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Kimberlite Indicator Mineral Analysis from the Westlake Plain: Follow-Up to the GSC Prairie Kimberlite Study

Manitoba
Energy and Mines

Darren Praznik
Minister

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KIMBERLITE INDICATOR MINERAL ANALYSIS FROM THE WESTLAKE PLAIN: FOLLOW-UP TO THE GSC PRAIRIE KIMBERLITE STUDY

by G. Matile and E. Nielsen (Manitoba Energy and Mines),
L.H. Thorleifson and R.G. Garrett (Geological Survey of Canada)

Manitoba
Energy and Mines
Geological Services

1996

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Kimberlite Indicator Mineral Analysis from the Westlake Plain: Follow-Up to the GSC Prairie Kimberlite Study

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Winnipeg, 1996

TABLE OF CONTENTS

INTRODUCTION

Previous work by Thorleifson and Garrett (1993) indicates that five of the twelve G10 garnets found in the 816 till samples collected from Manitoba, Saskatchewan and Alberta were from the Westlake plain and the area immediately to the south (down ice) of it. The surface till in this area was deposited by southerly flowing ice as is indicated by the orientation of drumlinoid ridges and flutes. This would suggest that the G10 garnets were derived from a source close to the north end of Lake Manitoba which is the site of the most northerly G10 garnet (Oliver Lake). This conclusion is supported by the distribution of chrome spinels which forms a similar dispersion train with its apex near the south end of Lake Winnipegosis and extending south and southeast in the direction of glacier movement (Thorleifson *et al.* 1994). It should be noted that chrome diopside forms a distinct and separate dispersion train in northern Manitoba extending south and southwest from the Wekusko Lake area. There are thus two separate and distinct dispersion trains; one indicating a source in the Wekusko Lake area and the other a source near the south end of Lake Winnipegosis.

SURFICIAL SEDIMENTS AND GLACIAL HISTORY

The Westlake plain extends from the west side of Lake Winnipegosis and Lake Manitoba to the base of the Manitoba Escarpment and from the south shore of Dawson Bay to the Whitemud River. It has relatively low relief with an extensive blanket of till and few bedrock outcrops. Glacial Lake Agassiz beach and offshore sand, silt and clay deposits are found in places along the escarpment and in the Swan River valley and Dauphin Lake areas. Thick accumulations of late Holocene sediments occur as alluvial fans along the major rivers at the base of the escarpment.

A fluted, carbonate-rich till sheet is found at the surface throughout the region. The orientation of flutes and a limited number of glacial striae indicate that the ice flowed primarily to the south. In the Swan River and Dauphin re-entrants the flutes splay towards the west and southwest, indicating the glacier was in part deflected by Duck and Riding mountains. The lack of confinement by the escarpment at the re-entrants resulted in ice "spilling" into the two respective valleys. In the northern portion of the area near Pelican Rapids, two sets of glacial striations were measured: the oldest set averages 119°, whereas the most prominent set averages 247°. The second set was generated by the same ice that deposited the carbonate-rich till exposed at surface.

The surface till on the Westlake plain is easily differentiated from the surface till above the escarpment by the carbonate content and matrix texture: the surface till on the plain being much higher in carbonate and lower in clay than the till above the escarpment. Drill holes east and northeast of Dauphin indicate that the carbonate-rich surface till of northern provenance overlies till with relatively low carbonate content similar to that on top of the escarpment (Klassen, 1979). This lower till is exposed at the surface in the Swan River and Dauphin re-entrants, where the carbonate-rich till locally pinches out, suggesting that an earlier ice flow from the northwest affected at least parts of this area. This agrees with glacial striation measurements in the Pelican Rapids area. The western limit of the advance that deposited the carbonate-rich till is clearly defined in the Dauphin re-entrant by the Petlura and Grifton moraines (Klassen, 1979).

The drift thickness varies from 0 to 80 metres. West of Lake Winnipegosis, drift thickness is poorly defined; the few holes that have been drilled in that area indicate that it is generally less than 20 m thick. Between Dauphin Lake and Lake Manitoba, drift thickness increases from north to south. Bedrock outcrops are common in the north, as in the Toutes Aides-Winnipegosis area, whereas in the Ste. Rose Du Lac-Ebb and Flow Lake area, thicknesses are commonly 20 to 40 m. West of Lake Manitoba in the McCreary-Gladstone area, drift thickness is between 20 and 80 m.

METHODOLOGY AND RESULTS

The primary objective for the 1994 field work was to undertake detailed till sampling in the Westlake plain area to aid the mineral exploration industry in the search for kimberlites. The spacing between till samples has been reduced from the one sample per 800 km^2 used by the GSC in the 1992 prairie grid survey to one sample per 100 km^2. This project, therefore represents the next level of detail in regional kimberlite exploration.

The Westlake plain was divided into 243 cells, measuring 10 by 10 km using the universal transverse mercator grid, which is defined on 1:250 000 scale NTS maps. Using random numbers generated by R. Garrett of the Geological Survey of Canada, a 1 km^2 target cell was defined within each 100 km^2 cell. The objective was to collect a till sample from as close as possible to each 1 km^2 target cell. Of the 243 original cells, samples were taken from 182 cells; 61 cells were not road accessible or did not have glacial till exposed at the surface.

At each of the 182 sample sites, two samples were collected; a 40 l bulk till sample weighing approximately 70 kg and a 3 kg split. The large sample was processed for kimberlite indicator minerals, and the 3 kg split was submitted for geochemical analysis.

Samples were processed at the Saskatchewan Research Council Laboratory in Saskatoon for kimberlite indicator minerals as funds become available. Microprobe analysis of selected indicator minerals was done at the University of Manitoba.

SUMMARY OF KIMBERLITE INDICATOR MINERALS

- The till samples were processed for kimberlite indicator minerals at the Saskatchewan Research Council. Following disaggregation in a cement mixer with the aid of Calgon, the >2 mm fraction was removed by screening and the sand fraction was pre-concentrated with respect to density using a shaker table. Non-paramagnetic material in the table concentrate, primarily quartz and feldspar, was rejected using a Permroll separator. Following removal of the ferromagnetic fraction, the paramagnetic fraction was separated on the basis of density and magnetic susceptiblity using a Magstream separator. The high density concentrate was further classified using a Frantz separator.

- The 0.25-1.0 mm, >3.2 G weakly paramagnetic fraction was visually examined for kimberlitic garnets and Cr-diopsides. A split of the 0.125-1.0 mm, >3.2 G, moderately paramagnetic fraction was examined for Cr-spinels and Mg-ilmenite.

- Selected grains were mounted, polished, and quantitatively analyzed by electron microprobe at the University of Manitoba. A total of 1046 grains were analyzed.

- The 42 garnets that were analyzed were identified as 29 Cr-pyrope, 1 Ti-Ca-Mg (eclogitic) almandite, 6 Cr-grossularite, 2 pyrope, 3 grossularite, and 1 almandite.

- Among the Cr-pyropes, 9 have G1, G2 or G11 titanian compositions. The remaining have low-Ti peridotitic compositions, one of which is a slightly subcalcic G10. The remaining 19 peridotitic garnets were classified as G9.

- One Ti-Ca-Mg-almandine garnet was classified as an eclogitic G3.

- Among the 478 pyroxenes that were analyzed, 469 exceeded the arbitrary minimum of 0.5% Cr203 used for designation of Cr-diopsides. The Cr-diopsides may clearly be divided into low calcium and high calcium groups.

- A total of 24 grains were confirmed as Cr-spinel, but none of these grains fall in the diamond inclusion compositional range (>12% MgO, >60% Cr203).

- A total of 475 ilmenites were analyzed, but only three were confirmed as being magnesian in composition. These three grains have favourable composition with respect to their implications for reducing conditions and hence diamond preservation.

- Two red corundum grains also were recovered.

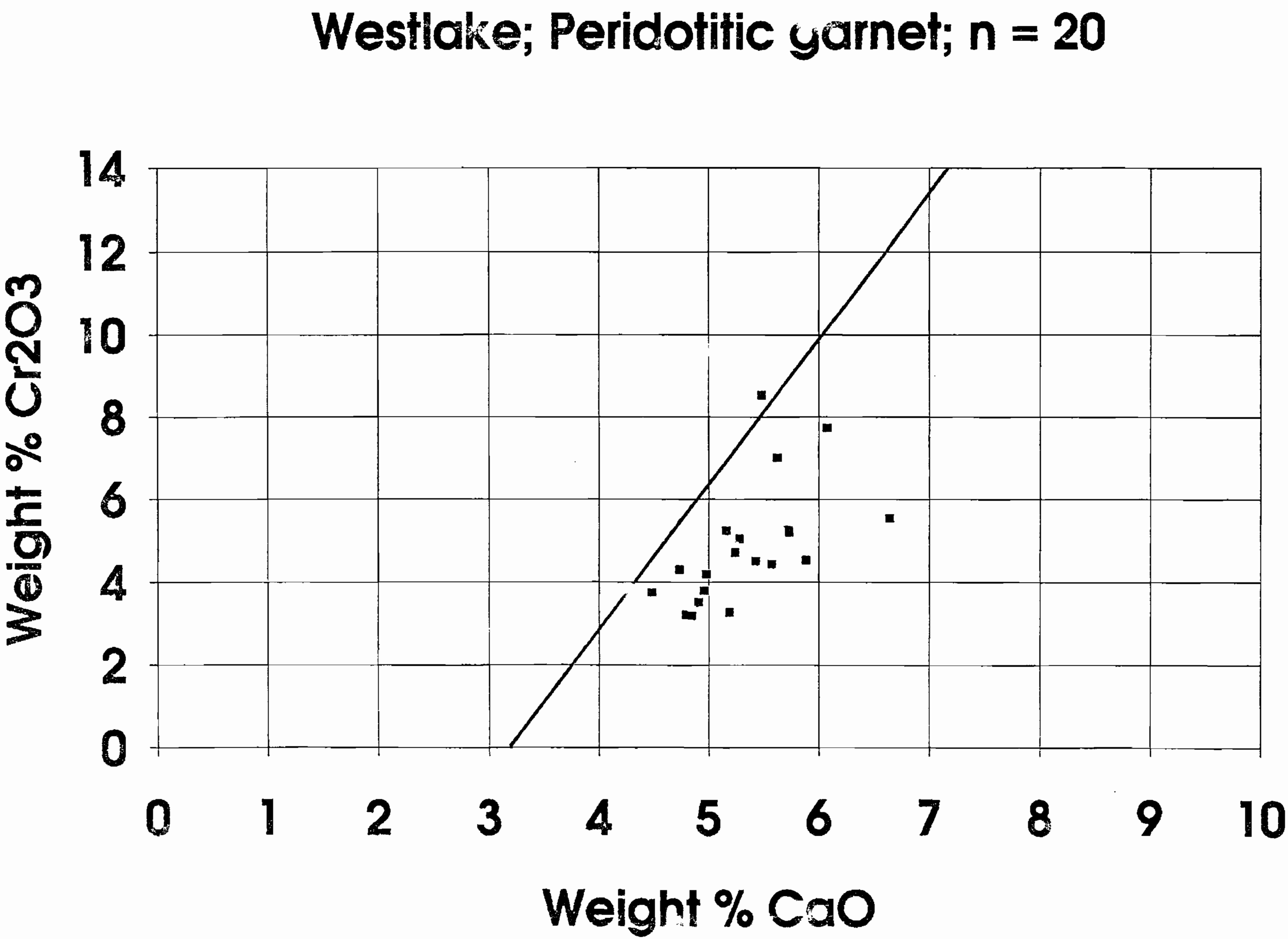
REFERENCES

Klassen, R.W.
1979: Pleistocene geology and geomorphology of the Riding Mountain and Duck Mountain areas, Manitoba-Saskatchewan; Geological Survey of Canada, Memoir 396, 52p.

