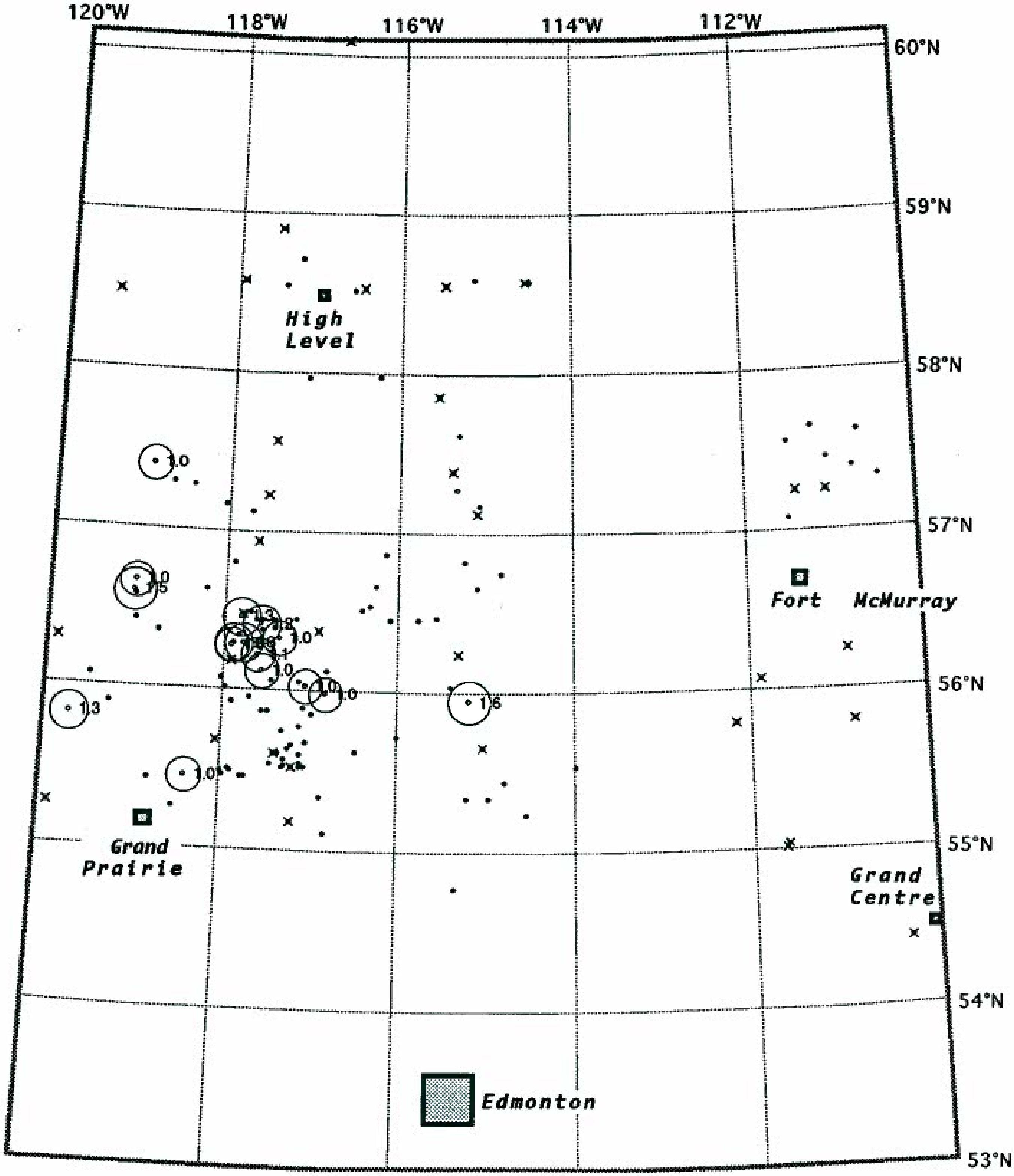


Figure 3.65. Terbium concentration (ppm) from NA, ≥ 75%ile.

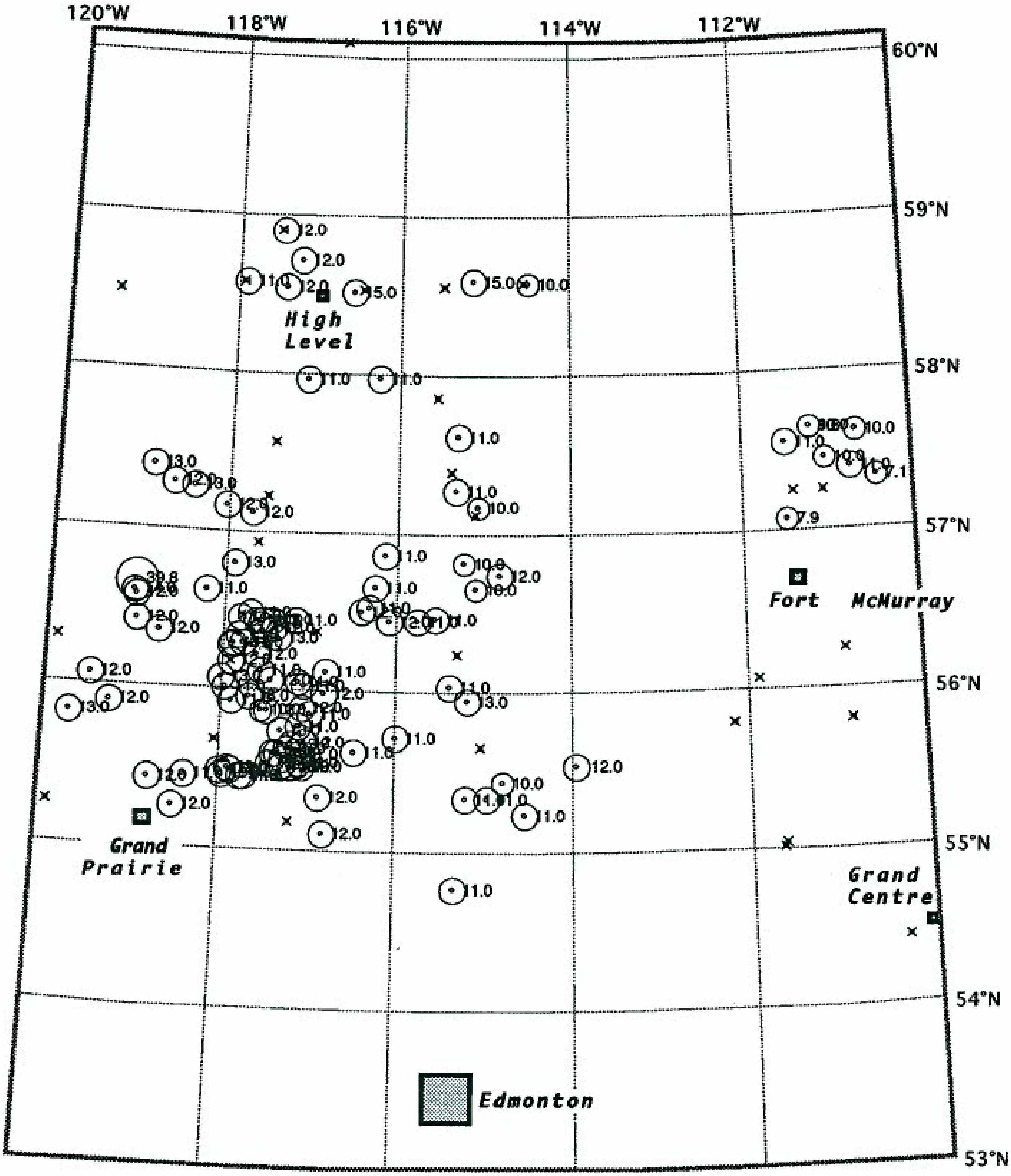


Figure 3.66. Thorium concentration (ppm) from NA for all shallow data.
(x = sample not yet analysed)

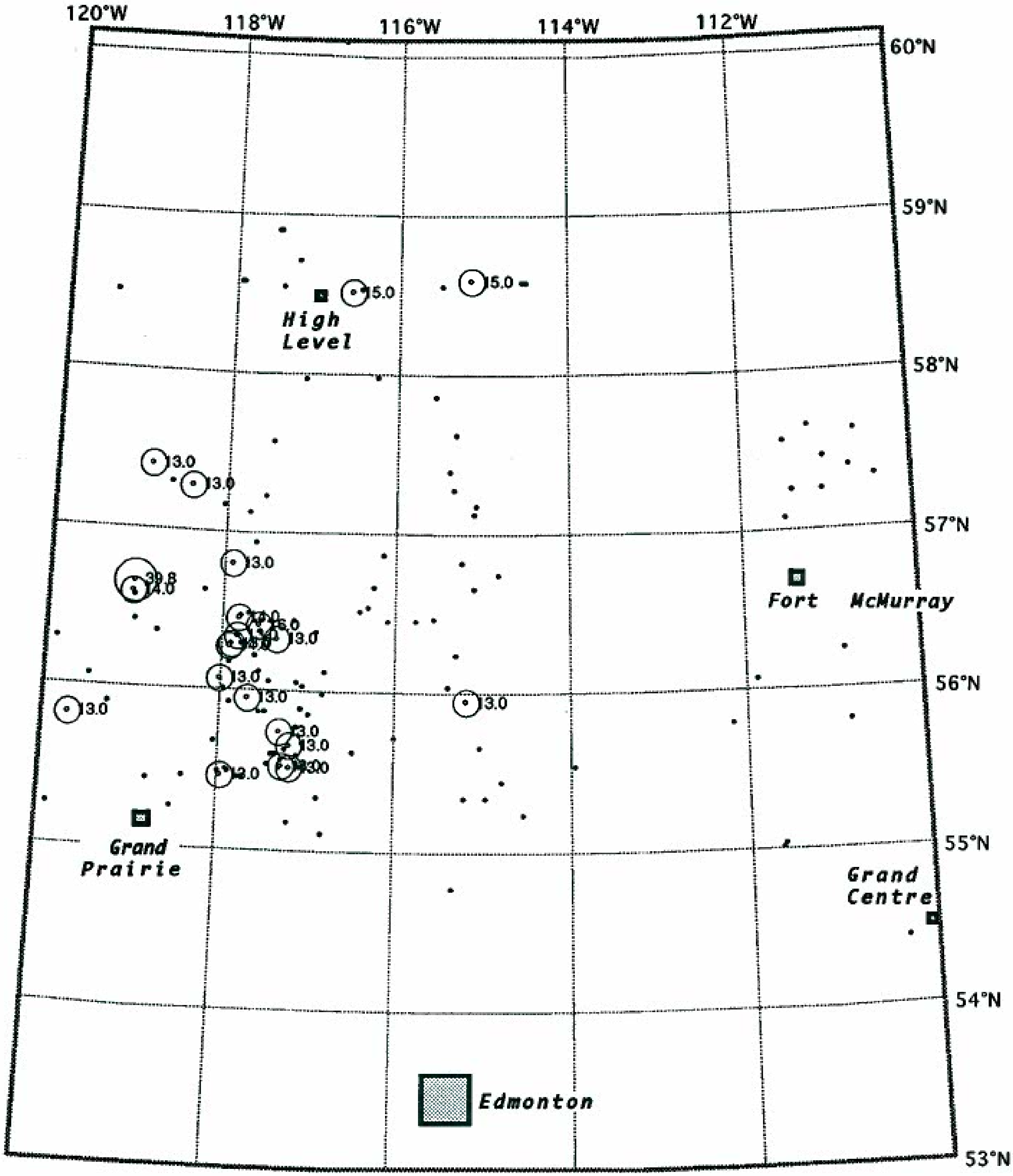


Figure 3.67. Thorium concentration (ppm) from NA, ≥ 75%ile.

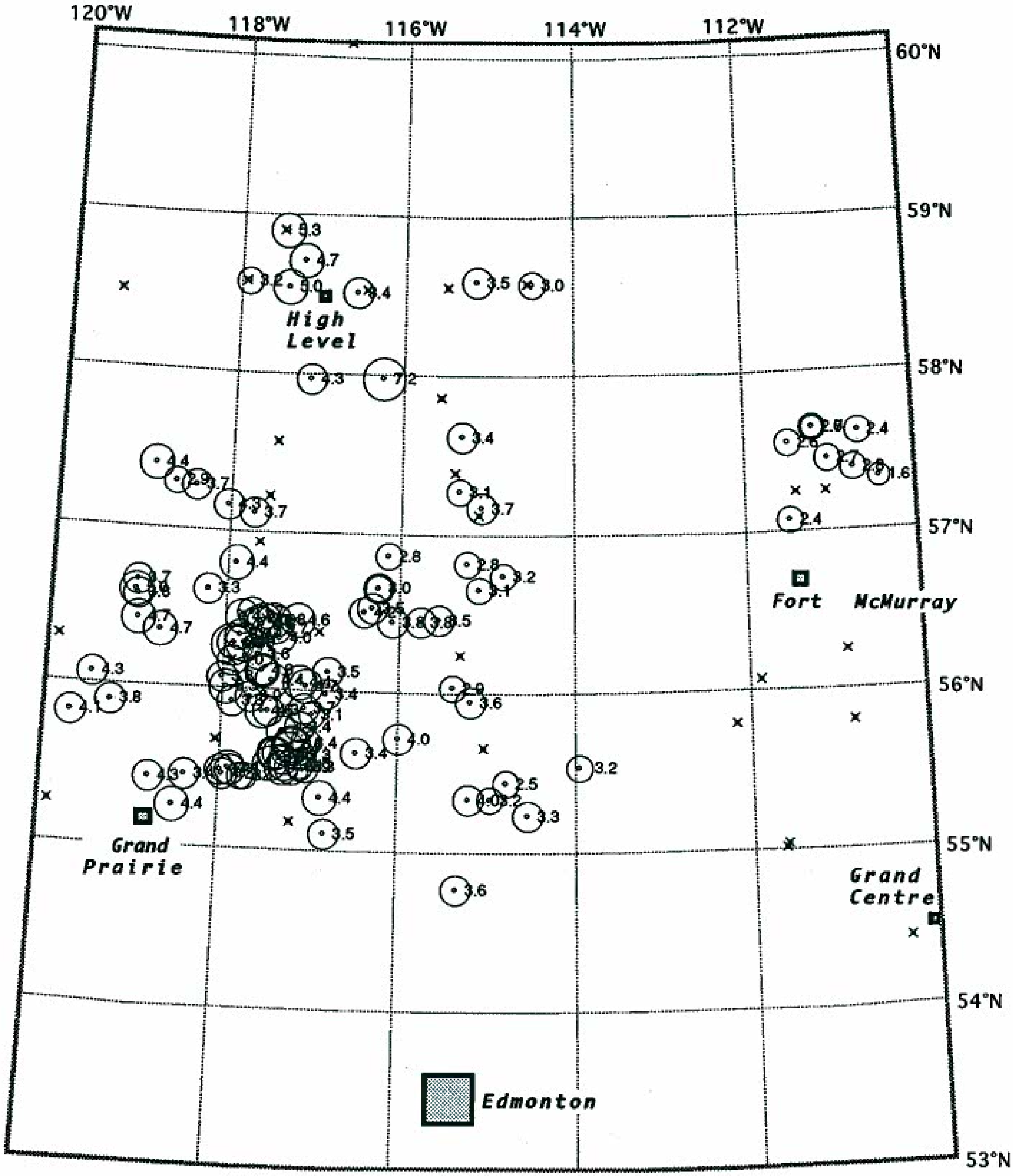


Figure 3.68. Uranium concentration (ppm) from NA for all shallow data. (x = sample not yet analysed)

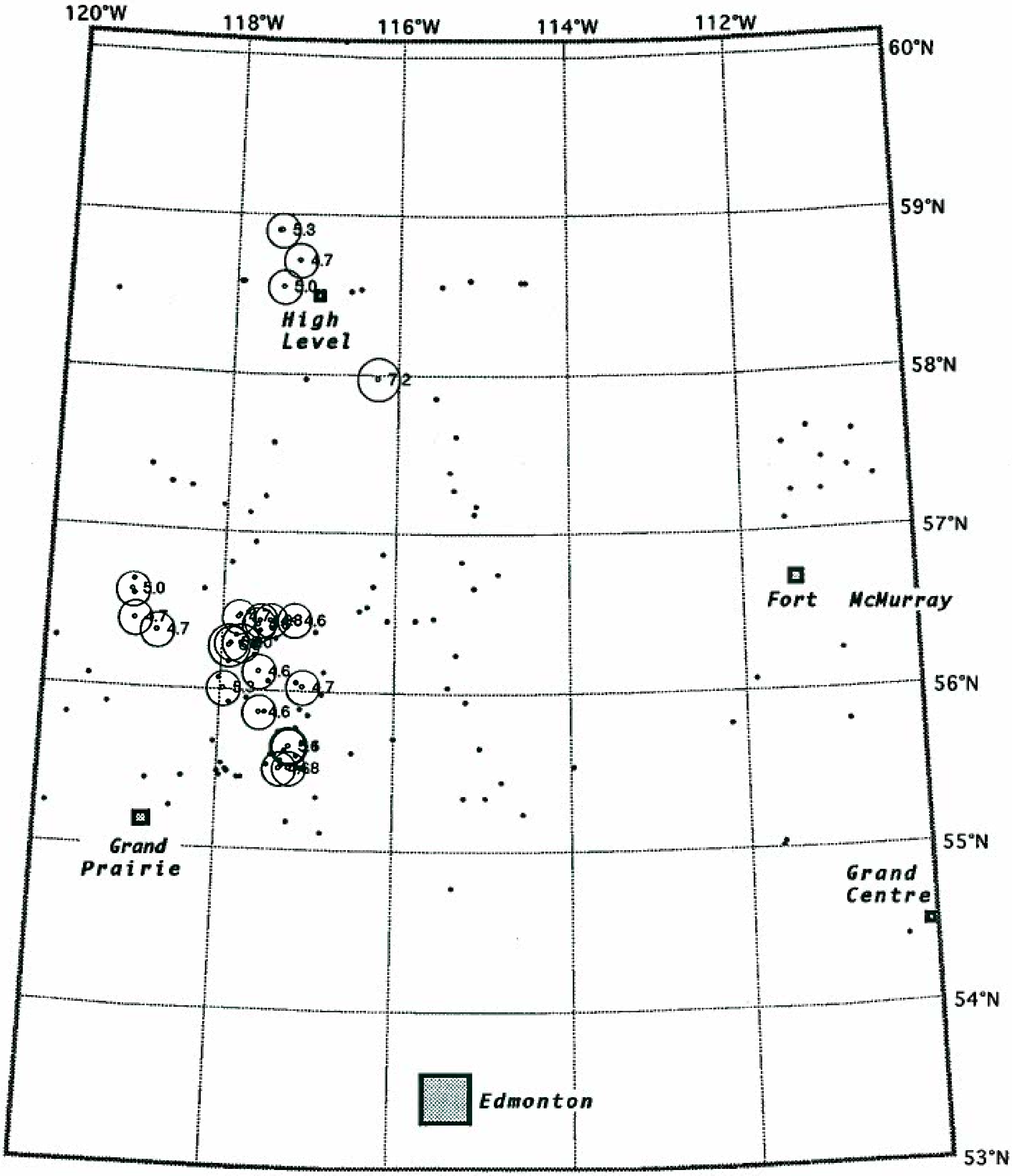


Figure 3.69. Uranium concentration (ppm) from NA, ≥ 75%ile.

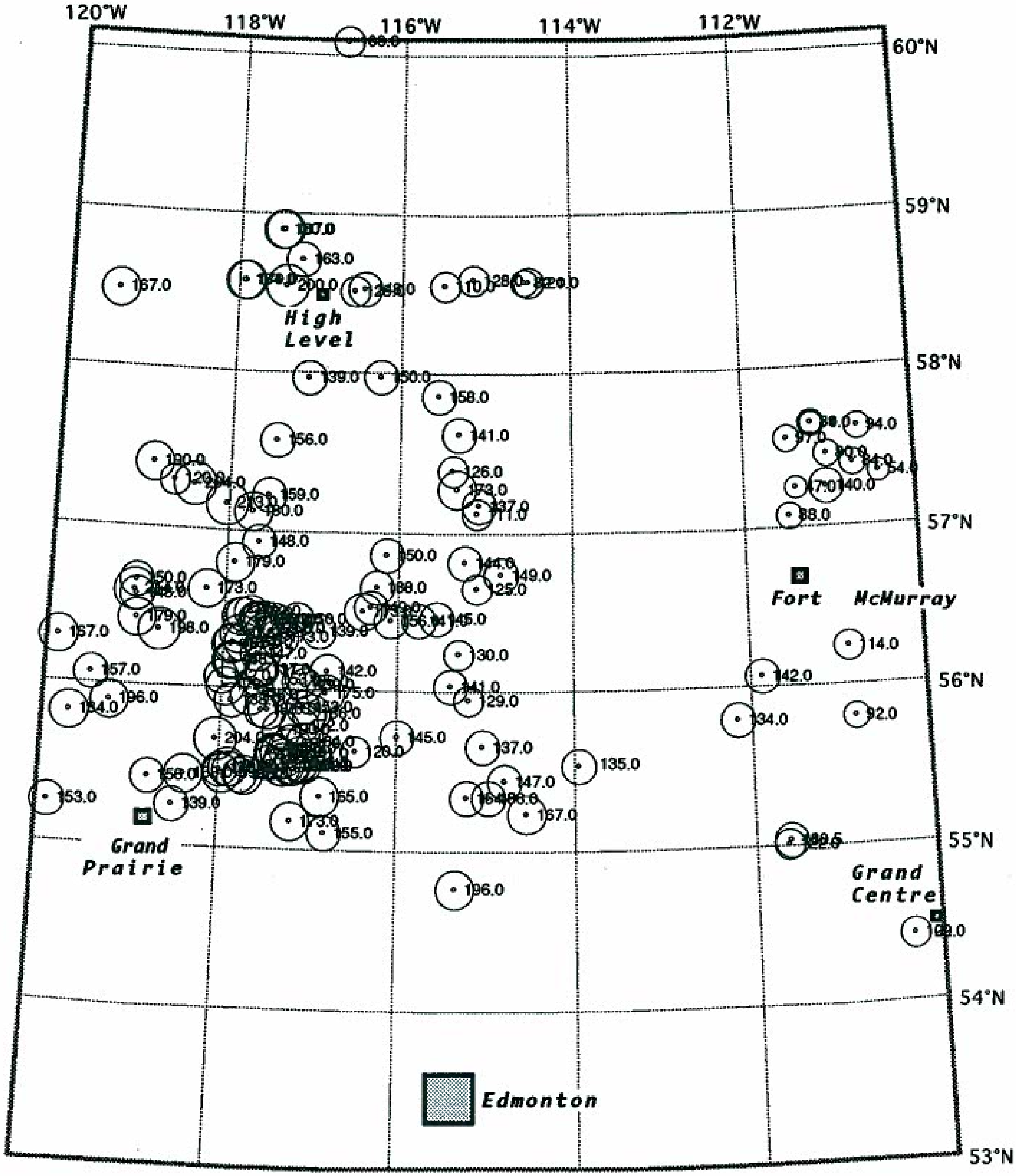


Figure 3.70. Vanadium concentration (ppm) from AA for all shallow data.

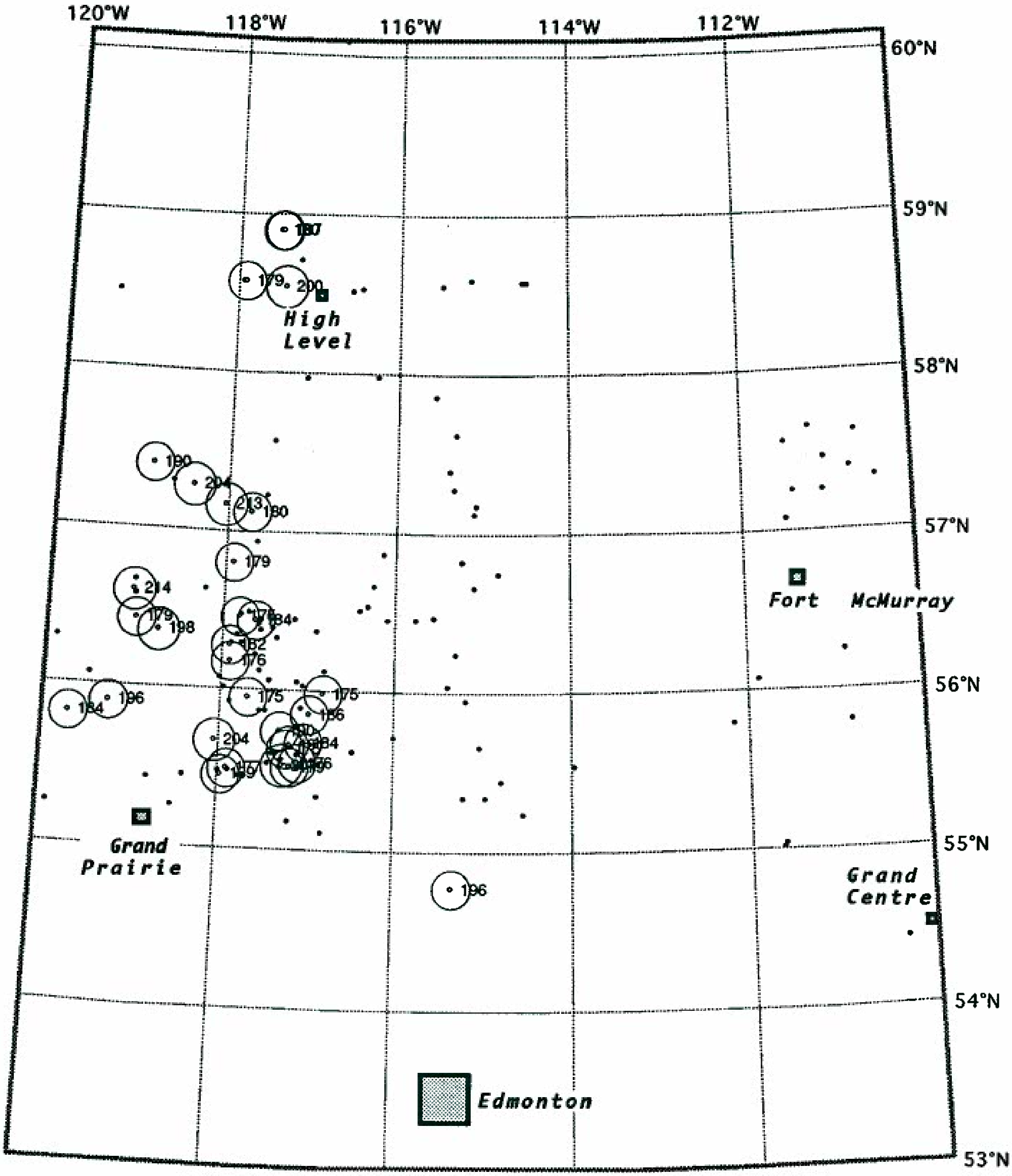


Figure 3.71. Vanadium concentration (ppm) from AA, ≥ 75%ile.

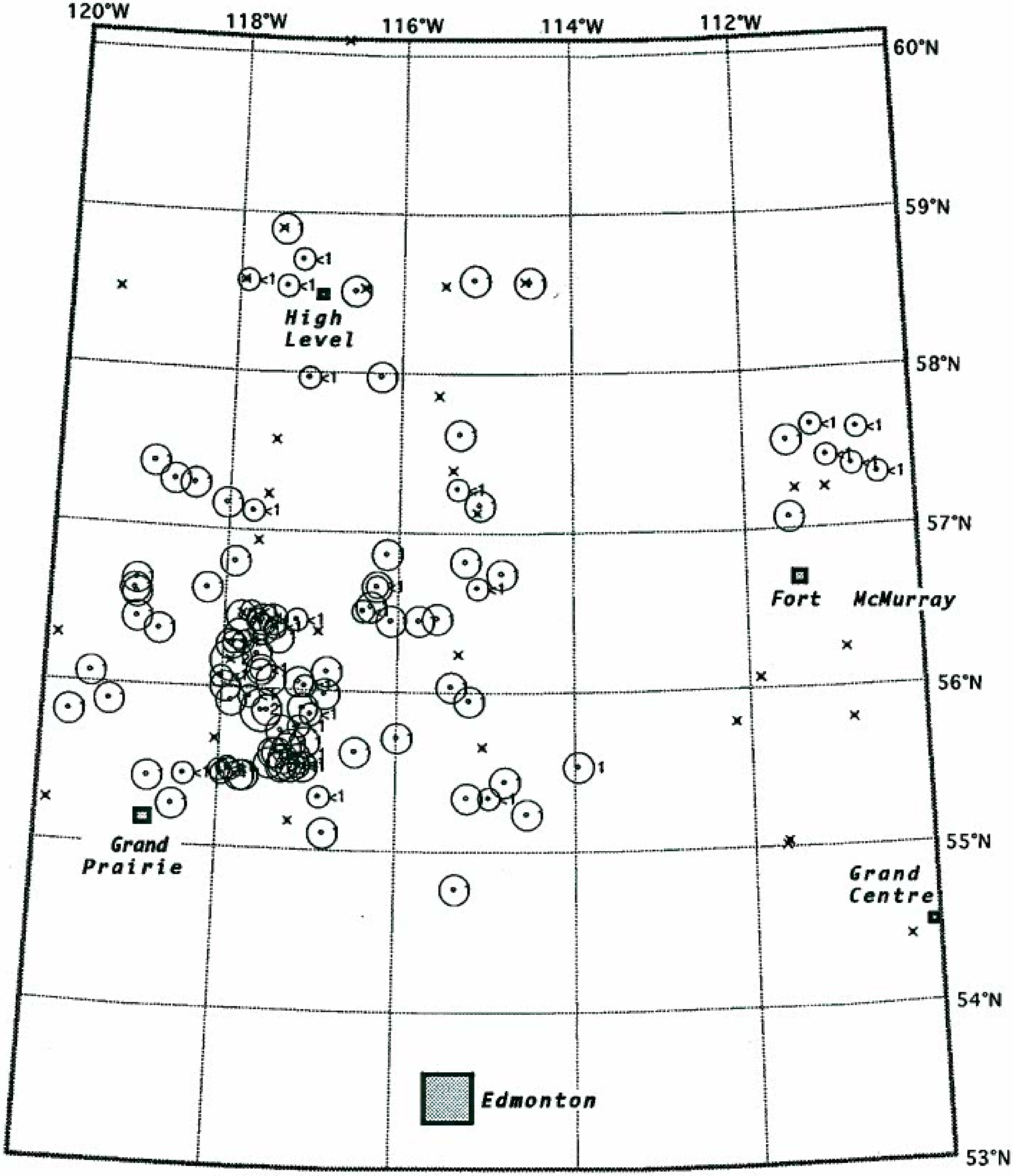


Figure 3.72. Tungsten concentration from NA for all shallow data.
(x = sample not yet analysed)

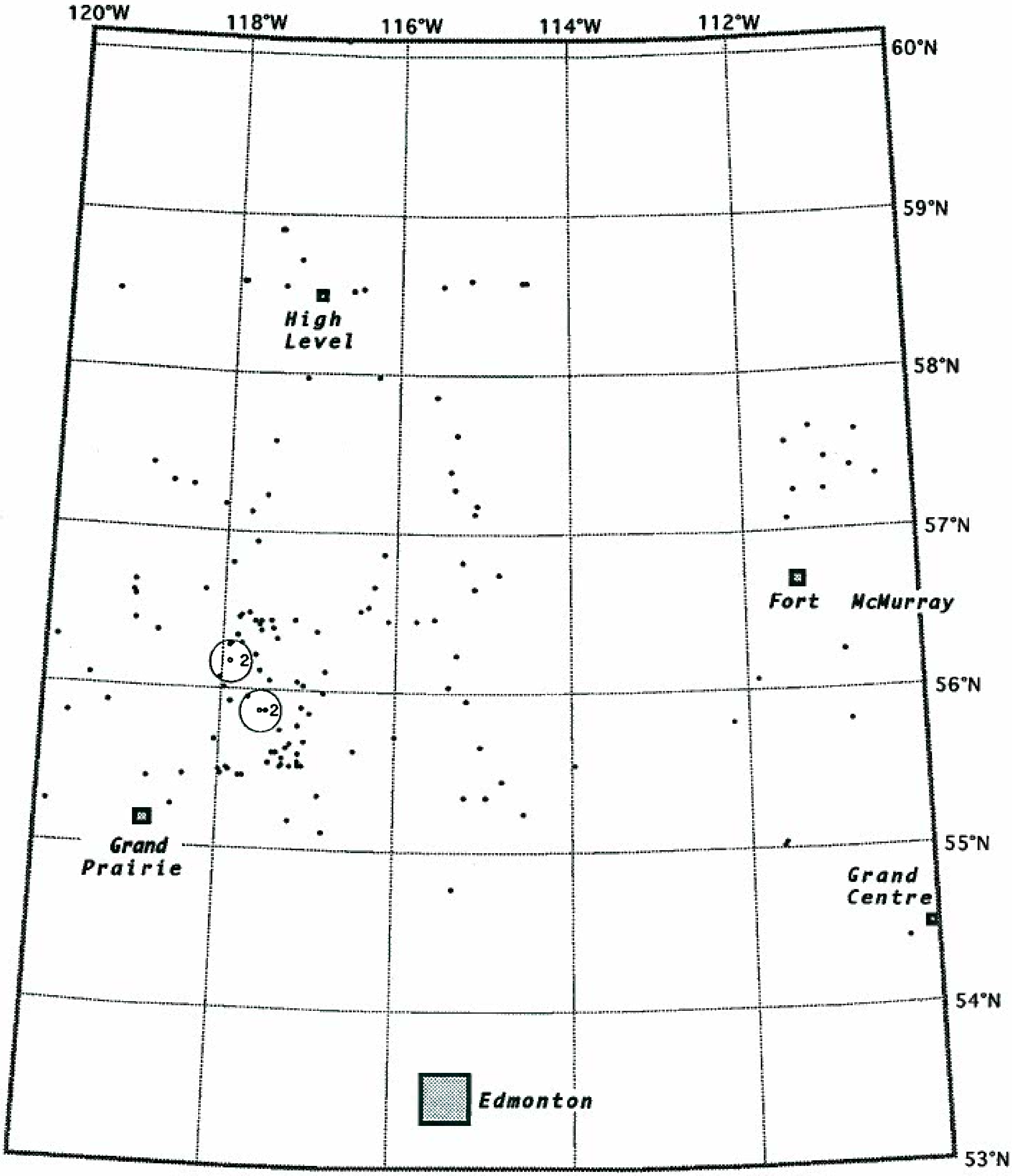


Figure 3.73. Tungsten concentration from NA, ≥ 75%ile.