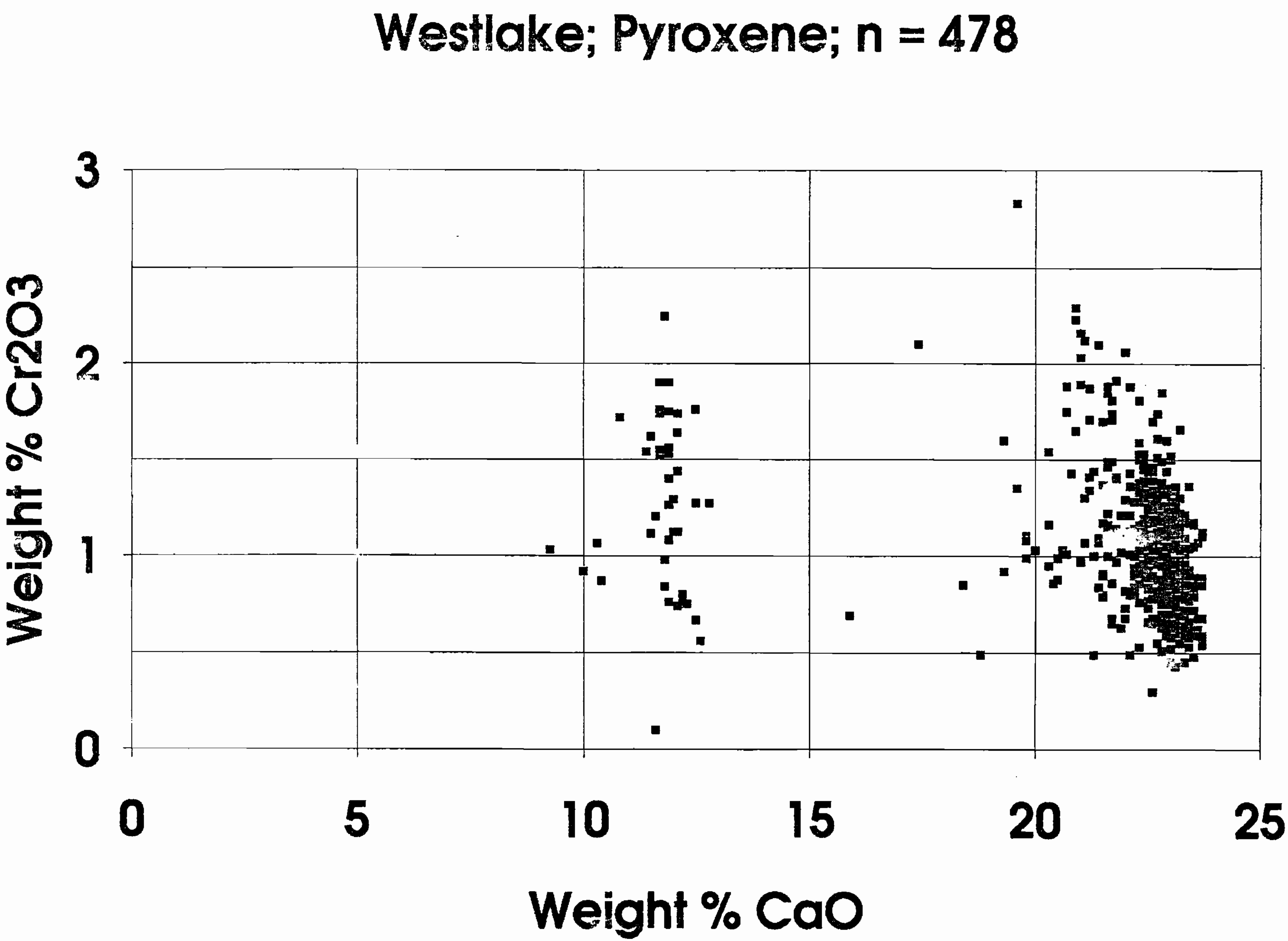
Thorleifson, L.H. and Garrett, R.G.
1993: Prairie kimberlite study - till matrix geochemistry and preliminary indicator mineral data; Geological Survey of Canada, Open File 2745, one diskette.

Thorleifson, L. H., Garrett, R.G., and Matile, G.
1994: Prairie kimberlite study - indicator mineral geochemistry. Geological Survey of Canada Open File 2875, one diskette.

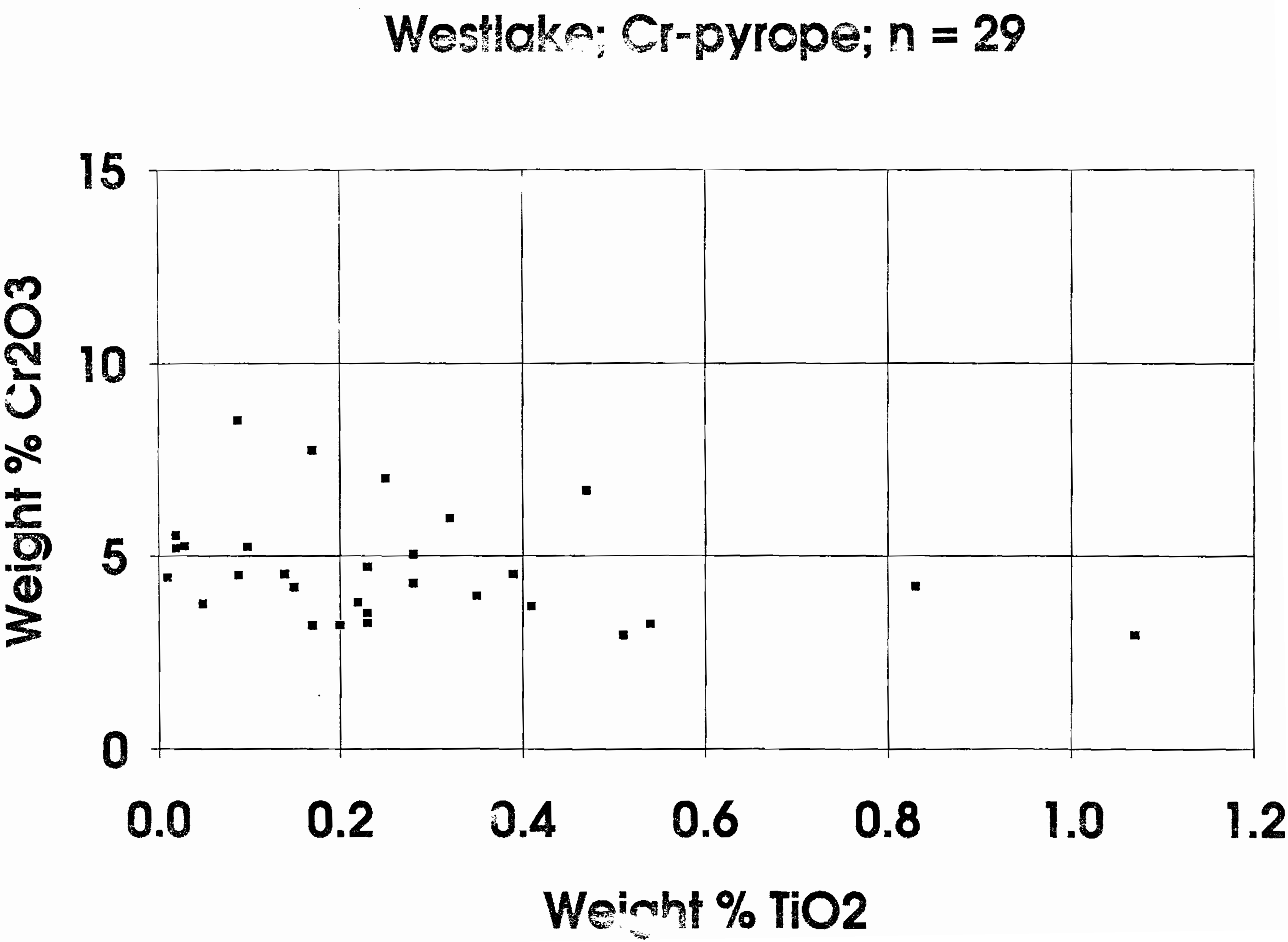
APPENDIX A:
PROBE ANALYSIS DATA



Westlake; Peridotitic garnet; n = 20
Weight % Cr2O3
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
Weight % CaO

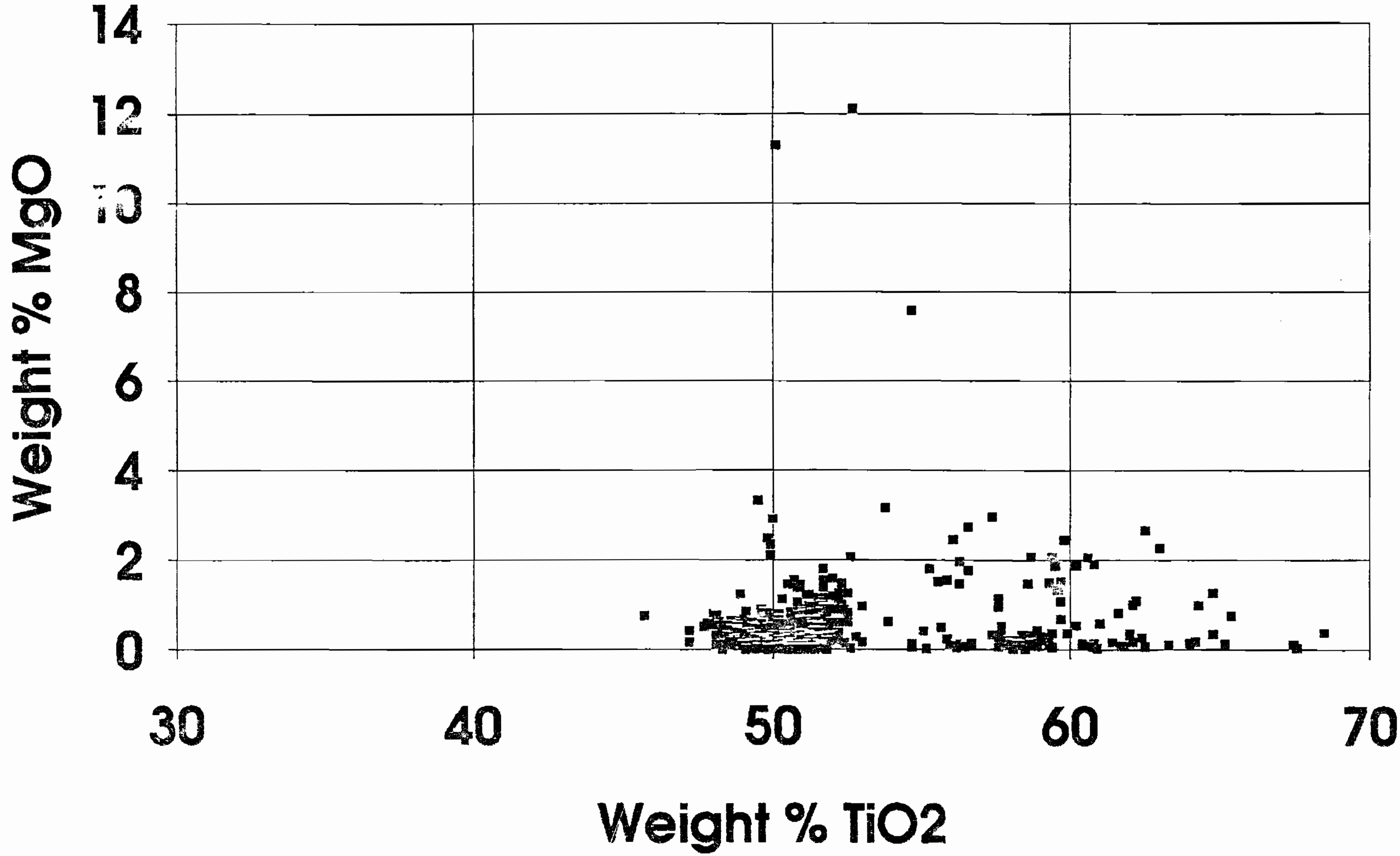


Westlake; Pyroxene; n = 478
3
2
1
0
0
5
10
15
20
25
Weight % Cr2O3
Weight % CaO

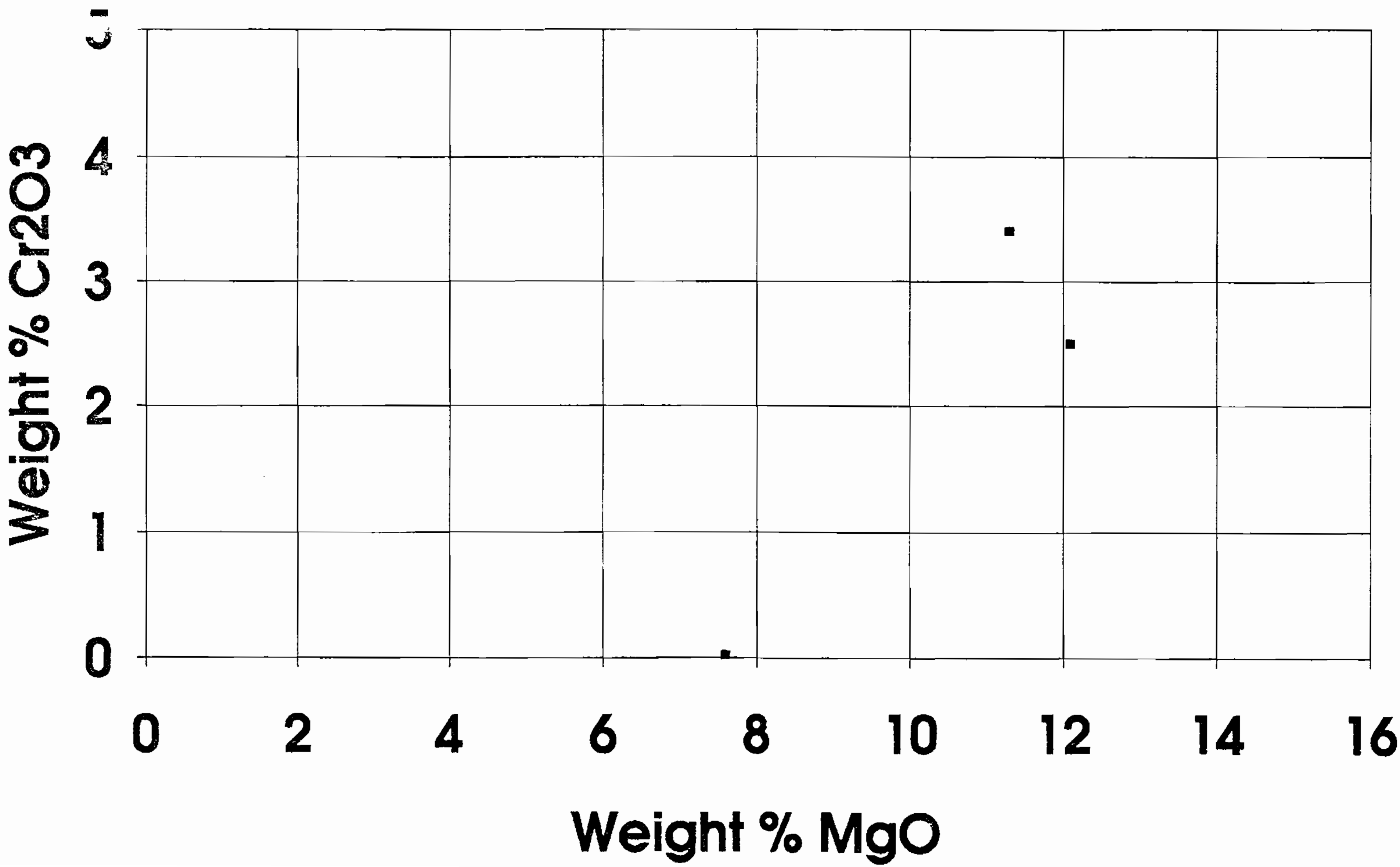


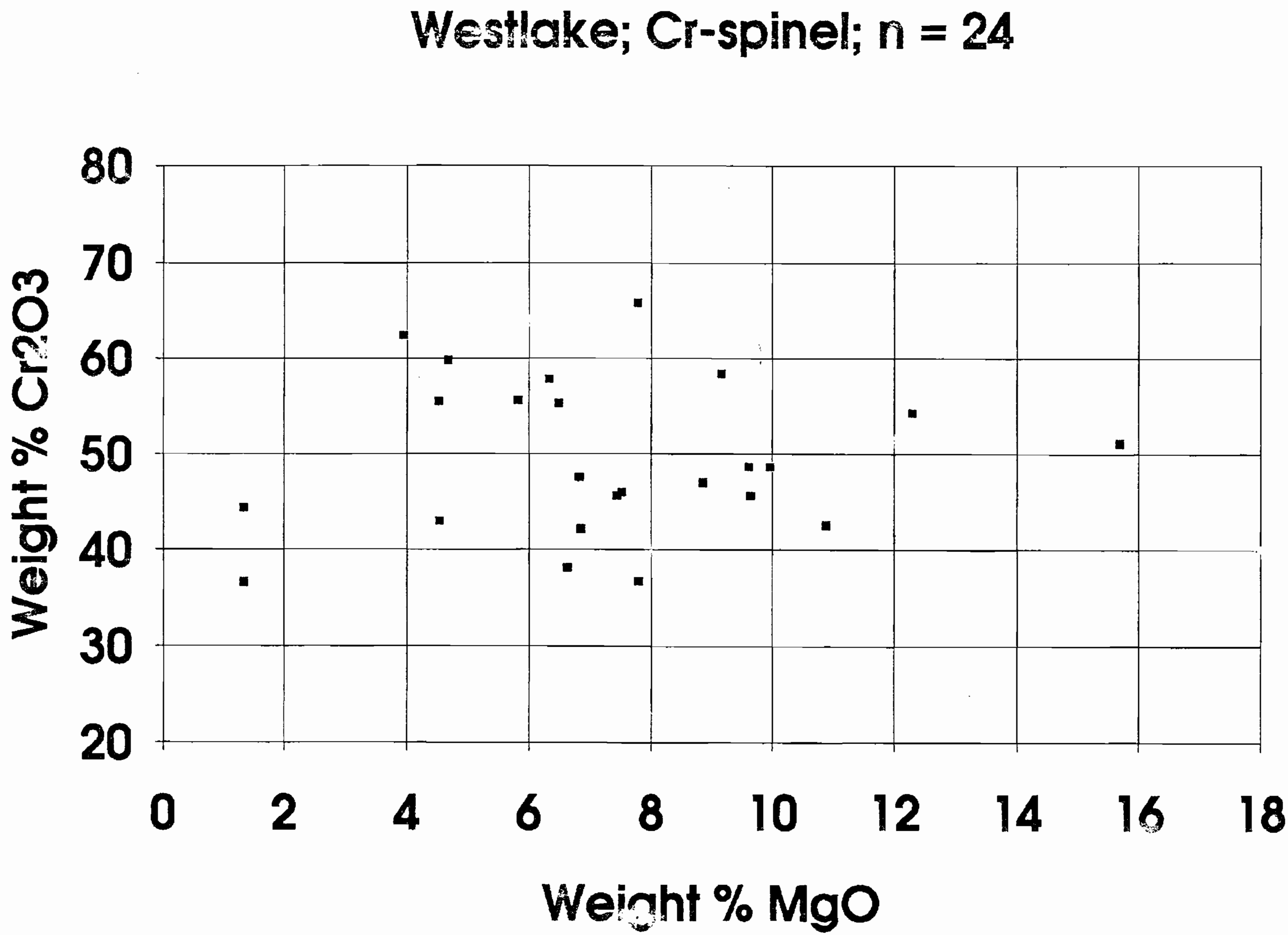
Westlake; Cr-pyrope; n = 29
Weight % Cr2O3
15
10
5
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Weight % TiO2