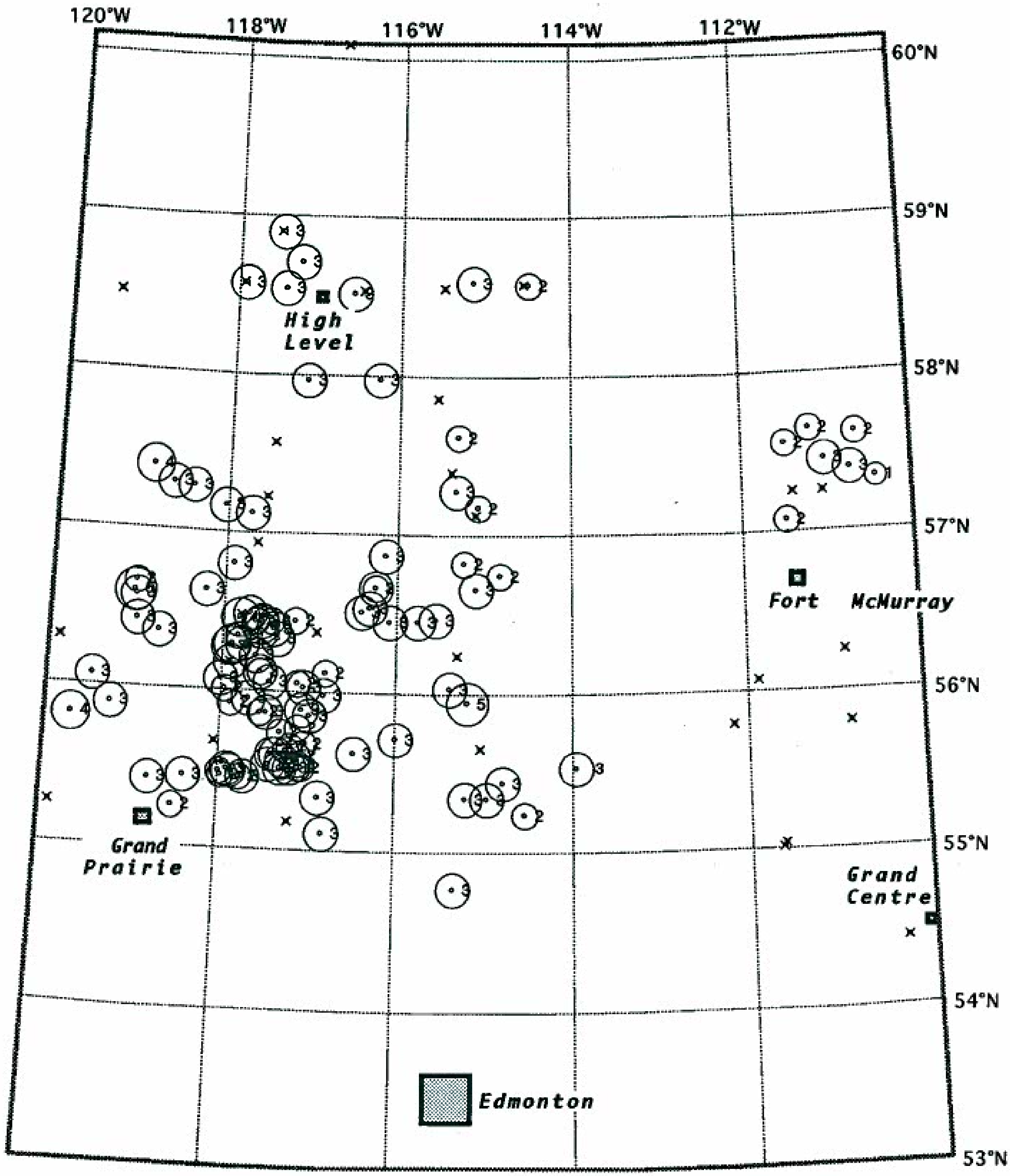


Figure 3.74. Ytterbium concentration from NA for all shallow data.
(x = sample not yet analysed)

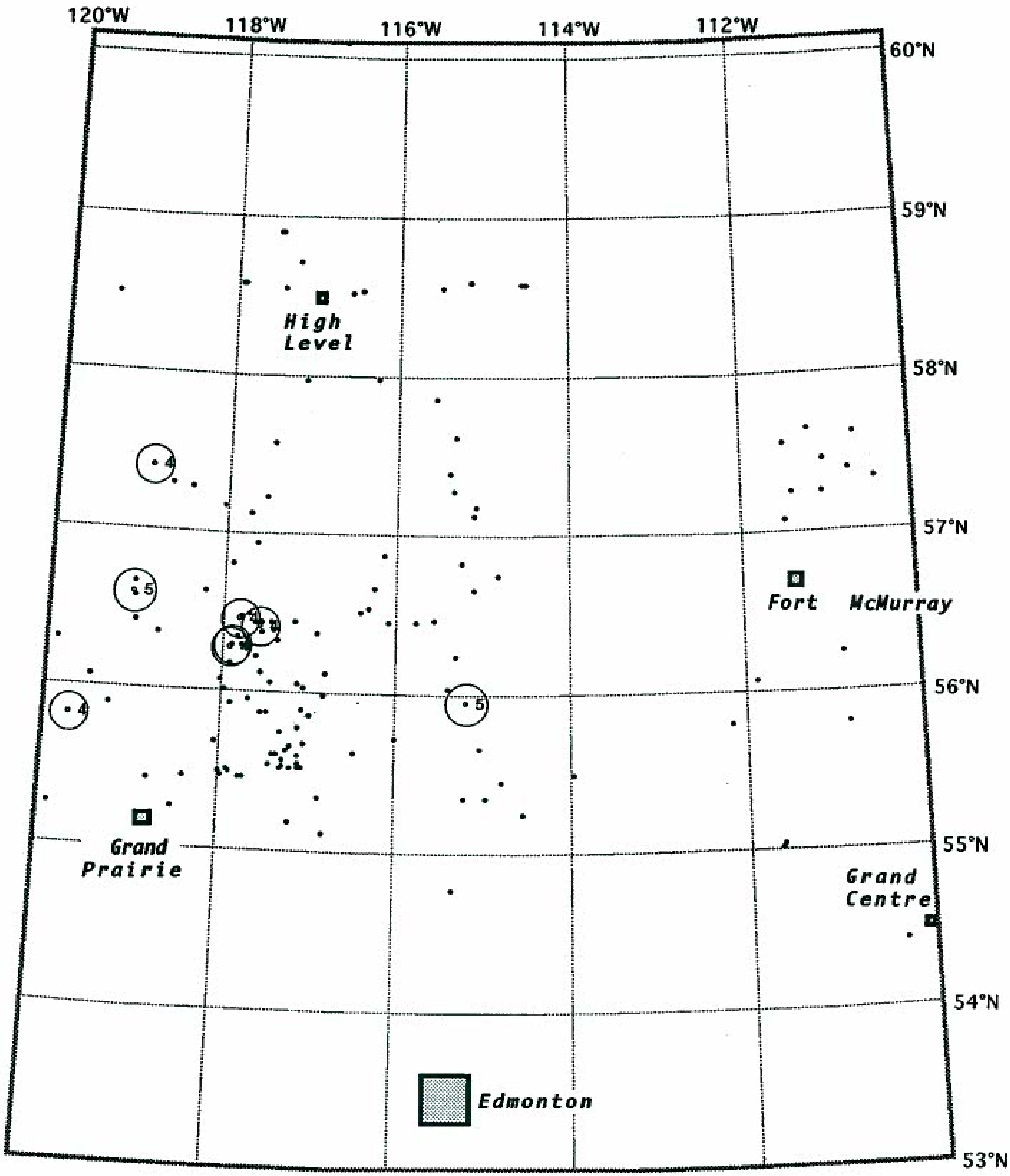


Figure 3.75. Ytterbium concentration from NA, ≥ 75%ile.

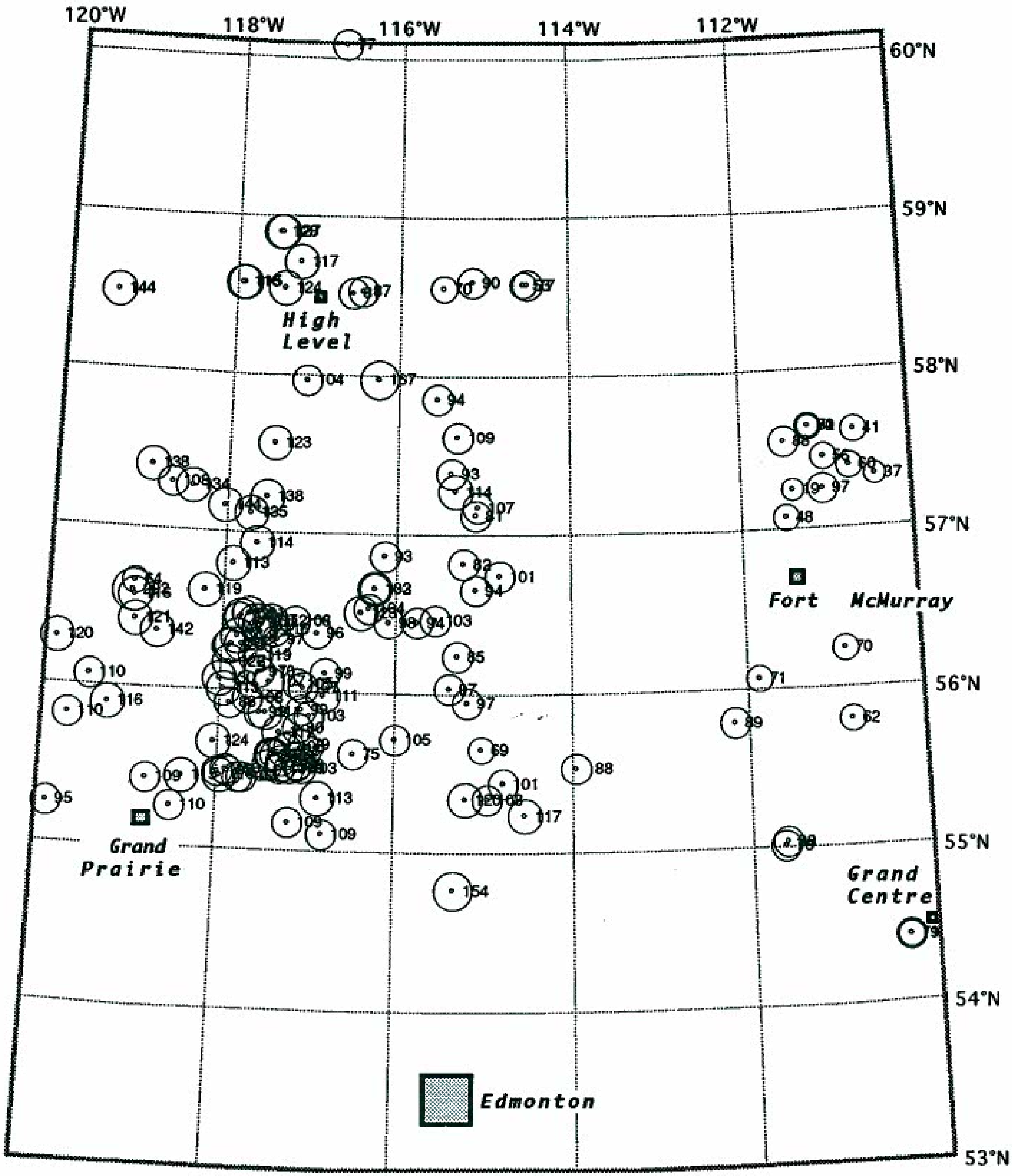


Figure 3.76. Zinc concentration from AA for all shallow data.

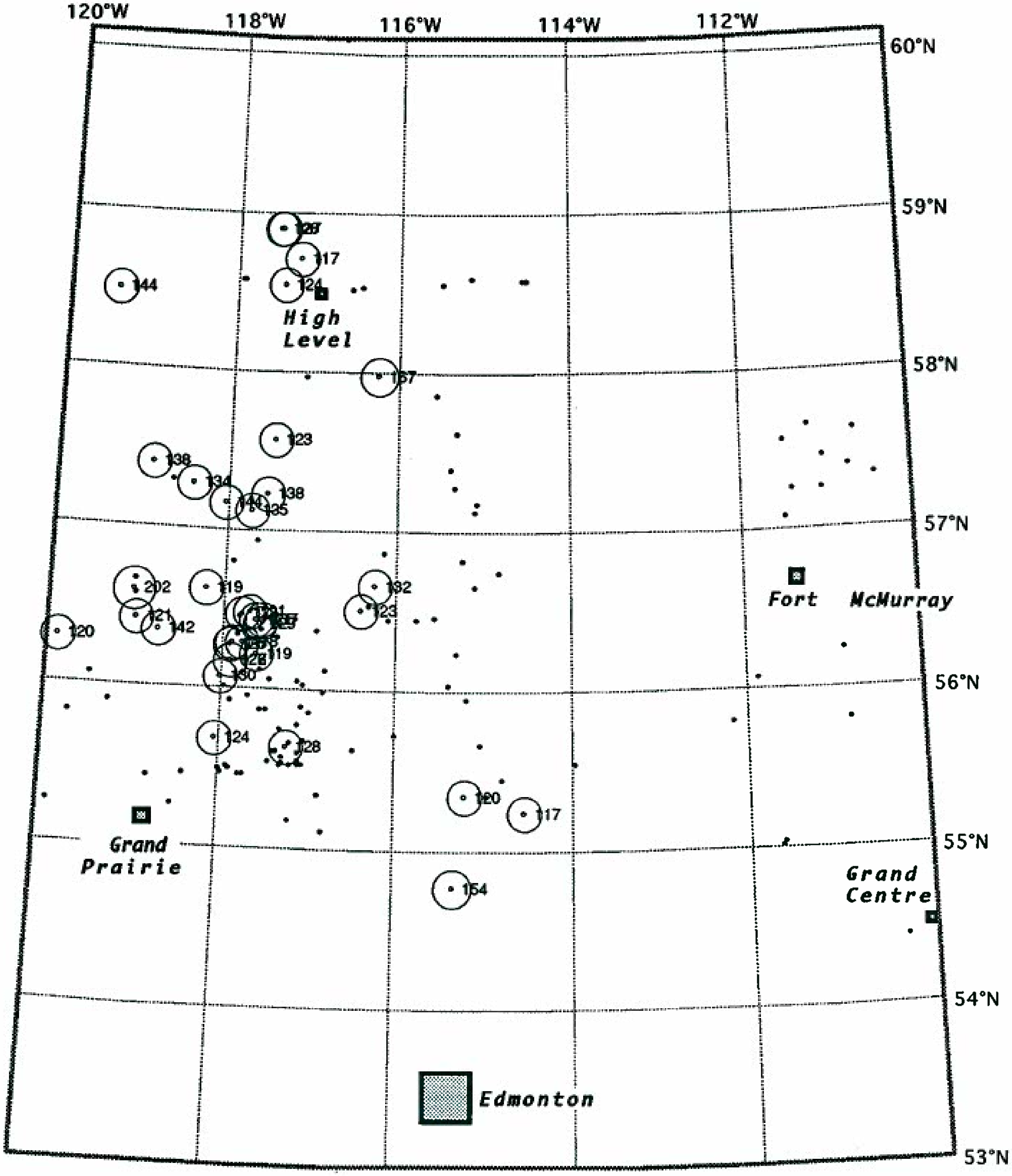


Figure 3.77. Zinc concentration from AA, ≥ 75%ile.

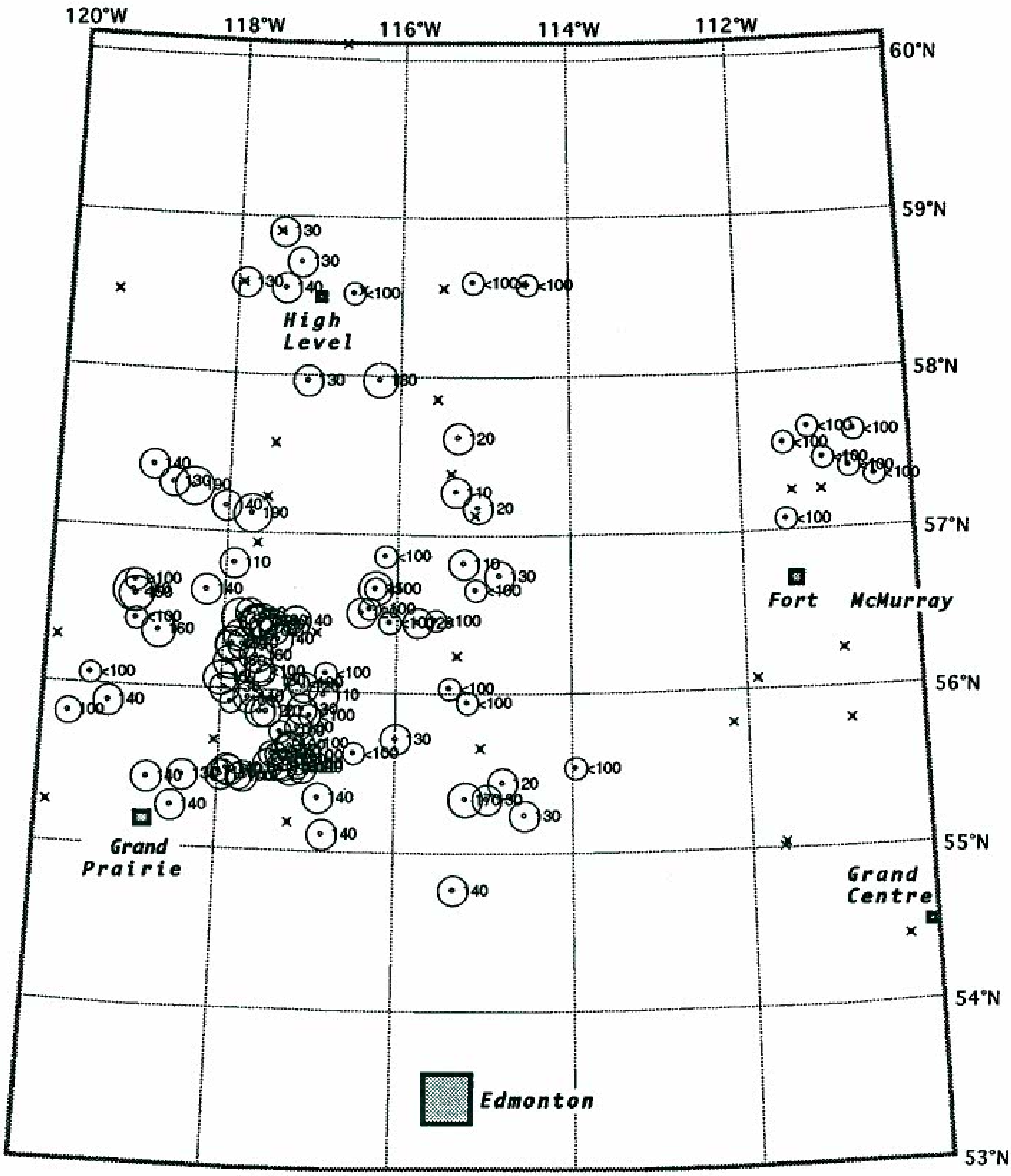


Figure 3.78. Zinc concentration from NA for all shallow data.
(x = sample not yet analysed)

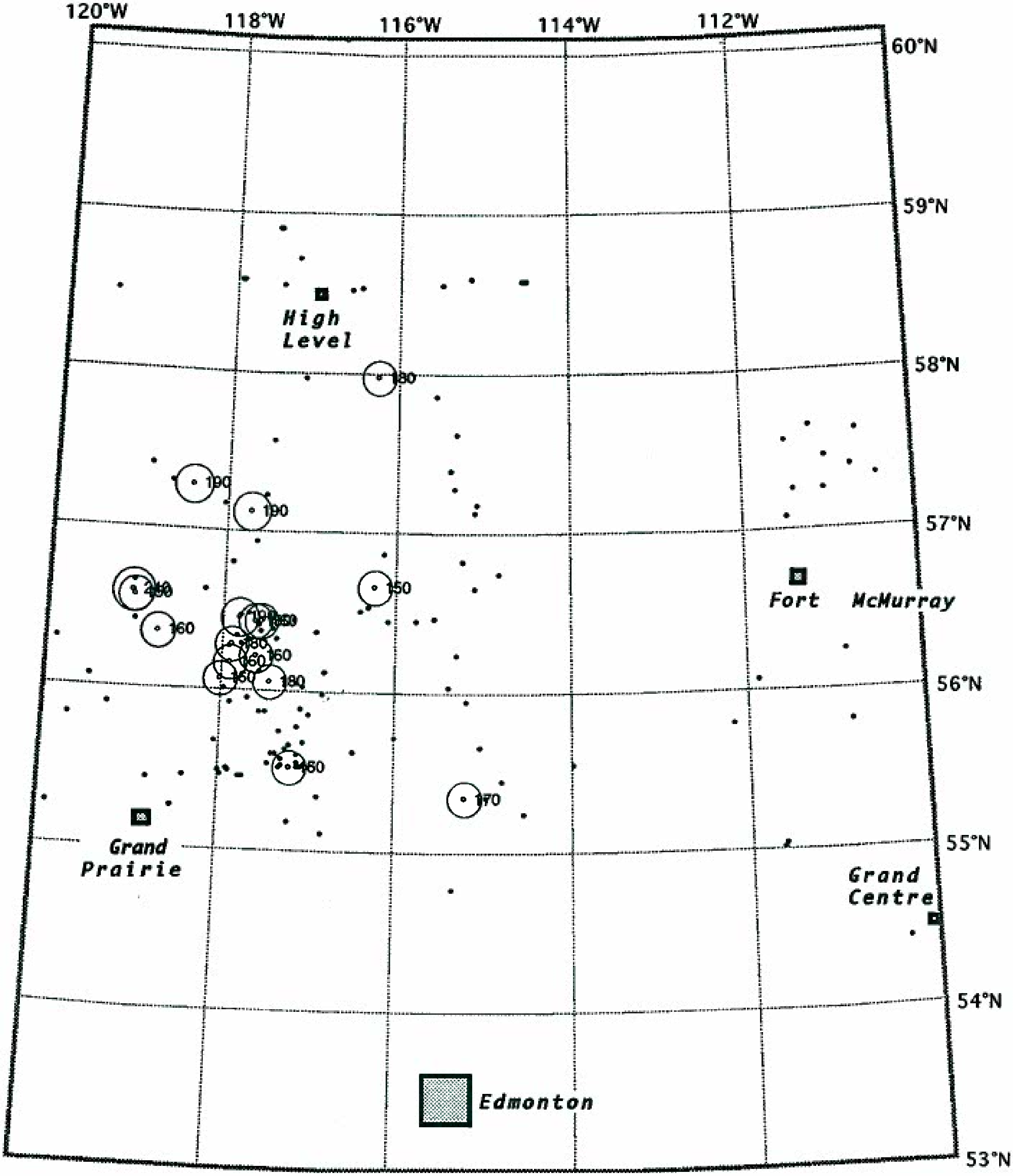


Figure 3.79. Zinc concentration from NA, ≥ 75%ile.

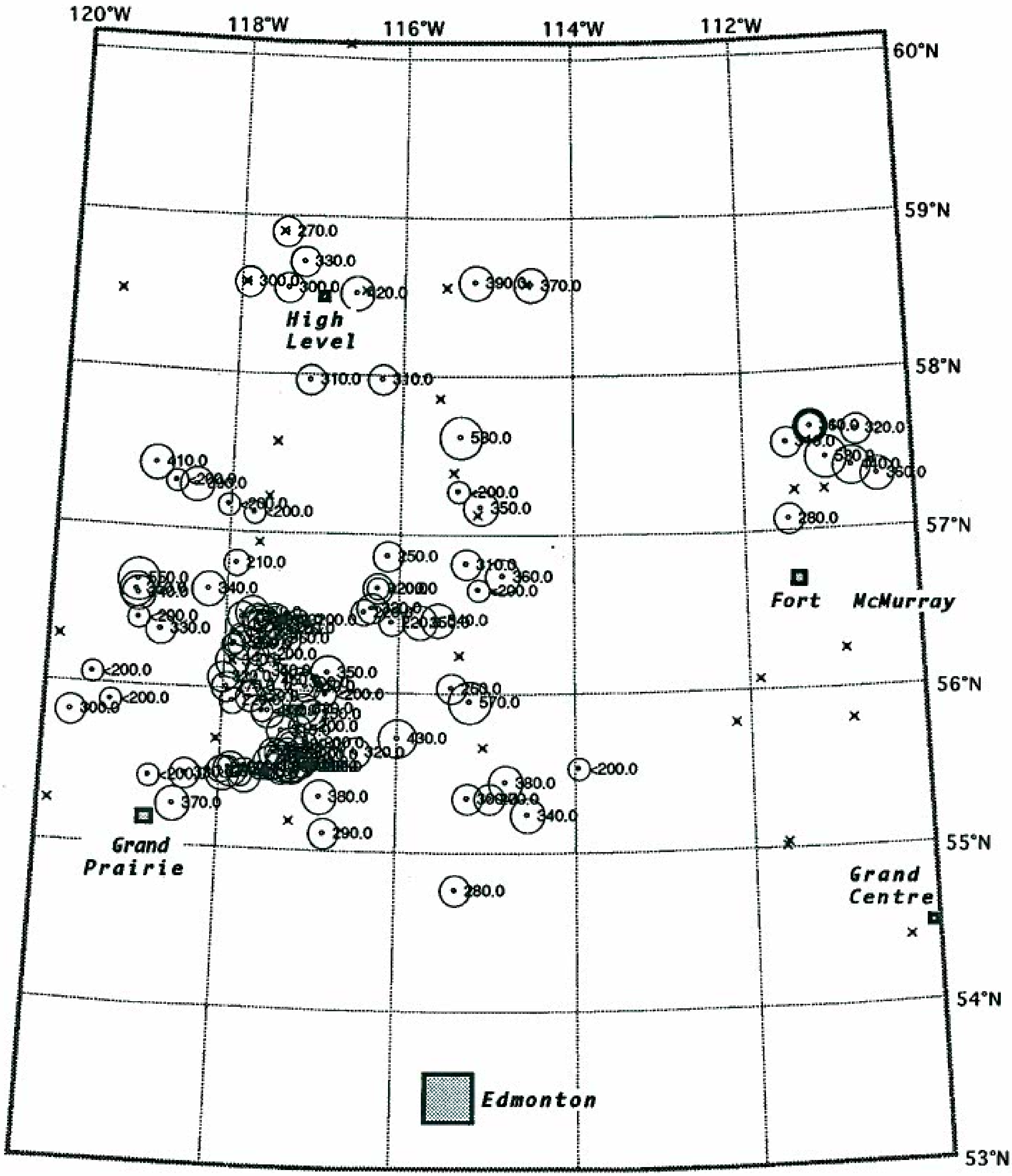


Figure 3.80. Zirconium concentration from NA for all shallow data.
(x = sample not yet analysed)

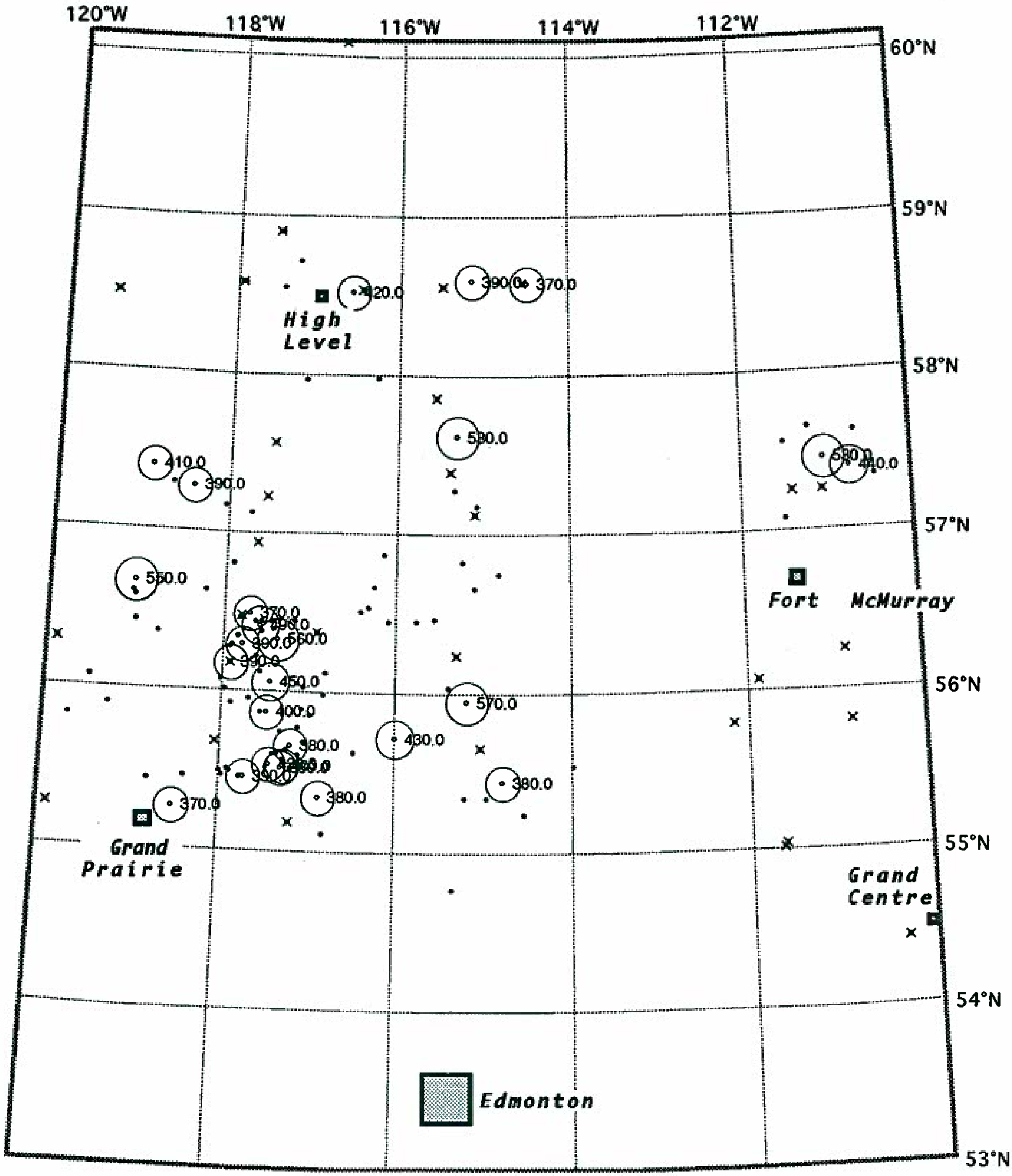


Figure 3.81. Zirconium concentration from NA, ≥ 75%ile.

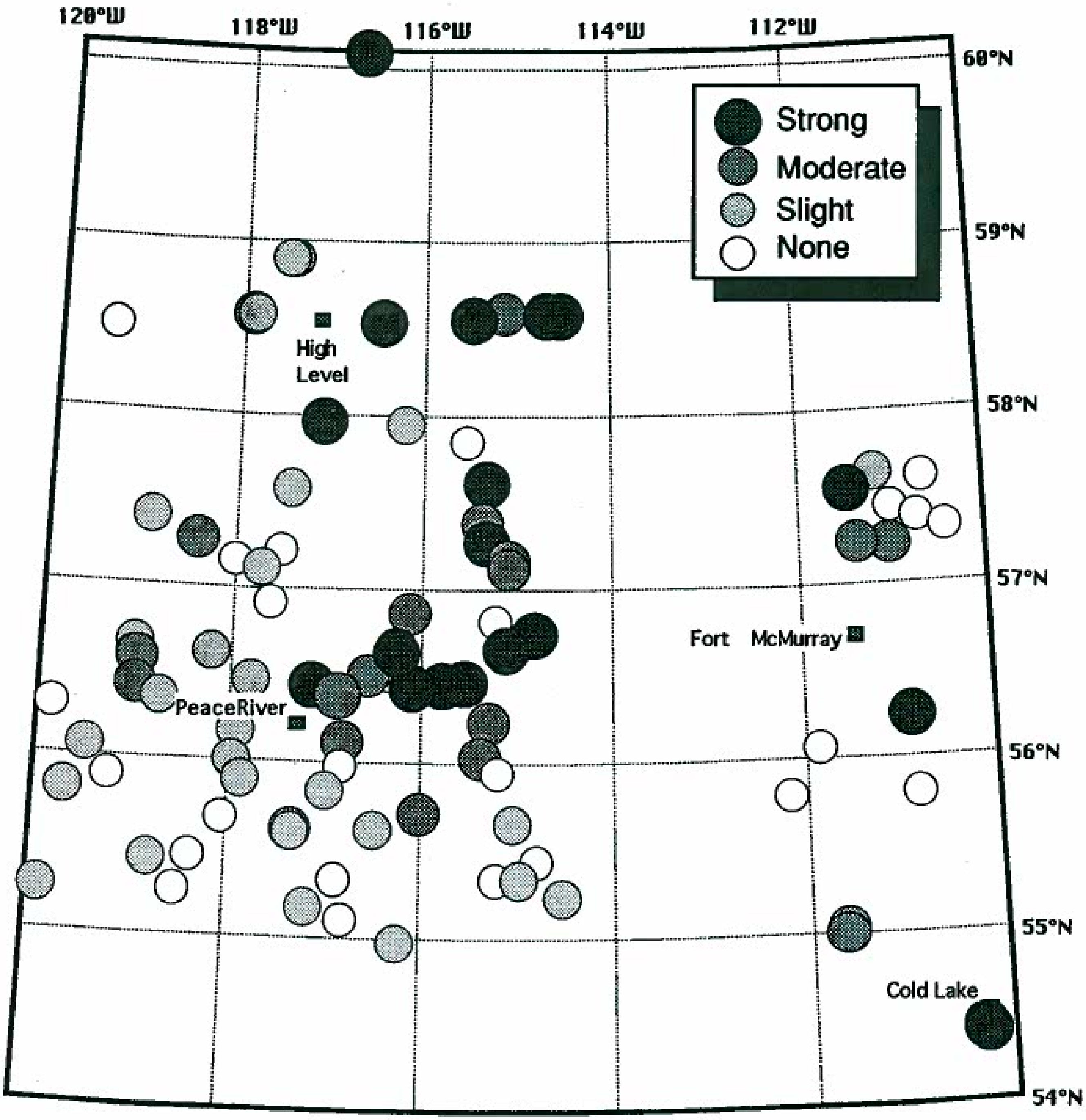


Figure 3.82. Reaction of the till samples to 10% HCl applied during collection, indicating relative carbonate content. $CaCO_3$ is more abundant in the till northeast and south of the Buffalo Head Hills (the highland east of the Peace River).