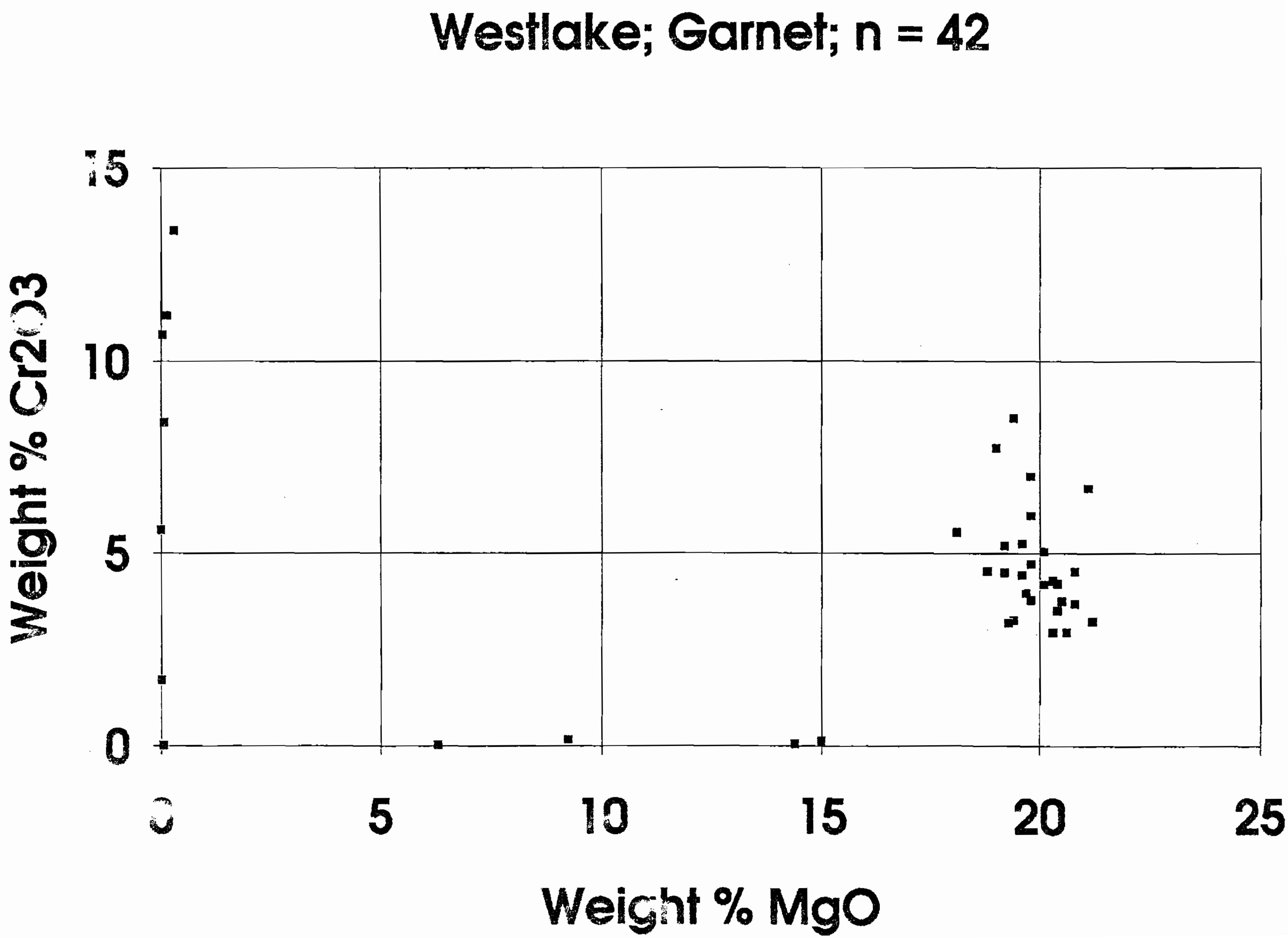
Westlake; Ilmenite; n = 475



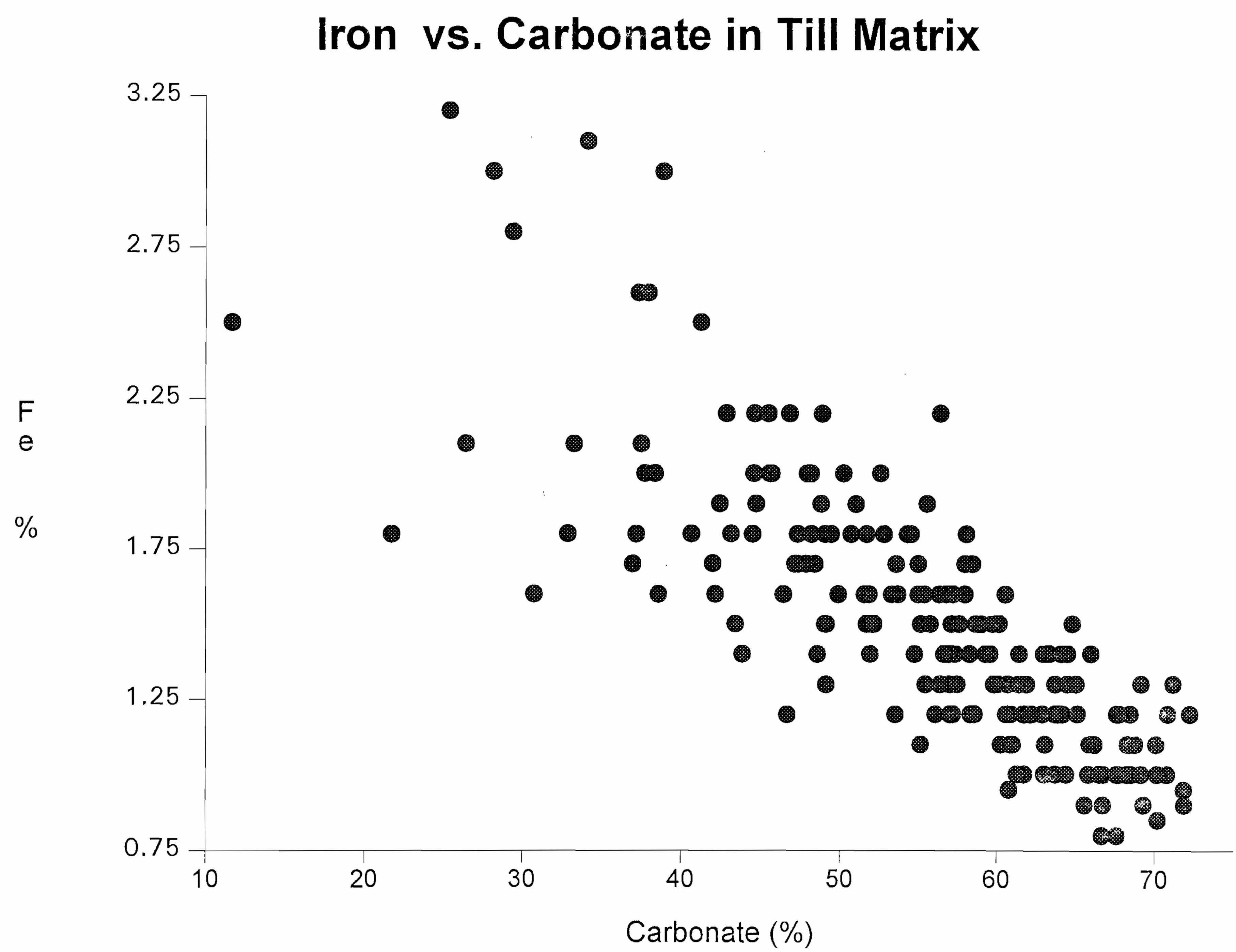
Westlake; Mg-ilmenite; n = 3



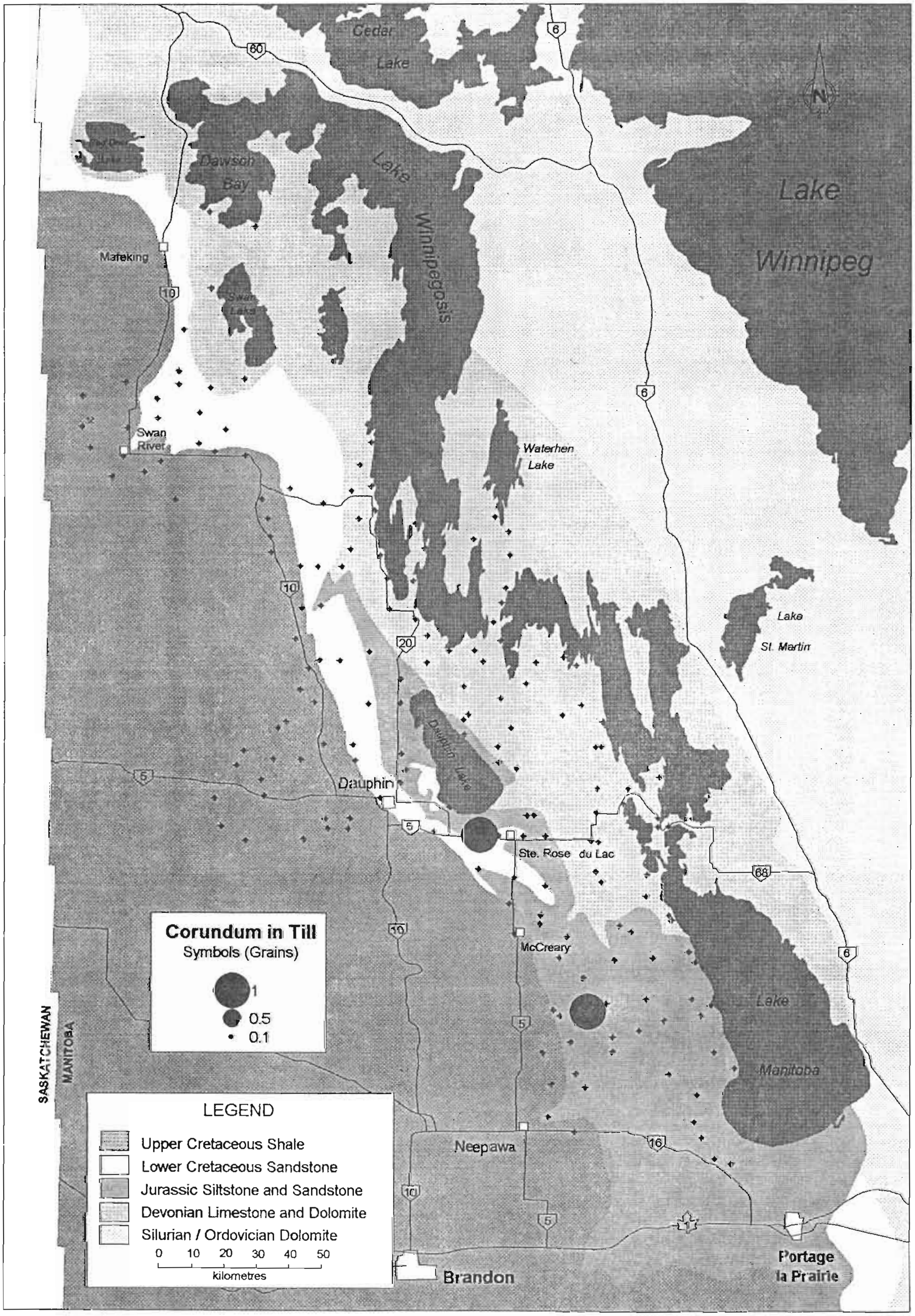

Westlake; Cr-spinel; n = 24
Weight % Cr2O3
80
70
60
50
40
30
20
0
2
4
6
8
10
12
14
16
18
Weight % MgO

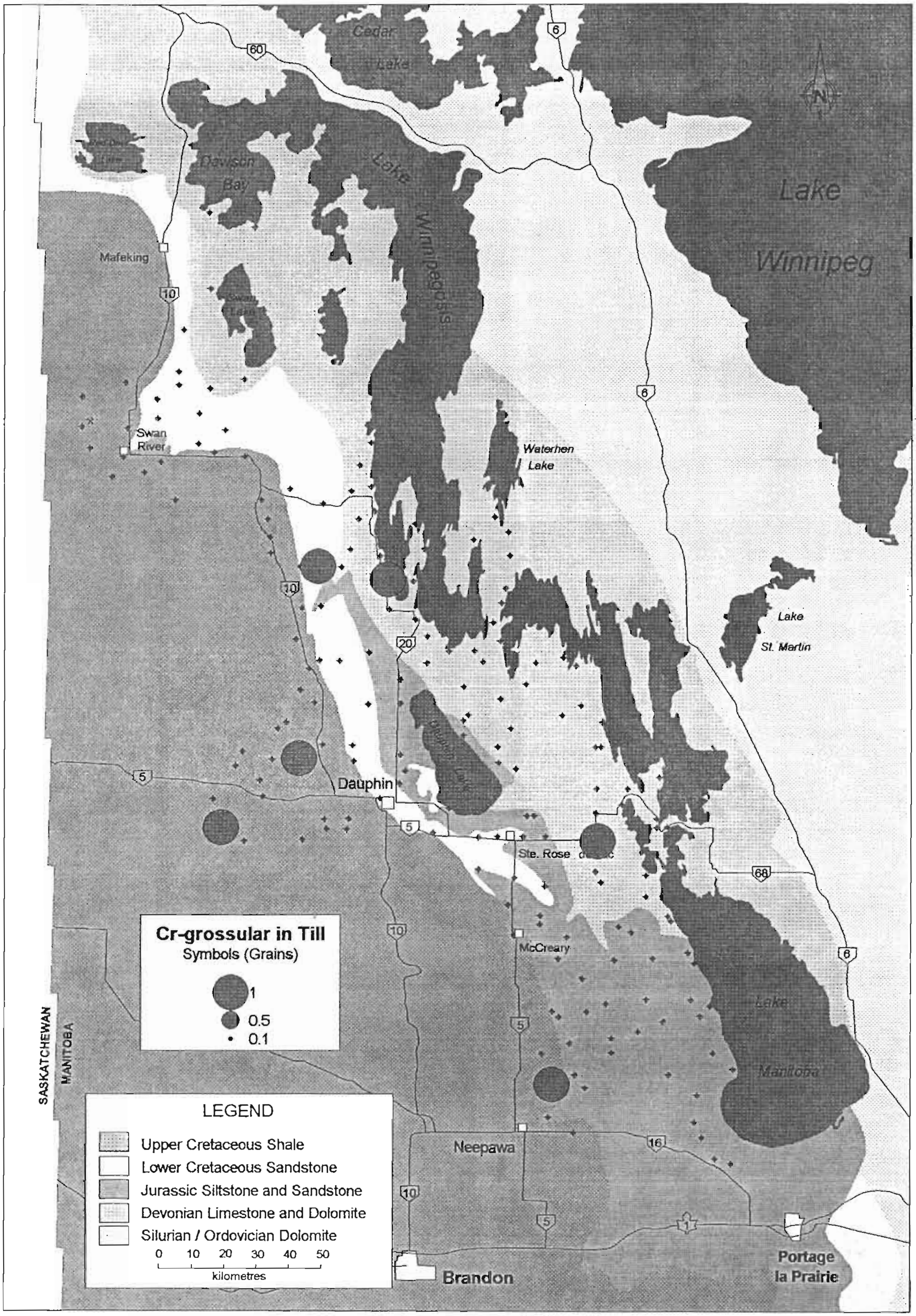


Westlake; Garnet; n = 42
Weight % Cr2O3
15
10
5
0
0
5
10
15
20
25
Weight % MgO

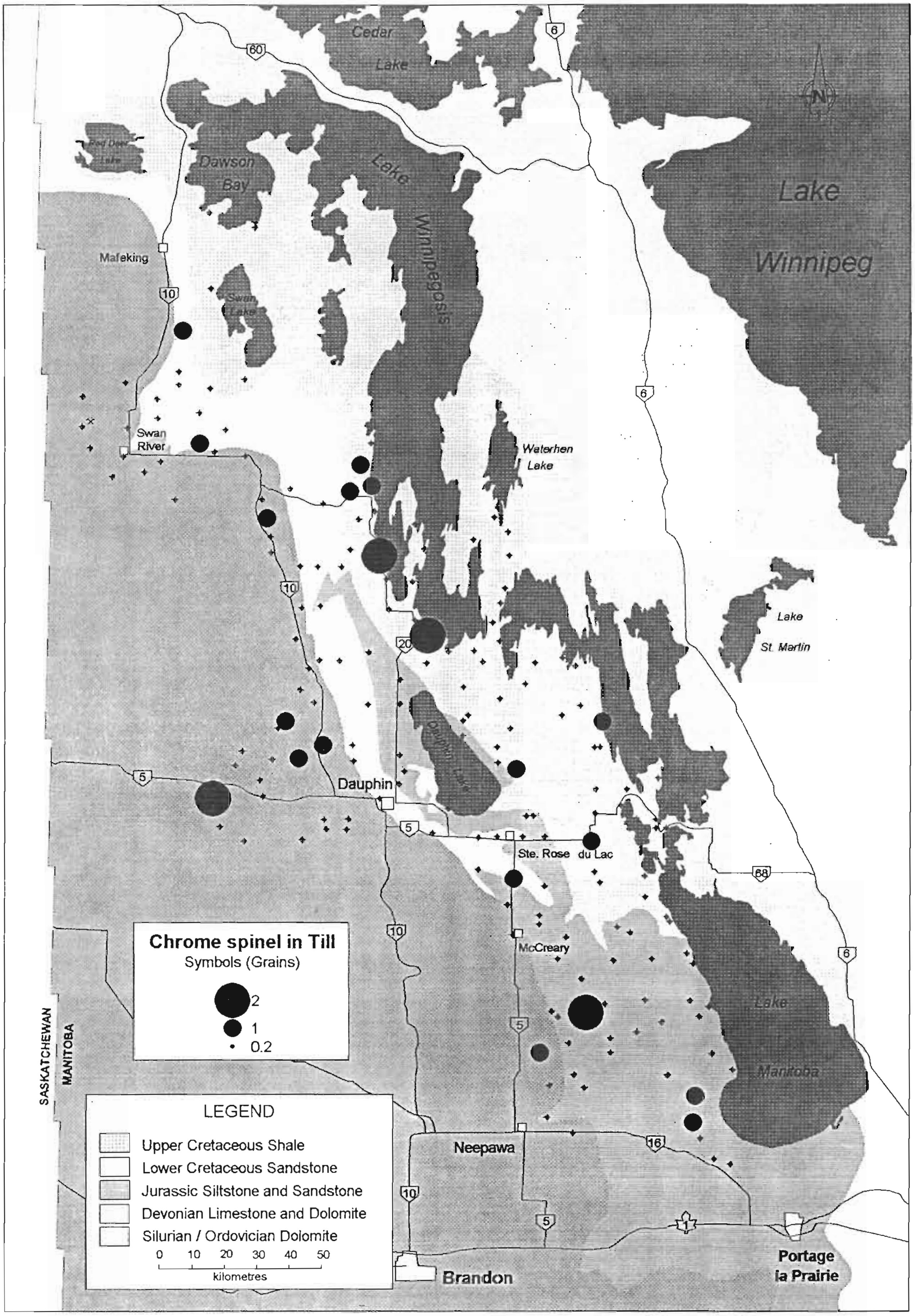

Iron vs. Carbonate in Till Matrix
Fe %
3.25
2.75
2.25
1.75
1.25
0.75
10
20
30
40
50
60
70
Carbonate (%)

APPENDIX B:
GRAIN COUNT

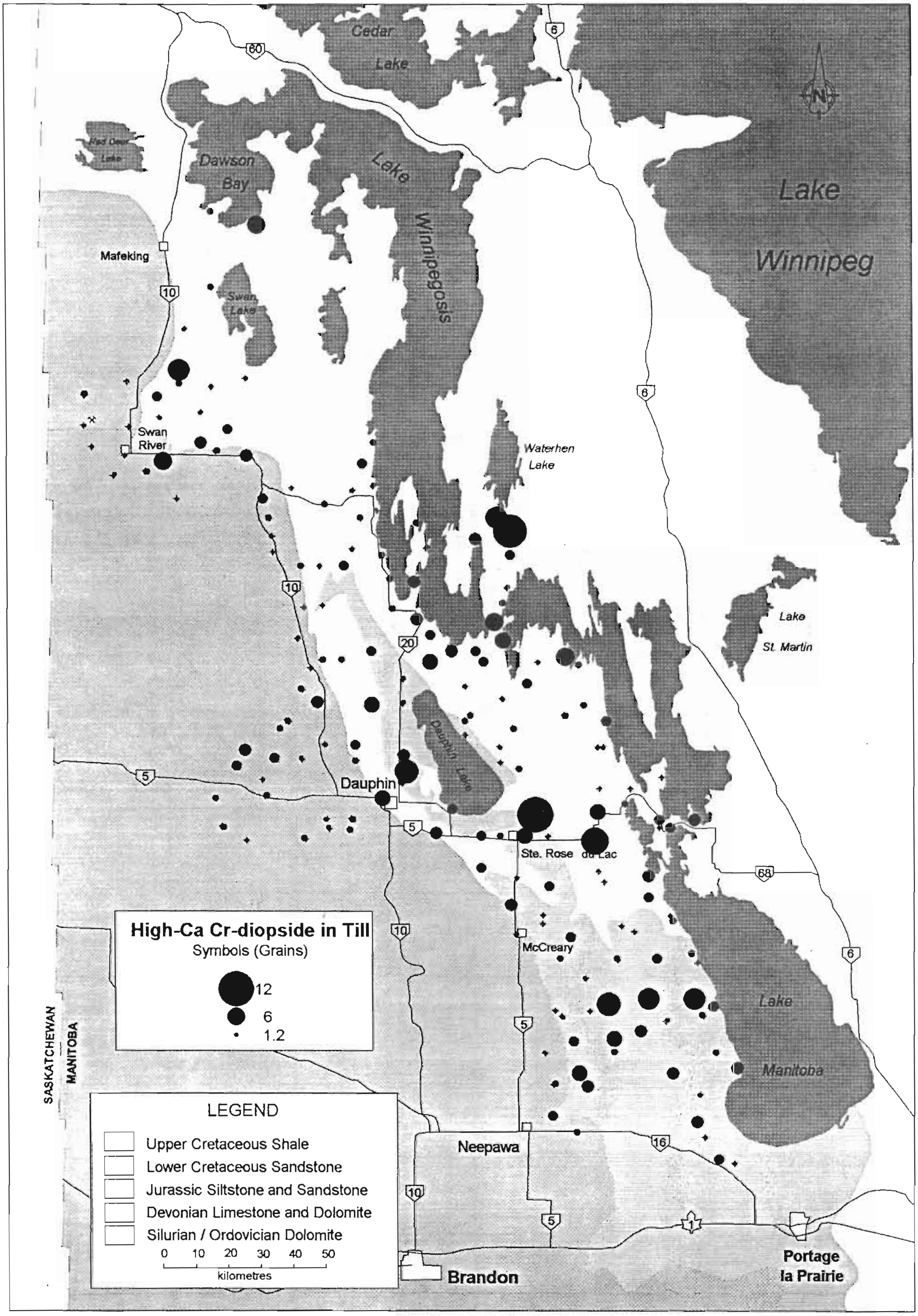

Cedar Lake
Lake Winnipegosis
Dawson Bay
Lake Winnipeg
Mafeking
Swan Lake
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
Corundum in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



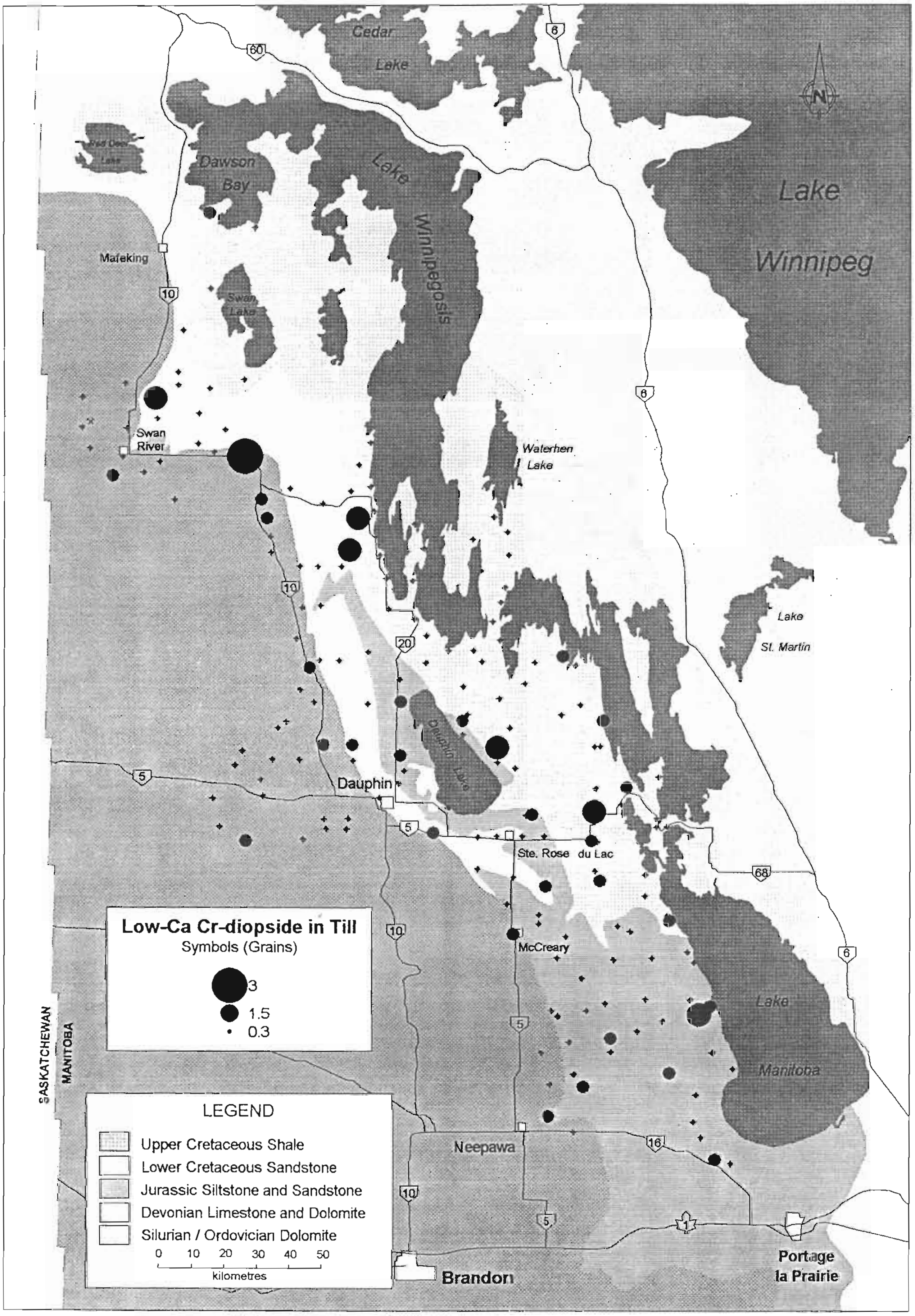
Cedar Lake
Lake Winnipegosis
Davison Bay
Swan Lake
Lake Winnipeg
Mafeking
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Ste. Rose
McCreary
Neepawa
Lake Manitoba
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
Cr-grossular in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



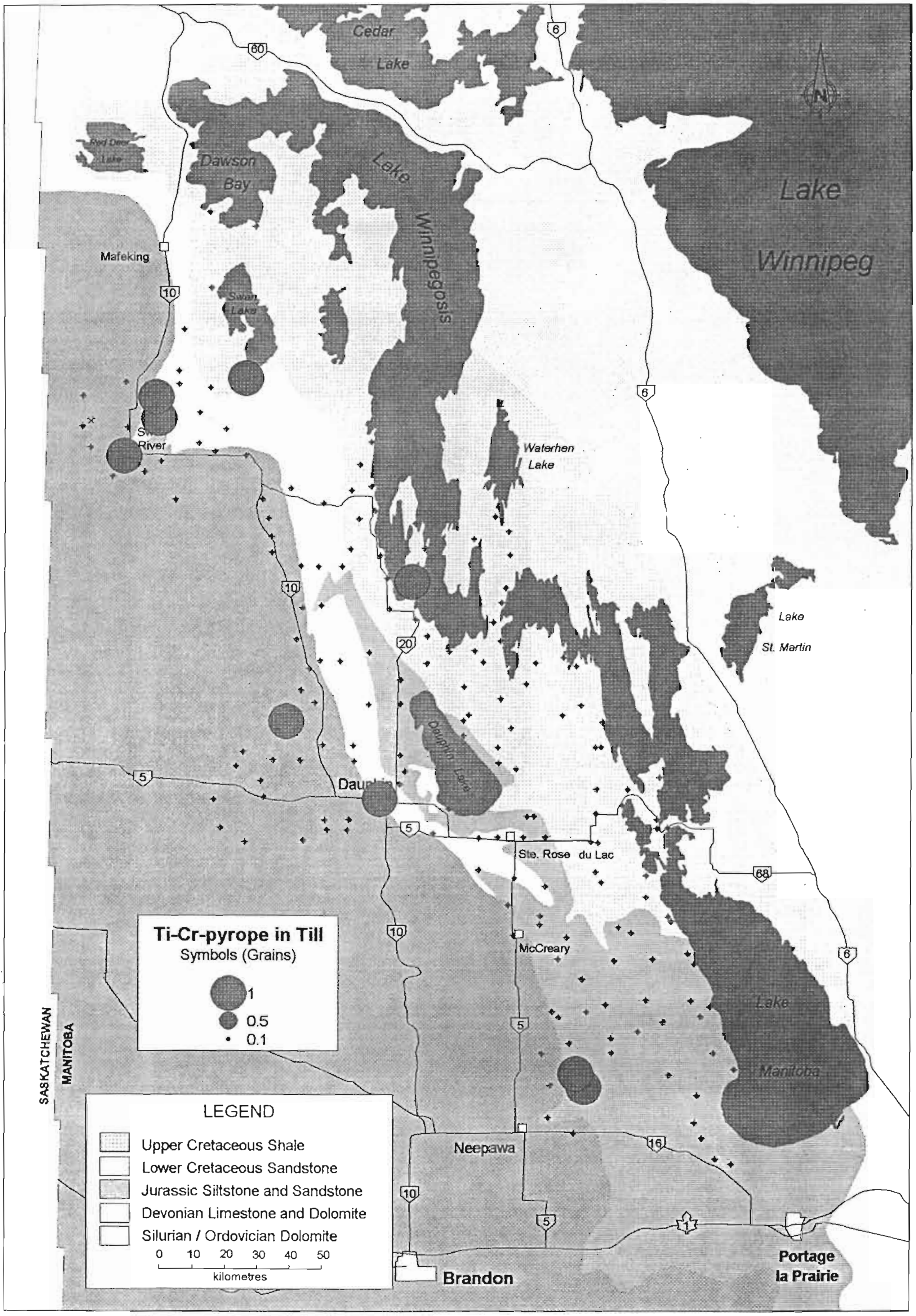
Cedar
Lake
Red Deer
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
60
6
10
20
5
68
16
1
Chrome spinel in Till
Symbols (Grains)
2
1
0.2
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