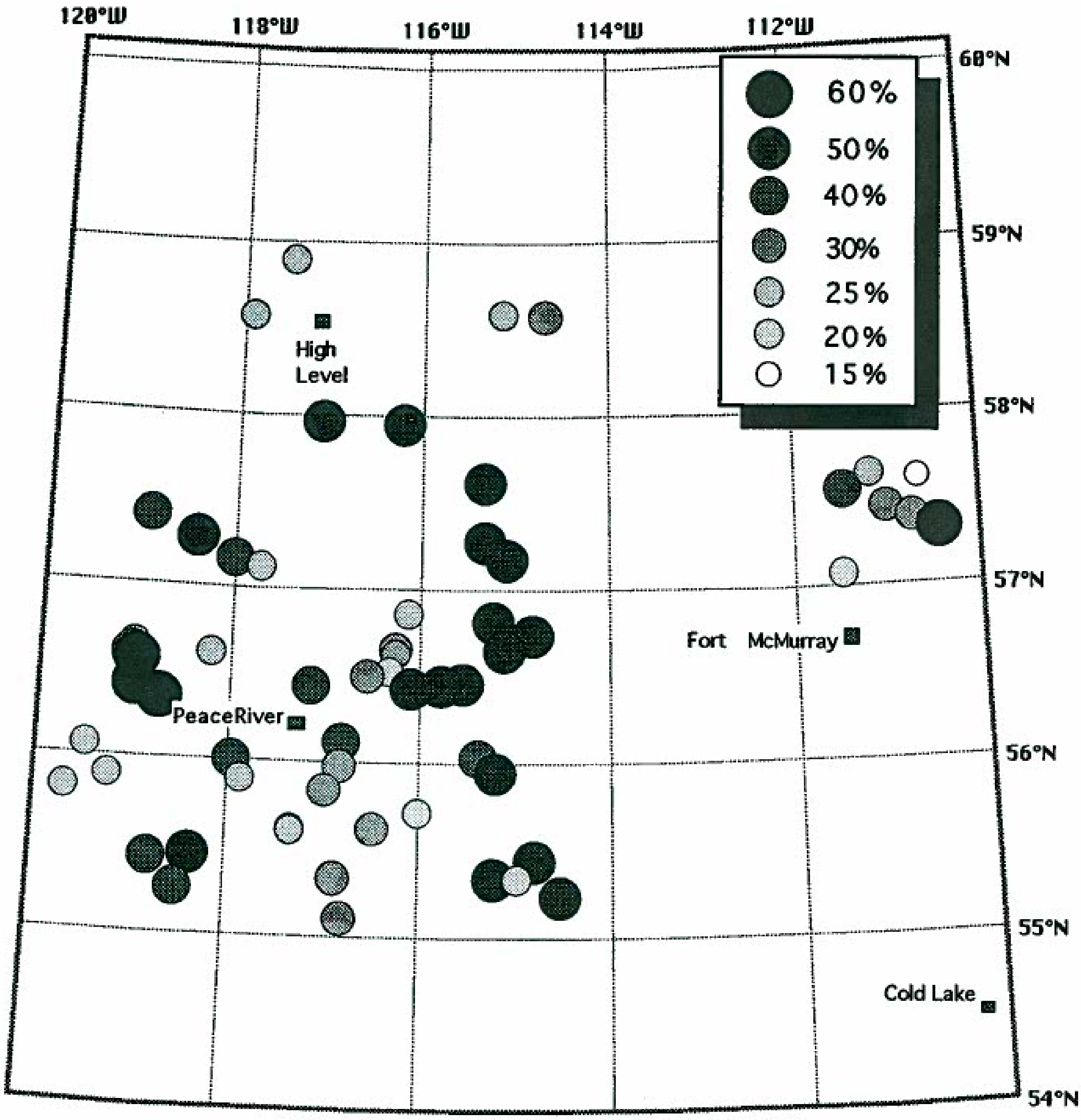


Figure 3.83. Percentage of silt in the till samples, as estimated in the field. Note correlation with figure 3.82, showing the field reaction of the samples to dilute HCl. Correlation is likely the result of silt being the terminal mode for carbonate.

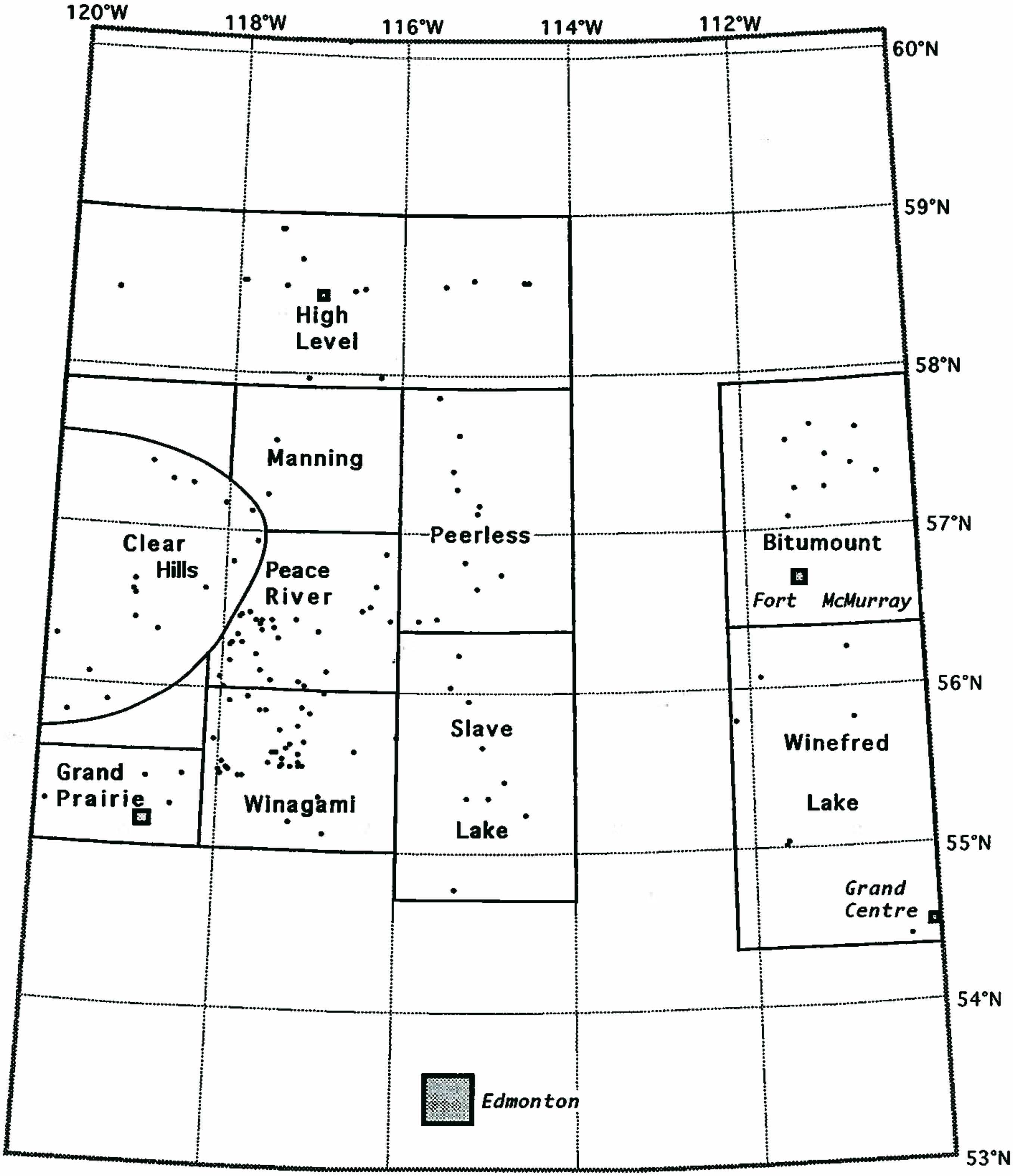
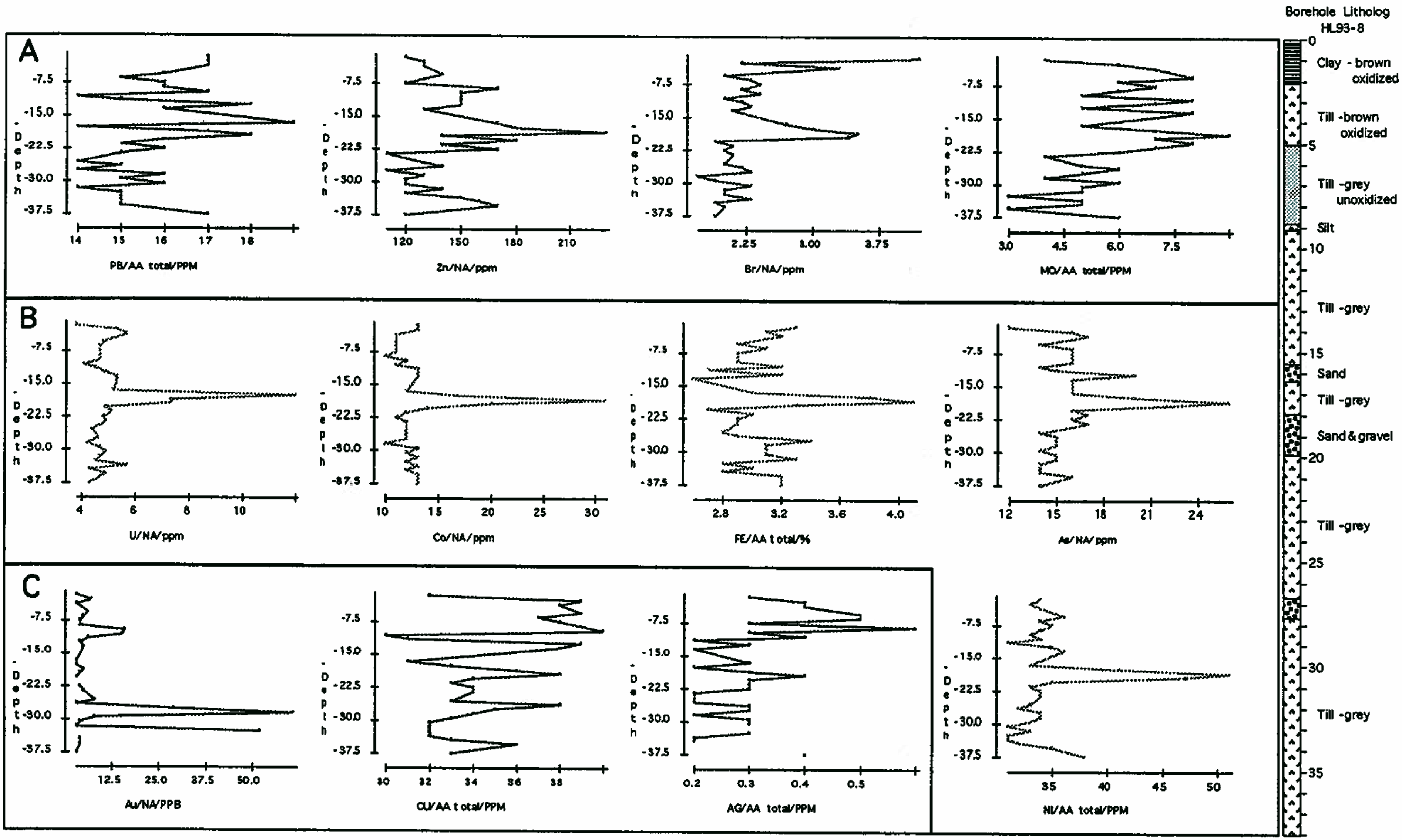


Figure 3.84. Map showing subareas in Northern Alberta for grouping the geochemical data.



'A' shows elements with a change in concentration above and below the 'concentration spike' at 17 m.

'B' shows elements with a 'concentration spike' at about 17 m, but little concentration change above and below.

(Sample interval = 1 m)

'C' shows elements with neither a spike at 17m, nor an upper and lower concentration variation.

Figure 3.85. Variations with depth in the concentrations of a selected set of elements for corehole HL93-8.

4 DRIFT STRATIGRAPHY

The six auger coreholes, which were drilled in the High Level to Fort Vermilion region to obtain till samples below the lacustrine cover, have also provided the first quality information on the Quaternary stratigraphy in this region (Figure 4.1).

4.1 DRIFT THICKNESS

Drift thickness varies from 6.5 m in hole HL93-11 to more than 29 m in hole HL93-10 (Figures 4.1 & 4.2). Hole HL93-10, which stopped at 29 m, was likely close to the bedrock because the till contained abundant shale clasts of pebble to sand size. The relatively thin drift in hole HL93-11 may be the result of the site being on the bank of the broad preglacial Peace River channel. Holes HL93-6 and HL93-4 lie within the channel and intersected a thicker drift sequence. Additional information on the drift thickness in Alberta can be found in Alberta Geological/ARC report by Dufresne and others (1994b).

4.2 STRATIGRAPHY

Preliminary inspection of the core, from the six auger holes, indicates, from the top to the bottom, discontinuous fluvial and/or eolian sand, overlying fine textured stratified lacustrine sediment, overlying pink diamicton, overlying till which was deposited on the Cretaceous bedrock (Figure 4.2).

The stratified lacustrine material consists of pink to brown, clay and silt. This unit contains streaks, and 1 to 5 mm diameter clasts of pink sediment. Secondary minerals have been deposited along small fractures and joint planes. These minerals include light gray streaks of silt-sized carbonate and fine to very coarse grained masses of gypsum. The lacustrine sediment was recognized only in those coreholes that were drilled at sites located below an elevation of 1200 m. This unit grades downward into a pink diamicton. The pink diamicton is massive, mottled, and contains a small proportion of clasts. Both the stratified sediment and the pink diamicton may be of lacustrine origin.

Till was intersected in many of the coreholes. The upper portion is grayish brown and grades downward into olive gray to gray till. This till contains more clasts than the pink diamicton. This sediment forms the surface unit in holes HL93-8, HL93-9, and HL93-10. The upper portion of this till also contains secondary gypsum crystals which have been deposited along the fractures.

Hole HL93-6 (Figure 4.2) intersected medium to fine grained sand below the lacustrine sediment. This sand and gravel is interpreted to be sediment deposited in a nonglacial channel that had eroded down into the underlying gray till.

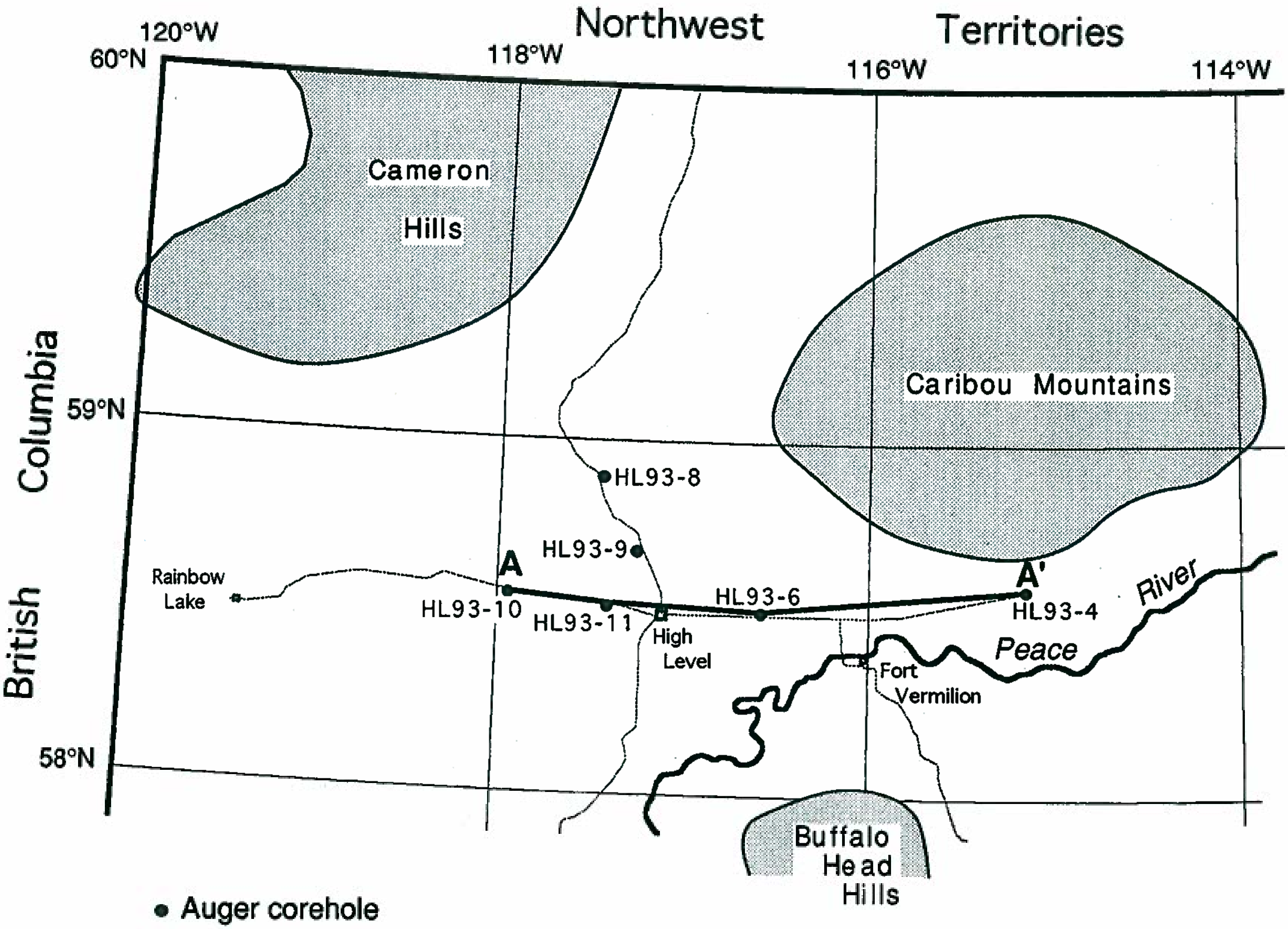


Figure 4.1. Map showing location of coreholes and cross section A-A' in the High Level to Fort Vermilion area.

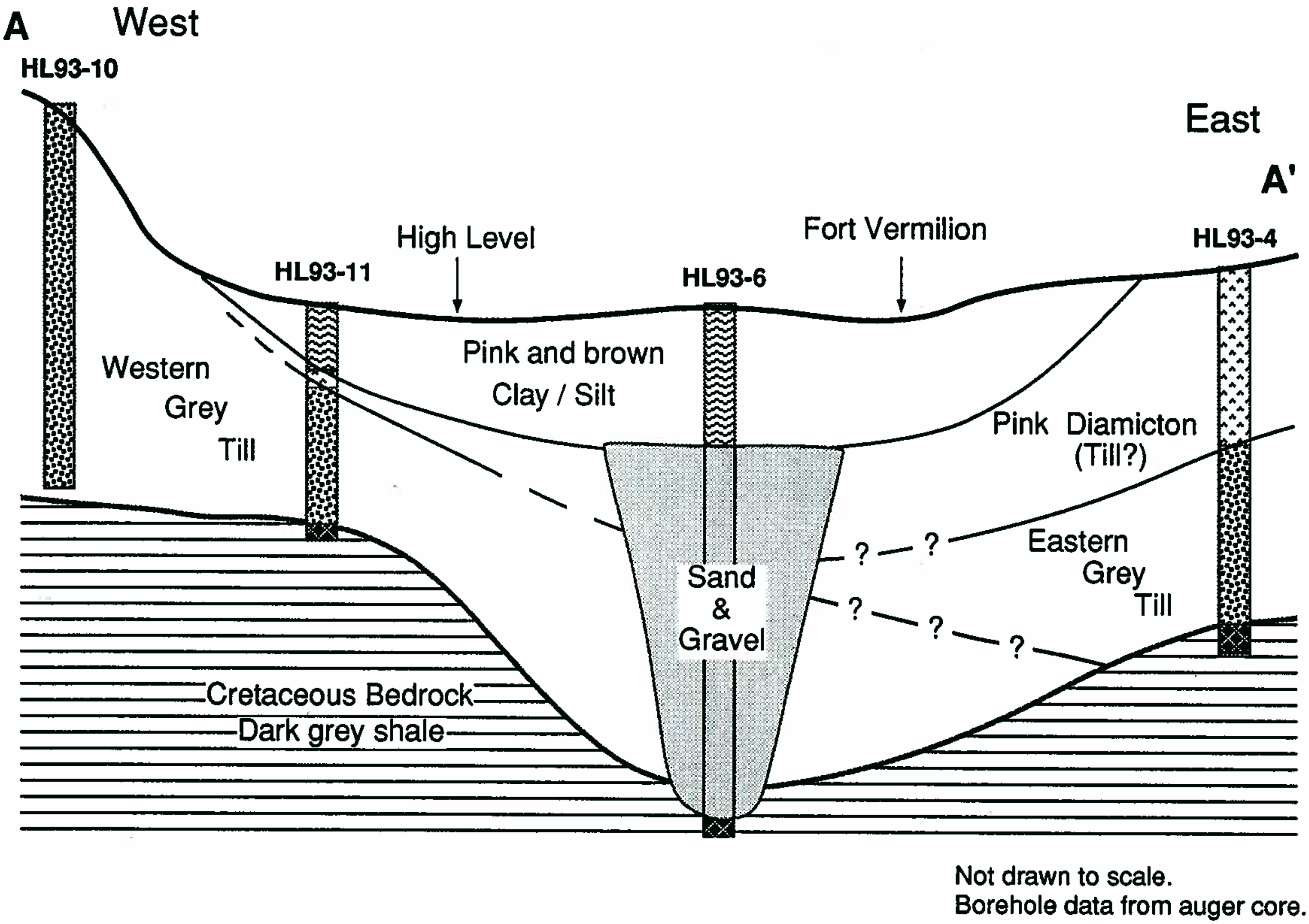


Figure 4.2. Geologic cross section A-A' showing preliminary drift stratigraphy of the High Level to Fort Vermilion area.

5 REFERENCES

Bayrock, L.A., 1971. Surficial geology of the Bitumount area, Alberta, NTS 74E. Alberta Research Council Map.

Bergman, S.C. 1987. Lamproites and other potassium-rich igneous rocks: a review of their occurrence, geochemistry and mineralogy. In Fitton, J.G. and Upton, B.J.G., eds., The alkaline igneous rocks. Geol. Soc. Lond., Spec. Publ., pp. 103-109.

Bloch, J., Schroder-Adams, C., Leckie, D.A., McIntyre, D.J., Craig, J. and Staniland, M. 1993. Revised stratigraphy of the lower Colorado Group (Albian to Turonian), Western Canada; Bulletin of Canadian Petroleum Geology, v. 41, pp. 325-348.

Bostock, H.J. 1970a. Physiographic regions of Canada. Geological Survey of Canada Map 1254A, 1:5,000,000 scale.

Bostock, H.J. 1970b. Physiographic subdivisions of Canada. In: Geology and Economic Minerals of Canada, R.J.W. Douglas (ed.) Geological Survey of Canada, Economic Geology Report 1, Chapter II. pp. 11-30.

Carrigy, M.A. 1968. Evidence of shock metamorphism in rocks from the Steen River Structure, Alberta; In B.M. French and N.M. Short (eds.) Shock Metamorphism Of Natural Materials, Mono Book Corp., Baltimore, Maryland, pp. 367-378.

Consolidated Carina Resources Corp.,1993. Unpublished news release, 16 April, 1993.

Dufresne, M.B., Henderson B.A., Fenton, M.M., Pawlowicz, and Richardson, R.J.H.,1994a. The mineral deposits potential of the Marguerite River and Fort Mackay areas, northeastern Alberta (NTS 74E). Alberta Geological Survey Department, Alberta Research Council Open File Report 1994-9, 67 p. plus appendices.

Dufresne, M.B., Olson, R.A., Schmitt, D.R., Mckinstry, B., Eccles, D.R., Fenton, M.M., Pawlowicz, J.G., Edwards, W.A.D., and Richardson, R.J.H., 1994b. The diamond potential of Alberta: a regional synthesis of the structural and stratigraphic setting, and other preliminary indications of diamond potential. Alberta Geological Survey Department, Alberta Research Council Open File Report 1994-10, in press.

Edwards, W.A.D., Scafe, D., Eccles, D.R., Miller, S., Berezniuk, T. and Boisvert, D. 1994. Mapping and reserve exploration of the Tertiary and preglacial formations of Alberta. Alberta Research Council open file report 1994-06, 111 p.

Fenton M.M., Schreiner B.T., Nielsen E., and Pawlowicz J.G. 1994. Quaternary Geology of the Western Plains. *In* G.D. Mossop and I. Shetsen (eds..), *Geological Atlas of the Western Canada Sedimentary Basin.* Published jointly by the Canadian Society of Petroleum Geologists and Alberta Research Council, Chapt. 26. p. 413-420.

Fipke, C.E. 1990. The development of advanced technology to distinguish between diamondiferous and barren diatremes; Geological Survey of Canada, Open File 2124.

Folinsbee, R.E., Ritchie, W.D. and Stansberry, G.F. 1957*. The Crowsnest Volcanics and Cretaceous geochronology; In 7th Annual Field Conference and Guide Book, Alberta Society of Petroleum Geologists, pp. 20-26.

Gent, M.R. 1993. Mineralogical and group classification program; Saskatchewan Energy Mines, Data file 18.

Greenbaum, D. 1977. The chromitiferous rocks of the Troodos Ophiolite complex, Cyprus; Economic Geology, v. 72, pp. 1175-1194.

Griffin, W.L., Ryan, C.G., Gurney, J.J., Sobolev, N.V. and Win, T.T. In press. Chromite macrocrysts in kimberlites and lamproites: geochemistry and origin; In H.O.A. Meyer (ed.) Proceedings Volume, Fifth International Kimberlite Conference, Araxa, Brazil, 1992.

Griffin, W.L. and Ryan C.G. 1993. Trace elements in garnets and chromites: Evaluation of diamond exploration targets; *In Diamonds: Exploration, Sampling And Evaluation*; Proceedings of a short course presented by the Prospectors and Developers Association of Canada, March 27, 1993, Toronto, Ontario, Canada, pp. 185-212.

Griffin, W.L., Ryan, C.G., Fisher, N.I. and Friedman, J.H. 1992. Trace Elements in garnets and chromites: their use in diamond exploration; In Round Table Conference On Diamond Exploration And Mining, New Delhi, December, 1992.

Gurney, J.J. 1984. A correlation between garnet and diamond in kimberlites;

Gurney, J.J. and Moore, R.O. 1993. Geochemical correlations between kimberlitic indicator minerals and diamonds; *In Diamonds: Exploration, Sampling And Evaluation*; Proceedings of a short course presented by the Prospectors and Developers Association of Canada, March 27, 1993, Toronto, Ontario, Canada, pp. 147-171.

Hawkins, P.A. 1994. Indicator mineral geochemistry in the Peace River diamond play. In the Calgary Mining Forum, Program and Abstracts. 10 & 11 February, 1994. Published by the Calgary Mineral Exploration Group, 37 p.

Klassen, R.W. 1989. Quaternary geology of the southern Canadian Interior Plains. *In:* Chapter 2 of Quaternary Geology of Canada and Greenland, R.J. Fulton (ed.). Geological Survey of Canada, Geology of Canada, no. 1 (also Geological Society of America, The Geology of North America, v. K-1), pp. 138-174.

Lehnert-Thiel, K., Loewer, R., Orr, R.G. and Robertshaw, P. 1992*. Diamond-bearing kimberlites in Saskatchewan, Canada: The Fort a la Corne case history; Exploration Mining Geology, Journal of the Geological Society of CIM, v. 1, pp. 391-403.

McCandless, T.E. and Gurney, J.J. 1989. Sodium in garnet and potassium in clinopyroxene: criteria for classifying mantle eclogites; *In* J. Ross (ed.), *Kimberlites And Related Rocks, Volume 2, Their Mantle/Crust Setting, Diamonds And Diamond Exploration*, Proceedings of the Fourth Kimberlite Conference, Perth 1986, Geological Society of Australia Special Publication No. 14, pp. 827-832.

Mitchell, R.H. 1991. Kimberlites and lamproites: Primary sources of diamond; Geoscience Canada, v. 18, pp. 1-16.

Mitchell R.H. 1989. Aspects of the petrology of kimberlites and lamproites: some definitions and distinctions; *In* Ross, J., ed., Kimberlites And Related Rocks, Volume 1: Their composition, Occurrence, Origin And Emplacement. Geological Society Of Australia Special Publication No. 14, pp. 7-45.

Mitchell, R.H. and Bergman, S.C. 1991. Petrology of Lamproites. Plenum Press, New York, 447 pp.

Pettapiece, W.W. 1986. Physiographic subdivisions of Alberta. Land Resources Research Center, Research Branch, Agriculture Canada, 1:1,500,000 scale.

Quirt, D. 1992a. Garclass - a program to classify garnets using the algorithm of Dawson and Stephens (1975); Saskatchewan Research Council, Publication R-1230-10-E-92.

Quirt, D. 1992b. Minclass - A program to classify garnets and pyroxenes using the discriminant functions of Dawson and Stephens (1975) and Stephens and Dawson (1977); Saskatchewan Research Council, Publication R-1230-12-E-92.

Scott Smith, B.H. 1992. Contrasting kimberlites and lamproites; Exploration and Mining Geology, vol. 1, no. 4, pp. 371-381.

Swanson, F.J. and Gent, M.R. 1993. Results of reconnaissance diamond indicator mineral sampling, Saskatchewan; *In* Dunne, K.P.E. and Grant, B. (eds.), *Mid-Continent Diamonds.* GAC-MAC Symposium Volume, Edmonton, Alberta, May 17-18, 1993, pp. 113-119.

6 APPENDICES

TABULATION OF ANALYTICAL RESULTS

Table 6.1. Results of microprobe analysis of diamond indicator mineral grains.

(for grains that were probed in 1993)

Site	Grain	Mineral (Min-ID.ASC)	% TiO2	% Cr2O3	% FeO	% MgO	% CaO	% SiO2	% Al2O3	% Na2O	% MnO	% K2O	% Total	ppm Ni	ppm Zn
NAT92-1	2	AMPHIBOLE	0.80	0.00	14.84	10.65	10.94	45.21	12.20	1.57	0.29	0.33	96.82	NA	NA
NAT92-1	3	CPX_04_UNKNOWN	0.40	0.21	9.82	15.74	12.10	49.64	6.38	1.07	0.15	0.54	96.05	NA	NA
NAT92-1	1	QUARTZ	0.04	0.00	0.00	0.00	0.02	100.90	0.01	0.00	0.00	0.00	100.98	NA	NA
NAT92-2	2	ALMANDINE	0.03	0.00	35.58	4.20	0.63	38.58	20.91	0.00	1.13	0.00	101.06	NA	NA
NAT92-2	4	ALMANDINE	0.01	0.00	31.16	0.54	1.09	37.21	20.13	0.04	9.50	0.00	99.68	NA	NA
NAT92-2	5	ALMANDINE	0.00	0.07	34.85	1.83	0.78	36.76	20.50	0.01	5.15	0.00	99.94	NA	NA
NAT92-2	7	ALMANDINE	0.02	0.09	35.80	2.02	4.10	37.49	20.66	0.02	0.24	0.00	100.44	NA	NA
NAT92-2	8	ALMANDINE	0.03	0.06	31.42	6.32	1.19	38.11	20.79	0.01	1.31	0.00	99.23	NA	NA
NAT92-2	1	G_03_CALCIC_PYROPE_ALMANDINE	0.22	0.07	22.79	2.26	14.99	38.99	20.67	0.03	0.33	0.00	100.35	NA	NA
NAT92-2	3	G_05_MAGNESIAN_ALMANDINE	0.01	0.16	28.93	3.77	6.42	38.18	20.99	0.00	1.78	0.00	100.24	NA	NA
NAT92-2	6	G_05_MAGNESIAN_ALMANDINE	0.00	0.10	29.12	8.54	1.84	38.56	21.51	0.00	0.36	0.00	100.02	NA	NA
NAT92-2	1	CPX_02_UNKNOWN	0.03	0.45	4.94	15.89	22.62	52.33	1.44	0.73	0.21	0.00	98.64	NA	NA
NAT92-4	1	ALMANDINE	0.05	0.11	31.39	3.59	6.50	37.80	20.91	0.00	0.40	0.00	100.75	NA	NA
NAT92-4	2	ALMANDINE	0.02	0.09	31.13	3.59	4.89	38.07	20.93	0.03	1.60	0.00	100.34	NA	NA
NAT92-4	3	ALMANDINE	0.11	0.09	38.54	2.77	1.42	37.07	20.48	0.00	0.18	0.00	100.65	NA	NA
NAT92-4	4	ALMANDINE	0.02	0.03	35.57	3.59	1.81	37.32	20.65	0.04	1.26	0.00	100.27	NA	NA
NAT92-4	5	ALMANDINE	0.03	0.02	33.37	6.11	1.54	38.42	21.11	0.00	0.62	0.00	101.20	NA	NA
NAT92-4	6	ALMANDINE	0.09	0.08	31.32	2.25	7.52	37.53	19.96	0.00	0.87	0.00	99.62	NA	NA
NAT92-4	7	ALMANDINE	0.10	0.00	31.17	5.81	3.28	38.19	20.72	0.00	0.40	0.00	99.66	NA	NA
NAT92-4	8	SPESSARTINE	0.02	0.08	28.70	0.26	0.33	36.36	20.28	0.06	14.16	0.00	100.25	NA	NA
NAT92-4	2	ALMANDINE	0.07	0.02	34.95	5.64	0.68	37.90	21.97	0.00	0.79	0.00	102.02	NA	NA
NAT92-4	1	G-6 Pyrope-grossular-almandine	0.45	0.00	22.39	0.06	29.67	34.99	7.37	0.02	1.45	0.00	96.42	NA	NA
NAT92-6	1	ALMANDINE	0.05	0.00	31.36	2.36	7.72	37.47	19.90	0.01	0.66	0.00	99.53	NA	NA
NAT92-6	2	ALMANDINE	0.00	0.00	30.87	7.08	1.78	38.77	21.20	0.00	0.47	0.00	100.16	NA	NA
NAT92-6	3	ALMANDINE	0.03	0.00	36.14	3.68	1.55	37.42	20.73	0.00	1.04	0.00	100.59	NA	NA
NAT92-6	4	ALMANDINE	0.00	0.00	32.95	6.65	0.45	38.11	21.51	0.00	1.14	0.00	100.81	NA	NA
NAT92-6	1	CPX_02_UNKNOWN	0.00	0.47	5.45	15.32	22.82	52.83	1.68	0.81	0.22	0.00	99.60	NA	NA
NAT92-7	1	ALMANDINE	0.00	0.00	36.01	3.61	1.43	37.84	20.72	0.03	0.62	0.00	100.26	NA	NA
NAT92-7	2	ALMANDINE	0.00	0.00	34.34	3.76	2.94	37.74	20.67	0.00	0.77	0.00	100.22	NA	NA
NAT92-7	3	ALMANDINE	0.00	0.03	33.11	5.54	1.46	37.97	20.74	0.00	1.14	0.00	99.98	NA	NA
NAT92-7	4	G_05_MAGNESIAN_ALMANDINE	0.03	0.00	29.65	8.31	0.95	38.80	21.79	0.00	0.37	0.00	99.89	NA	NA
NAT92-9	3	ALMANDINE	0.00	0.06	31.35	6.87	1.01	38.75	21.08	0.01	1.29	0.00	100.42	NA	NA
NAT92-9	1	CPX_01_UNKNOWN	0.33	0.10	20.18	17.95	6.58	52.63	1.36	0.11	0.22	0.00	99.46	NA	NA
NAT92-9	2	G_05_MAGNESIAN_ALMANDINE	0.00	0.09	29.95	7.89	0.96	37.82	21.53	0.00	1.19	0.00	99.42	NA	NA
NAT92-10	3	ALMANDINE	0.04	0.00	35.68	2.45	4.06	36.23	20.83	0.00	0.33	0.00	99.63	NA	NA
NAT92-10	4	ALMANDINE	0.04	0.00	32.88	4.78	1.80	37.71	20.64	0.00	1.08	0.00	98.93	NA	NA
NAT92-10	8	ALMANDINE	0.05	0.00	34.11	0.87	7.11	37.31	20.20	0.00	0.17	0.00	99.83	NA	NA
NAT92-10	9	ALMANDINE	0.00	0.00	33.61	3.41	3.82	37.58	20.84	0.00	1.47	0.00	100.73	NA	NA
NAT92-10	10	ALMANDINE	0.01	0.00	32.13	2.35	6.91	37.27	20.18	0.03	1.08	0.00	99.96	NA	NA
NAT92-10	11	ALMANDINE	0.01	0.00	31.78	2.67	6.84	37.49	20.40	0.02	0.39	0.00	99.60	NA	NA
NAT92-10	2	G_03_CALCIC_PYROPE_ALMANDINE	0.00	0.06	14.23	15.84	5.21	40.88	22.30	0.00	0.55	0.00	99.08	NA	NA
NAT92-10	1	G_05_MAGNESIAN_ALMANDINE	0.00	0.00	28.09	9.42	1.06	39.60	21.62	0.02	0.60	0.00	100.42	NA	NA
NAT92-10	5	G_05_MAGNESIAN_ALMANDINE	0.00	0.00	29.37	1.53	6.67	37.17	19.89	0.00	5.02	0.00	99.64	NA	NA
NAT92-10	6	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	27.98	5.48	6.38	38.68	20.47	0.02	1.19	0.00	100.30	NA	NA