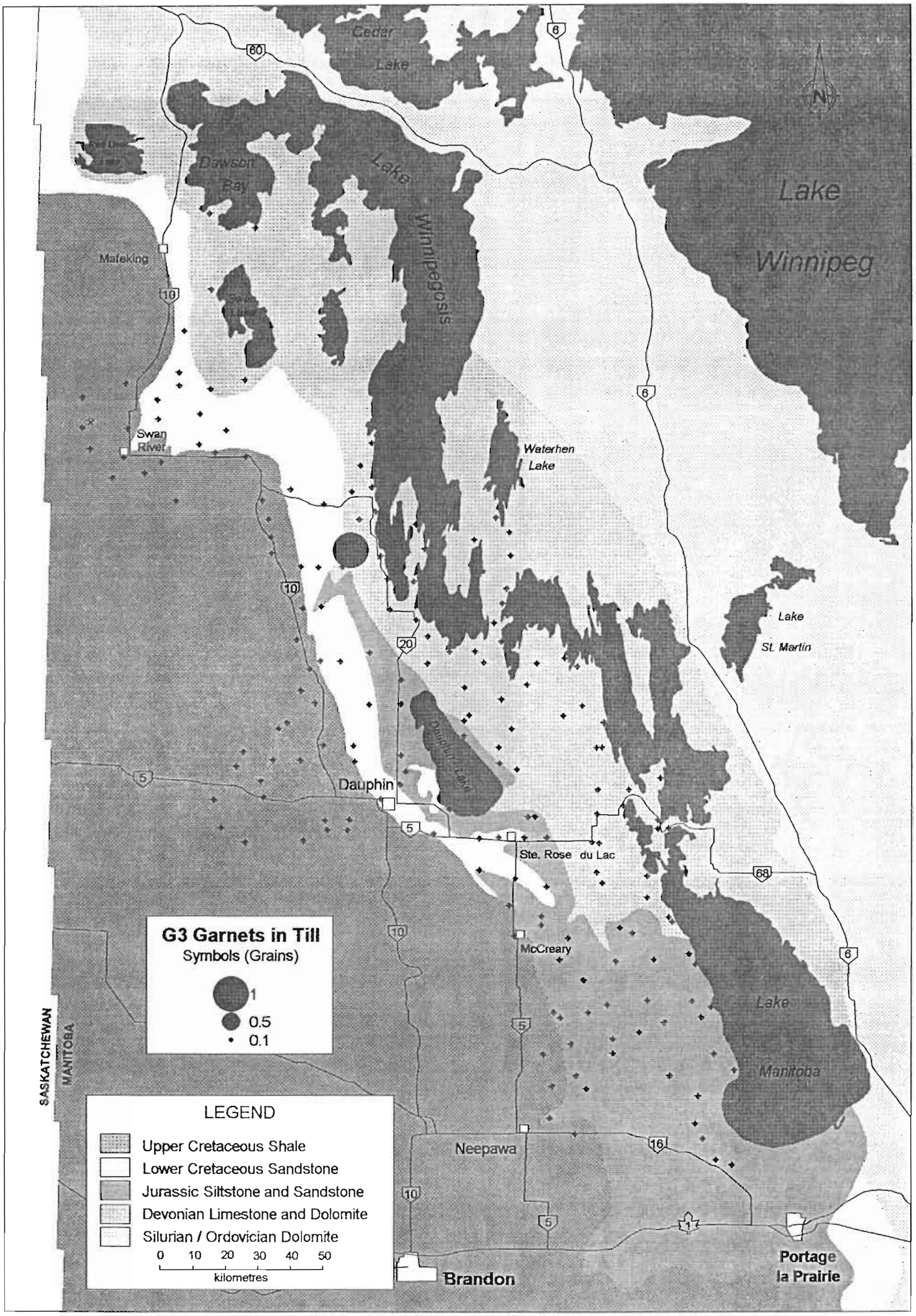
Cedar
Lake
Red Deer
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
High-Ca Cr-diopside in Till
Symbols (Grains)
12
6
1.2
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

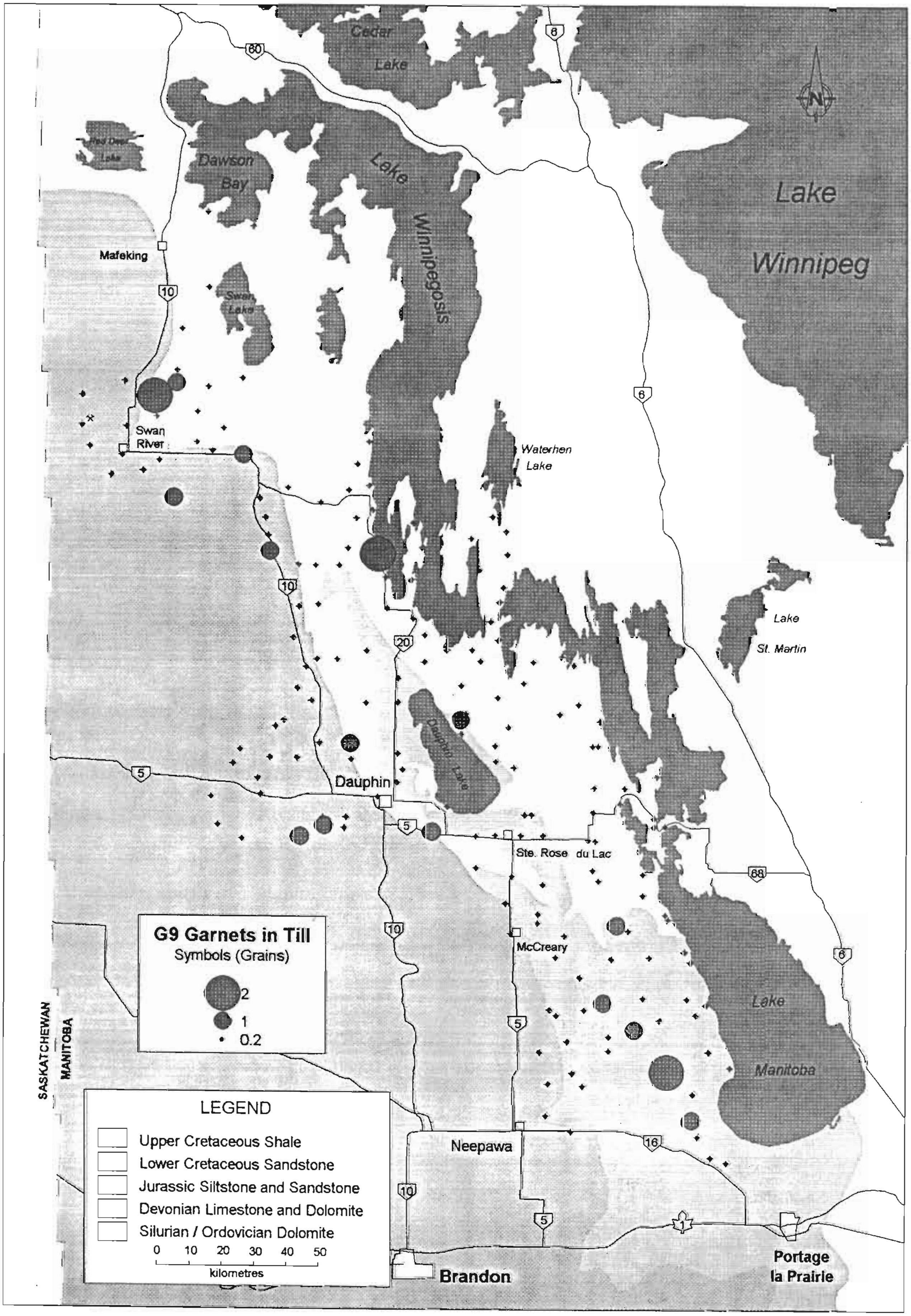


Cedar Lake
Lake Winnipeg
Lake Winnipegosis
Dawson Bay
Red Deer Lake
Swan Lake
Mafeking
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
N
Low-Ca Cr-diopside in Till
Symbols (Grains)
3
1.5
0.3
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

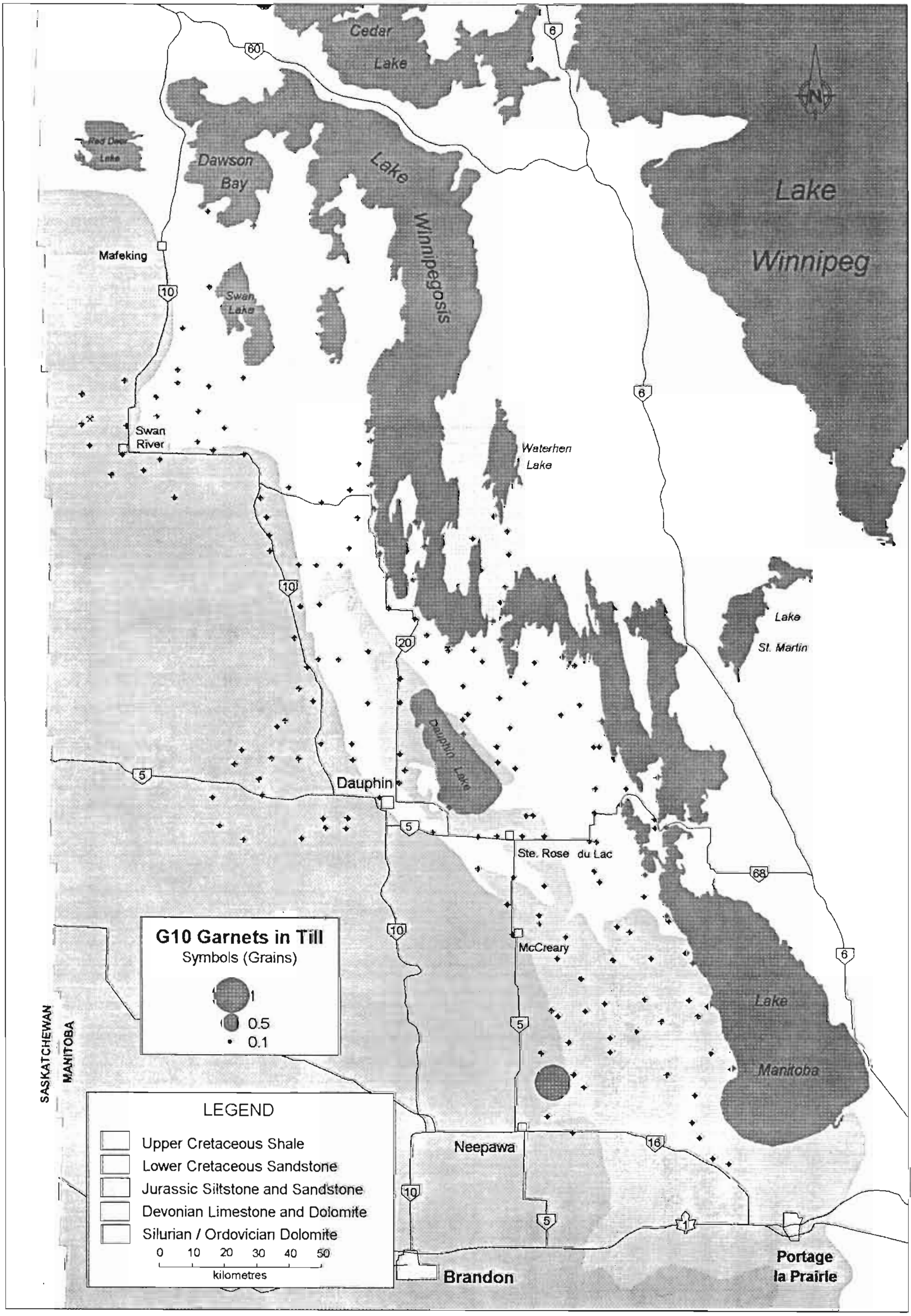


Cedar Lake
Red Deer Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Mafeking
Swan Lake
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
Ti-Cr-pyrope in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

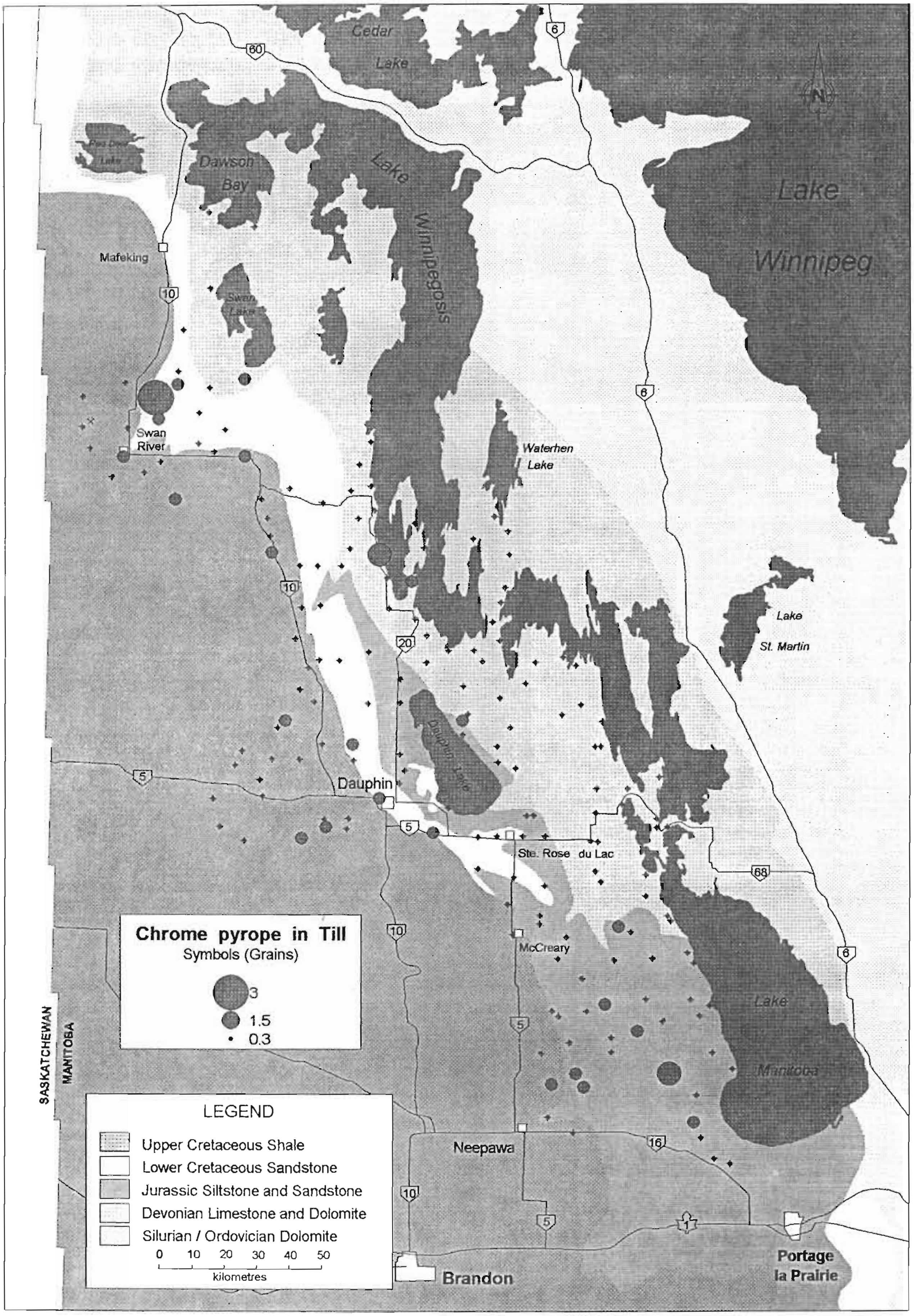

Cedar
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
G3 Garnets in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



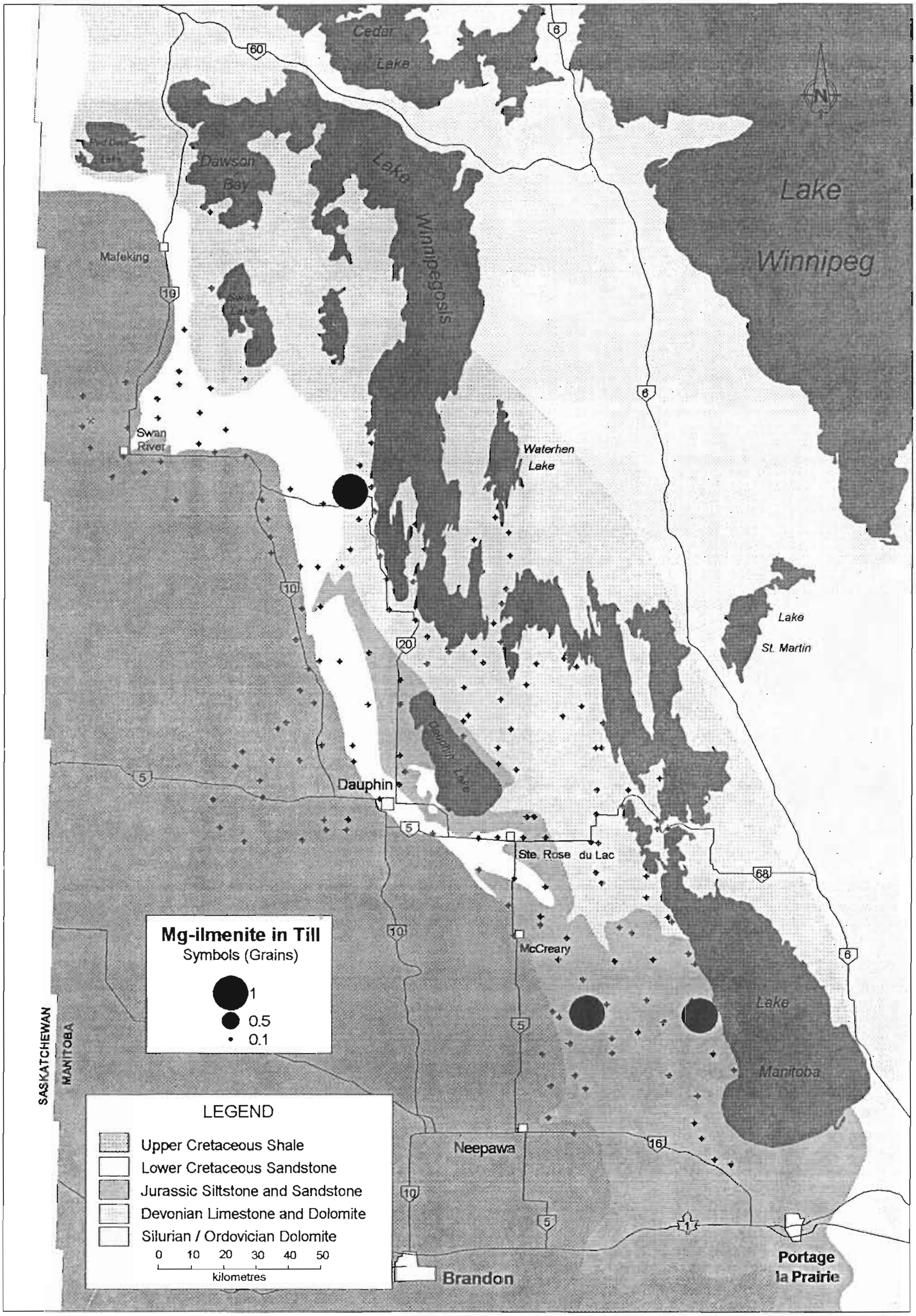
Cedar Lake
Red Deer Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Mafeking
Swan Lake
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
G9 Garnets in Till
Symbols (Grains)
2
1
0.2
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



Cedar Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Swan Lake
Mafeking
Swan River
Waterhen Lake
Lake St. Martin
Dauphin Lake
Dauphin
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
G10 Garnets in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

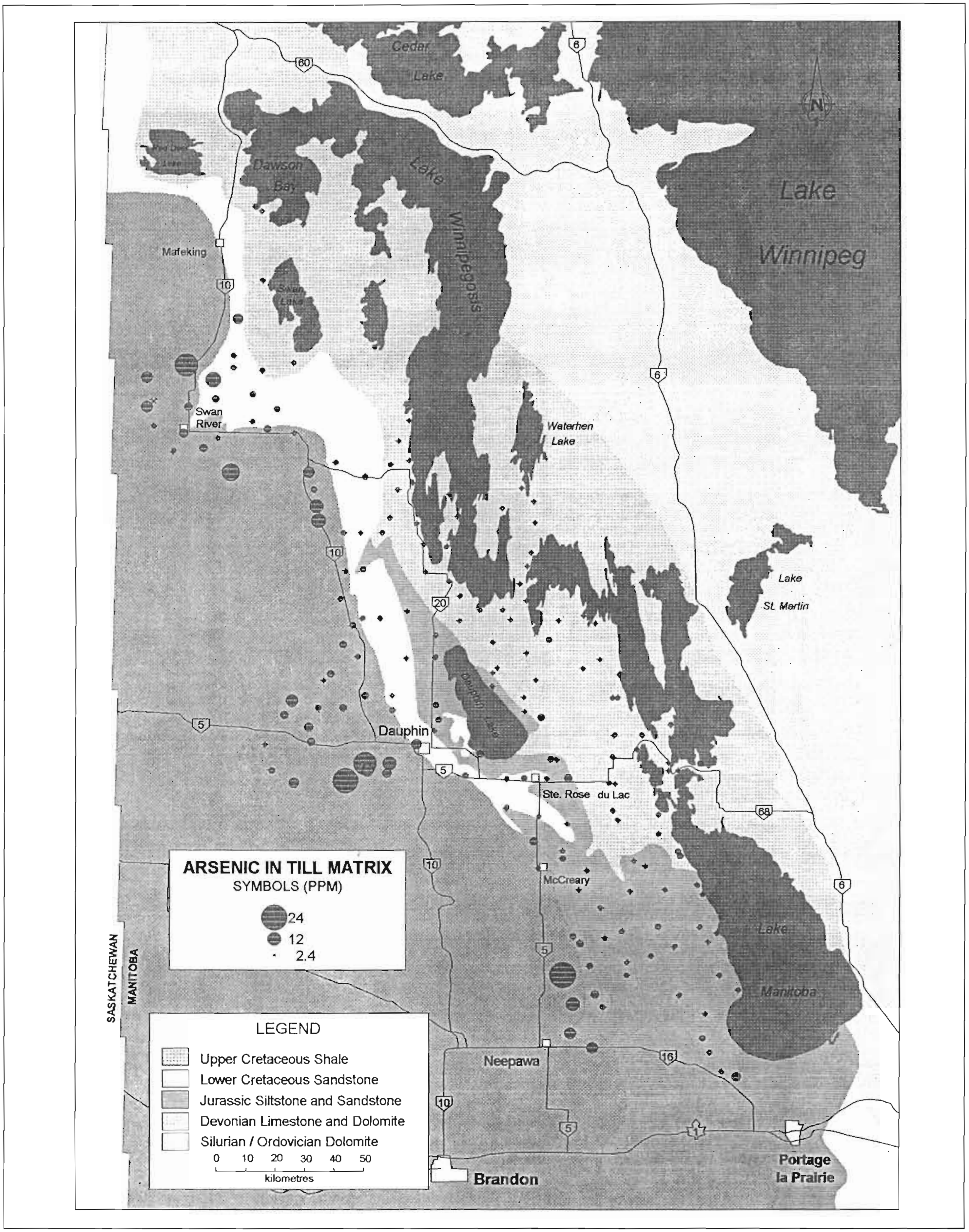


Cedar
Lake
Lake
Winnipeg
Dawson
Bay
Lake
Winnipegosis
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
Chrome pyrope in Till
Symbols (Grains)
3
1.5
0.3
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