			%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
Site	Grain	Mineral (Min-ID.ASC)	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	Total	Ni	Zn
NAT92-10	7	UNKNOWN	0.00	0.06	35.34	3.29	1.75	27.74	21.21	0.00	1.12	0.00	90.51	NA	NA
NAT92-10	1	ALMANDINE	0.12	0.00	33.17	2.05	6.72	37.60	20.87	0.01	0.30	0.00	100.83	NA	NA
NAT92-10	2	G_05_MAGNESIAN_ALMANDINE	0.05	0.04	29.20	9.26	1.07	39.35	22.20	0.02	0.29	0.00	101.47	NA	NA
NAT92-11	1	ALMANDINE	0.06	0.00	37.43	3.28	0.64	37.64	20.67	0.03	0.28	0.00	100.04	NA	NA
NAT92-11	3	ALMANDINE	0.01	0.01	36.47	0.65	5.57	36.97	19.89	0.02	0.24	0.00	99.83	NA	NA
NAT92-11	5	ALMANDINE	0.00	0.00	31.69	0.54	0.66	37.03	19.85	0.03	10.40	0.00	100.20	NA	NA
NAT92-11	6	ALMANDINE	0.09	0.00	30.94	2.80	7.32	38.19	20.10	0.01	0.51	0.00	99.96	NA	NA
NAT92-11	7	ALMANDINE	0.00	0.08	34.41	4.66	0.53	37.50	21.13	0.00	1.55	0.00	99.88	NA	NA
NAT92-11	4	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	29.00	0.44	0.85	37.14	20.00	0.01	12.69	0.00	100.23	NA	NA
NAT92-11	2	GROSSULAR	0.24	0.00	7.56	0.07	32.97	38.54	19.00	0.01	0.42	0.00	98.81	NA	NA
NAT92-12	1	ALMANDINE	0.04	0.00	32.97	6.59	0.77	38.98	21.34	0.00	0.45	0.00	101.15	NA	NA
NAT92-13	1	ALMANDINE	0.02	0.19	37.98	2.77	1.34	36.80	20.15	0.00	0.51	0.00	99.76	NA	NA
NAT92-13	2	ALMANDINE	0.01	0.00	35.63	2.95	3.68	37.38	20.62	0.00	0.36	0.00	100.63	NA	NA
NAT92-13	4	ALMANDINE	0.04	0.00	32.42	2.08	7.39	37.73	20.42	0.00	0.73	0.00	100.80	NA	NA
NAT92-13	8	ALMANDINE	0.00	0.13	33.81	4.46	1.63	37.59	20.66	0.00	1.19	0.00	99.48	NA	NA
NAT92-13	3	CORUNDUM	0.02	0.03	0.37	0.01	0.00	0.00	94.32	0.00	0.00	0.00	94.76	NA	NA
NAT92-13	7	CORUNDUM	0.04	0.12	0.15	0.00	0.00	0.02	96.75	0.00	0.00	0.00	97.09	NA	NA
NAT92-13	5	G_05_MAGNESIAN_ALMANDINE	0.05	0.00	26.60	2.80	2.53	37.18	20.50	0.05	10.04	0.00	99.75	NA	NA
NAT92-13	9	G_05_MAGNESIAN_ALMANDINE	0.04	0.07	26.54	5.04	6.95	37.97	20.67	0.00	1.72	0.00	99.00	NA	NA
NAT92-13	6	SPESSARTINE	0.03	0.00	26.67	0.50	0.67	36.11	20.25	0.02	15.91	0.00	100.17	NA	NA
NAT92-13	1	CPX_02_UNKNOWN	0.06	0.28	7.34	14.20	23.70	53.44	0.76	0.60	0.25	0.00	100.63	NA	NA
NAT92-15	1	ALMANDINE	0.04	0.00	34.26	4.20	2.19	38.04	20.84	0.00	0.50	0.00	100.07	NA	NA
NAT92-15	2	ALMANDINE	0.05	0.08	35.97	3.18	1.80	38.04	20.76	0.00	1.60	0.00	101.47	NA	NA
NAT92-15	3	ALMANDINE	0.06	0.00	33.03	6.11	1.92	38.01	21.17	0.00	0.65	0.00	100.95	NA	NA
NAT92-15	6	ALMANDINE	0.04	0.09	33.40	3.74	3.23	38.37	20.79	0.01	0.52	0.00	100.20	NA	NA
NAT92-15	7	ALMANDINE	0.04	0.00	34.99	3.44	0.72	37.30	20.88	0.01	2.75	0.00	100.12	NA	NA
NAT92-15	8	ALMANDINE	0.04	0.00	31.04	5.91	3.14	39.06	21.15	0.00	0.42	0.00	100.75	NA	NA
NAT92-15	9	ALMANDINE	0.07	0.00	34.01	1.97	5.89	37.58	20.45	0.00	0.41	0.00	100.38	NA	NA
NAT92-15	10	ALMANDINE	0.08	0.08	32.51	2.14	6.77	37.80	20.21	0.06	1.13	0.00	100.76	NA	NA
NAT92-15	11	ALMANDINE	0.11	0.00	32.62	3.99	5.04	38.59	20.47	0.00	0.24	0.00	101.05	NA	NA
NAT92-15	12	ALMANDINE	0.05	0.00	38.56	2.10	1.62	37.68	20.31	0.04	0.10	0.00	100.45	NA	NA
NAT92-15	4	G_05_MAGNESIAN_ALMANDINE_	0.09	0.00	29.44	4.12	6.73	38.66	20.51	0.02	1.11	0.00	100.68	NA	NA
NAT92-15	5	G_05_MAGNESIAN_ALMANDINE	0.00	0.09	22.55	0.51	2.72	37.04	20.12	0.05	16.22	0.00	99.30	NA	NA
NAT92-16	2	ALMANDINE	0.03	0.04	34.41	2.90	4.19	37.38	20.69	0.00	0.43	0.00	100.08	NA	NA
NAT92-16	4	ALMANDINE	0.06	0.05	32.23	2.32	6.70	37.41	19.38	0.04	1.13	0.00	99.31	NA	NA
NAT92-16	5	ALMANDINE	0.07	0.00	32.56	2.45	6.77	37.57	20.23	0.00	0.82	0.00	100.46	NA	NA
NAT92-16	6	ALMANDINE	0.00	0.00	38.02	2.84	0.88	36.90	20.94	0.00	1.21	0.00	100.78	NA	NA
NAT92-16	7	ALMANDINE	0.00	0.01	36.17	3.59	1.58	37.78	20.14	0.01	0.81	0.00	100.07	NA	NA
NAT92-16	1	G_05_MAGNESIAN_ALMANDINE	0.07	0.00	29.72	0.73	11.35	37.56	19.38	0.00	1.05	0.00	99.86	NA	NA
NAT92-16	3	G_05_MAGNESIAN_ALMANDINE	0.07	0.03	26.59	3.51	10.10	38.18	20.59	0.03	0.88	0.00	99.98	NA	NA
NAT92-17	5	ALMANDINE	0.02	0.09	32.90	1.57	1.85	37.17	20.09	0.01	5.51	0.00	99.20	NA	NA
NAT92-17	6	ALMANDINE	0.00	0.00	34.40	4.20	2.76	37.87	20.87	0.00	0.47	0.00	100.57	NA	NA
NAT92-17	8	ALMANDINE	0.00	0.00	32.13	2.46	3.94	37.68	20.72	0.03	2.76	0.00	99.72	NA	NA
NAT92-17	9	ALMANDINE	0.00	0.12	33.42	3.68	2.99	37.86	20.72	0.06	1.64	0.00	100.49	NA	NA
NAT92-17	2	G_05_MAGNESIAN_ALMANDINE	0.02	0.00	28.59	1.24	8.03	36.95	20.51	0.00	4.69	0.00	100.03	NA	NA
NAT92-17	7	G_05_MAGNESIAN_ALMANDINE	0.02	0.00	30.32	1.92	7.99	36.92	19.86	0.00	1.35	0.00	98.37	NA	NA

Site	Grain	Mineral (Min-ID.ASC)	% TiO2	% Cr2O3	% FeO	% MgO	% CaO	% SiO2	% Al2O3	% Na2O	% MnO	% K2O	% Total	ppm Ni	ppm Zn
NAT92-17	1	PICRO_CHROMITE	1.18001	43.11	21.12	15.01	0	0.08001	18.04	NA	0.22001	NA	98.98	1730	0
NAT92-17	4	SPESSARTINE	0.07	0.00	16.80	1.35	1.01	36.87	20.25	0.00	23.12	0.00	99.47	NA	NA
NAT92-17	1	STAUROLITE	0.67	0.00	13.39	1.59	0.00	27.23	52.00	0.00	0.11	0.00	95.00	NA	NA
NAT92-17	3	STAUROLITE	0.63	0.05	12.48	1.84	0.00	28.04	51.82	0.00	0.17	0.00	95.04	NA	NA
NAT92-18	1	ALMANDINE	0.06	0.01	37.08	2.31	2.94	37.20	20.53	0.02	0.21	0.00	100.35	NA	NA
NAT92-18	6	ALMANDINE	0.05	0.03	33.33	3.28	4.53	37.43	20.72	0.00	0.41	0.00	99.78	NA	NA
NAT92-18	2	G_03_CALCIC_PYROPE_ALMANDINE	0.11	0.09	17.24	0.49	0.22	37.21	19.83	0.00	23.19	0.00	98.38	NA	NA
NAT92-18	3	STAUROLITE	0.74	0.08	12.70	1.73	0.00	28.51	51.40	0.00	0.19	0.00	95.36	NA	NA
NAT92-18	4	STAUROLITE	0.68	0.05	12.78	2.24	0.04	28.01	51.34	0.00	0.00	0.00	95.14	NA	NA
NAT92-18	5	STAUROLITE	0.58	0.00	12.99	1.88	0.00	28.34	51.80	0.00	0.09	0.00	95.68	NA	NA
NAT92-18	1	ALMANDINE	0.05	0.02	34.26	3.56	3.26	37.08	21.57	0.01	1.06	0.00	100.89	NA	NA
NAT92-18	2	ALMANDINE	0.06	0.00	31.67	4.14	4.08	37.17	21.90	0.03	2.42	0.00	101.47	NA	NA
NAT92-18	3	ALMANDINE	0.09	0.00	38.68	2.32	1.95	37.42	21.32	0.03	0.08	0.00	101.89	NA	NA
NAT92-18	4	UNKNOWN	0.00	0.00	5.11	0.13	1.74	90.98	4.25	0.00	1.57	0.00	103.79	NA	NA
NAT92-19	5	ALMANDINE	0.01	0.00	31.66	2.10	6.80	37.39	20.03	0.01	1.54	0.00	99.53	NA	NA
NAT92-19	6	ALMANDINE	0.10	0.00	31.52	1.74	8.16	37.75	20.07	0.01	0.48	0.00	99.85	NA	NA
NAT92-19	7	ALMANDINE	0.04	0.09	32.38	1.59	7.97	37.58	20.40	0.01	0.75	0.00	100.80	NA	NA
NAT92-19	4	G_09_CHROME_PYROPE	0.01	3.94	8.04	18.72	5.52	41.29	20.55	0.00	0.62	0.00	98.69	NA	NA
NAT92-19	1	STAUROLITE	0.65	0.15	14.38	1.56	0.00	27.90	51.86	0.01	0.00	0.00	96.52	NA	NA
NAT92-19	2	STAUROLITE	0.69	0.17	13.53	1.89	0.00	28.04	52.28	0.00	0.15	0.00	96.77	NA	NA
NAT92-19	3	STAUROLITE	0.72	0.01	13.47	1.25	0.00	27.68	51.71	0.00	0.31	0.00	95.15	NA	NA
NAT92-19	8	STAUROLITE	0.70	0.14	13.94	1.83	0.00	28.35	52.17	0.00	0.00	0.00	97.13	NA	NA
NAT92-19	1	SUB_PICRO_ILMENITE	58.19	0	28.71	2.96001	0.07001	0.41001	0.22001	NA	0.45001	NA	91.05	190	81
NAT92-19	4	G_03_CALCIC_PYROPE_ALMANDINE	0.07	0.06	22.65	2.79	8.27	36.75	21.17	0.02	8.21	0.00	100.00	NA	NA
NAT92-19	2	G_05_MAGNESIAN_ALMANDINE	0.09	0.00	28.30	9.31	1.48	38.54	22.35	0.00	0.48	0.00	100.55	NA	NA
NAT92-19	3	G_08_FERRO_MAGNESIAN_GROSSULAR	0.08	0.00	11.86	0.00	23.41	36.81	21.76	0.00	0.23	0.00	94.15	NA	NA
NAT92-19	1	UNKNOWN	1.18	0.00	25.36	3.72	11.49	38.51	12.40	1.34	0.47	1.33	95.79	NA	NA
NAT92-20	1	ALMANDINE	0.03	0.00	34.90	2.45	4.60	37.40	20.69	0.03	0.50	0.00	100.61	NA	NA
NAT92-20	2	ALMANDINE	0.03	0.07	32.86	5.18	2.86	38.07	20.90	0.02	0.26	0.00	100.25	NA	NA
NAT92-20	3	ALMANDINE	0.02	0.00	31.83	2.10	7.18	37.08	19.92	0.02	1.00	0.00	99.14	NA	NA
NAT92-20	4	ALMANDINE	0.12	0.00	32.27	1.75	7.70	37.37	20.29	0.00	0.80	0.00	100.31	NA	NA
NAT92-20	5	ALMANDINE	0.00	0.01	31.91	5.75	2.22	37.95	20.98	0.00	0.97	0.00	99.79	NA	NA
NAT92-20	6	ALMANDINE	0.03	0.00	38.89	1.99	2.48	37.45	20.55	0.02	0.27	0.00	101.67	NA	NA
NAT92-20	7	ALMANDINE	0.02	0.10	33.84	3.97	3.36	37.53	20.60	0.03	0.71	0.00	100.16	NA	NA
NAT92-20	8	ALMANDINE	0.03	0.04	32.54	5.14	3.48	37.68	20.83	0.03	0.59	0.00	100.35	NA	NA
NAT92-20	9	ALMANDINE	0.04	0.13	34.07	4.43	2.87	37.80	20.73	0.00	0.91	0.00	100.99	NA	NA
NAT92-20	10	ALMANDINE	0.07	0.00	35.37	4.52	1.79	37.43	20.62	0.00	0.72	0.00	100.51	NA	NA
NAT92-20	2	G_05_MAGNESIAN_ALMANDINE	0.00	0.00	29.76	6.49	1.93	37.89	21.38	0.00	2.27	0.00	99.73	NA	NA
NAT92-20	1	UNKNOWN (Salite?)	0.07	0.00	31.55	11.64	1.07	51.27	0.70	0.07	0.89	0.00	97.26	NA	NA
NAT92-21	2	ALMANDINE	0.05	0.00	33.57	1.14	7.61	37.46	20.30	0.00	1.04	0.00	101.17	NA	NA
NAT92-21	3	ALMANDINE	0.06	0.00	32.75	2.72	6.02	37.44	20.38	0.00	0.91	0.00	100.27	NA	NA
NAT92-21	4	ALMANDINE	0.03	0.00	37.23	2.36	2.30	37.08	20.27	0.02	0.86	0.00	100.14	NA	NA
NAT92-21	5	ALMANDINE	0.09	0.00	32.41	2.16	7.15	37.38	20.33	0.00	1.00	0.00	100.52	NA	NA
NAT92-21	7	ALMANDINE	0.03	0.00	32.35	2.47	6.81	37.85	20.22	0.00	0.80	0.00	100.53	NA	NA
NAT92-21	6	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	28.01	3.42	8.74	38.22	20.70	0.03	0.76	0.00	100.00	NA	NA
NAT92-21	1	STAUROLITE	0.65	0.05	12.93	2.09	0.00	28.59	50.73	0.00	0.05	0.00	95.08	NA	NA

Site	Grain	Mineral (Min-ID.ASC)	% TiO2	% Cr2O3	% FeO	% MgO	% CaO	% SiO2	% Al2O3	% Na2O	% MnO	% K2O	% Total	ppm Ni	ppm Zn
NAT92-21	2	ALMANDINE	0.12	0.00	36.35	4.01	1.61	37.01	21.73	0.02	0.50	0.00	101.34	NA	NA
NAT92-21	5	SPESSARTINE	0.06	0.02	29.75	2.09	0.54	36.28	20.60	0.07	10.62	0.00	100.03	NA	NA
NAT92-21	1	SPINEL_MAGNETITE-SERIES	0.10	0.00	72.53	0.40	0.24	1.58	2.34	0.07	0.37	0.00	77.64	NA	NA
NAT92-21	3	UNKNOWN	0.00	0.00	24.34	1.95	0.02	24.30	40.38	0.00	0.47	0.00	91.47	NA	NA
NAT92-21	4	UNKNOWN (Salite?)	0.13	0.00	32.95	14.38	0.88	49.28	0.95	0.02	0.65	0.00	99.25	NA	NA
NAT92-22	1	ALMANDINE	0.05	0.10	33.91	2.18	2.96	37.25	20.29	0.02	3.24	0.00	100.00	NA	NA
NAT92-22	3	ALMANDINE	0.03	0.00	32.11	4.89	2.29	38.09	20.45	0.00	1.53	0.00	99.39	NA	NA
NAT92-22	4	ALMANDINE	0.01	0.06	33.56	4.88	1.91	38.23	21.26	0.01	1.10	0.00	101.01	NA	NA
NAT92-22	5	ALMANDINE	0.03	0.12	36.79	2.71	2.02	36.86	20.86	0.00	0.85	0.00	100.25	NA	NA
NAT92-22	6	ALMANDINE	0.01	0.06	34.91	3.83	3.01	37.45	20.85	0.01	0.52	0.00	100.64	NA	NA
NAT92-22	8	ALMANDINE	0.01	0.06	33.27	3.81	4.15	37.42	20.57	0.00	0.28	0.00	99.57	NA	NA
NAT92-22	10	ALMANDINE	0.04	0.00	34.73	4.10	0.55	37.28	20.64	0.01	2.72	0.00	100.08	NA	NA
NAT92-22	11	G_03_CALCIC_PYROPE_ALMANDINE	0.00	0.03	18.36	3.92	0.81	37.65	20.67	0.00	17.75	0.00	99.20	NA	NA
NAT92-22	2	G_05_MAGNESIAN_ALMANDINE	0.10	0.00	29.46	3.46	7.66	37.93	20.85	0.02	0.61	0.00	100.08	NA	NA
NAT92-22	9	G_05_MAGNESIAN_ALMANDINE	0.03	0.00	30.30	3.71	6.83	37.51	20.05	0.02	0.97	0.00	99.42	NA	NA
NAT92-22	12	G_05_MAGNESIAN_ALMANDINE	0.00	0.00	29.55	6.39	1.98	38.50	20.81	0.02	2.79	0.00	100.03	NA	NA
NAT92-22	7	SPESSARTINE	0.00	0.00	24.64	0.13	0.91	36.66	20.31	0.04	16.58	0.00	99.26	NA	NA
NAT92-22	1	QUARTZ	0.08	0.00	0.51	0.07	0.00	101.21	0.18	0.00	0.00	0.00	102.04	NA	NA
NAT92-23	1	ALMANDINE	0.04	0.04	31.65	2.46	7.39	37.33	20.31	0.01	1.01	0.00	100.25	NA	NA
NAT92-23	3	ALMANDINE	0.06	0.00	33.23	5.58	0.92	38.03	20.99	0.00	1.07	0.00	99.88	NA	NA
NAT92-23	5	ALMANDINE	0.05	0.12	31.88	6.59	1.54	38.44	21.22	0.00	1.00	0.00	100.83	NA	NA
NAT92-23	2	G_05_MAGNESIAN_ALMANDINE	0.01	0.00	29.25	5.96	1.27	37.96	21.16	0.00	4.78	0.00	100.39	NA	NA
NAT92-23	4	G_05_MAGNESIAN_ALMANDINE	0.10	0.00	28.31	3.89	8.50	37.21	20.56	0.00	0.58	0.00	99.16	NA	NA
NAT92-23	6	G_06_PYROPE_GROSSULAR_ALMANDINE	0.10	0.00	15.94	0.00	0.52	36.58	20.10	0.00	26.63	0.00	99.86	NA	NA
NAT92-23	7	SPESSARTINE	0.01	0.00	28.38	0.46	1.05	36.61	19.92	0.04	13.36	0.00	99.84	NA	NA
NAT92-23	-	PluckedOutOfMount	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA	NA
NAT92-23	1	AMPHIBOLE	0.65	0.06	15.92	11.27	11.46	44.64	9.27	1.12	0.49	0.55	95.44	NA	NA
NAT92-23	3	AMPHIBOLE	1.30	0.00	18.55	9.77	10.67	42.44	9.80	1.02	0.49	0.71	94.74	NA	NA
NAT92-23	2	CPX_01_UNKNOWN	0.21	0.16	6.51	17.94	12.08	51.37	5.13	0.70	0.26	0.00	94.37	NA	NA
NAT92-23	4	UNKNOWN	0.00	0.00	0.06	0.00	0.15	65.55	19.12	12.01	0.00	0.00	96.89	NA	NA
NAT92-24	1	ALMANDINE	0.00	0.08	31.66	7.99	0.95	37.78	21.31	0.02	0.50	0.00	100.29	NA	NA
NAT92-24	2	ALMANDINE	0.00	0.16	34.87	3.42	3.13	37.24	20.48	0.00	0.46	0.00	99.76	NA	NA
NAT92-24	3	ALMANDINE	0.00	0.09	30.97	7.63	1.04	38.04	21.64	0.00	1.47	0.00	100.88	NA	NA
NAT92-24	4	ALMANDINE	0.00	0.04	37.93	2.70	2.03	36.90	20.85	0.01	0.25	0.00	100.71	NA	NA
NAT92-24	5	ALMANDINE	0.07	0.03	35.10	4.86	0.85	38.11	20.90	0.00	0.75	0.00	100.64	NA	NA
NAT92-24	6	ALMANDINE	0.00	0.00	37.86	2.85	1.42	37.61	20.53	0.02	0.88	0.00	101.17	NA	NA
NAT92-24	7	ALMANDINE	0.04	0.00	35.16	4.36	1.73	37.71	21.17	0.00	0.61	0.00	100.78	NA	NA
NAT92-24	8	ALMANDINE	0.08	0.00	36.16	2.97	1.24	37.39	20.42	0.00	1.97	0.00	100.24	NA	NA
NAT92-24	9	ALMANDINE	0.00	0.00	36.10	4.24	0.33	37.81	21.21	0.00	2.13	0.00	101.82	NA	NA
NAT92-25	1	ALMANDINE	0.00	0.09	35.79	3.41	2.95	37.15	20.72	0.02	0.21	0.00	100.33	NA	NA
NAT92-25	2	ALMANDINE	0.08	0.06	36.65	3.79	0.97	37.48	20.99	0.00	0.70	0.00	100.71	NA	NA
NAT92-25	4	ALMANDINE	0.00	0.14	33.14	0.49	0.48	36.36	20.70	0.04	8.91	0.00	100.27	NA	NA
NAT92-25	5	ALMANDINE	0.02	0.11	31.84	5.51	2.94	37.67	20.85	0.00	0.30	0.00	99.23	NA	NA
NAT92-25	6	ALMANDINE	0.01	0.10	31.29	2.90	6.95	37.76	20.83	0.01	0.86	0.00	100.71	NA	NA
NAT92-25	7	ALMANDINE	0.00	0.08	36.32	4.48	1.00	37.44	21.02	0.00	0.22	0.00	100.55	NA	NA
NAT92-25	8	ALMANDINE	0.00	0.05	35.79	3.30	2.56	37.53	20.24	0.01	0.48	0.00	99.97	NA	NA

			%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
Site	Grain	Mineral (Min-ID.ASC)	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	Total	Ni	Zn
NAT92-25	3	G_05_MAGNESIAN_ALMANDINE	0.05	0.13	28.43	5.19	6.79	38.35	20.66	0.01	0.59	0.00	100.18	NA	NA
NAT92-25	9	G_05_MAGNESIAN_ALMANDINE	0.05	0.04	25.16	9.62	2.61	38.70	21.74	0.00	0.61	0.00	98.53	NA	NA
NAT92-25	1	CPX_02_UNKNOWN	0.02	0.16	5.85	15.53	22.75	53.69	0.80	0.75	0.23	0.00	99.77	NA	NA
NAT92-25	2	ALMANDINE	0.10	0.00	31.21	1.36	8.93	37.18	20.69	0.05	0.90	0.00	100.41	NA	NA
NAT92-25	3	ALMANDINE	0.07	0.00	32.18	7.77	1.04	38.67	21.84	0.01	0.76	0.00	102.35	NA	NA
NAT92-25	4	ALMANDINE	0.02	0.00	31.44	7.34	1.36	38.81	21.90	0.03	0.48	0.00	101.38	NA	NA
NAT92-25	5	G_05_MAGNESIAN_ALMANDINE	0.08	0.01	28.54	9.18	1.17	38.79	22.53	0.00	0.33	0.00	100.62	NA	NA
NAT92-25	1	G_05_MAGNESIAN_ALMANDINE	0.05	0.02	30.18	8.32	1.76	38.57	22.16	0.01	0.41	0.00	101.48	NA	NA
NAT92-26	2	ALMANDINE	0.08	0.10	34.20	3.86	2.82	37.69	20.72	0.01	1.07	0.00	100.55	NA	NA
NAT92-26	3	ALMANDINE	0.06	0.00	38.12	1.16	4.10	37.25	20.41	0.00	0.17	0.00	101.25	NA	NA
NAT92-26	4	ALMANDINE	0.00	0.12	34.41	3.04	1.05	38.16	20.71	0.02	3.07	0.00	100.58	NA	NA
NAT92-26	5	ALMANDINE	0.09	0.12	31.26	2.69	7.34	38.23	20.01	0.00	0.71	0.00	100.43	NA	NA
NAT92-26	6	ALMANDINE	0.02	0.00	34.11	3.51	3.80	37.81	20.66	0.00	0.55	0.00	100.46	NA	NA
NAT92-26	7	ALMANDINE	0.04	0.06	34.90	0.75	7.16	36.68	19.85	0.00	0.53	0.00	99.96	NA	NA
NAT92-26	8	ALMANDINE	0.01	0.00	37.05	3.30	2.00	37.85	20.94	0.00	0.36	0.00	101.51	NA	NA
NAT92-26	9	ALMANDINE	0.00	0.10	34.67	4.90	1.12	37.90	21.23	0.00	0.47	0.00	100.39	NA	NA
NAT92-26	10	ALMANDINE	0.00	0.00	37.31	1.83	0.45	36.84	19.96	0.00	3.09	0.00	99.49	NA	NA
NAT92-26	1	G_05_MAGNESIAN_ALMANDINE	0.03	0.18	30.17	4.15	4.07	37.62	20.74	0.02	3.16	0.00	100.14	NA	NA
NAT92-26	1	STAUROLITE	0.09	0.06	0.81	0.70	0.00	30.59	54.14	0.00	0.00	0.00	86.39	NA	NA
NAT92-26	1	ALMANDINE	0.05	0.03	30.55	5.75	3.41	39.22	21.41	0.01	0.69	0.00	101.11	NA	NA
NAT92-26	2	ALMANDINE	0.03	0.07	35.96	3.60	0.99	38.37	20.67	0.00	1.48	0.00	101.18	NA	NA
NAT92-26	3	ALMANDINE	0.03	0.07	30.91	6.03	1.09	37.31	21.04	0.00	1.82	0.00	98.30	NA	NA
NAT92-27	1	PICRO_CHROMITE	0.66001	48.19	26.2	13.22	0	0.06001	10.27	NA	0.28001	NA	98.99	830	0
NAT92-29	1	ALMANDINE	0.05	0.00	32.03	6.13	1.65	38.04	20.94	0.00	1.05	0.00	99.89	NA	NA
NAT92-29	4	ALMANDINE	0.00	0.04	35.07	4.13	1.56	37.82	20.82	0.00	1.08	0.00	100.52	NA	NA
NAT92-29	5	ALMANDINE	0.00	0.00	31.72	1.39	0.29	36.64	20.64	0.04	9.22	0.00	99.95	NA	NA
NAT92-29	6	ALMANDINE	0.05	0.03	33.03	1.11	5.95	36.92	19.97	0.00	2.88	0.00	99.93	NA	NA
NAT92-29	7	ALMANDINE	0.03	0.07	35.06	3.32	2.82	37.24	20.18	0.00	0.95	0.00	99.66	NA	NA
NAT92-29	8	ALMANDINE	0.01	0.01	33.90	3.55	3.94	37.16	20.31	0.04	0.82	0.00	99.74	NA	NA
NAT92-29	3	SPESSARTINE	0.04	0.01	29.98	0.28	0.53	36.67	20.07	0.08	12.04	0.00	99.70	NA	NA
NAT92-29	2	SPINEL	0.10	0.00	3.49	24.31	0.01	0.01	67.28	0.00	0.16	0.00	95.36	NA	NA
NAT92-29	1	G-5 Magnesian almandine	0.04	0.00	29.52	0.01	30.24	35.42	1.48	0.00	1.02	0.00	97.72	NA	NA
NAT92-30	1	ALMANDINE	0.00	0.09	35.65	4.82	1.33	37.38	20.80	0.01	0.49	0.00	100.57	NA	NA
NAT92-30	6	ALMANDINE	0.00	0.00	35.06	5.02	1.24	37.70	21.10	0.00	0.46	0.00	100.58	NA	NA
NAT92-30	4	GROSSULAR	0.32	0.00	12.12	0.19	32.42	38.80	14.86	0.00	0.61	0.00	99.32	NA	NA
NAT92-30	2	STAUROLITE	0.68	0.01	12.71	1.94	0.01	28.29	51.50	0.00	0.07	0.00	95.19	NA	NA
NAT92-30	3	STAUROLITE	0.49	0.08	14.18	1.79	0.00	27.96	52.20	0.00	0.15	0.00	96.87	NA	NA
NAT92-30	5	STAUROLITE	0.49	0.14	13.26	2.00	0.00	28.89	51.38	0.00	0.05	0.00	96.21	NA	NA
NAT92-30	7	STAUROLITE	0.72	0.00	13.60	1.75	0.00	28.09	51.20	0.00	0.00	0.00	95.35	NA	NA
NAT92-30	8	STAUROLITE	0.74	0.00	12.28	1.96	0.03	28.16	51.77	0.00	0.02	0.00	94.96	NA	NA
NAT92-30	9	STAUROLITE	0.30	0.11	14.87	1.47	0.01	26.25	53.48	0.00	0.07	0.00	96.56	NA	NA
NAT92-30	10	STAUROLITE	0.46	0.03	14.05	1.65	0.02	28.06	52.03	0.01	0.20	0.00	96.49	NA	NA
NAT92-30	11	STAUROLITE	0.46	0.00	13.34	1.91	0.00	27.25	51.32	0.00	0.00	0.00	94.28	NA	NA
NAT92-30	12	STAUROLITE	0.47	0.00	13.23	2.06	0.00	28.51	52.35	0.00	0.04	0.00	96.65	NA	NA
NAT92-30	1	CPX_04_UNKNOWN	0.18	0.00	12.60	12.50	21.55	51.99	1.59	0.36	0.44	0.00	101.20	NA	NA
NAT92-30	1	ALMANDINE	0.00	0.03	31.97	7.56	0.99	39.39	21.39	0.01	0.47	0.00	101.81	NA	NA

Site	Grain	Mineral (Min-ID.ASC)	% TiO2	% Cr2O3	% FeO	% MgO	% CaO	% SiO2	% Al2O3	% Na2O	% MnO	% K2O	% Total	ppm Ni	ppm Zn
NAT92-30	2	ALMANDINE	0.00	0.06	32.08	7.51	0.76	38.93	21.15	0.01	0.26	0.00	100.76	NA	NA
NAT92-30	3	ALMANDINE	0.00	0.07	33.13	5.81	1.01	37.58	20.94	0.03	0.93	0.00	99.49	NA	NA
NAT92-30	4	ALMANDINE	0.04	0.00	34.79	5.05	1.00	38.24	21.18	0.00	0.66	0.00	100.95	NA	NA
NAT92-30	5	ALMANDINE	0.05	0.08	34.89	4.91	1.18	37.75	21.30	0.01	0.97	0.00	101.15	NA	NA
NAT92-31	1	ALMANDINE	0.01	0.00	30.69	0.51	3.24	36.26	20.18	0.06	7.61	0.00	98.56	NA	NA
NAT92-31	2	ALMANDINE	0.00	0.00	31.26	3.53	4.16	37.47	20.61	0.04	2.50	0.00	99.58	NA	NA
NAT92-31	3	ALMANDINE	0.00	0.00	33.02	5.35	2.71	37.30	20.66	0.00	0.48	0.00	99.52	NA	NA
NAT92-31	6	ALMANDINE	0.01	0.02	32.81	4.64	3.16	37.11	20.96	0.01	1.45	0.00	100.17	NA	NA
NAT92-31	7	ALMANDINE	0.00	0.00	32.62	3.41	4.19	37.66	20.72	0.00	1.73	0.00	100.33	NA	NA
NAT92-31	8	ALMANDINE	0.04	0.00	32.48	2.32	5.78	37.43	20.24	0.00	1.54	0.00	99.83	NA	NA
NAT92-31	9	ALMANDINE	0.01	0.00	34.50	4.01	1.66	37.87	20.84	0.04	1.07	0.00	99.99	NA	NA
NAT92-31	4	GROSSULAR	0.30	0.00	7.70	0.14	30.82	38.73	19.78	0.00	0.98	0.00	98.44	NA	NA
NAT92-31	5	SPESSARTINE	0.00	0.07	28.01	1.84	0.92	36.72	20.48	0.00	10.91	0.00	98.94	NA	NA
NAT92-31	1	ALMANDINE	0.05	0.01	35.36	3.43	0.96	37.67	21.42	0.02	2.71	0.00	101.62	NA	NA
NAT92-31	2	G-6 Pyrope-grossular-almandine	0.81	0.02	23.29	0.10	32.30	34.47	4.12	0.04	0.56	0.00	95.70	NA	NA
NAT92-31	3	UNKNOWN	0.09	0.00	49.63	1.77	3.58	0.00	0.00	0.03	5.34	0.00	60.44	NA	NA
NAT92-32	3	ALMANDINE	0.08	0.09	34.58	0.86	2.35	37.26	19.69	0.04	5.72	0.00	100.66	NA	NA
NAT92-32	4	ALMANDINE	0.00	0.00	31.46	1.65	6.05	37.39	20.57	0.03	3.55	0.00	100.70	NA	NA
NAT92-32	6	ALMANDINE	0.00	0.03	33.98	2.94	1.21	37.77	20.62	0.02	3.53	0.00	100.10	NA	NA
NAT92-32	7	ALMANDINE	0.04	0.00	35.63	1.81	3.75	36.80	20.12	0.03	1.90	0.00	100.09	NA	NA
NAT92-32	9	ALMANDINE	0.01	0.00	32.37	3.88	4.16	36.82	21.25	0.00	0.84	0.00	99.33	NA	NA
NAT92-32	8	SPESSARTINE	0.00	0.03	27.06	0.71	0.19	36.40	20.03	0.00	15.03	0.00	99.45	NA	NA
NAT92-32	1	STAUROLITE	0.70	0.15	11.65	1.12	0.00	27.96	52.38	0.00	0.15	0.00	94.11	NA	NA
NAT92-32	5	STAUROLITE	0.63	0.08	14.18	1.65	0.00	27.68	51.66	0.02	0.19	0.00	96.08	NA	NA
NAT92-32	2	UNKNOWN	0.47	0.08	5.91	0.06	34.70	39.04	18.75	0.00	0.17	0.00	99.18	NA	NA
NAT92-32	2	ALMANDINE	0.02	0.00	34.31	4.82	1.15	38.54	20.91	0.00	0.97	0.00	100.73	NA	NA
NAT92-32	3	ALMANDINE	0.00	0.00	31.24	6.84	1.15	38.61	21.61	0.00	1.47	0.00	100.91	NA	NA
NAT92-32	1	G-8 Ferro-magnesian grossular	0.00	0.08	23.06	2.79	1.83	41.84	19.90	0.00	12.99	0.00	102.49	NA	NA
NAT92-33	4	ALMANDINE	0.02	0.00	31.84	7.02	0.79	38.64	21.51	0.00	0.35	0.00	100.19	NA	NA
NAT92-33	6	ALMANDINE	0.02	0.11	32.13	2.61	2.57	37.36	20.75	0.00	4.04	0.00	99.59	NA	NA
NAT92-33	1	SPHENE	35.29	0.00	1.63	0.04	27.50	29.99	1.67	0.00	0.02	0.00	96.14	NA	NA
NAT92-33	2	STAUROLITE	0.67	0.00	13.30	2.12	0.00	28.38	51.12	0.00	0.08	0.00	95.67	NA	NA
NAT92-33	3	STAUROLITE	0.41	0.03	13.68	1.74	0.00	26.68	53.55	0.00	0.16	0.00	96.27	NA	NA
NAT92-33	5	STAUROLITE	0.50	0.04	14.36	1.84	0.00	27.77	52.75	0.01	0.06	0.00	97.32	NA	NA
NAT92-33	7	STAUROLITE	0.57	0.00	13.21	1.70	0.00	28.28	52.40	0.00	0.24	0.00	96.40	NA	NA
NAT92-33	8	STAUROLITE	0.54	0.00	12.28	2.06	0.00	27.88	52.30	0.00	0.37	0.00	95.42	NA	NA
NAT92-33	9	STAUROLITE	0.63	0.08	13.62	1.55	0.00	28.17	51.65	0.00	0.27	0.00	95.97	NA	NA
NAT93-37	1	CPX_02_UNKNOWN	0.09	0.00	6.04	15.05	23.23	52.47	1.89	0.77	0.13	0.00	99.67	NA	NA
NAT93-37	3	G_08_FERRO_MAGNESIAN_GROSSULAR	0.03	0.01	14.04	0.00	22.56	36.63	21.14	0.00	0.24	0.02	94.67	NA	NA
NAT93-37	2	UNKNOWN (Jaedite?)	0.83	0.06	13.86	14.78	11.94	46.90	7.49	1.48	0.15	0.69	98.17	NA	NA
NAT93-37	1	G_05_MAGNESIAN_ALMANDINE	0.21	0.06	23.89	10.91	3.13	38.36	22.70	0.02	0.37	0.00	99.65	NA	NA
NAT93-37	2	G_05_MAGNESIAN_ALMANDINE	0.07	0.03	25.00	8.97	4.36	38.13	22.30	0.03	0.32	0.00	99.21	NA	NA
NAT93-37	3	G_05_MAGNESIAN_ALMANDINE	0.02	0.12	24.37	11.76	1.96	39.29	22.44	0.02	0.28	0.00	100.26	NA	NA
NAT93-37	3	G_05_MAGNESIAN_ALMANDINE	0.14	0.11	24.20	7.83	6.48	38.68	21.60	0.02	0.59	0.00	99.65	NA	NA
NAT93-37	1	STAUROLITE	0.42	0.00	13.44	1.81	0.01	27.01	54.81	0.03	0.28	0.00	97.80	NA	NA
NAT93-37	2	STAUROLITE	0.58	0.01	14.56	1.71	0.01	26.53	53.07	0.00	0.16	0.00	96.63	NA	NA

			%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
Site	Grain	Mineral (Min-ID.ASC)	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	Total	Ni	Zn
NAT93-37	4	UNKNOWN	0.00	0.00	0.36	0.00	0.00	92.68	0.05	0.00	0.03	0.00	93.12	NA	NA
NAT93-38	1	G_03_CALCIC_PYROPE_ALMANDINE	0.10	0.00	22.32	6.29	10.65	39.62	21.29	0.00	0.39	0.00	100.66	NA	NA
NAT93-38	2	G_03_CALCIC_PYROPE_ALMANDINE	0.10	0.00	23.80	1.94	13.13	38.63	20.80	0.01	2.55	0.00	100.96	NA	NA
NAT93-45	1	CPX_04_UNKNOWN	0.06	0.02	7.92	13.49	22.87	52.67	1.36	0.64	0.40	0.01	99.45	NA	NA
NAT93-45	2	CPX_04_UNKNOWN	0.05	0.04	8.10	13.76	22.98	52.39	1.15	0.72	0.39	0.01	99.59	NA	NA
NAT93-45	3	C-4 Low-Cr-diopside	0.10	0.05	12.20	11.46	22.49	50.59	0.72	0.68	1.08	0.00	99.37	NA	NA
NAT93-45	2	ALMANDINE	0.10	0.03	32.80	1.61	7.55	36.84	20.76	0.03	0.97	0.00	100.71	NA	NA
NAT93-45	1	G_05_MAGNESIAN_ALMANDINE	0.08	0.14	25.51	11.53	1.08	38.50	22.21	0.02	0.47	0.00	99.54	NA	NA
NAT93-45	2	G_11_UVAROVITE_PYROPE	0.34	6.47	7.31	19.21	5.65	40.71	18.80	0.07	0.44	0.00	99.01	NA	NA
NAT93-45	1	STAUROLITE	0.65	0.00	13.62	1.84	0.03	28.06	52.82	0.02	0.10	0.00	97.14	NA	NA
NAT93-45	3	STAUROLITE	0.57	0.00	13.45	1.76	0.02	27.10	54.20	0.02	0.05	0.00	97.17	NA	NA
NAT93-45	4	STAUROLITE	0.56	0.00	14.01	2.07	0.01	27.72	54.76	0.01	0.14	0.00	99.27	NA	NA
NAT93-51	1	UNKNOWN	0.29001	34.68	31.65	13.38	0	0.03001	16.65	NA	0.28001	NA	97.24	1971	84
NAT93-51	2	CPX_04_UNKNOWN	0.23	0.60	11.60	14.97	10.84	49.58	6.88	1.04	0.36	0.46	96.56	NA	NA
NAT93-51	3	RUTILE	97.36	0.08	0.48	0.00	0.04	0.00	0.05	0.00	0.04	0.00	98.06	NA	NA
NAT93-51	6	RUTILE	95.37	0.13	0.97	0.00	0.04	0.00	0.05	0.00	0.04	0.00	96.60	NA	NA
NAT93-51	1	STAUROLITE	0.56	0.00	13.36	1.68	0.01	27.83	54.66	0.01	0.14	0.00	98.25	NA	NA
NAT93-51	4	STAUROLITE	0.68	0.01	13.97	1.80	0.00	28.37	54.01	0.03	0.11	0.00	98.97	NA	NA
NAT93-51	5	STAUROLITE	0.61	0.00	13.77	2.08	0.00	28.52	53.97	0.00	0.13	0.00	99.09	NA	NA
NAT93-53	1	G_09_CHROME_PYROPE	0.16	1.78	9.72	18.46	5.07	42.06	21.45	0.02	0.57	0.00	99.28	NA	NA
NAT93-55	1	CPX_05_CHROME_DIOPSIDE	0.05	1.73	2.42	15.60	21.32	54.65	1.35	1.72	0.11	0.00	98.94	NA	NA
NAT93-59	1	CPX_02_DIOPSIDE	0.23	0.83	4.55	17.88	20.82	53.42	2.26	0.53	0.14	0.00	100.66	NA	NA
NAT93-71	1	CPX_01_UNKNOWN	0.12	0.19	9.74	18.95	11.22	50.94	3.25	1.02	0.42	0.38	96.22	NA	NA
NAT93-71	2	CPX_02_UNKNOWN	0.08	0.14	7.27	14.59	22.71	53.18	0.49	1.14	0.35	0.00	99.94	NA	NA
NAT93-71	5	G_08_FERRO_MAGNESIAN_GROSSULAR	0.17	0.02	12.79	0.04	22.76	36.36	22.96	0.02	0.24	0.00	95.35	NA	NA
NAT93-71	4	TOURMALINE	1.00	0.00	10.47	4.21	0.81	34.22	30.78	1.89	0.02	0.04	83.45	NA	NA
NAT93-71	3	C-4 Low-Cr-diopside	0.12	0.01	8.91	13.02	21.90	52.69	0.59	1.51	0.35	0.02	99.12	NA	NA
NAT93-71	1	G_05_MAGNESIAN_ALMANDINE	0.09	0.00	30.38	4.33	6.59	38.32	21.33	0.01	0.48	0.00	101.52	NA	NA
NAT93-71	2	STAUROLITE	0.49	0.00	14.15	1.24	0.00	27.50	55.26	0.01	0.24	0.00	98.90	NA	NA
NAT93-71	3	STAUROLITE	0.64	0.05	13.15	2.14	0.01	27.70	54.24	0.02	0.06	0.00	98.01	NA	NA
NAT93-71	4	STAUROLITE	0.60	0.00	12.54	1.78	0.00	27.72	54.19	0.02	0.06	0.00	96.91	NA	NA
NAT93-73	1	SUB_PICRO_CHROMITE	1.43001	36.87	22.96	13.69	0	0.08001	21.94	NA	0.27001	NA	97.43	1536	0
NAT93-73	2	SUB_PICRO_CHROMITE	0.13001	58.27	22.64	7.09001	0	0.03001	8.09001	NA	0.38001	NA	96.9	441	1779
NAT93-74	3	ALMANDINE	0.09	0.01	32.14	2.36	7.09	37.82	20.61	0.02	1.01	0.00	101.16	NA	NA
NAT93-74	8	ALMANDINE	0.09	0.00	30.97	5.32	4.15	38.05	21.23	0.03	1.01	0.00	100.86	NA	NA
NAT93-74	10	ALMANDINE	0.09	0.01	31.83	2.16	7.15	38.29	20.69	0.02	1.30	0.00	101.52	NA	NA
NAT93-74	13	ALMANDINE	0.14	0.00	33.57	0.72	7.75	36.51	20.18	0.02	1.01	0.00	99.90	NA	NA
NAT93-74	1	G_05_MAGNESIAN_ALMANDINE	0.05	0.00	28.96	6.65	4.04	37.96	21.81	0.03	0.43	0.00	99.93	NA	NA
NAT93-74	2	G_05_MAGNESIAN_ALMANDINE	0.02	0.22	23.31	12.84	1.06	40.26	22.30	0.01	0.33	0.00	100.35	NA	NA
NAT93-74	3	G_05_MAGNESIAN_ALMANDINE	0.09	0.00	28.20	9.28	1.30	38.59	22.14	0.03	0.43	0.00	100.06	NA	NA
NAT93-74	4	G_05_MAGNESIAN_ALMANDINE	0.09	0.04	27.59	7.94	3.74	39.00	21.61	0.04	0.45	0.00	100.50	NA	NA
NAT93-74	5	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	29.28	9.19	1.06	39.26	22.22	0.02	0.54	0.00	101.68	NA	NA
NAT93-74	6	G_05_MAGNESIAN_ALMANDINE	0.10	0.00	24.68	6.07	9.00	36.96	21.23	0.03	0.58	0.00	98.64	NA	NA
NAT93-74	7	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	27.96	4.77	7.22	36.56	21.06	0.00	0.76	0.00	98.43	NA	NA
NAT93-74	9	G_05_MAGNESIAN_ALMANDINE	0.07	0.00	28.23	6.85	4.45	38.36	21.37	0.05	0.86	0.00	100.25	NA	NA
NAT93-74	12	GROSSULAR	0.58	0.02	4.66	0.06	34.82	37.48	20.14	0.03	0.21	0.00	98.00	NA	NA

			%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
Site	Grain	Mineral (Min-ID.ASC)	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	Total	Ni	Zn
NAT93-74	1	STAUROLITE	0.46	0.01	13.40	1.81	0.01	26.54	54.79	0.02	0.07	0.00	97.12	NA	NA
NAT93-74	2	STAUROLITE	0.73	0.04	13.85	1.94	0.02	27.37	53.94	0.03	0.06	0.00	97.97	NA	NA
NAT93-74	4	STAUROLITE	0.59	0.00	13.50	2.10	0.00	26.98	53.49	0.00	0.05	0.00	96.72	NA	NA
NAT93-74	14	STAUROLITE	0.48	0.00	14.22	1.78	0.01	27.94	54.14	0.03	0.11	0.00	98.71	NA	NA
NAT93-74	15	STAUROLITE	0.74	0.00	12.73	1.43	0.03	28.44	54.26	0.00	0.32	0.00	97.93	NA	NA
NAT93-74	16	STAUROLITE	0.58	0.08	14.21	1.46	0.00	28.07	54.21	0.00	0.17	0.00	98.79	NA	NA
NAT93-74	11	UNKNOWN	0.47	0.26	0.25	0.01	1.32	0.93	0.04	0.07	0.27	0.00	3.63	NA	NA
NAT93-74	1	G_03_CALCIC_PYROPE_ALMANDINE	0.11	0.06	20.25	8.72	9.06	40.30	21.58	0.00	0.46	0.00	100.54	NA	NA
NAT93-75	1	G_09_CHROME_PYROPE	0.12	5.17	8.47	18.76	5.48	41.93	18.86	0.03	0.48	0.00	99.29	NA	NA
NAT93-76	1	CPX_01_UNKNOWN	0.23	0.03	12.21	16.82	11.68	51.11	3.84	0.52	0.32	0.12	96.87	NA	NA
NAT93-76	2	CPX_04_UNKNOWN	0.34	0.10	6.36	14.98	24.05	51.08	1.96	0.38	0.09	0.00	99.34	NA	NA
NAT93-76	3	CPX_04_UNKNOWN	0.29	1.01	12.01	15.79	11.81	49.37	5.83	0.96	0.31	0.57	97.96	NA	NA
NAT93-76	1	G_05_MAGNESIAN_ALMANDINE	0.04	0.08	27.29	8.09	3.66	38.95	22.06	0.02	0.83	0.00	101.02	NA	NA
NAT93-76	2	G_05_MAGNESIAN_ALMANDINE	0.06	0.01	24.53	11.23	2.72	39.48	22.05	0.00	0.27	0.00	100.35	NA	NA
NAT93-76	3	G_05_MAGNESIAN_ALMANDINE	0.05	0.00	25.11	10.70	2.87	39.43	21.83	0.02	0.29	0.00	100.31	NA	NA
NAT93-76	4	RUTILE	96.88	0.05	0.51	0.00	0.04	0.00	0.01	0.03	0.11	0.00	97.63	NA	NA
NAT93-76	1	STAUROLITE	0.61	0.00	14.05	1.69	0.01	28.14	54.60	0.02	0.19	0.00	99.31	NA	NA
NAT93-76	2	STAUROLITE	0.49	0.00	14.58	1.60	0.02	27.62	54.80	0.02	0.06	0.00	99.20	NA	NA
NAT93-76	3	STAUROLITE	0.65	0.06	14.10	1.78	0.00	28.78	53.41	0.01	0.10	0.00	98.89	NA	NA
NAT93-76	4	STAUROLITE	0.59	0.02	13.38	1.76	0.02	28.40	52.13	0.04	0.12	0.00	96.45	NA	NA
NAT93-76	5	STAUROLITE	0.66	0.00	13.27	1.41	0.01	28.10	52.44	0.04	0.15	0.00	96.08	NA	NA
NAT93-76	6	STAUROLITE	0.51	0.00	12.69	1.64	0.01	28.07	55.16	0.01	0.18	0.00	98.25	NA	NA
NAT93-76	7	STAUROLITE	0.65	0.00	13.70	1.48	0.00	28.29	53.79	0.02	0.18	0.00	98.12	NA	NA
NAT93-76	8	STAUROLITE	0.55	0.00	10.44	1.67	0.00	28.34	53.35	0.17	0.27	0.00	94.79	NA	NA
NAT93-78	7	ALMANDINE	0.06	0.16	31.01	3.63	6.35	38.25	20.65	0.01	0.73	0.00	100.86	NA	NA
NAT93-78	9	G_03_CALCIC_PYROPE_ALMANDINE	0.09	0.07	22.93	6.50	9.16	38.91	21.50	0.01	0.64	0.00	99.81	NA	NA
NAT93-78	3	G_05_MAGNESIAN_ALMANDINE	0.02	0.09	24.42	12.29	1.33	39.37	22.32	0.00	0.28	0.00	100.12	NA	NA
NAT93-78	8	G_05_MAGNESIAN_ALMANDINE	0.14	0.00	25.60	6.84	7.00	38.86	21.47	0.02	0.97	0.00	100.89	NA	NA
NAT93-78	4	GAHNITE SPINEL	0.10	0.00	10.03	3.26	0.05	0.00	53.81	1.15	0.11	0.00	68.51	NA	NA
NAT93-78	1	SPHENE	33.04	0.03	2.53	0.02	25.90	28.46	1.62	0.06	0.13	0.00	91.79	NA	NA
NAT93-78	5	SPHENE	36.29	0.00	2.42	0.00	25.56	30.17	0.25	0.52	0.21	0.00	95.42	NA	NA
NAT93-78	2	STAUROLITE	0.51	0.00	13.99	1.66	0.01	27.59	55.36	0.02	0.36	0.00	99.49	NA	NA
NAT93-78	6	STAUROLITE	0.66	0.02	13.80	1.84	0.00	28.93	54.30	0.04	0.09	0.00	99.67	NA	NA
NAT93-78	1	G_03_CALCIC_PYROPE_ALMANDINE	0.07	0.00	22.13	9.25	6.12	40.03	21.35	0.00	0.44	0.00	99.39	NA	NA
NAT93-80	2	G_03_CALCIC_PYROPE_ALMANDINE	0.12	0.00	22.28	3.26	13.46	38.74	21.12	0.01	0.74	0.00	99.72	NA	NA
NAT93-80	1	SPINEL	0.02	0.04	4.90	24.15	0.02	0.00	67.17	0.02	0.11	0.00	96.44	NA	NA
NAT93-82	1	CPX_02_UNKNOWN	0.05	0.65	4.11	15.87	22.90	53.58	1.55	0.59	0.10	0.00	99.39	NA	NA
NAT93-82	2	CPX_02_UNKNOWN	0.01	0.17	4.53	15.83	23.00	53.91	0.76	0.84	0.28	0.00	99.34	NA	NA
NAT93-82	3	CPX_02_UNKNOWN	0.10	0.58	3.93	16.48	22.66	53.75	1.65	0.60	0.13	0.00	99.88	NA	NA
NAT93-83	1	CPX_04_UNKNOWN	0.11	0.77	8.17	15.71	18.01	52.39	2.65	0.77	0.04	0.00	98.63	NA	NA
NAT93-83	1	G_03_CALCIC_PYROPE_ALMANDINE	0.13	0.22	20.32	12.50	4.43	39.71	21.62	0.05	0.70	0.00	99.69	NA	NA
NAT93-85	1	CPX_02_UNKNOWN	0.04	0.02	5.12	15.92	23.29	53.48	1.17	0.46	0.27	0.00	99.77	NA	NA
NAT93-85	1	G_03_CALCIC_PYROPE_ALMANDINE	0.04	0.00	15.51	12.83	0.42	40.39	21.43	0.00	8.96	0.00	99.58	NA	NA
NAT93-85	4	G_03_CALCIC_PYROPE_ALMANDINE	0.19	0.00	21.91	5.51	12.01	38.48	21.00	0.01	0.69	0.00	99.80	NA	NA
NAT93-85	2	G_05_MAGNESIAN_ALMANDINE	0.06	0.00	25.30	8.35	5.70	39.78	21.19	0.01	0.49	0.00	100.88	NA	NA
NAT93-85	3	G_05_MAGNESIAN_ALMANDINE	0.00	0.11	29.75	7.98	1.19	39.16	21.08	0.00	0.70	0.00	99.98	NA	NA

			%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
Site	Grain	Mineral (Min-ID.ASC)	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	Total	Ni	Zn
NAT93-87	1	CPX_02_UNKNOWN	0.04	0.47	6.84	16.00	21.49	53.53	1.36	0.52	0.27	0.00	100.52	NA	NA
NAT93-87	1	ALMANDINE	0.02	0.00	36.90	3.48	1.79	38.25	20.47	0.00	0.71	0.00	101.62	NA	NA
NAT93-87	9	G_05_MAGNESIAN_ALMANDINE	0.13	0.00	29.00	7.72	2.81	39.66	21.19	0.00	0.51	0.00	101.01	NA	NA
NAT93-87	2	G_05_MAGNESIAN_ALMANDINE	0.09	0.00	28.10	5.66	6.15	37.89	21.19	0.01	0.67	0.00	99.76	NA	NA
NAT93-87	3	G_05_MAGNESIAN_ALMANDINE	0.08	0.00	25.88	11.39	1.04	40.52	21.86	0.03	0.46	0.00	101.26	NA	NA
NAT93-87	4	G_05_MAGNESIAN_ALMANDINE	0.04	0.00	25.56	11.02	1.44	40.17	21.66	0.00	0.86	0.00	100.75	NA	NA
NAT93-87	5	G_05_MAGNESIAN_ALMANDINE	0.01	0.04	25.11	11.45	1.30	39.99	21.70	0.00	0.48	0.00	100.09	NA	NA
NAT93-87	6	G_05_MAGNESIAN_ALMANDINE	0.07	0.00	24.88	11.96	1.32	40.15	21.55	0.01	0.52	0.00	100.47	NA	NA
NAT93-87	7	G_05_MAGNESIAN_ALMANDINE	0.01	0.00	24.11	12.10	1.15	40.07	21.79	0.00	0.87	0.00	100.10	NA	NA
NAT93-87	8	G_05_MAGNESIAN_ALMANDINE	0.06	0.00	23.49	6.73	8.37	39.52	21.17	0.03	0.67	0.00	100.03	NA	NA
NAT93-87	10	G_05_MAGNESIAN_ALMANDINE	0.08	0.00	26.75	9.69	1.90	39.83	21.39	0.02	1.06	0.00	100.72	NA	NA
NAT93-87	11	G_05_MAGNESIAN_ALMANDINE	0.16	0.00	25.49	11.15	1.38	39.58	21.74	0.06	0.94	0.00	100.50	NA	NA
NAT93-87	12	G_05_MAGNESIAN_ALMANDINE	0.07	0.00	25.10	11.63	0.68	40.73	21.51	0.01	1.42	0.00	101.14	NA	NA
NAT93-89	2	CPX_04_UNKNOWN	0.09	0.03	8.93	13.63	22.56	53.19	0.43	0.98	0.34	0.00	100.17	NA	NA
NAT93-89	3	CPX_04_UNKNOWN	0.08	0.04	8.36	13.07	22.86	52.03	1.52	1.02	0.33	0.00	99.29	NA	NA
NAT93-89	1	C-4 Low-Cr-diopside	0.16	0.01	11.30	11.36	23.05	50.28	1.78	0.41	0.63	0.02	98.99	NA	NA
NAT93-89	2	ALMANDINE	0.05	0.01	33.78	6.06	1.01	37.65	21.46	0.01	0.48	0.00	100.49	NA	NA
NAT93-89	4	ALMANDINE	0.05	0.00	36.15	1.74	1.30	36.25	21.03	0.03	3.90	0.00	100.44	NA	NA
NAT93-89	1	ALMANDINE	0.03	0.00	30.81	1.78	7.87	37.34	20.40	0.01	1.90	0.00	100.14	NA	NA
NAT93-89	3	ALMANDINE	0.08	0.05	36.05	1.23	5.67	37.34	20.68	0.03	0.43	0.00	101.57	NA	NA
NAT93-89	4	ALMANDINE	0.10	0.01	33.19	2.03	6.96	37.82	20.77	0.00	0.84	0.00	101.72	NA	NA
NAT93-89	5	ALMANDINE	0.05	0.04	32.37	1.82	7.00	36.51	20.29	0.01	2.23	0.00	100.32	NA	NA
NAT93-89	7	ALMANDINE	0.15	0.00	33.00	2.48	6.68	37.55	20.48	0.00	0.94	0.00	101.26	NA	NA
NAT93-89	8	ALMANDINE	0.12	0.01	31.84	2.73	6.99	37.58	21.05	0.02	0.64	0.00	100.98	NA	NA
NAT93-89	1	G_03_CALCIC_PYROPE_ALMANDINE	0.10	0.00	22.51	2.33	12.99	38.40	21.20	0.04	2.68	0.00	100.26	NA	NA
NAT93-89	2	G_05_MAGNESIAN_ALMANDINE	0.12	0.00	27.13	5.48	7.22	37.60	21.44	0.01	0.72	0.00	99.72	NA	NA
NAT93-89	3	G_05_MAGNESIAN_ALMANDINE	0.11	0.00	23.90	6.50	8.65	39.01	21.88	0.03	0.72	0.00	100.80	NA	NA
NAT93-89	4	G_05_MAGNESIAN_ALMANDINE	0.07	0.02	27.73	5.75	6.27	38.38	21.43	0.00	0.55	0.00	100.19	NA	NA
NAT93-89	1	G_05_MAGNESIAN_ALMANDINE	0.08	0.05	28.60	7.28	3.73	38.61	21.48	0.03	0.45	0.00	100.30	NA	NA
NAT93-89	3	G_05_MAGNESIAN_ALMANDINE	0.06	0.00	28.09	9.60	1.30	38.37	21.85	0.04	0.52	0.00	99.81	NA	NA
NAT93-89	6	RUTILE	97.78	0.11	0.54	0.00	0.04	0.00	0.02	0.02	0.05	0.00	98.56	NA	NA
NAT93-89	2	STAUROLITE	0.96	0.00	11.41	2.60	0.01	26.41	56.93	0.05	0.08	0.00	98.45	NA	NA
PR93-3	1	G_09_CHROME_PYROPE	0.17	4.12	7.89	19.30	5.36	42.26	19.60	0.00	0.42	0.00	99.13	NA	NA
PR93-3	1	G_03_CALCIC_PYROPE_ALMANDINE	0.20	0.00	19.17	7.92	10.35	39.88	21.30	0.07	0.57	0.00	99.46	NA	NA
PR93-6B	1	G_09_CHROME_PYROPE	0.22	3.34	8.24	19.36	4.98	42.58	20.08	0.03	0.63	0.00	99.46	NA	NA
PR93-6B	2	G_09_CHROME_PYROPE	0.26	4.00	8.61	19.17	4.89	42.75	19.73	0.00	0.42	0.00	99.82	NA	NA
PR93-6B	3	G_09_CHROME_PYROPE	0.19	4.22	8.29	19.01	5.04	42.23	19.97	0.02	0.30	0.00	99.28	NA	NA
PR93-6B	4	G_09_CHROME_PYROPE	0.31	3.55	8.47	19.40	4.93	41.98	19.83	0.04	0.50	0.00	99.02	NA	NA
PR93-6A	1	G_03_CALCIC_PYROPE_ALMANDINE	0.19	0.00	21.83	9.84	6.01	40.05	21.25	0.05	0.54	0.00	99.76	NA	NA
PR93-6B	1	G_05_MAGNESIAN_ALMANDINE	0.16	0.00	24.97	6.56	7.69	39.29	20.95	0.00	0.63	0.00	100.25	NA	NA
PR93-6B	2	G_05_MAGNESIAN_ALMANDINE	0.02	0.03	28.91	4.80	6.51	38.45	20.52	0.00	0.81	0.00	100.04	NA	NA
PR93-10	1	CPX_02_DIOPSIDE	0.11	0.64	5.35	15.04	21.48	53.94	1.39	1.26	0.19	0.00	99.39	NA	NA

Table 6.2. Results, from surface samples, of chemical analyses of till matrix (<0.063 mm) using AA and INAA analyses.

(1) NAT = sample from N. Alta Till Proj; SB = sample from Winagami Proj; LEL = samp from Peace R. Proj
AA = atomic absorption following total digestion; INAA = neutron activation.

Samp # (1)	Lon°	Lat°	Lith	From	To(m)	Ag	Ag	As	Au	Ba	Br	Cd	Cd	Ce	Co	Co	Cr	Cs	Cu	Eu	Fe	Fe	Hf	Ir	La	Lu
					Concentration >>>>>	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppb	ppm	ppm
					Method (1) >>>>>	AA	INAA	INAA	INAA	INAA	INAA	AA	INAA	INAA	AA	INAA	INAA	INAA	AA	INAA	AA	INAA	INAA	INAA	INAA	INAA
					Detection Limit >>>>>	0.2 ppm	2 ppm	0.5 ppm	2 ppb	50 ppm	0.5 ppm	0.2 ppm	5 ppm	5 ppm	2 ppm	5 ppm	20 ppm	0.5 ppm	2 ppm	1 ppm	0.02%	0.2%	1 ppm	50 ppb	2 ppm	0.2 ppm
NAT92-1	115.045494	55.655777	till	2.0	2.3	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	8	nd	nd	nd	28	nd	2.50	nd	nd	nd	nd	nd
NAT92-2	115.311295	56.241127	till	3.0	3.3	0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	12	nd	nd	nd	27	nd	3.00	nd	nd	nd	nd	nd
NAT92-3	115.104530	57.128601	till	2.5	3.0	0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	8	nd	nd	nd	24	nd	2.60	nd	nd	nd	nd	nd
NAT92-4	115.392570	57.388626	till	3.3	3.5	0.2	nd	nd	nd	nd	nd	0.3	nd	nd	11	nd	nd	nd	30	nd	3.30	nd	nd	nd	nd	nd
NAT92-5	115.552650	57.855755	till	3.0	3.3	0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	5	nd	nd	nd	33	nd	2.90	nd	nd	nd	nd	nd
NAT92-6	116.482430	58.542141	till	1.0	1.3	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	9	nd	nd	nd	31	nd	2.80	nd	nd	nd	nd	nd
NAT92-7	114.554718	58.589458	till	2.8	3.0	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	7	nd	nd	nd	18	nd	2.70	nd	nd	nd	nd	nd
NAT92-8	115.496025	58.556770	till	2.0	2.2	0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	8	nd	nd	nd	27	nd	2.80	nd	nd	nd	nd	nd
NAT92-9	116.740000	60.100000	till	2.0	2.2	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	10	nd	nd	nd	26	nd	3.10	nd	nd	nd	nd	nd
NAT92-10	117.482651	58.907486	till	3.5	3.8	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	8	nd	nd	nd	40	nd	2.90	nd	nd	nd	nd	nd
NAT92-11	119.435425	58.494476	till	2.0	2.5	0.3	nd	nd	nd	nd	nd	0.5	nd	nd	12	nd	nd	nd	35	nd	3.30	nd	nd	nd	nd	nd
NAT92-12	117.922272	58.573204	till	1.3	1.5	0.3	nd	nd	nd	nd	nd	0.2	nd	nd	11	nd	nd	nd	33	nd	3.30	nd	nd	nd	nd	nd
NAT92-13	117.470474	57.573986	till	1.5	1.7	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	11	nd	nd	nd	34	nd	3.20	nd	nd	nd	nd	nd
NAT92-14	117.542633	57.226784	till	2.5	2.8	0.3	nd	nd	nd	nd	nd	0.3	nd	nd	10	nd	nd	nd	37	nd	3.40	nd	nd	nd	nd	nd
NAT92-15	117.626968	56.930439	till	3.0	3.4	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	10	nd	nd	nd	33	nd	2.70	nd	nd	nd	nd	nd
NAT92-16	117.797569	56.479240	till	1.0	1.3	0.2	nd	nd	nd	nd	nd	0.4	nd	nd	11	nd	nd	nd	35	nd	2.90	nd	nd	nd	nd	nd
NAT92-17	117.902939	56.179340	till	2.0	2.2	<0.2	nd	nd	nd	nd	nd	0.3	nd	nd	9	nd	nd	nd	33	nd	3.20	nd	nd	nd	nd	nd
NAT92-18	119.869659	56.300076	till	1.5	1.7	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	13	nd	nd	nd	34	nd	2.90	nd	nd	nd	nd	nd
NAT92-19	117.902969	56.179340	till	2.0	2.2	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	9	nd	nd	nd	35	nd	3.10	nd	nd	nd	nd	nd
NAT92-20	116.914932	56.379333	till	1.2	1.5	0.2	nd	nd	nd	nd	nd	0.3	nd	nd	8	nd	nd	nd	34	nd	3.10	nd	nd	nd	nd	nd
NAT92-21	118.050995	55.685005	till	2.5	2.8	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	9	nd	nd	nd	31	nd	3.20	nd	nd	nd	nd	nd
NAT92-22	119.880760	55.257896	till	1.5	1.7	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	14	nd	nd	nd	36	nd	3.30	nd	nd	nd	nd	nd
NAT92-23	117.177483	55.179489	till	1.5	1.7	<0.2	nd	nd	nd	nd	nd	0.3	nd	nd	11	nd	nd	nd	33	nd	3.30	nd	nd	nd	nd	nd
NAT92-24	111.057915	57.249889	till	2.0	2.2	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	10	nd	nd	nd	28	nd	3.10	nd	nd	nd	nd	nd
NAT92-25	111.403374	57.249889	till	1.8	2.0	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	5	nd	nd	nd	10	nd	1.50	nd	nd	nd	nd	nd
NAT92-26	110.861938	55.799088	till	3.0	3.2	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	7	nd	nd	nd	18	nd	2.40	nd	nd	nd	nd	nd
NAT92-27	110.903915	56.246296	till	2.0	2.2	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	10	nd	nd	nd	22	nd	3.10	nd	nd	nd	nd	nd
NAT92-28	111.877754	56.077339	till	1.5	1.8	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	6	nd	nd	nd	27	nd	2.90	nd	nd	nd	nd	nd
NAT92-29	112.187798	55.797279	till	3.0	3.5	<0.2	nd	nd	nd	nd	nd	0.3	nd	nd	8	nd	nd	nd	26	nd	3.20	nd	nd	nd	nd	nd
NAT92-30	111.666733	55.009575	till	1.5	1.8	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	10	nd	nd	nd	25	nd	3.10	nd	nd	nd	nd	nd
NAT92-31A	111.647591	55.038666	till	4.0	5.0	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	12	nd	nd	nd	28	nd	3.30	nd	nd	nd	nd	nd
NAT92-31B	111.647591	55.038666	till	4.0	5.0	0.2	nd	nd	nd	nd	nd	0.2	nd	nd	11	nd	nd	nd	28	nd	3.40	nd	nd	nd	nd	nd
NAT92-31C	111.647591	55.038696	till	4.0	5.0	<0.2	nd	nd	nd	nd	nd	<0.2	nd	nd	11	nd	nd	nd	29	nd	3.20	nd	nd	nd	nd	nd
NAT92-31D	111.647591	55.038696	till	4.0	5.0	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	10	nd	nd	nd	30	nd	3.30	nd	nd	nd	nd	nd
NAT92-32	110.329117	54.422314	till	2.0	2.5	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	10	nd	nd	nd	26	nd	3.20	nd	nd	nd	nd	nd
NAT92-33	110.329137	54.422344	till	3.5	4.0	<0.2	nd	nd	nd	nd	nd	0.2	nd	nd	9	nd	nd	nd	24	nd	2.70	nd	nd	nd	nd	nd
NAT93-35	118.502798	55.259612	till	1.5	1.8	0.3	<2	12.0	4	980	2.2	0.3	<5	60	9	15	95	5.2	36	1	2.30	2.8	5	<50	34	<0.2
NAT93-36	118.791573	55.434174	till	2.5	2.8	0.2	<2	14.0	5	890	2.2	0.3	<5	62	12	16	79	5.7	31	<1	2.90	3.6	5	<50	37	<0.2
NAT93-37	118.380879	55.455982	till	3.5	3.8	0.2	<2	18.0	10	1100	1.6	<0.2	<5	58	14	28	110	5	40	1	3.30	4.3	4	<50	35	0.2
NAT93-38	119.256644	55.895966	till	1.5	1.8	0.9	<2	16.0	<2	910	2.4	<0.2	<5	63	9	12	100	6.6	34	1	3.20	3.4	4	<50	38	0.2
NAT93-39	114.797688	55.444968	till	1.0	1.3	<0.2	<2	11.0	3	850	0.9	<0.2	<5	59	8	13	96	4.3	35	1	2.90	3.5	5	<50	35	0.3
NAT93-40	115.202941	55.943092	till	1.0	1.3	0.3	<2	16.0	7	870	2.6	<0.2	<5	110	9	14	100	4.6	33	3	3.10	3.7	11	<50	58	0.5
NAT93-41	115.391913	56.033980	till	1.8	2.0	0.6	<2	12.0	6	820	3.7	<0.2	<5	67	12	16	69	4.2	29	1	3.80	2.8	7	<50	34	<0.2
NAT93-42	116.012510	55.714038	till	2.0	2.3	<0.2	<2	13.0	<2	780	2.4	0.2	<5	66	10	12	75	5.1	29	1	3.00	2.9	6	<50	37	<0.2
NAT93-43	116.477531	55.626762	till	1.8	2.0	0.3	<2	14.0	3	750	2.8	0.2	<5	63	12	16	76	4.8	25	1	3.00	2.9	6	<50	33	<0.2
NAT93-44	116.981889	55.852193	till	1.0	1.3	0.3	<2	15.0	2	1100	4.7	0.2	<5	65	7	7	96	5.6	32	1	3.70	3.0	6	<50	39	0.2
NAT93-45	116.825499	55.986723	till	1.5	1.8	0.6	<2	16.0	4	900	2.4	<0.2	<5	69	6	11	92	6.1	33	1	3.20	3.2	6	<50	39	<0.2
NAT93-46	116.812466	56.121254	till	1.2	1.5	<0.2	<2	14.0	8	920	5.1	0.2	<5	59	8	10	70	4.8	29	1	3.10	3.0	6	<50	35	<0.2
NAT93-47	119.485239	56.074121	till	1.2	1.5	0.3	<2	15.0	3	990	2.7	0.2	<5	66	8	10	72	5.5	35	1	3.30	3.1	4	<50	37	<0.2
NAT93-48	119.700771	55.819606	till	1.0	1.3	1.4	<2	15.0	6	1100	2.7	0.2	<5	85	7	11	98	6.8	37	1	2.80	3.4	5	<50	52	0.3
NAT93-49	118.863613	57.404592	till	1.2	1.5	0.2	<2	13.0	4	1200	0.8	0.2	<5	69	7	12	120	6	34	1	2.50	3.0	7	<50	39	0.3
NAT93-50	118.422845	57.284647	till	2.5	2.8	0.5	<2	21.0	3	1100	2.0	<0.2	<5	69	8	12	98	5.9	31	<1	3.30	3.4	8	<50	38	<0.2
NAT93-51	114.541601	55.237706	till	3.1	3.2	0.3	<2	16.0	5	930	1.6	<0.2	<5	60	9	14	91	5.5	30	<1	2.80	3.4	7	<50	34	<0.2
NAT93-52	115.220233	55.339513	till	3.0	3.2	0.2	<2	12.0	13	950	1.1	<0.2	<5	60	10	15	92	4.8	30	1	2.80	3.0	6	<50	35	<0.2
NAT93-53	116.865597	55.332242	till	2.5	3.0	0.2	<2	15.0	14	950	2.3	<0.2	<5	64	8	11	93	5.3	29	1	2.90	3.2	5	<50	37	<0.2
NAT93-54	116.802771	55.110438	till	0.8	1.0	0.2	<2	16.0	3	970	2.1	0.2	<5	69	10	14	99	5.5	30	1	3.00	3.3	5	<50	38	<0.2
NAT93-55	118.740789	56.361331	till	3.0	3.2	0.4	<2	16.0	25	1000	2.0	<0.2	<5	74	9	15	100	6.6	37	1	2.50	3.3	6	<50	39	<0.2
NAT93-56	118.997814	56.426774	till	1.7	1.9	0.2	<2	15.0	5	850	2.8	<0.2	<5	68	10	16	97	5.6	34	1	3.10	3.5	5	<50	40	<0.2
NAT93-57	119.006968	56.583099	till	1.0	1.3	0.2	<2	15.0	7	960	2.8	<0.2	<5	65	10	14	100	5.6	29	1	3.20	3.3	7	<50	37	<0.2
NAT93-58	119.026920	56.670345	till	0.5	0.8	0.4	<2	18.0	20	640	1.3	<0.2	<5	290	6	8	95	4.1	30	1	3.70	5.6	12	<50	110	<0.2
NAT93-59	119.046873	56.608542	till	2.5	2.7	<0.2	<2	27.0	6	980	1.3	<0.2	<5	80	18	28	130	6.6	34	2	3.00	3.9	7	<50	45	0.6
NAT93-60	116.403975	56.506631	till	3.0	3.3	0.4	<2	17.0	18	1000	2.4	<0.2	<5	63	10	15	85	6	32	<1	3.60	3.6	6	<50	38	0.2
NAT93-61	116.101513	56.452093	till	2.0	2.2	0.2	<2	16.0	6	770	2.4	<0.2	<5	68	12	17	81	5	28	1	3.20	3.5	7	<50	39	0.3
NAT93-62	115.772750	56.459370	till	3.0	3.2	<0.2	<2	14.0	2	820	2.5	0.2	<5	64	7	10	82	4.5	25	1	2.80	3.0	7	<50	36	<0.2
NAT93-63	115.555767	56.470267	till	1.5	1.7	0.7	<2	14.0	14	770	2.5	<0.2	<5	58	11	15	74	4.7	29	1	3.30	2.9	6	<50	33	<0.2
NAT93-64	115.118842	56.655675	till	2.0	2.2	0.3	<2	14.0	13	770	1.7	0.3	<5	64	8	10	72	3.9	24	1	3.20	3.0	10	<50	33	0.2
NAT93-65	114.826878	56.742928	till	2.0	2.2	<0.2	<2	16.0	8	770	1.7	0.2	<5	71	9	16	91	5	25	1	2.90	3.5	9	<50	39	<0.2
NAT93-66	117.105189	57.975252	till	3.0	3.2	2.0	<2	15.0	6	820	1.5	0.2	<5	60	7	7	71	3.9	31	<1	3.50	2.9	6	<50	35	<0.2
NAT93-67	114.512365	58.585885	till	15.0	15.5	0.3	<2	7.1	<2	580	1.6	<0.2	<5	57	8	10	64	4.3	24	<1	3.10	2.2	6	<50	31	<0.2
NAT93-68	113.973608	55.538768	till			0.2	<2	13.0	4	660	0.7	<0.2	<5	67	8	13	79	4.6	28	1	3.50	3.4	9	<50	41	0.3
NAT93-69	118.646443	57.306452	till			0.3	<2	14.0	3	1300	<0.5	<0.2	<5	65	10	22	79	4.5	38	1	3.70	3.9	6	<50	37	0.3
NAT93-70	115.349313	54.764969	till			0.8	<2	22.0	<2	1200	1.5	0.2	<5	63	10	17	100	6.5	34	1	3.30	3.8	5	<50	35	<0.2
NAT93-71	118.022858	57.171979	till	1.8	2.0	<0.2	<2	16.0	6	1000	2.0	0.2	<5	79	12	19	130	7.1	42	1	3.20	3.8	6	<50	43	0.3
NAT93-72	117.727772	57.121012	till	1.2	1.5	0.5	<2	16.0	5	1300	2.9	0.5	<5	66	11	16	100	6.2	35	1	4.80	3.3	5	<50	36	<0.2
NAT93-73	118.215513	56.633992	till	1.5	1.8	0.3	<2	17.0	3	1000	3.3	<0.2	<5	64	11	16	99	5.8	34	1	3.50	3.4	6	<50	35	<0.2
NAT93-74	116.147238	56.862901	till	1.5	1.8	0.2	<2	14.0	4	840	3.4	<0.2	<5	62	10	14	83	5	32	<1	3.70	3.3	6	<50	35	0.3
NAT93-75	116.260155	56.659316	till	2.0	2.3	0.2	<2	14.0	3	740	2.0	0.3	<5	56	11	15	70	4.8	26	1	3.20	3.1	6	<50	35	0.2
NAT93-76	115.244917	56.826557	till	0.3	0.5	<0.2	<2	12.0	6	740	2.2	<0.2	<5	54	7	6	65	4.3	17	<1	2.60	2.6	8	<50	33	0.3

Samp # (1)	Mn	Mo	Mo	Na	Ni	Ni	Pb	Rb	Sb	Sc	Se	Sm	Sn	Ta	Tb	Te	Th	U	V	W	Yb	Zn	Zn	Zr	Weight
Concentration >>>>>	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	grams
Method (1) >>>>>	AA	AA	INAA	INAA	AA	INAA	AA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	AA	INAA	INAA	AA	INAA	INAA	INAA
Detection Limit >>>>>	5 ppm	2 ppm	1 ppm	0.02%	2 ppm	10 ppm	2 ppm	5 ppm	0.1 ppm	0.2 ppm	5 ppm	0.1 ppm	100 ppm	0.5 ppm	0.5 ppm	10 ppm	0.2 ppm	0.2 ppm	5 ppm	1 ppm	1 ppm	2 ppm	100 ppm	200 ppm	
NAT92-1	137	4	nd	nd	25	nd	15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	137	nd	nd	69	nd	nd	nd
NAT92-2	324	4	nd	nd	27	nd	16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	130	nd	nd	85	nd	nd	nd
NAT92-3	160	3	nd	nd	21	nd	15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	111	nd	nd	81	nd	nd	nd
NAT92-4	250	5	nd	nd	29	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	126	nd	nd	93	nd	nd	nd
NAT92-5	94	4	nd	nd	28	nd	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	158	nd	nd	94	nd	nd	nd
NAT92-6	260	4	nd	nd	30	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	148	nd	nd	87	nd	nd	nd
NAT92-7	274	3	nd	nd	22	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	82	nd	nd	53	nd	nd	nd
NAT92-8	275	6	nd	nd	26	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	110	nd	nd	70	nd	nd	nd
NAT92-9	390	4	nd	nd	29	nd	14	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	108	nd	nd	77	nd	nd	nd
NAT92-10	197	7	nd	nd	31	nd	19	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	180	nd	nd	128	nd	nd	nd
NAT92-11	316	5	nd	nd	45	nd	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	167	nd	nd	144	nd	nd	nd
NAT92-12	340	4	nd	nd	35	nd	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	164	nd	nd	116	nd	nd	nd
NAT92-13	270	5	nd	nd	34	nd	21	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	156	nd	nd	123	nd	nd	nd
NAT92-14	296	6	nd	nd	37	nd	19	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	159	nd	nd	138	nd	nd	nd
NAT92-15	225	4	nd	nd	30	nd	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	148	nd	nd	114	nd	nd	nd
NAT92-16	324	5	nd	nd	36	nd	18	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	157	nd	nd	128	nd	nd	nd
NAT92-17	210	4	nd	nd	30	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	146	nd	nd	126	nd	nd	nd
NAT92-18	264	6	nd	nd	39	nd	20	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	167	nd	nd	120	nd	nd	nd
NAT92-19	218	4	nd	nd	33	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	168	nd	nd	127	nd	nd	nd
NAT92-20	222	4	nd	nd	26	nd	16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	139	nd	nd	96	nd	nd	nd
NAT92-21	173	5	nd	nd	33	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	204	nd	nd	124	nd	nd	nd
NAT92-22	576	3	nd	nd	43	nd	16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	153	nd	nd	95	nd	nd	nd
NAT92-23	360	5	nd	nd	37	nd	19	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	173	nd	nd	109	nd	nd	nd
NAT92-24	268	6	nd	nd	27	nd	19	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	140	nd	nd	97	nd	nd	nd
NAT92-25	157	4	nd	nd	11	nd	11	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	47	nd	nd	19	nd	nd	nd
NAT92-26	253	5	nd	nd	16	nd	14	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	92	nd	nd	62	nd	nd	nd
NAT92-27	390	5	nd	nd	25	nd	15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	114	nd	nd	70	nd	nd	nd
NAT92-28	109	3	nd	nd	20	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	142	nd	nd	71	nd	nd	nd
NAT92-29	186	7	nd	nd	23	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	134	nd	nd	89	nd	nd	nd
NAT92-30	363	4	nd	nd	28	nd	16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	122	nd	nd	78	nd	nd	nd
NAT92-31A	470	5	nd	nd	33	nd	17	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	141	nd	nd	88	nd	nd	nd
NAT92-31B	454	6	nd	nd	32	nd	14	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	136	nd	nd	91	nd	nd	nd
NAT92-31C	436	6	nd	nd	31	nd	16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	142	nd	nd	90	nd	nd	nd
NAT92-31D	448	4	nd	nd	32	nd	13	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	139	nd	nd	86	nd	nd	nd
NAT92-32	446	5	nd	nd	27	nd	18	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	129	nd	nd	79	nd	nd	nd
NAT92-33	465	6	nd	nd	26	nd	12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	102	nd	nd	71	nd	nd	nd
NAT93-35	200	4	<1	1.2	34	30	18	110	1.5	13	<5	5.8	<100	1.1	0.9	<10	12	4.4	139	1	2	110	140	370	10.89
NAT93-36	373	5	<1	0.64	35	43	15	110	1.2	15	<5	6.2	<100	1.2	0.9	<10	12	4.3	156	1	3	109	140	<200	10.17
NAT93-37	380	4	1	0.82	42	64	17	79	1.6	16	<5	5.9	<100	1.1	1	<10	11	3.4	168	<1	3	115	130	330	10.56
NAT93-38	224	5	<1	0.47	34	<10	15	120	1.1	15	<5	6.1	<100	1.1	0.6	<10	12	3.8	196	1	3	116	140	<200	10.65
NAT93-39	177	3	<1	0.88	28	40	16	69	1.2	16	<5	6	<100	1	0.8	<10	10	2.5	147	1	3	101	120	380	11.65
NAT93-40	247	6	<1	0.62	35	42	16	97	1.1	15	<5	12.1	<100	1.3	1.6	<10	13	3.6	129	1	5	97	<100	570	10.75
NAT93-41	526	3	<1	0.54	34	31	17	83	0.9	11	<5	6	<100	1.4	0.9	<10	11	2.9	141	1	3	97	<100	260	10.59
NAT93-42	366	5	<1	0.53	32	32	17	110	1.0	12	<5	6.3	<100	1.2	0.9	<10	11	4	145	1	3	105	130	430	10.89
NAT93-43	446	5	1	0.43	35	49	13	110	1.0	12	<5	5.9	<100	1	0.7	<10	11	3.4	120	1	3	75	<100	320	12.63
NAT93-44	193	4	<1	0.44	37	51	16	100	1.2	13	<5	7.2	<100	1.1	0.8	<10	11	3.1	186	<1	3	103	<100	250	10.37
NAT93-45	175	6	<1	0.48	38	56	18	120	1.3	14	<5	6.8	<100	1.2	1	<10	12	3.4	175	1	3	111	110	<200	10.37
NAT93-46	268	5	<1	0.5	30	40	19	93	1.1	12	<5	5.9	<100	1	0.6	<10	11	3.5	142	1	2	99	<100	350	10.60
NAT93-47	194	6	<1	0.59	29	30	16	110	1.2	12	<5	6.5	<100	1.5	0.9	<10	12	4.3	157	1	3	110	<100	<200	10.25
NAT93-48	165	5	<1	0.48	37	65	16	120	1.3	15	<5	10.1	<100	1	1.3	<10	13	4.1	184	1	4	110	100	300	10.59
NAT93-49	135	4	<1	0.55	38	54	17	110	2.4	16	<5	7.4	<100	1.6	1	<10	13	4.4	190	1	4	138	140	410	10.51
NAT93-50	148	6	<1	0.44	34	51	19	120	1.6	15	<5	6.5	<100	1.3	0.7	<10	13	3.7	204	1	3	134	190	390	10.52
NAT93-51	226	4	<1	0.65	30	39	17	110	1.3	14	<5	6	<100	1.1	0.8	<10	11	3.3	167	1	2	117	130	340	10.41
NAT93-52	199	5	<1	0.77	36	44	14	110	1.3	15	<5	5.8	<100	1.2	0.6	<10	11	4	154	1	3	120	170	300	10.38
NAT93-53	180	5	1	0.69	28	41	15	120	1.2	15	<5	6.2	<100	1.1	0.9	<10	12	4.4	165	<1	3	113	140	380	10.46
NAT93-54	250	6	1	0.73	31	48	16	120	1.3	15	<5	6.3	<100	1.2	0.9	<10	12	3.5	155	1	3	109	140	290	12.63
NAT93-55	205	3	1	0.47	33	55	22	140	1.2	15	<5	6.4	<100	1.3	0.8	<10	12	4.7	198	1	3	142	160	330	12.36
NAT93-56	294	5	<1	0.51	36	50	15	130	1.1	15	<5	6.5	<100	1.2	0.9	<10	12	4.7	179	1	3	121	<100	<200	10.03
NAT93-57	317	6	1	0.51	31	36	17	110	1.1	13	<5	6.1	<100	1.1	0.8	<10	12	3.8	148	1	3	116	150	340	11.11
NAT93-58	270	8	1	0.14	25	35	13	70	2.8	24	<5	9	<100	1.9	1	<10	39.8	3.7	150	1	2	64	<100	550	10.83
NAT93-59	208	6	<1	0.57	50	87	19	120	1.3	19	<5	9.2	<100	1.1	1.5	<10	14	5	214	1	5	202	240	350	11.62
NAT93-60	310	7	<1	0.5	33	34	16	110	1.2	14	<5	6.4	<100	1.1	0.9	<10	12	4.2	173	<1	3	123	120	220	10.43
NAT93-61	370	4	<1	0.55	35	49	15	96	1.0	12	<5	6.1	<100	1.1	0.8	<10	12	3.8	156	1	3	98	<100	220	11.47
NAT93-62	253	5	<1	0.61	27	35	17	100	1.0	12	<5	6.2	<100	1.1	0.8	<10	11	3.8	141	1	3	94	120	350	11.37
NAT93-63	332	7	<1	0.48	33	28	17	92	1.0	11	<5	6	<100	0.9	0.9	<10	11	3.5	145	1	3	103	<100	340	10.39
NAT93-64	280	4	1	0.58	26	39	15	85	1.0	10	<5	5.9	<100	1.1	0.8	<10	10	3.1	125	<1	3	94	<100	<200	11.16
NAT93-65	330	7	<1	0.52	31	51	17	110	1.1	13	<5	6.5	<100	1.2	0.8	<10	12	3.2	149	1	2	101	130	360	10.19
NAT93-66	227	7	<1	0.51	25	<10	16	93	0.9	11	<5	6	<100	1.1	0.6	<10	11	4.3	139	<1	3	104	130	310	10.14
NAT93-67	337	4	<1	0.42	27	27	13	110	0.5	10	<5	5.2	<100	0.8	0.6	<10	10	3	121	1	2	77	<100	370	11.17
NAT93-68	266	6	<1	0.6	31	26	15	80	1.0	13	<5	7.4	<100	1.1	0.8	<10	12	3.2	135	1	3	88	<100	<200	11.16
NAT93-69	362	7	<1	0.92	32	51	18	110	1.6	15	<5	6.4	<100	1.1	0.9	<10	12	2.9	120	1	3	108	130	<200	10.79
NAT93-70	198	5	1	0.51	36	61	16	120	1.5	16	<5	6.1	<100	1.2	0.8	<10	11	3.6	196	1	3	154	140	280	10.18
NAT93-71	310	5	1	0.55	43	66	18	120	1.5	16	<5	6.1	<100	1	0.8	<10	12	4.3	213	1	3	144	140	<200	11.29
NAT93-72	450	3	1	0.49	38	46	20	120	1.4	14	<5	6.2	<100	1.3	0.6	<10	12	3.7	180	<1	3	135	190	<200	11.57
NAT93-73	361	6	1	0.53	37	27	17	100	1.2	13	<5	6.3	<100	1.1	0.6	<10	11	3.3	173	1	3	119	140	340	11.75
NAT93-74	370	7	<1	0.54	36	42	16	100	1.1	13	<5	6	<100	1	0.6	<10	11	2.8	150	1	3	93	<100	250	10.53
NAT93-75	374	5	<1	0.5	31	28	15	97	0.9	12	<5	6.1	<100	1.1	0.9	<10	11	3	138	1	2	103	<100	<200	10.40
NAT93-76	110	4	<1	0.52	23	35	14	100	0.7	11	<5	4.8	<100	1	0.6	<10	10	2.8	144	1	2	82	110	310	11.05

Samp # (1)	Lon°	Lat°	Lith	From	To(m)	Ag	Ag	As	Au	Ba	Br	Cd	Cd	Ce	Co	Co	Cr	Cs	Cu	Eu	Fe	Fe	Hf	Ir	La	Lu	Mn	Mo	Mo	Na	Ni	Ni	Pb	Rb	Sb	Sc	Se	Sm	Sn	Ta	Tb	Te	Th	U	V	W	Yb	Zn	Zn	Zr	Weight
NAT93-77	115.089082	57.175534	till	8.0	8.3	0.2	<2	15.0	4	720	1.8	0.4	<5	54	10	13	71	3.8	27	1	3.00	2.8	6	<50	32	<0.2	341	6	<1	0.53	30	27	17	89	1.0	11	<5	5.6	<100	0.9	0.8	<10	10	3.7	137	1	2	107	120	350	10.30
NAT93-78	115.335099	57.622666	till	3.0	3.3	0.2	<2	14.0	18	700	1.8	0.2	<5	59	11	15	73	4.6	27	1	3.20	2.9	6	<50	33	<0.2	465	5	<1	0.43	37	31	17	110	1.0	12	<5	5.7	<100	1	0.6	<10	11	3.4	141	1	2	109	120	530	10.42
NAT93-79	116.257624	57.982514	till	10.0	10.5	<0.2	<2	21.0	<2	1200	1.2	0.3	<5	58	13	16	80	5.3	26	1	3.50	4.1	5	<50	32	<0.2	309	6	1	0.53	52	74	18	95	1.5	13	<5	5.8	<100	1.1	0.8	<10	11	7.2	150	1	3	167	180	310	10.18
NAT93-81	111.029191	57.462403	till	10.0	10.5	0.2	<2	3.9	<2	320	1.4	<0.2	<5	63	7	9	49	1.7	15	<1	1.80	1.5	13	<50	31	<0.2	185	3	1	0.24	23	28	13	63	0.4	7.4	<5	5.2	<100	1.1	0.6	<10	10	2.7	80	<1	3	56	<100	530	10.09
NAT93-82	110.454578	57.338768	till	3.0	3.5	0.2	<2	3.2	<2	300	2.2	<0.2	<5	42	3	5	36	1.2	11	<1	1.80	1.4	8	<50	22	<0.2	169	2	<1	0.41	11	<10	10	49	0.3	4.8	<5	3.7	<100	0.8	<0.5	<10	7.1	1.6	54	<1	1	37	<100	360	13.50
NAT93-83	110.745265	57.404221	till	10.0	10.5	<0.2	<2	6.0	2	480	1.0	<0.2	<5	72	9	11	40	2.8	18	1	2.30	2.2	9	<50	38	<0.2	460	4	<1	0.44	24	21	15	82	0.6	9	<5	6.2	<100	1.1	0.8	<10	11	2.8	84	<1	3	60	<100	440	10.57
NAT93-84	111.202795	57.647831	diamict	6.0	6.5	0.3	<2	7.6	3	430	0.9	<0.2	<5	62	7	9	49	2.3	19	1	2.40	2.0	7	<50	31	<0.2	253	4	<1	0.5	19	20	13	70	0.5	8.3	<5	5.4	<100	0.8	0.8	<10	9.2	2.7	88	<1	2	70	<100	360	14.14
NAT93-84G	111.202795	57.647841	diamict	6.0	6.5	0.3	<2	7.4	3	390	0.8	<0.2	<5	59	6	7	50	2.4	18	1	3.00	2.2	6	<50	30	<0.2	251	2	<1	0.48	17	22	12	60	0.5	8.1	<5	5.2	<100	1	0.6	<10	8.6	2.6	89	<1	2	62	<100	310	13.01
NAT93-84P	111.202795	57.647851	diamict	6.0	6.5	0.2	<2	4.2	<2	240	0.7	0.2	<5	62	3	<5	34	1.4	11	<1	2.10	1.4	6	<50	33	0.2	160	3	<1	0.33	12	<10	12	36	0.4	5.1	<5	5.2	<100	0.6	0.6	<10	10	2	54	<1	2	31	<100	210	8.48
NAT93-86	111.496257	57.564205	till	5.0	5.5	0.2	<2	6.6	6	350	1.1	<0.2	<5	67	6	5	64	3.5	18	1	2.00	2.1	8	<50	37	<0.2	168	2	<1	0.35	17	<10	20	83	0.6	8.4	<5	5.8	<100	1	0.6	<10	11	2.6	97	1	2	88	<100	310	11.27
NAT93-88	111.501796	57.076978	till	1.2	1.5	0.4	<2	14.0	9	350	12.0	0.2	<5	49	11	16	49	2.5	19	<1	6.10	5.3	10	<50	26	<0.2	940	4	<1	0.2	24	38	13	62	0.6	8.7	<5	4.7	<100	0.9	0.7	<10	7.9	2.4	88	1	2	48	<100	280	11.63
NAT93-89	110.677291	57.629659	till	2.0	2.5	<0.2	<2	4.8	<2	340	2.5	<0.2	<5	52	7	6	37	1.4	15	<1	2.20	1.5	7	<50	29	<0.2	167	6	1	0.24	28	34	14	59	0.3	6	<5	4.3	<100	0.7	0.5	<10	10	2.4	94	<1	2	41	<100	320	11.19
NAT93-500	114.976950	55.339521	till	2.0	2.2	0.4	<2	14.0	8	870	1.7	<0.2	<5	64	11	18	86	4.7	31	1	3.40	3.4	7	<50	35	<0.2	316	5	<1	0.64	33	25	17	100	1.1	14	<5	6.1	<100	1.2	0.8	<10	11	3.2	156	<1	3	108	130	270	10.57
NAT93-501	115.342733	57.273683	till	3.0	3.2	0.3	<2	18.0	3	860	2.1	0.2	<5	59	10	13	81	5.3	31	1	3.60	3.3	6	<50	37	0.3	274	5	<1	0.45	32	28	18	110	1.3	13	<5	6.3	<100	1.2	0.6	<10	11	3.1	173	<1	3	114	110	<200	10.41
NAT93-502	116.266790	56.659318	till	2.0	2.2	0.2	<2	17.0	4	870	2.4	0.3	<5	64	9	14	82	5.7	34	1	3.60	3.3	5	<50	36	0.2	264	8	1	0.46	35	32	16	100	1.1	13	<5	6.3	<100	1.1	0.6	<10	11	4	160	<1	3	132	150	320	10.42
NAT93-503	116.326510	56.542986	till	2.2	2.4	<0.2	<2	13.0	3	790	2.3	2.0	<5	57	10	12	73	5.2	28	<1	3.10	2.9	5	<50	34	<0.2	332	5	<1	0.49	32	24	16	100	0.9	12	<5	5.8	<100	1.1	0.8	<10	11	3.5	149	1	3	104	<100	320	10.27
HL93-4-2.5	115.159492	58.593159	till	2.5		0.6	<2	10.0	3	670	2.3	<0.2	<5	75	8	10	82	4.6	27	1	3.00	3.1	7	<50	43	0.3	247	5	<1	0.58	28	29	20	110	0.9	12	<5	6.8	<100	1	0.6	<10	15	3.5	128	1	3	90	<100	390	10.47
HL93-6-2.0	116.599871	58.520458	till	2.0		0.2	<2	10.0	3	680	1.9	<0.2	<5	76	8	8	83	4.3	24	1	2.70	2.7	6	<50	44	0.2	206	4	<1	0.62	27	27	16	110	0.7	11	<5	6.8	<100	0.9	0.8	<10	15	3.4	128	1	3	81	<100	420	10.57
HL93-8-2.5	117.469041	58.902094	till	2.5		0.4	<2	16.0	7	1000	2.2	0.2	<5	60	8	13	90	6.2	39	1	3.10	3.1	5	<50	39	0.3	238	6	3	0.54	33	49	17	110	1.0	12	<5	6.2	<100	1.2	0.9	<10	12	5.3	187	1	3	127	130	270	11.27
HL93-9-2.5	117.237134	58.716729	till	2.5		0.2	<2	18.0	4	780	3.0	0.2	<5	77	14	19	87	5.3	31	1	3.30	3.8	6	<50	39	<0.2	360	5	3	0.53	38	46	17	100	1.1	12	<5	6	<100	1.2	0.8	<10	12	4.7	163	<1	3	117	130	330	10.43
HL93-10-1.5	117.914995	58.574983	till	1.5		0.3	<2	14.0	3	1000	2.3	0.2	<5	59	11	12	93	5.5	33	1	3.50	3.2	5	<50	36	0.2	293	5	<1	0.44	36	27	15	120	1.0	13	<5	6.2	<100	1	0.9	<10	11	3.2	179	<1	3	115	130	300	10.11
HL93-11-2.2	117.427913	58.545908	till	2.2		0.3	<2	18.0	5	1200	7.0	0.4	<5	73	10	14	98	6.4	43	1	3.50	3.9	5	<50	42	<0.2	230	6	4	0.54	37	46	17	120	1.2	13	<5	6.6	<100	1.2	0.8	<10	12	5	200	<1	3	124	140	300	10.21
93-SB-46	117.027428	55.675048	diamict	1.0	1.2	<0.2	<2	12.0	3	1000	3.7	0.2	<5	65	11	11	110	6.9	37	1	3.20	3.2	4	<50	39	0.3	384	4	<1	0.39	35	41	15	130	1.0	16	<5	6.3	<100	1.2	0.6	<10	12	3.4	184	1	2	79	<100	<200	11.33
93-SB-50	117.057807	55.51981	till	1.5	1.7	0.2	<2	17.0	<2	880	2.0	0.2	<5	66	9	12	96	5.6	31	<1	3.30	3.2	6	<50	36	0.4	260	5	2	0.53	29	33	17	110	1.2	14	<5	6.1	<100	1.2	0.8	<10	12	3.3	162	1	2	103	120	<200	10.66
93-SB-56	117.069562	55.898307	till	1.0	1.2	0.3	<2	16.0	2	950	2.4	<0.2	<5	72	8	14	89	5.7	33	2	3.40	3.4	6	<50	39	0.3	260	4	1	0.56	30	44	18	100	1.1	13	<5	6.6	<100	1	0.8	<10	12	3.7	153	1	3	99	130	320	10.68
93-SB-51	117.099774	55.518663	till	1.7	1.9	0.2	<2	8.6	<2	690	3.4	<0.2	<5	52	10	11	81	5.7	29	1	2.70	2.5	2	<50	30	0.2	288	5	<1	0.31	31	<10	12	98	0.8	12	<5	4.6	<100	0.7	<0.5	<10	8.8	2.9	134	<1	2	70	<100	<200	10.22
93-SB-47	117.101982	55.607173	till	1.2	1.4	0.3	<2	16.0	4	820	2.8	0.2	<5	61	9	15	85	5.1	29	1	2.90	3.2	5	<50	33	0.3	334	6	3	0.55	30	39	14	99	1.1	13	<5	5.7	<100	1	0.7	<10	11	3.3	141	<1	2	87	<100	<200	10.47
93-SB-55	117.102816	55.774075	till	1.0	1.2	0.3	2	11.0	3	980	4.7	0.2	<5	62	9	12	95	6.7	31	1	3.00	2.9	4	<50	35	<0.2	240	6	1	0.39	31	38	13	110	0.9	13	<5	5.4	<100	1.1	0.8	<10	11	3.4	172	<1	2	90	100	<200	10.84
93-SB-48	117.105019	55.555491	till	1.0	1.2	0.5	<2	15.0	3	980	3.0	0.2	<5	68	9	11	92	6.2	33	1	2.70	3.2	5	<50	36	<0.2	210	6	<1	0.48	30	48	16	100	1.1	13	<5	6.2	<100	1.1	0.7	<10	12	3.8	176	<1	2	99	<100	290	10.42
93-SB-52	117.181372	55.526886	till	1.1	1.3	0.2	<2	13.0	3	880	3.4	0.2	<5	74	13	18	110	6.9	41	1	3.00	3.4	5	<50	40	0.2	392	7	1	0.5	40	60	18	130	1.1	14	<5	6.2	<100	1.1	0.9	<10	13	4.5	179	1	3	98	160	250	10.15
93-SB-52	117.181372	55.526886	till	3.4	3.6	0.4	<2	15.0	2	940	3.2	0.4	<5	71	11	18	110	6.9	35	<1	3.20	3.5	5	<50	41	0.3	263	5	<1	0.58	36	57	19	120	1.1	14	<5	6.4	<100	1.3	0.9	<10	13	4.8	159	<1	3	109	150	350	10.19
93-SB-07	117.190356	55.665013	diamict	1.6	1.7	0.2	<2	13.0	2	970	2.7	0.3	<5	73	13	18	110	7.3	47	1	3.20	3.6	4	<50	40	<0.2	310	5	<1	0.51	39	48	15	140	1.0	16	<5	6.6	<100	1.3	0.8	<10	13	5.1	191	1	2	108	130	230	10.33
93-SB-08	117.198306	55.665463	till	1.9	2.0	<0.2	<2	13.0	2	890	2.8	<0.2	<5	70	9	12	98	6.9	35	1	3.20	3.5	4	<50	39	<0.2	204	4	1	0.47	34	48	19	130	1.0	15	<5	6.4	<100	1.2	0.7	<10	13	5.6	181	1	2	106	100	380	10.20
93-SB-09	117.23906	55.63595	till	2.3	2.4	<0.2	<2	18.0	3	880	1.6	0.3	<5	64	10	11	87	5.5	46	<1	2.90	3.2	6	<50	37	<0.2	196	5	<1	0.54	33	36	16	120	1.2	14	<5	6.1	<100	1.3	0.7	<10	12	4.4	175	1	2	128	120	<200	10.93
93-SB-53	117.264613	55.538631	till	1.1	1.3	0.2	<2	13.0	<2	850	2.9	0.4	<5	71	12	15	95	7	37	<1	3.20	3.3	4	<50	40	0.2	320	6	<1	0.51	37	40	18	130	1.0	14	<5	6.2	<100	1.1	0.8	<10	13	4.3	204	1	2	103	130	400	10.11
93-SB-10	117.277956	55.577024	till	1.3	1.5	<0.2	<2	13.0	<2	940	2.1	<0.2	<5	65	10	13	100	5.9	30	1	2.70	2.9	6	<50	38	0.2	168	3	<1	0.56	35	41	16	110	1.2	14	<5	6.2	<100	1.2	0.7	<10	12	4.3	164	1	3	102	<100	350	10.07
93-SB-62	117.299322	55.518785	diamict	1.5	1.7	0.5	<2	14.0	3	890	2.2	0.2	<5	70	9	12	86	6.1	32	1	3.10	3.3	6	<50	39	<0.2	174	5	1	0.51	29	41	16	110	1.0	13	<5	6.2	<100	1.3	0.9	<10	12	4.6	172	1	3	107	<100	380	11.24
93-SB-06	117.309472	55.75238	till	0.5	0.7	0.4	<2	14.0	3	900	2.9	0.2	<5	70	9	13	100	6.7	39	1	2.90	3.4	4	<50	39	<0.2	224	5	<1	0.41	32	41	18	120	1.0	15	<5	6.4	<100	1	0.7	<10	13	4.2	190	1	2	112	<100	310	10.66
93-SB-11B	117.336562	55.614118	till	6.8	7.0	0.2	<2	16.0	4	880	1.5	<0.2	<5	65	11	13	96	5.5	35	<1	3.20	3.0	5	<50	35	0.3	174	5	1	0.54	31	42	15	110	1.0	13	<5	6.1	<100	1.2	0.6	<10	11	3.8	162	1	3	106	<100	220	10.50
93-SB-72	117.389256	55.604797	till	4.0	4.2	0.3	<2	18.0	3	960	1.6	0.2	<5	67	8	12	84	5.8	33	1	2.90	3.4	6	<50	37	<0.2	225	6	<1	0.55	29	41	15	100	1.1	13	<5	6.2	<100	1	0.7	<10	12	4.5	166	1	3	114	100	270	10.10
93-SB-72	117.389256	55.604797	till	8.7	8.9	0.4	<2	14.0	4	870	1.6	0.2	<5	61	10	16	93	5.7	32	1	3.10	3.1	6	<50	35	<0.2	304	5	1	0.59	32	46	16	110	1.1	13	<5	5.9	<100	1.2	0.6	<10	11	4.1	155	1	3	103	100	320	10.24
93-SB-65B	117.425552	55.548793	till	1.4	1.6	0.3	<2	14.0	3	940	1.5	0.2	<5	68	8	14	99	5.6	35	<1	2.70	3.1	6	<50	37	0.2	242	7	1	0.54	31	43	18	100	1.0	13	<5	6.1	<100	1.1	0.9	<10	12	4.5	157	1	3	107	110	420	10.02
93-BH-006	117.433509	56.446974	till	8.5	8.8	0.3	<2	16.0	3	990	1.8	0.3	<5	61	8	14	93	6.6	38	1	2.80	3.0	6	<50	35	<0.2	208	6	2	0.47	32	45	17	110	1.2	11	<5	6.4	<100	1.3	0.8	<10	12	4.8	149	1	2	112	100	350	10.01
93-SB-05	117.472274	55.875855	till	1.8	2.0	<0.2	<2	13.0	4	980	1.4	0.2	<5	67	9	12	94	5.5	30	1	3.10	3.1	7	<50	36	<0.2	236	5	1	0.54	31	33	16	110	1.1	13	<5	6.1	<100	1.2	0.8	<10	12	4.3	173	1	3	111	120	400	10.33
93-SB-38	117.533317	55.869319	till	1.4	1.6	<0.2	<2	13.0	3	810	2.1	<0.2	<5	52	11	13	83	4.8	29	<1	3.10	2.9	5	<50	31	<0.2	340	4	<1	0.51	34	40	14	95	1.0	11	<5	5.4	<100	1.2	0.6	<10	10	4.6	135	2	2	99	120	<200	11.13
93-SB-32	117.682262	55.956639	till	0.7	0.8	<0.2	<2	17.0	7	970	1.9	<0.2	<5	68	7	8	110	5.9	36	1	3.60	3.5	7	<50	41	0.4	145	5	<1	0.52	31	44	18	98	1.3	15	<5	7.6	<100	1.1	0.9	<10	13	3.9	175	<1	3	108	110	320	10.18
93-SB-44	117.727046	55.460609	till	1.3	1.5	0.3	<2	14.0	<2	980	2.0	0.4	<5	63	10	14	97	5.9	38	2	3.00	3.7	5	<50	35	0.4	173	5	1	0.71	34	64	17	100	1.3	16	<5	6	<100	1	0.9	<10	11	3.1	173	1	3	103	110	390	10.83
93-SB-43	117.762641	55.461294	till	2.3	2.5	0.4	<2	16.0	2	940	1.6	<0.2	<5	58	9	11	96	4.7	34	1	3.10	3.4	6	<50	35	0.4	198	7	1	0.65	30	42	16	110	1.2	14	<5	5.9	<100	1	0.8	<10	11	3.2	160	1	2	106	100	<200	10.57
93-SB-42	117.878805	55.493537	till	1.0	1.2	0.4	<2	16.0	<2	1200	3.2	<0.2	<5	68	7	12	100	5.4	33	2	2.70	3.5	6	<50	43	0.4	233	5	<1	0.71	43	45	13	95	1.3	14	<5	7.3	<100	1	0.9	<10	12	4.1	139	<1	3	85	110	360	11.50
93-SB-26	117.890247	55.929483	till	1.3	1.5	<0.2	<2	13.0	2	730	2.3	0.2	<5	62	10	13	88	4.9	28	1	2.90	2.9	7	<50	36	0.3	274	5	<1	0.55	32	19	16	110	0.9	12	<5	6.1	<100	1.2	0.9	<10	11	3.8	138	1	2	86	<100	220	10.58
93-SB-41	117.906069	55.509053	till	1.2	1.4	0.3	<2	14.0	3	950	3.5	0.2	<5	67	14	13	110	6.8	31	1	3.90	3.2	4	<50	37	0.2	375	5	1	0.49	43	36	16	130	1.2	15	<5	6.2	<100	1	0.6	<10	12	4.4	177	<1	3	106	140	<200	10.63
93-BH-013	117.908669	56.797718	till	21.3	21.6	0.2	<2	13.0	3	950	1.4	0.7	<5	82	9	14	110	7.8	46	1	3.00	3.5	4	<50	42	<0.2	250	5	1	0.46	34	34	24	130	1.0	16	<5	6.4	<100	1.1	0.8	<10	13	4.4	179	1	3	113	110	210	10.84
93-SB-39	117.95687	55.465537	till	1.4	1.6	0.3	<2	14.0	4	990	2.9	0.4	<5	72	15	16	120	7.8	36	1	3.50	3.6	4	<50	42	0.2	382	7	<1	0.49	45	47	17	140	1.2	17	<5	6.5	<100	1.2	0.7	<10	13	4.2	189	<1	2	116	130	360	10.26
93-SB-40	117.992286	55.490189	till	1.3	1.5	0.2	2	17.0	3	1000	2.4	<0.2	<5	57	11	12	87	5	28	<1	3.50	3.2	6	<50	33	0.3	375	6	1	0.57	36	54	16	99	1.3	12	<5	5.9	<100	1	0.9	<10	11	3.4	145	<1	2	102	<100	220	11.05
93-LEL-35	117.054245	56.037126	till	3.8	3.9	0.3	<2	14.0	3	930	2.1	0.2	<5	63	8	15	100	4.7	29	1	3.20	3.5	7	<50	38	<0.2	275	5	<1	0.68	28	44	18	120	1.1	13	<5	6.2	<100	1.2	1	<10	11	4.7	139	<1	3	107	120	270	11.45
93-LEL-41	117.129086	56.053242	till	1.0	1.1	0.2	<2	13.0	4	880	1.1	<0.2	<5	61	7	8	110	4.1	31	1	3.00	3.4	7	<50	38	<0.2	164	5	<1	0.64	28	29	15	110	1.1	12	<5	6.1	<100	1	0.7	<10	11	4.4	136	1	2	105	<100	300	9.91
93-LEL-120	117.15931	56.451591	till	15.0	15.3	0.3	<2	14.0	5	1000	1.6	0.5	<5	61	10	13	100	4.2	38	1	2.50	3.5	6	<50	38	<0.2	252	5	1	0.58	29	31	14	110	1.0	13	<5	6.1	<100	1.2	0.7	<10	11	4.6	150	<1	2	108	140	<200	9.78
93-LEL-01	117.375163	56.328581	till	1.0	1.1	0.4	<2	18.0	14	1200	1.1	<0.2	<5	74	7	11	120	4.9	34	1	3.00	4.5	9	<50	44	<0.2	143	6	<1	0.71	29	39	16	110	1.8	15	<5	7.5	<100	1.4	1	<10	13	4	173	1	3	97	140	560	9.82
93-LEL-29	117.426022	56.39399	till	1.1	1.2	0.5	<2	16.0	6	1500	2.9	0.2	<5	64	8	15	110	4.9	36	1	3.50	3.9	7	<50	40	0.3	224	5	<1	0.64	41	60	18	120	1.5	14	<5	6.5	<100	1.3	0.7	<10	12	3.7	153	<1	3	116	130	<200	11.10
93-LEL-53	117.448001	56.057891	till	1.5	1.6	0.3	<2	14.0	3	970	1.5	0.3	<5	63	9	11	110	6.1	35	<1	3.00	3.2	6	<50	38	0.2	250	4	<1	0.54	33	40	16	110	1.0	12	<5	6	<100	1.2	0.9	<10	12	4.4	153	1	3	107	180	450	6.88
93-LEL-20	117.555395	56.379105	till	1.1	1.2	0.2	<2	16.0	3	1100	2.8	<0.2	<5	64	8	11	120	4.4	29	1	2.80	3.6	8	<50	40	0.2	172	6	<1	0.66	28	41	16	100	1.3	13	<5	6.4	<100	1.3	0.6	<10	11	3.2	158	1	3	93	100	350	9.77
93-LEL-18	117.56607	56.443754	till	1.2	1.3	0.3	<2	19.0	6	1100	3.5	0.4	<5	64	18	27	110	4.9	34	1	2.90	4.2	6	<50	39	0.2	370	5	2	0.61	46	68	20	110	1.7	13	<5	6.3	<100	1.2	0.9	<10	11	4.9	165	1	3	137	160	<200	6.78
93-LEL-55	117.566282	56.130192	till	>10		0.2	2	14.0	4	1100	1.0	0.3	<5	58	8	14	100	4.8	30	1	2.90	3.4	8	<50	34	<0.2	319	5	1	0.73	30	41	14	89	1.3	11	<5	5.9	<100	1.2	0.8	<10	11	4.3	131	<1	3	110	110	340	10.27
93-LEL-47	117.56789	56.130181	till	9.0	9.1	0.4	2	15.0	5	1200	1.3	0.2	<5	55	7	14	85	4	25	1	2.90	3.4	11	<50	35	<0.2	350	5	<1	0.74	27	45	13	86	1.2	10	<5	5.9	<100	1.3	1	<10	11	4.6	117	1	2	97	<100	350	11.39
93-LEL-21	117.57869	56.420338	till	0.3	0.4	0.3	<2	18.0	7	1200	2.0	<0.2	<5	73	8	14	130	5.2	39	<1	3.30	5.8	8	<50	48	0.3	220	7	<1	0.79	34	67	17	110	1.9	18	<5	10	<100	1.1	1.2	<10	16	4.6	173	<1	4	129	<100	490	9.14
93-LEL-05	117.603262	56.231539	till	1.4	1.5	<0.2	5	16.0	5	1200	1.2	0.4	<5	73	13	25	89	5.8	33	1	3.20	3.8	5	<50	38	<0.2	461	4	1	0.58	41	75	18	100	1.4	13	<5	6.1	<100	1.1	1.1	<10	12	3.6	147	1	3	119	160	<200	8.58
93-LEL-15	117.626079	56.443458	till	0.7	0.8	0.4	<2	16.0	6	1800	3.5	0.5	<5	70	18	25	100	5.7	37	1	3.00	3.9	6	<50	42	<0.2	463	7	<1	0.57	44	55	21	120	1.5	15	<5	7.1	<100	1.3	0.9	<10	12	4.1	184	<1	2	121	140	<200	10.72
93-LEL-14	117.627716	56.444358	till	1.0	1.1	0.3	<2	13.0	7	1100	2.2	0.2	<5	62	9	17	100	5	29	1	2.80	3.7	6	<50	37	0.2	241	6	<1	0.62	30	<10	17	120	1.3	14	<5	5.9	<100	1.1	0.7	<10	11	4.3	162	<1	2	111	180	340	8.64
93-LEL-13	117.687027	56.495254	till	1.5	1.6	0.2	<2	14.0	5	1300	8.2	0.5	<5	61	14	18	110	4.5	32	1	2.60	3.7	5	<50	38	0.2	437	5	<1	0.61	39	63	18	120	1.6	14	<5	5.9	<100	1.2	0.7	<10	11	3.7	163	<1	3	121	110	370	9.11
93-LEL-22	117.767634	56.304305	till	0.3	0.4	0.5	<2	21.0	11	1800	3.1	<0.2	<5	69	9	14	120	5.3	45	3	3.40	4.4	7	<50	45	<0.2	237	6	<1	0.62	50	55	20	120	1.6	14	<5	8.1	<100	0.9	1.3	<10	12	6	167	<1	3	118	110	390	8.35
93-LEL-24	117.818688	56.348899	till	1.1	1.2	0.3	<2	16.0	7	1300	3.1	0.2	<5	71	11	16	99	5.4	33	1	3.30	4.1	7	<50	40	<0.2	302	7	<1	0.53	36	64	18	140	1.6	14	<5	6.5	<100	1.3	0.8	<10	13	3.9	166	1	2	114	110	<200	7.48
93-LEL-09	117.819576	56.465691	till	1.0	1.1	0.3	<2	17.0	7	1100	3.9	<0.2	<5	87	7	10	110	5.7	36	2	2.50	4.2	7	<50	50	0.3	140	5	<1	0.64	29	47	16	120	1.4	17	<5	10.2	<100	1.5	1.3	<10	14	4.7	175	1	4	105	190	290	11.92
93-LEL-140	117.896276	56.297338	till	1.0	1.1	<0.2	<2	15.0	8	1100	1.6	0.5	<5	79	11	17	110	7.3	43	2	2.50	3.6	5	<50	44	0.4	280	4	<1	0.53	38	70	18	130	1.3	15	<5	8.2	<100	1.2	1.3	<10	13	5	173	<1	4	147	180	<200	10.38
93-LEL-26	117.9006	56.185701	till	2.0	2.1	0.3	<2	17.0	5	1200	1.3	0.2	<5	69	8	15	110	4.9	31	1	3.30	4.2	6	<50	41	<0.2	218	5	1	0.63	29	63	17	130	1.5	15	<5	6.5	<100	1.6	0.9	<10	12	4	176	2	3	122	160	390	10.38
93-LEL-25	117.920493	56.276308	till	0.7	0.8	0.5	<2	18.0	4	1600	1.8	<0.2	<5	89	7	15	130	6.6	35	1	3.00	4.5	6	<50	52	<0.2	144	7	<1	0.55	35	60	19	140	1.6	17	<5	9.5	<100	1.6	1	<10	14	6.8	182	1	4	123	140	<200	10.26
93-LEL-101	117.965558	56.013422	till	4.2	4.3	0.3	<2	15.0	15	1100	2.4	0.4	<5	62	11	16	100	4.9	37	1	2.40	3.4	6	<50	40	<0.2	314	5	<1	0.62	31	62	17	120	1.2	13	<5	6.3	<100	1.2	0.9	<10	11	5.3	173	1	2	113	130	270	9.83
93-LEL-39	118.008803	56.072557	till	2.0	2.1	0.4	<2	19.0	6	1200	2.1	0.2	<5	71	10	20	120	5.2	38	2	3.70	4.6	6	<50	44	0.3	265	6	<1	0.73	47	55	20	130	1.8	15	<5	7.7	<100	1	0.9	<10	13	3.8	162	<1	3	130	160	320	8.92

Table 6.3. Results, from coreholes, of chemical analyses of till matrix (<0.063 mm) using AA and INAA analyses.

HL = High Level area | PR = Peace River area | McA = McAllister section | AA = Atomic absorption following total digestion, INAA = neutron activation

Hole#	Lon°	Lat°	Lith	Depth	Ag	Ag	As	Au	Ba	Br	Cd	Cd	Ce	Co	Co	Cr	Cs	Cu	Eu	Fe	Fe	Hf	Ir	La	Lu	Mn	Mo	Mo	Na	Ni	Ni	Pb	Rb	Sb	Sc	Se	Sm	Sn	Ta	Tb	Te	Th	U	V	W	Yb	Zn	Zn	Zr	Weight
				Concentration >>>>>	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppb	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	grams
				Method (1) >>>>>	AA	INAA	INAA	INAA	INAA	INAA	AA	INAA	INAA	AA	INAA	INAA	INAA	AA	INAA	AA	INAA	INAA	INAA	INAA	INAA	AA	AA	INAA	INAA	AA	INAA	AA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	INAA	AA	INAA	INAA	AA	INAA	INAA	INAA
				Detection Limit >>>>>	0.2 ppm	2 ppm	0.5 ppm	2 ppb	50 ppm	0.5 ppm	0.2 ppm	5 ppm	5 ppm	2 ppm	5 ppm	20 ppm	0.5 ppm	2 ppm	1 ppm	0.02%	0.20%	1 ppm	50 ppm	2 ppm	0.2 ppm	5 ppm	2 ppm	1 ppm	0.02%	2 ppm	10 ppm	2 ppm	5 ppm	0.1 ppm	0.2 ppm	5 ppm	0.1 ppm	100 ppm	0.5 ppm	0.5 ppm	10 ppm	0.2 ppm	0.2 ppm	5 ppm	1 ppm	1 ppm	2 ppm	100 ppm	200 ppm	
HL4	115.159492	58.593159	till	2.5	0.6	<2	10	3	670	2.3	<0.2	<5	75	8	10	82	4.6	27	1	3	3.1	7	<50	43	0.3	247	5	<1	0.58	28	29	20	110	0.9	12	<5	6.8	<100	1	0.6	<10	15	3.5	128	1	3	90	<100	390	10.47
HL4	115.159492	58.593159	till	3.5	<0.2	<2	10	5	610	1.6	0.2	<5	77	8	12	72	4.8	26	1	2.8	2.9	5	<50	42	0.2	360	6	<1	0.55	29	33	15	100	0.8	11	<5	6.4	<100	1	0.8	<10	15	3.6	136	1	2	84	<100	420	10.95
HL4	115.159492	58.593159	till	4.5	0.2	<2	9.1	3	670	1.2	<0.2	<5	74	8	10	84	5.4	26	1	3.1	2.9	6	<50	43	0.3	377	3	<1	0.58	29	31	15	100	0.8	12	<5	6.4	<100	1.1	1	<10	14	4	136	1	2	82	130	280	10.05
HL4	115.159492	58.593159	till	5.5	<0.2	<2	10	2	700	1.8	<0.2	<5	80	9	13	92	5.6	26	<1	3.1	2.9	7	<50	46	0.2	250	4	<1	0.64	31	35	14	120	0.8	12	<5	6.7	<100	1.2	0.9	<10	15	3.9	134	1	3	86	100	510	10.44
HL4	115.159492	58.593159	till	6.5	0.2	<2	11	<2	820	1.9	<0.2	<5	84	9	13	97	5.6	26	1	3.4	3.2	7	<50	45	<0.2	283	5	<1	0.63	30	39	15	120	0.8	12	<5	6.6	<100	1.2	0.9	<10	15	4	142	1	3	83	110	390	10.15
HL4	115.159492	58.593159	till	7.5	<0.2	<2	10	3	670	1.5	<0.2	<5	70	10	10	77	5.3	26	1	2.7	2.9	6	<50	42	<0.2	243	4	<1	0.6	28	33	13	99	0.8	11	<5	6.4	<100	1.2	0.7	<10	14	3.5	150	1	3	87	100	260	10.06
HL4	115.159492	58.593159	till	8.5	<0.2	<2	9	4	630	1.9	<0.2	<5	74	8	9	71	4.5	25	<1	3.1	2.6	6	<50	41	0.3	248	5	<1	0.66	27	49	14	91	0.7	11	<5	6.1	<100	0.9	0.9	<10	14	3.5	119	1	3	77	<100	360	10.09
HL4	115.159492	58.593159	till	9.5	<0.2	2	10	11	1000	1.9	<0.2	<5	71	8	11	77	4.9	26	1	2.8	2.7	5	<50	41	0.3	265	4	<1	0.62	29	29	14	100	0.8	11	<5	6.1	<100	1.4	0.9	<10	13	3.7	139	1	3	86	110	-200	10.89
HL4	115.159492	58.593159	till	10.0	<0.2	<2	11	13	730	2.2	0.2	<5	63	8	9	89	5.7	29	1	2.7	2.4	6	<50	37	0.3	190	6	<1	0.63	32	37	15	110	0.9	11	<5	5.8	<100	1.5	0.9	<10	12	3.9	167	1	3	95	<100	330	10.26
HL4	115.159492	58.593159	till	11.0	0.3	<2	7.5	3	940	1.2	<0.2	<5	58	6	6	110	6.2	30	1	1.7	1.7	5	<50	34	<0.2	68	6	<1	0.63	29	56	13	100	0.9	11	<5	5.3	<100	1.3	0.8	<10	10	3.5	187	1	3	109	<100	-200	10.30
HL4	115.159492	58.593159	till	13.0	<0.2	<2	9.2	2	840	1.9	<0.2	<5	56	6	6	100	5.8	27	<1	2.4	2.3	4	<50	33	0.3	83	6	<1	0.6	30	41	13	99	0.9	11	<5	5.3	<100	1	0.7	<10	9.1	3.5	180	<1	3	99	<100	-200	11.23
HL8	117.469041	58.902094	till	1.5	0.3	<2	12	3	840	4.2	<0.2	<5	73	9	13	91	7.2	32	1	3.3	3.4	4	<50	45	0.2	190	4	<1	0.42	34	31	17	140	0.9	16	<5	6.9	<100	1.1	0.8	<10	15	3.8	197	<1	3	110	120	250	10.09
HL8	117.469041	58.902094	till	2.5	0.4	<2	16	7	1000	2.2	0.2	<5	60	8	13	90	6.2	39	1	3.1	3.1	5	<50	39	0.3	238	6	3	0.54	33	49	17	110	1	12	<5	6.2	<100	1.2	0.9	<10	12	5.3	187	1	3	127	130	270	11.27
HL8	117.469041	58.902094	till	3.5	0.4	<2	17	3	990	3.3	0.3	<5	64	9	11	96	6.3	38	1	3.2	3.1	5	<50	40	<0.2	203	7	2	0.53	34	33	17	110	1.1	13	<5	6.2	<100	1.3	0.8	<10	12	5.7	197	1	3	137	130	<200	10.64
HL8	117.469041	58.902094	till	5.5	0.5	<2	14	6	980	2	0.5	<5	60	9	11	89	5.7	39	1	2.9	2.8	5	<50	37	<0.2	192	8	3	0.49	36	47	16	110	1	13	<5	6.2	<100	1.3	0.8	<10	12	4.8	196	1	3	126	140	270	11.34
HL8	117.469041	58.902094	till	6.5	0.5	<2	16	5	1000	2.3	0.4	<5	68	9	11	100	5.9	37	1	3.1	3	4	<50	40	0.2	201	6	3	0.54	34	33	15	120	1.1	13	<5	6.2	<100	1.1	0.7	<10	12	4.7	190	1	3	131	130	330	10.79
HL8	117.469041	58.902094	till	7.5	0.3	<2	16	4	950	2.4	0.3	<5	61	9	11	87	6.5	38	1	2.9	2.9	4	<50	38	0.2	196	7	4	0.52	35	43	16	110	1.1	12	<5	6.1	<100	1.2	0.8	<10	12	4.7	177	1	3	129	120	380	10.63
HL8	117.469041	58.902094	till	8.5	0.6	<2	16	4	1000	2.2	0.3	<5	62	9	10	94	6.2	39	1	2.9	3	5	<50	38	<0.2	208	6	3	0.53	34	50	16	130	1.1	13	<5	6.4	<100	1.2	0.6	<10	12	4.7	193	<1	3	139	170	210	10.42
HL8	117.469041	58.902094	till	9.5	0.3	<2	16	16	1000	2.4	0.3	<5	68	9	12	91	6.7	40	<1	2.9	3	5	<50	39	<0.2	190	5	3	0.53	33	38	17	120	1.1	13	<5	6.3	<100	1.4	0.7	<10	12	4.7	187	1	3	126	150	340	10.14
HL8	117.469041	58.902094	till	10.5	0.4	<2	14	15	930	2	0.2	<5	67	9	11	92	5.8	30	<1	3.2	2.9	5	<50	37	<0.2	251	8	2	0.54	34	27	14	110	0.9	12	<5	5.8	<100	1.2	0.6	<10	11	4.1	184	1	3	125	150	<200	10.45
HL8	117.469041	58.902094	till	11.5	0.2	<2	15	6	920	2.2	0.2	<5	69	9	13	100	6.4	31	1	2.7	3.5	7	<50	42	<0.2	241	7	2	0.56	31	32	15	130	1	13	<5	6.1	<100	1.3	0.8	<10	12	4.5	167	1	3	108	150	240	10.33
HL8	117.469041	58.902094	till	12.5	0.3	<2	20	4	900	2.3	0.3	<5	66	10	13	100	5.5	39	<1	3.2	3.2	6	<50	38	<0.2	240	5	2	0.53	35	51	18	96	1.1	12	<5	6.3	<100	1.1	0.9	<10	12	4.9	187	<1	3	127	150	340	10.47
HL8	117.469041	58.902094	till	13.5	0.2	<2	16	5	950	2.1	0.4	<5	66	9	13	100	6.5	38	1	2.6	3	4	<50	39	<0.2	231	8	5	0.52	36	49	16	110	1.2	13	<5	6	<100	1.4	0.8	<10	12	5.3	190	1	3	132	130	380	10.25
HL8	117.469041	58.902094	till	16.5	0.3	2	16	3	990	2.7	0.3	<5	65	10	12	83	6.4	31	1	3	3.3	5	<50	40	<0.2	280	5	2	0.51	33	21	19	120	1	12	<5	6.4	<100	1.2	0.9	<10	13	5.2	167	1	3	121	170	290	10.44
HL8	117.469041	58.902094	till	17.5	0.2	<2	20	3	940	3	0.5	<5	68	13	17	86	5.9	33	1	3.8	4.2	3	<50	40	<0.2	584	7	7	0.41	41	49	14	110	1.1	13	<5	6.8	<100	1	1	<10	12	12	167	<1	3	126	180	<200	10.03
HL8	117.469041	58.902094	till	18.5	0.3	<2	26	5	880	3.5	0.5	<5	93	17	31	130	6.7	36	2	4.1	6.1	5	<50	53	<0.2	664	9	9	0.54	51	69	17	120	1.4	18	<5	6.1	<100	1.1	0.9	<10	12	7.3	178	<1	4	146	230	<200	10.11
HL8	117.469041	58.902094	till	19.5	0.4	<2	22	4	1000	3.4	0.6	<5	68	14	20	89	7	38	2	3.3	4.1	3	<50	41	<0.2	376	7	7	0.4	47	59	18	110	1.3	13	<5	6.8	<100	1.4	0.8	<10	12	7.3	196	1	3	148	140	<200	10.13
HL8	117.469041	58.902094	till	20.5	0.3	<2	16	3	900	1.9	0.4	<5	63	11	14	89	6.2	34	1	2.7	2.9	5	<50	38	<0.2	224	8	3	0.47	35	37	16	110	1	12	<5	6.1	<100	1.2	0.8	<10	12	4.9	179	1	3	127	180	<200	10.60
HL8	117.469041	58.902094	till	21.5	0.3	<2	17	<2	830	2.1	0.3	<5	62	10	12	88	5.9	33	1	3	3.1	5	<50	38	<0.2	220	7	2	0.5	33	35	15	110	0.9	12	<5	6.1	<100	1	0.7	<10	12	5.1	163	<1	3	127	140	300	10.11
HL8	117.469041	58.902094	till	22.5	0.3	<2	16	4	950	2	0.3	<5	62	9	11	100	6.6	34	1	2.9	3.1	5	<50	39	<0.2	214	6	2	0.52	34	37	16	120	1	13	<5	6.2	<100	1.3	0.9	<10	12	4.8	176	<1	3	114	170	300	10.31
HL8	117.469041	58.902094	till	23.5	0.2	4	17	5	1000	2.1	0.4	<5	64	9	12	91	6.3	34	<1	2.9	3	6	<50	39	<0.2	228	4	3	0.54	34	33	15	120	1.1	12	<5	6.3	<100	1.3	0.8	<10	13	4.9	172	<1	3	118	110	320	10.71
HL8	117.469041	58.902094	till	25.5	0.2	<2	14	8	980	2	0.2	<5	64	9	12	92	6.3	33	1	2.8	3	5	<50	38	0.2	237	5	1	0.52	33	31	14	110	1	12	<5	5.9	<100	1.2	0.8	<10	12	4.4	171	<1	2	120	130	<200	10.12
HL8	117.469041	58.902094	till	26.5	0.3	<2	15	3	970	2.2	0.2	<5	60	7	12	100	5.6	38	1	2.9	3	5	<50	38	<0.2	253	6	1	0.53	32	26	15	120	1	12	<5	6	<100	1	0.7	<10	12	4.5	178	1	3	115	140	230	10.59
HL8	117.469041	58.902094	till	27.5	0.3	<2	15	29	960	2.3	0.3	<5	69	11	12	89	5.7	35	1	3.4	3.3	4	<50	38	0.2	294	5	2	0.54	34	58	14	110	1.1	12	<5	5.8	<100	1.2	0.7	<10	11	4.6	184	1	2	119	110	<200	10.12
HL8	117.469041	58.902094	till	28.5	0.2	2	15	61	900	1.7	0.4	<5	59	10	10	80	5.6	34	1	3.1	2.9	5	<50	36	<0.2	234	4	2	0.54	34	27	16	100	1	11	<5	5.8	<100	1.2	0.8	<10	11	4.2	179	1	2	126	130	<200	10.37
HL8	117.469041	58.902094	till	29.5	0.3	<2	14	8	1000	1.9	0.2	<5	69	10	13	96	6.1	33	1	3.1	3.1	5	<50	39	0.2	267	6	2	0.52	33	39	15	110	1	12	<5	6	<100	1.2	0.8	<10	12	4.7	179	1	3	118	120	240	10.52
HL8	117.469041	58.902094	till	30.5	0.3	<2	15	4	920	2.3	0.3	<5	64	11	12	110	6.4	32	1	3.1	3.3	5	<50	39	<0.2	261	5	2	0.49	31	53	16	120	1	12	<5	6.1	<100	1.4	0.8	<10	12	4.9	175	1	2	117	120	360	10.74
HL8	117.469041	58.902094	till	31.5	<0.2	<2	15	3	920	2	0.3	<5	67	10	13	110	6.4	32	1	3.3	3.1	6	<50	40	0.3	246	5	2	0.54	33	31	14	120	1	13	<5	6.3	<100	1.2	0.9	<10	13	4.7	173	1	3	113	140	230	10.41
HL8	117.469041	58.902094	till	32.5	0.3	<2	14	52	890	2	0.2	<5	60	10	12	81	6.2	32	1	2.8	2.9	5	<50	37	<0.2	248	3	1	0.49	31	40	15	110	1	12	<5	6.3	<100	1	0.7	<10	11	4.5	180	<1	3	113	120	220	10.10
HL8	117.469041	58.902094	till	33.5	0.2	<2	14	<2	880	2.3	0.2	<5	64	9	13	97	6.1	32	1	3	3	5	<50	39	<0.2	227	5	1	0.49	31	35	15	110	0.9	13	<5	6.1	<100	1.3	0.8	<10	12	5.7	166	1	3	118	150	<200	10.23
HL8	117.469041	58.902094	till	34.5	0.2	<2	14	4	870	1.9	0.2	<5	66	10	12	97	6	33	1	2.8	3	5	<50	39	0.3	250	5	1	0.5	32	33	15	120	1	13	<5	5.9	<100	1.2	0.6	<10	12	4.3	168	<1	3	113	160	280	10.80
HL8	117.469041	58.902094	till	35.5	<0.2	<2	16	4	980	2	0.4	<5	65	10	13	89	6.4	36	1	3.2	3.2	6	<50	41	<0.2	271	3	1	0.53	35	27	15	120	1.2	13	<5	6.4	<100	1.1	1	<10	13	4.9	184	1	3	120	170	330	10.47
HL8	117.469041	58.902094	till	37.5	0.4	<2	14	3	900	1.9	0.4	<5	67	11	13	88	6.2	33	1	3.2	3.3	4	<50	38	0.3	265	6	1	0.5	38	36	17	120	1	13	<5	6	<100	0.9	0.7	<10	12	4.3	178	1	2	127	120	340	10.15
HL9	117.237134	58.716729	Till	1.5	0.2	<2	14	3	850	3.6	0.3	<5	67	15	16	84	5	31	1	3.6	3.2	5	<50	37	0.2	498	6	1	0.49	41	28	18	100	0.9	12	<5	6.2	<100	1.2	0.8	<10	12	3.9	156	<1	3	112	170	<200	10.56
HL9	117.237134	58.716729	Till	2.5	0.2	<2	18	4	780	3	0.2	<5	77	14	19	87	5.3	31	1	3.3	3.8	6	<50	39	<0.2	360	5	3	0.53	38	46	17	100	1.1	12	<5	6	<100	1.2	0.8	<10	12	4.7	163	<1	3	117	130	330	10.43
HL9	117.237134	58.716729	Till	3.5	<0.2	<2	12	2	790	2.1	<0.2	<5	65	9	10	70	5.5	29	1	3	2.9	5	<50	37	<0.2	290	5	2	0.51	29	28	16	100	0.8	11	<5	5.8	<100	1.1	0.8	<10	12	4.2	156	1	2	109	100	270	10.22
HL9	117.237134	58.716729	Till	4.5	<0.2	<2	13	2	870	1.9	0.3	<5	69	10	12	86	5.8	32	<1	3	2.9	6	<50	38	0.2	263	6	2	0.52	32	43	15	110	0.9	12	<5	6	<100	1.1	0.8	<10	12	4.4	155	<1	3	108	110	350	10.37
HL9	117.237134	58.716729	Till	5.5	0.3	<2	13	2	830	2.8	0.2	<5	58	10	10	79	5.6	35	1	3.2	2.8	5	<50	37	0.2	266	7	1	0.49	33	46	14	110	0.9	12	<5	5.8	<100	1	0.8	<10	11	4.1	171	1	3	115	100	250	10.28
HL9	117.237134	58.716729	Till	6.5	<0.2	<2	12	<2	850	2.6	<0.2	<5	60	9	10	85	6	31	<1	2.9	2.8	5	<50	37	<0.2	264	5	1	0.51	32	47	15	100	0.9	11	<5	5.6	<100	1	0.7	<10	12	4.3	164	1	3	111	120	380	9.71
HL9	117.237134	58.716729	Till	7.5	0.3	<2	13	2	800	2.5	0.3	<5	63	10	12	85	5	30	1	3.4	3.2	5	<50	38	<0.2	304	7	2	0.54	31	37	15	100	0.9	12	<5	5.7	<100	1.1	0.9	<10	12	4.3	157	1	2	108	120	260	9.76
HL10	117.914995	58.574983	Till	1.5	0.3	<2	14	3	1000	2.3	0.2	<5	59	11	12	93	5.5	33	1	3.5	3.2	5	<50	36	0.2	293	5	<1	0.44	36	27	15	120	1	13	<5	6.2	<100	1	0.9	<10	11	3.2	179	<1	3	115	130	300	10.11
HL10	117.914995	58.574983	Till	3.5	0.3	<2	21	5	1000	2.1	0.2	<5	65	8	9	98	6.4	38	1	3	3.5	5	<50	40	0.2	147	6	2	0.41	30	28	17	110	1.1	13	<5	6.3	<100	1.2	0.8	<10	12	4.3	193	1	3	124	160	<200	10.17
HL10	117.914995	58.574983	Till	5.5	0.2	<2	16	7	920	1.8	0.2	<5	63	9	14	98	5.8	38	1	2.9	2.8	5	<50	37	0.2	202	5	2	0.42	38	46	18	110	1	12	<5	5.9	<100	1.2	0.8	<10	12	4.6	185	1	3	119	110	260	10.25
HL10	117.914995	58.574983	Till	7.5	0.4	<2	16	4	980	2	0.3	<5	65	10	13	93	5.9	37	1	2.9	3	5	<50	39	0.2	230	8	1	0.44	35	39	17	110	1	12	<5	6.1	<100	1.3	0.7	<10	12	4.7	190	1	3	137	140	270	10.51
HL10	117.914995	58.574983	Till	9.5	<0.2	<2	16	9	960	2.1	0.2	<5	67	10	13	91	6.4	38	1	2.9	3	5	<50	39	<0.2	203	6	3	0.45	35	41	17	110	1	12	<5	6.1	<100	1.1	0.9	<10	12	4.4	192	1	3	119	150	240	10.62
HL10	117.914995	58.574983	Till	11.5	0.3	<2	14	4	890	1.8	<0.2	<5	64	10	13	86	5.9	33	1	3.1	3.2	5	<50	38	0.2	270	6	2	0.51	34	34	17	100	1	12	<5	5.9	<100	1.1	0.9	<10	11	4.2	176	1	3	124	130	310	10.63
HL10	117.914995	58.574983	Till	13.5	0.4	2	15	3	970	2	0.3	<5	64	11	13	86	6.5	36	1	3.3	3.1	5	<50	38	<0.2	230	8	3	0.47	35	47	16	110	1.1	13	<5	5.9	<100	1.1	0.9	<10	12	4.5	193	1	3	123	<100	230	10.48
HL10	117.914995	58.574983	Till	15.5	0.5	3	15	3	1000	2.1	0.4	<5	69	10	14	93	6.7	36	1	3.1	3.3	5	<50	40	<0.2	231	8	3	0.5	33	51	16	120	1.1	14	<5	6.2	<100	1	1	<10	12	4.6	190	1	3	123	150	<200	10.27
HL10	117.914995	58.574983	Till	17.5	0.3	<2	15	4	910	1.8	0.2	<5	60	11	13	91	6.2	32	1	3.4	3.1	5	<50	39	<0.2	270	9	1	0.53	32	45	17	110	1	12	<5	6	<100	1.3	0.8	<10	12	4.6	177	1	3	122	140	<200	10.38
HL10	117.914995	58.574983	Till	19.5	0.2	3	15	6	860	1.5	0.3	<5	66	11	14	84	6.2	32	<1	3	3.4	5	<50	37	<0.2	284	6	2	0.53	34	48	18	100	1	12	<5	6	<100	1.1	1	<10	12	4.5	173	<1	3	131	130	<200	10.19
HL10	117.914995	58.574983	Till	21.5	0.5	<2	15	5	1000	1.9	0.3	<5	66	11	13	86	6.7	35	1	3.4	3.3	5	<50	40	<0.2	263	7	2	0.48	35	51	18	110	1	13	<5	6.1	<100	1.4	0.7	<10	12	4.8	179	1	3	132	200	<200	10.69
HL10	117.914995	58.574983	Till	23.5	0.3	<2	19	<2	1300	2	0.4	<5	74	11	16	100	7.1	35	1	2.7	3.4	5	<50	42	<0.2	220	4	3	0.49	36	47	16	120	1.2	14	<5	6.4	<100	1.3	0.7	<10	13	5.5	182	<1	3	128	200	300	10.65
HL10	117.914995	58.574983	Till	27.5	0.2	<2	16	4	840	1.8	0.4	<5	67	11	14	88	6.1	31	1	3.4	3.4	6	<50	39	<0.2	264	5	2	0.57	34	44	16	110	1	12	<5	6.2	<100	1.5	0.9	<10	12	4.7	159	1	3	117	150	290	10.72
HL10	117.914995	58.574983	Till	28.5	0.2	<2	15	3	800	1.9	0.5	<5	58	11	14	83	5.7	37	1	3.2	2.9	5	<50	36	<0.2	319	9	4	0.51	36	53	16	110	1.1	11	<5	5.6	<100	1	0.9	<10	12	4.9	183	5	2	126	120	<200	10.25
HL11	117.427913	58.545908	till	1.2	0.2	<2	8.2	4	620	5.3	<0.2	<5	69	7	8	57	3.2	23	1	2.8	2.5	6	<50	40	0.2	224	4	<1	0.67	23	34	14	88	0.5	9.2	<5	6.2	<100	1.1	0.7	<10	14	2.6	102	<1	2	65	<100	<200	10.11
HL11	117.427913	58.545908	till	2.2	0.3	<2	18	5	1200	7	0.4	<5	73	10	14	98	6.4	43	1	3.5	3.9	5	<50	42	<0.2	230	6	4	0.54	37	46	17	120	1.2	13	<5	6.6	<100	1.2	0.8	<10	12	5	200	<1	3	124	140	300	10.21
HL11	117.427913	58.545908	till	3.2	0.6	<2	23	6	1100	4.8	0.6	<5	64	10	13	92	6	43	1	3.6	3.8	5	<50	38	0.3	450	7	3	0.56	41	48	18	120	1.3	13	<5	6.6	<100	1.2	0.8	<10	12	5.1	199	<1	3	144	200	<200	10.06
HL11	117.427913	58.545908	till	4.2	0.7	<2	16	5	1100	3.8	0.4	<5	61	9	11	90	5.9	41	1	3.1	2.9	5	<50	37	0.2	215	6	2	0.56	34	57	17	110	1.1	13	<5	6.4	<100	0.7	0.8	<10	12	4.7	191	1	3	133	160	<200	10.52
HL11	117.427913	58.545908	till	5.2	0.5	<2	16	4	1000	3.1	0.5	<5	59	11	12	88	6.2	44	1	2.8	2.8	5	<50	36	0.2	220	6	2	0.52	37	49	16	110	1	12	<5	6	<100	1	0.8	<10	11	4.6	204	1	3	149	140	<200	10.46
HL11	117.427913	58.545908	till	6.1	0.5	<2	17	5	1100	4.2	0.5	<5	65	9	10	98	6.4	42	1	3.1	2.9	5	<50	38	<0.2	201	7	3	0.58	37	64	16	120	1.1	12	<5	6.1	<100	1.1	0.8	<10	12	4.6	200	1	3	146	140	<200	10.50
HL11	117.427913	58.545908	till	7.0	0.7	<2	178	6	830	2.7	4.1	<5	57	220	460	25	2.5	100	1	18.2	19	<1	<50	33	<0.2	390	142	117	0.28	447	770	12	38	6.7	6	10	6.1	<100	<0.5	0.7	<10	6.2	25.1	162	<1	2	585	700	<200	10.09
HL11	117.427913	58.545908	till	7.5	1.3	<2	143	8	560	2.9	8.5	13	33	168	1130	<20	3.1	155	<1	14	20.1	<1	<50	19	<0.2	72	129	75	0.19	358	2110	14	37	7.1	4.6	10	4.8	<100	<0.5	<0.5	<10	3.9	15	252	<1	1	910	2200	<200	10.34

Hole#	Lon°	Lat°	Lith	Depth	Ag	Ag	As	Au	Ba	Br	Cd	Cd	Ce	Co	Co	Cr	Cs	Cu	Eu	Fe	Fe	Hf	Ir	La	Lu
McA	117.566282	56.130187	till	>10	0.2	2	14	4	1100	1	0.3	<5	58	8	14	100	4.8	30	1	2.9	3.4	8	<50	34	<0.2
McA	117.566282	56.130187	till	>10	<0.2	3	14	5	1100	1.4	0.2	<5	63	8	13	80	4	29	1	3	3.1	8	<50	34	0.3
McA	117.566282	56.130187	till	>10	0.3	<2	14	3	1000	1	0.3	<5	60	9	15	87	4.9	27	1	3.1	3.1	7	<50	34	0.2
McA	117.566282	56.130187	till	>10	0.2	<2	12	6	1100	2	0.2	<5	63	8	10	84	5.6	32	1	2.9	3.2	6	<50	35	<0.2
McA	117.566282	56.130187	till	>10	0.3	<2	14	5	1100	1	<0.2	<5	60	10	14	99	4.6	29	1	3	3.3	7	<50	36	0.3
PR3	117.159310	56.451585	till	15.0	0.3	<2	14	5	1000	1.6	0.5	<5	61	10	13	100	4.2	38	1	2.5	3.5	6	<50	38	<0.2
PR3	117.159310	56.451585	till	16.1	0.4	<2	13	12	950	1.9	<0.2	<5	64	8	12	110	4.2	34	2	2.9	3.3	6	<50	39	<0.2
PR3	117.159310	56.451585	till	17.6	0.3	<2	15	8	1000	1.8	0.7	<5	63	9	16	94	5.4	44	2	2.8	3.3	5	<50	37	0.2
PR3	117.159310	56.451585	till	18.6	<0.2	<2	14	34	990	1.9	0.6	<5	59	9	12	100	4.8	43	<1	2.5	3.4	6	<50	38	<0.2
PR3	117.159310	56.451585	till	19.6	0.2	<2	13	41	990	1.8	0.3	<5	60	8	12	96	5.8	39	<1	2.9	3.1	6	<50	36	<0.2
PR3	117.159310	56.451585	till	20.9	0.2	<2	17	10	1000	1.9	0.3	<5	57	8	14	100	4	34	1	3.4	3.7	7	<50	38	<0.2
PR3	117.159310	56.451585	till	20.9	0.2	<2	16	11	1000	1.9	0.4	<5	57	9	14	94	4.1	33	1	3.6	3.6	7	<50	35	<0.2
PR3	117.159310	56.451585	till	22.3	0.6	<2	15	3	1100	1.8	0.3	<5	64	8	12	100	3.7	29	1	3.4	3.7	8	<50	40	<0.2
PR3	117.159310	56.451585	till	22.8	<0.2	<2	17	4	1100	2.3	0.3	<5	65	8	14	78	5.2	29	1	3.3	3.5	7	<50	35	<0.2
PR3	117.159310	56.451585	till	24.1	0.3	<2	15	3	1000	1.5	<0.2	<5	68	11	15	100	5.6	33	<1	2.9	3.6	6	<50	38	0.3
PR3	117.159310	56.451585	till	25.5	0.4	<2	13	5	990	1.4	0.3	<5	60	9	11	110	3.6	29	1	2.9	3.4	7	<50	36	<0.2
PR3	117.159310	56.451585	till	27.3	<0.2	<2	13	6	970	1.4	0.3	<5	64	9	14	100	5.2	32	1	3.1	3.6	7	<50	37	0.3
PR3	117.159310	56.451585	till	28.5	0.2	<2	13	5	1200	1.7	0.3	<5	61	11	11	89	3.6	27	1	3.4	3.7	8	<50	33	0.3
PR3	117.159310	56.451585	till	30.3	0.3	<2	13	8	990	1.5	0.2	<5	66	9	14	96	5.8	38	1	3.2	3.4	5	<50	36	0.2
PR3	117.159310	56.451585	till	31.6	0.2	<2	13	3	900	1.7	<0.2	<5	67	9	14	120	5.3	35	1	3.2	3.4	6	<50	36	0.2
PR8	117.896276	56.297336	till	1.0	<0.2	<2	15	8	1100	1.6	0.5	<5	79	11	17	110	7.3	43	2	2.5	3.6	5	<50	44	0.4
PR8	117.896276	56.297336	till	2.0	0.2	<2	15	<2	1100	1.3	0.8	<5	89	10	17	110	6.8	34	1	2.9	3.8	5	<50	44	0.4
PR8	117.896276	56.297336	till	3.0	<0.2	<2	18	<2	1200	1.5	0.3	<5	71	10	15	110	6.2	32	1	2.6	3.8	7	<50	40	0.3
PR8	117.896276	56.297336	till	4.0	0.2	<2	15	12	1100	1.9	<0.2	<5	71	9	12	120	6.9	34	<1	2.5	3.7	6	<50	41	0.3
PR8	117.896276	56.297336	till	5.0	0.2	<2	21	<2	920	1.7	0.2	<5	71	10	12	94	6.8	32	1	3.1	4.1	6	<50	40	0.3
PR8	117.896276	56.297336	till	6.0	0.2	<2	14	10	990	2.1	<0.2	<5	75	11	14	96	6.2	33	1	2.8	3.6	6	<50	42	0.3
PR8	117.896276	56.297336	till	7.0	<0.2	<2	14	7	970	1.8	0.2	<5	73	10	14	110	6.4	33	1	3.4	3.7	6	<50	40	0.3
PR8	117.896276	56.297336	till	8.0	<0.2	<2	14	6	1000	2.1	0.2	<5	72	10	14	95	5.9	33	1	2.6	3.4	5	<50	38	0.3
PR8	117.896276	56.297336	till	9.0	0.2	<2	17	4	1100	1.4	<0.2	<5	74	8	15	92	7	33	1	2.8	3.8	6	<50	43	0.3
PR8	117.896276	56.297336	till	10.0	0.2	<2	18	3	2100	2.6	0.2	<5	85	6	10	130	8.1	46	2	2.6	3.1	4	<50	49	0.3
PR8	117.896276	56.297336	till	11.5	0.2	<2	17	6	13000	6.5	<0.2	<5	83	5	5	150	10	53	2	1.1	1.4	4	<50	49	<0.2
PR8	117.896276	56.297336	till	13.5	0.2	<2	28	5	750	5.1	0.5	<5	70	9	14	100	6.6	37	1	2	2.8	5	<50	41	0.4
PR10	117.965558	56.013414	till	3.5	0.3	<2	14	6	1100	1.5	0.4	<5	67	10	18	130	4.7	37	1	2.9	4	6	<50	40	<0.2
PR10	117.965558	56.013414	till	4.2	0.3	<2	15	15	1100	2.4	0.4	<5	62	11	16	100	4.9	37	1	2.4	3.4	6	<50	40	<0.2
PR10	117.965558	56.013414	till	4.8	0.3	<2	16	13	1100	1.6	0.3	<5	67	9	17	120	4.7	35	<1	3.3	3.8	6	<50	40	0.2
PR10	117.965558	56.013414	till	6.1	0.4	<2	12	6	1000	1.7	0.2	<5	55	7	13	100	4.6	31	<1	2.9	3.4	6	<50	37	<0.2
PR10	117.965558	56.013414	till	7.4	<0.2	<2	12	8	1100	1.2	0.4	<5	65	9	16	95	6.1	31	1	3.1	3.6	6	<50	38	0.3
PR10	117.965558	56.013414	till	8.4	0.3	<2	14	4	1000	1.7	0.3	<5	62	9	14	110	4.9	34	1	3.2	3.9	6	<50	39	<0.2
PR10	117.965558	56.013414	till	11.4	<0.2	<2	12	6	1100	1.4	0.3	<5	68	10	16	110	6.1	33	1	3	3.5	6	<50	40	0.3
PR10	117.965558	56.013414	till	17.5	<0.2	<2	13	13	960	1.4	0.2	<5	65	8	13	86	5.9	31	2	2.8	3.5	6	<50	37	<0.2
PR10	117.965558	56.013414	till	18.6	0.2	<2	15	9	1000	1.4	0.5	<5	58	9	15	100	5.1	31	1	3	3.6	5	<50	38	<0.2
PR10	117.965558	56.013414	till	19.8	0.2	<2	12	6	1000	1.2	1.1	<5	66	10	16	120	5.1	32	<1	2.4	3.6	6	<50	40	<0.2
PR10	117.965558	56.013414	till	21.3	0.2	<2	13	3	990	1.3	0.3	<5	64	9	15	110	5.8	34	1	3.2	3.4	5	<50	36	<0.2
PR10	117.965558	56.013414	till	28.1	0.2	<2	26	4	1000	1.7	<0.2	<5	60	10	18	90	6.3	35	1	4	4.9	6	<50	39	<0.2
PR10	117.965558	56.013414	till	30.0	<0.2	<2	10	8	670	1	<0.2	<5	59	7	10	110	4.7	21	1	2	2.4	7	<50	36	0.3
PR10	117.965558	56.013414	till	31.4	<0.2	<2	7.5	8	1300	0.8	<0.2	<5	61	6	8	120	5.7	18	1	1.8	2.2	9	<50	35	0.3
Win 6	117.433509	56.446979	silt/clay	3.4	0.2	<2	12	3	870	2	0.2	<5	72	9	14	110	8.4	41	1	2.9	3.3	3	<50	42	<0.2
Win 6	117.433509	56.446979	diamict	5.8	0.2	<2	16	4	950	2	0.3	<5	77	12	23	120	7.9	65	1	3.1	3.7	4	<50	42	0.2
Win 6	117.433509	56.446979	till	8.5	0.3	<2	16	3	990	1.8	0.3	<5	61	8	14	93	6.6	38	1	2.8	3	6	<50	35	<0.2
Win 6	117.433509	56.446979	till	9.9	0.3	<2	16	5	900	2.2	0.3	<5	65	8	13	100	6	40	1	3	3.1	6	<50	36	<0.2
Win 6	117.433509	56.446979	till	12.7	0.3	<2	16	2	950	1.9	<0.2	<5	62	8	13	97	5.9	32	1	2.7	3.2	6	<50	36	<0.2
Win 6	117.433509	56.446979	till	15.4	0.4	<2	16	<2	960	1.9	0.2	<5	60	9	13	88	6.5	33	1	2.8	2.9	5	<50	35	<0.2
Win 6	117.433509	56.446979	till	19.1	0.2	<2	17	5	940	1.9	0.2	<5	62	8	13	100	6.5	57	1	2.9	3	6	<50	36	<0.2
Win 6	117.433509	56.446979	till	21.8	0.2	<2	16	<2	910	1.6	0.3	<5	62	8	12	89	6.4	31	1	2.6	3	5	<50	35	<0.2
Win 6	117.433509	56.446979	till	24.5	0.3	<2	17	<2	930	1.8	0.2	<5	64	9	13	90	6.1	32	1	2.8	3	5	<50	35	<0.2
Win 6	117.433509	56.446979	till	27.3	<0.2	<2	17	3	910	1.5	0.3	<5	65	9	13	91	6	31	1	2.7	3.1	5	<50	36	<0.2
Win 6	117.433509	56.446979	till	30.0	0.2	<2	17	<2	950	1.9	<0.2	<5	69	9	13	96	6.4	32	<1	2.6	3.2	6	<50	38	<0.2
Win 6	117.433509	56.446979	till	32.8	0.3	<2	18	4	980	1.9	0.3	<5	73	8	16	110	6.5	31	1	3.1	3.5	6	<50	41	<0.2
Win 6	117.433509	56.446979	till	39.0	<0.2	<2	16	<2	880	1.8	0.2	<5	64	8	12	110	5.4	30	<1	2.8	3.2	6	<50	37	0.2
Win 6	117.433509	56.446979	till	41.8	<0.2	<2	15	<2	920	1.7	0.4	<5	66	9	14	100	5.6	49	1	3	3.3	6	<50	37	<0.2
Win 6	117.433509	56.446979	till	44.5	0.3	2	15	4	890	1.8	0.3	<5	70	8	14	110	6.1	37	1	2.9	3.4	6	<50	36	<0.2
Win13	117.908669	56.797720	diamict	14.9	0.2	<2	12	3	970	2.1	0.8	<5	74	9	14	110	8.3	50	<1	3.2	3.8	3	<50	42	<0.2
Win13	117.908669	56.797720	silt/clay	20.6	<0.2	<2	10	4	810	1	0.6	<5	58	8	10	76	3.7	40	1	2.8	2.5	5	<50	32	<0.2
Win13	117.908669	56.797720	till	21.3	0.2	<2	13	3	950	1.4	0.7	<5	82	9	14	110	7.8	46	1	3	3.5	4	<50	42	<0.2
Win13	117.908669	56.797720	till	22.1	0.3	<2	13	5	890	2	0.3	<5	69	9	14	97	6.2	36	1	2.9	3.2	6	<50	37	<0.2
Win13	117.908669	56.797720	till	23.3	0.4	<2	14	3	1100	1.2	0.5	<5	72	9	16	110	7	40	1	2.6	3.5	5	<50	39	0.2
Win13	117.908669	56.797720	till	24.4	0.2	<2	14	4	950	1.6	0.3	<5	58	8	14	81	5.9	37	1	2.5	3.3	6	<50	35	<0.2
Win13	117.908669	56.797720	till	27.1	0.3	<2	14	<2	1000	1.2	0.4	<5	63	8	13	95	6	36	1	2.7	3.2	6	<50	35	0.2
Win13	117.908669	56.797720	till	29.9	0.4	<2	13	5	960	1.9	0.3	<5	64	9	13	97	5.6	39	1	2.5	3.3	6	<50	37	<0.2
Win13	117.908669	56.797720	till	32.6	0.4	2	14	<2	1000	1.5	0.2	<5	58	9	12	94	5.8	34	1	2.7	3.1	6	<50	33	<0.2
Win13	117.908669	56.797720	till	35.4	0.4	<2	15	4	1000	1.8	0.4	<5	64	8	13	98	5.9	37	1	2.3	3.3	6	<50	35	<0.2
Win13	117.908669	56.797720	till	36.7	0.3	<2	14	4	970	1.6	0.4	<5	64	8	13	110	5.7	35	<1	2.6	3.2	6	<50	34	<0.2
Win13	117.908669	56.797720	till	40.8	0.4	<2	14	52	990	1.8	0.4	<5	62	8	15	93	5.5	47	1	2.7	3.1	5	<50	34	<0.2

Hole#	Depth	Mn	Mo	Mo	Na	Ni	Ni	Pb	Rb	Sb	Sc	Se	Sm	Sn	Ta	Tb	Te	Th	U	V	W	Yb	Zn	Zn	Zr	Weight
McA	>10	319	5	1	0.73	30	41	14	89	1.3	11	<5	5.9	<100	1.2	0.8	<10	11	4.3	131	<1	3	110	110	340	10.27
McA	>10	254	5	1	0.68	26	33	16	92	1.2	10	<5	5.8	<100	1.2	1	<10	11	4.3	112	1	3	102	<100	290	12.14
McA	>10	285	6	<1	0.67	31	41	15	89	1.2	11	<5	5.7	<100	1.1	1.1	<10	11	4.2	133	1	3	114	110	390	10.22
McA	>10	204	4	<1	0.63	28	32	16	110	1.2	12	<5	5.9	<100	1.1	0.9	<10	11	4.4	138	<1	3	112	120	310	9.77
McA	>10	284	4	<1	0.73	31	48	16	99	1.3	12	<5	5.9	<100	1.3	0.9	<10	11	4.2	141	1	4	115	120	240	9.42
PR3	15.0	252	5	1	0.58	29	31	14	110	1	13	<5	6.1	<100	1.2	0.7	<10	11	4.6	150	<1	2	108	140	<200	9.78
PR3	16.1	250	6	3	0.54	31	39	16	120	1	12	<5	5.8	<100	1	0.7	<10	10	3.9	156	1	2	111	170	<200	9.22
PR3	17.6	234	6	2	0.52	32	38	11	110	1.1	12	<5	6	<100	1.1	1	<10	11	5	138	1	3	131	150	220	11.57
PR3	18.6	226	4	1	0.58	28	61	16	110	1	13	<5	6	<100	1.1	0.8	<10	11	4.1	156	1	3	113	160	280	11.31
PR3	19.6	246	4	1	0.54	29	40	16	110	1	11	<5	5.8	<100	1.2	1	<10	11	4.4	137	<1	3	110	100	290	12.07
PR3	20.9	285	7	2	0.65	30	44	15	110	1.2	12	<5	6	<100	1.1	0.8	<10	11	5.3	125	2	3	110	130	280	14.12
PR3	20.9	290	6	2	0.63	30	39	14	110	1.2	11	<5	6	<100	1.4	0.8	<10	11	5	119	1	3	113	130	460	13.76
PR3	22.3	306	7	2	0.74	32	40	16	100	1.1	11	<5	6.5	<100	1.2	0.8	<10	12	4.8	112	2	2	103	140	280	15.41
PR3	22.8	294	5	2	0.58	31	40	16	84	1.1	11	<5	6.1	<100	1.2	0.7	<10	11	5.4	122	<1	3	120	110	520	14.22
PR3	24.1	263	6	2	0.58	30	43	16	110	1.1	13	<5	6	<100	1.2	0.8	<10	11	4.6	136	<1	3	114	140	460	11.40
PR3	25.5	265	6	1	0.68	29	39	15	96	1.1	11	<5	5.9	<100	1.1	0.9	<10	11	4.3	136	1	2	105	110	400	10.45
PR3	27.3	270	4	<1	0.63	28	48	14	91	1	12	<5	5.7	<100	1.2	0.8	<10	11	4.2	119	<1	3	107	110	220	11.46
PR3	28.5	420	7	1	0.66	26	35	13	85	0.9	10	<5	5.5	<100	1.2	0.7	<10	10	4.1	110	<1	3	98	110	370	15.65
PR3	30.3	273	5	1	0.56	32	49	16	110	1.1	12	<5	5.8	<100	1.2	0.7	<10	11	4.4	139	1	3	124	160	360	14.15
PR3	31.6	280	6	3	0.58	33	40	13	110	0.9	12	<5	6	<100	1.2	0.8	<10	12	4.3	139	1	3	107	120	<200	10.83
PR8	1.0	280	4	<1	0.53	38	70	18	130	1.3	15	<5	8.2	<100	1.2	1.3	<10	13	5	173	<1	4	147	180	<200	10.38
PR8	2.0	365	5	<1	0.53	57	87	16	130	1.2	15	<5	7.9	<100	1.3	1.1	<10	13	5	177	1	4	164	200	<200	8.05
PR8	3.0	143	5	<1	0.67	27	43	16	120	1.4	14	<5	6.5	<100	1.2	0.9	<10	12	4.6	156	<1	4	131	170	260	10.37
PR8	4.0	81	7	1	0.55	30	42	19	130	1.2	15	<5	6.5	<100	1.2	1	<10	13	5.1	175	1	3	124	170	270	11.95
PR8	5.0	154	4	<1	0.54	31	34	15	110	1.1	14	<5	6.3	<100	1.2	0.8	<10	12	4.3	163	2	3	118	110	280	9.63
PR8	6.0	243	6	2	0.58	30	39	15	110	1.1	14	<5	6.5	<100	1.2	1	<10	13	4.5	164	1	3	112	150	260	9.29
PR8	7.0	267	4	2	0.56	31	59	16	120	1	13	<5	6.2	<100	1.3	0.7	<10	12	4.1	156	<1	3	117	120	320	9.67
PR8	8.0	260	5	2	0.56	32	54	16	110	1	13	<5	6.1	<100	1.1	0.8	<10	12	4.2	140	1	3	109	130	230	10.66
PR8	9.0	190	7	2	0.56	29	40	17	120	1.1	14	<5	6.4	<100	1.2	0.8	<10	13	4.7	170	1	3	94	<100	<200	9.20
PR8	10.0	94	6	3	0.39	23	39	17	140	1.1	16	<5	8.4	<100	1.3	1	<10	13	5.9	221	1	3	89	100	<200	8.98
PR8	11.5	33	12	7	0.26	15	<10	11	160	1	17	<5	8.4	<100	1.3	1	<10	13	12	247	2	3	57	<100	330	8.59
PR8	13.5	52	8	3	0.36	41	60	12	110	0.7	12	<5	7.6	<100	1.3	1.1	<10	11	4.6	156	<1	4	261	300	<200	10.66
PR10	3.5	290	6	<1	0.69	33	58	20	130	1.3	14	<5	6.2	<100	1.4	0.7	<10	12	5	175	1	3	125	130	<200	10.93
PR10	4.2	314	5	<1	0.62	31	62	17	120	1.2	13	<5	6.3	<100	1.2	0.9	<10	11	5.3	173	1	2	113	130	270	9.83
PR10	4.8	220	6	1	0.74	31	37	18	130	1.3	14	<5	6.3	<100	1.1	0.8	<10	12	4.6	150	<1	3	116	200	<200	7.91
PR10	6.1	220	4	<1	0.65	30	45	16	120	1.2	12	<5	5.9	<100	1.1	0.6	<10	11	4.2	148	1	2	109	130	240	9.68
PR10	7.4	297	4	1	0.61	31	46	16	110	1.2	13	<5	6.2	<100	1	1	<10	12	4.5	153	1	3	117	140	440	11.07
PR10	8.4	232	6	<1	0.67	32	31	17	120	1.3	14	<5	6.2	<100	1.3	0.9	<10	11	4.6	163	2	3	114	140	<200	11.76
PR10	11.4	220	3	<1	0.64	30	41	17	110	1.3	14	<5	6.2	<100	1.3	0.9	<10	12	4.6	153	<1	3	113	130	240	9.42
PR10	17.5	183	4	<1	0.59	29	42	15	110	1.2	13	<5	5.8	<100	1.4	0.8	<10	12	4.4	143	1	3	112	170	350	9.52
PR10	18.6	290	7	1	0.63	33	45	16	120	1.3	13	<5	6	<100	1.1	0.8	<10	11	4.4	147	1	3	108	170	340	11.68
PR10	19.8	224	5	1	0.65	33	50	17	130	1.3	14	<5	6.1	<100	1.1	1	<10	11	4.6	178	1	3	127	150	<200	9.57
PR10	21.3	290	5	2	0.59	35	53	14	110	1.2	12	<5	5.9	<100	1.2	1	<10	11	4.6	158	1	3	118	150	<200	9.51
PR10	28.1	460	6	<1	0.57	33	34	14	110	1.4	13	<5	6.1	<100	1.4	0.7	<10	12	4.6	159	<1	3	134	140	<200	10.91
PR10	30.0	72	4	<1	0.58	23	25	15	120	0.9	12	<5	5.9	<100	1.2	0.8	<10	11	4.2	139	<1	3	103	120	260	12.37
PR10	31.4	50	3	<1	0.48	21	23	15	100	0.7	11	<5	5.7	<100	1.4	1	<10	12	4	134	<1	3	86	<100	330	11.41
Win 6	3.4	210	5	<1	0.37	33	53	13	140	1.2	16	<5	6.2	<100	1.1	0.6	<10	14	4	172	1	2	98	130	<200	10.45
Win 6	5.8	263	6	1	0.4	34	49	16	120	1	16	<5	6.5	<100	1.3	0.9	<10	13	3.9	176	1	2	105	110	220	10.23
Win 6	8.5	208	6	2	0.47	32	45	17	110	1.2	11	<5	6.4	<100	1.3	0.8	<10	12	4.8	149	1	2	112	100	350	10.01
Win 6	9.9	208	5	1	0.48	31	56	15	110	1.1	13	<5	6.1	<100	1.2	0.8	<10	12	4.5	163	1	3	114	<100	210	10.41
Win 6	12.7	240	6	1	0.5	30	31	13	110	1.2	12	<5	6.3	<100	1.3	0.8	<10	12	4.9	165	1	3	114	100	270	10.49
Win 6	15.4	206	5	2	0.48	30	38	15	120	1.1	12	<5	6.3	<100	1.1	0.8	<10	12	4.7	162	1	2	116	110	240	10.98
Win 6	19.1	218	6	1	0.49	33	46	15	110	1.1	12	<5	6.3	<100	1	0.9	<10	12	4.9	167	1	2	113	<100	220	11.00
Win 6	21.8	224	5	2	0.49	29	38	14	120	1.1	12	<5	6.1	<100	1.3	0.7	<10	12	4.4	157	<1	3	107	100	<200	10.35
Win 6	24.5	220	6	1	0.48	30	44	13	100	1	12	<5	6	<100	1.2	0.8	<10	12	4.2	162	<1	2	110	100	<200	10.48
Win 6	27.3	225	6	1	0.49	31	34	16	110	1	13	<5	6	<100	1.2	0.8	<10	12	4.3	167	1	3	115	<100	<200	10.51
Win 6	30.0	229	5	1	0.54	29	46	15	110	1	13	<5	6.1	<100	1.1	0.8	<10	12	4.4	162	<1	3	108	120	300	10.54
Win 6	32.8	211	5	1	0.56	30	55	16	120	1.1	15	<5	6.4	<100	1.3	0.7	<10	12	4.4	167	<1	3	115	110	<200	10.10
Win 6	39.0	232	5	1	0.57	30	28	15	100	1.1	13	<5	6	<100	0.9	0.8	<10	12	4.2	156	1	3	104	110	240	10.13
Win 6	41.8	268	5	1	0.59	32	36	17	110	1.1	13	<5	6	<100	1.2	0.8	<10	12	4.3	153	<1	2	113	130	290	10.52
Win 6	44.5	245	4	2	0.57	30	42	16	100	1.1	14	<5	6	<100	1	1	<10	12	4.2	167	2	3	106	<100	240	10.51
Win13	14.9	268	4	<1	0.37	36	46	18	130	1	16	<5	6.3	<100	1.1	0.7	<10	13	4.4	204	<1	3	113	140	<200	10.11
Win13	20.6	345	7	<1	0.56	29	24	12	81	1.1	11	<5	5.1	<100	0.9	<0.5	<10	10	3.2	146	1	2	100	100	260	10.60
Win13	21.3	250	5	1	0.46	34	34	24	130	1	16	<5	6.4	<100	1.1	0.8	<10	13	4.4	179	1	3	113	110	210	10.84
Win13	22.1	257	4	<1	0.48	30	48	18	100	1	13	<5	6	<100	1.1	0.8	<10	12	4.2	149	1	2	102	110	260	10.12
Win13	23.3	296	6	1	0.5	35	49	17	120	1.1	15	<5	6.3	<100	1.1	0.9	<10	12	4.3	175	1	3	117	120	280	10.32
Win13	24.4	275	6	<1	0.56	32	51	18	100	1.2	13	<5	5.7	<100	1	0.8	<10	11	4.2	156	1	3	114	100	280	10.31
Win13	27.1	260	6	1	0.57	32	38	16	110	1.2	13	<5	5.7	<100	0.9	0.9	<10	11	4.2	162	<1	3	118	120	<200	10.14
Win13	29.9	258	7	1	0.57	34	47	15	98	1.2	13	<5	5.7	<100	1.1	0.8	<10	11	4.1	159	1	3	113	<100	<200	10.08
Win13	32.6	240	6	1	0.5	33	48	15	110	1.2	12	<5	5.8	<100	1.1	0.7	<10	11	4.4	155	<1	2	116	<100	240	10.55
Win13	35.4	251	7	1	0.54	34	43	16	110	1.2	13	<5	6.1	<100	1.2	0.8	<10	12	4.4	162	<1	2	112	110	220	11.02
Win13	36.7	254	4	2	0.54	32	46	15	110	1.2	13	<5	6	<100	1	0.6	<10	12	4.4	156	<1	3	112	120	340	10.10
Win13	40.8	265	7	1	0.51	32	39	16	100	1.2	13	<5	5.8	<100	1	0.8	<10	11	4.1	162	1	2	113	100	270	10.35