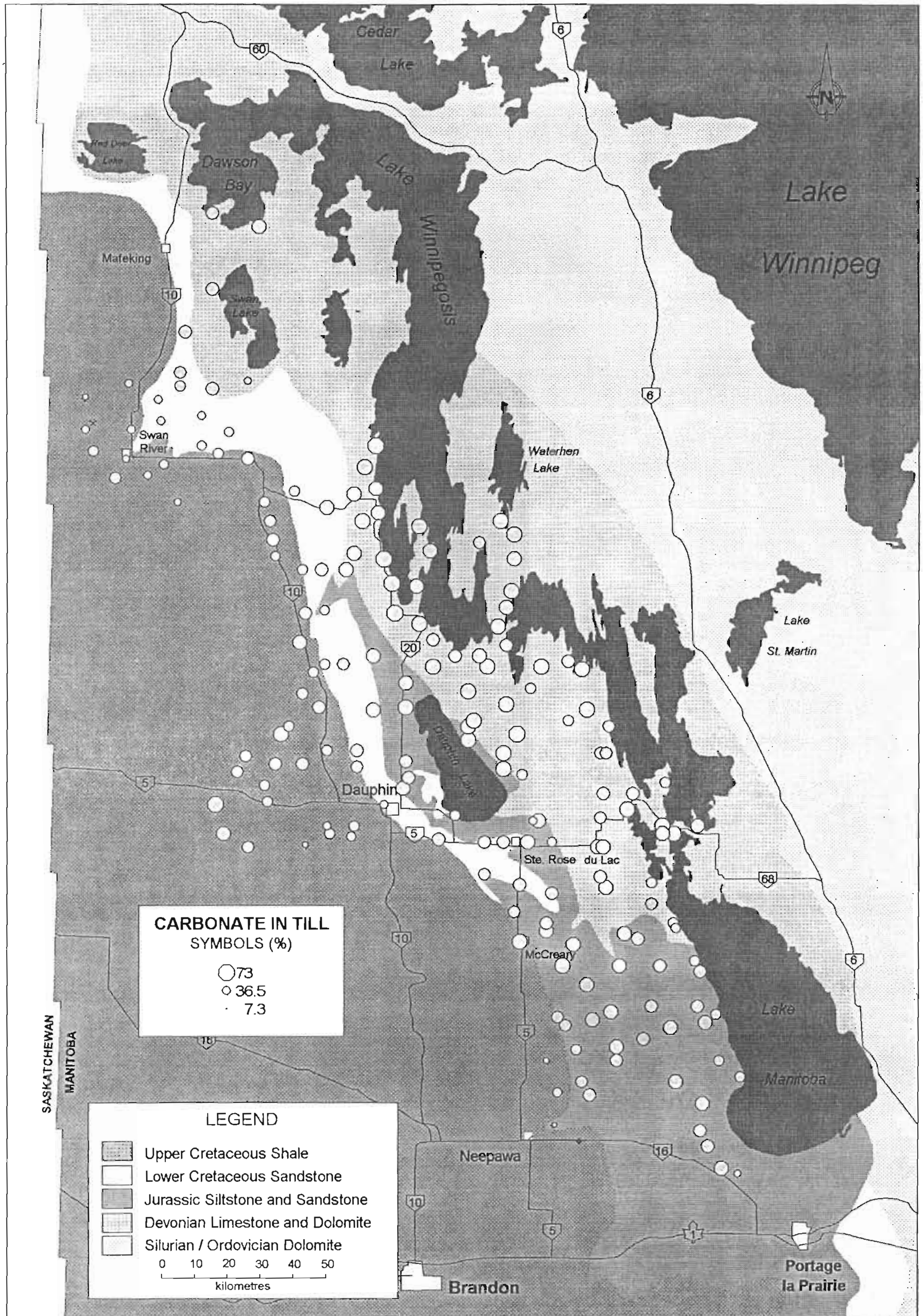


Cedar
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
Mg-ilmenite in Till
Symbols (Grains)
1
0.5
0.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

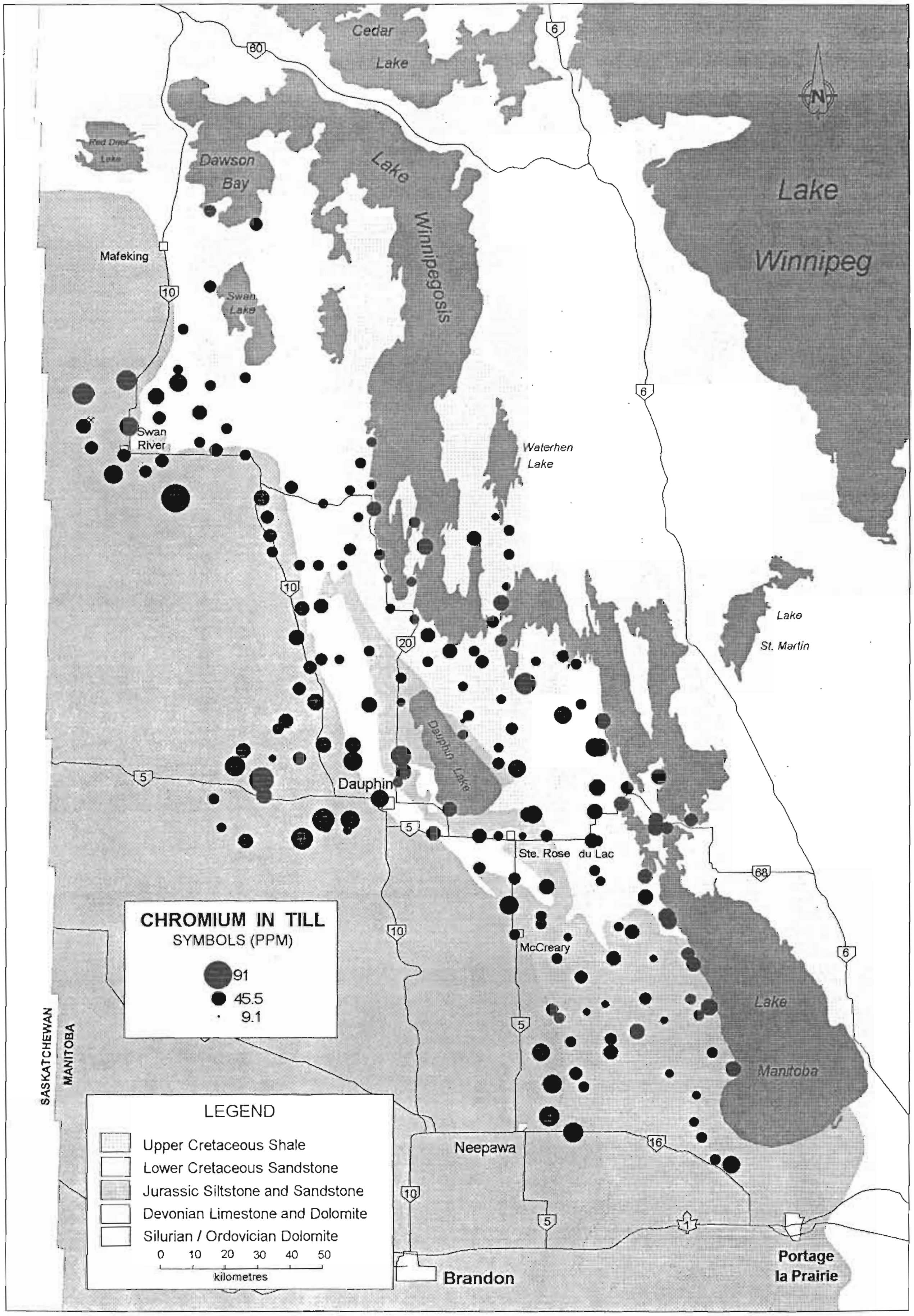
APPENDIX C:
CHEMICAL ANALYSIS



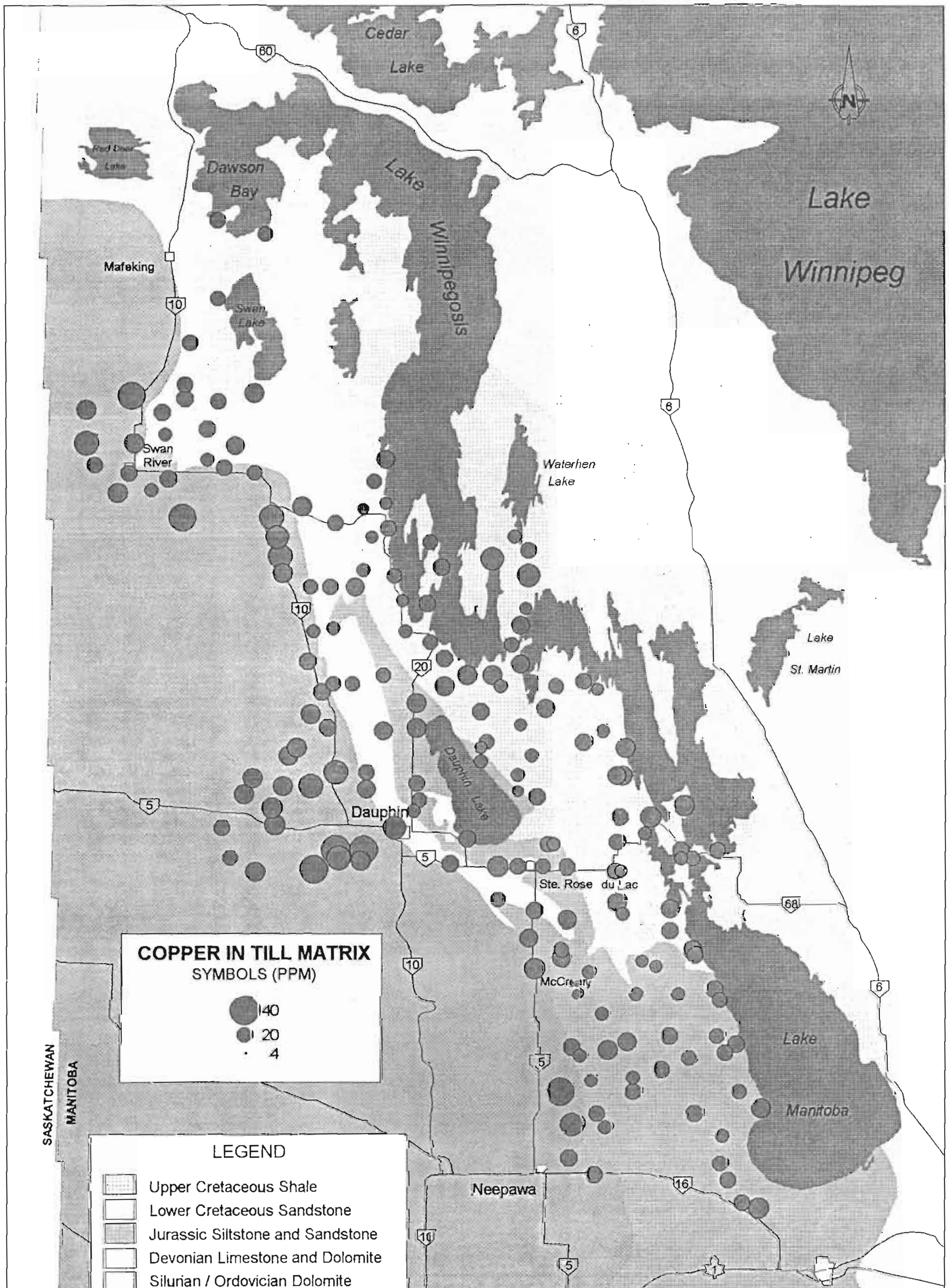
ARSENIC IN TILL MATRIX
SYMBOLS (PPM)
24
12
2.4
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres
Cedar Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Mafeking
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA

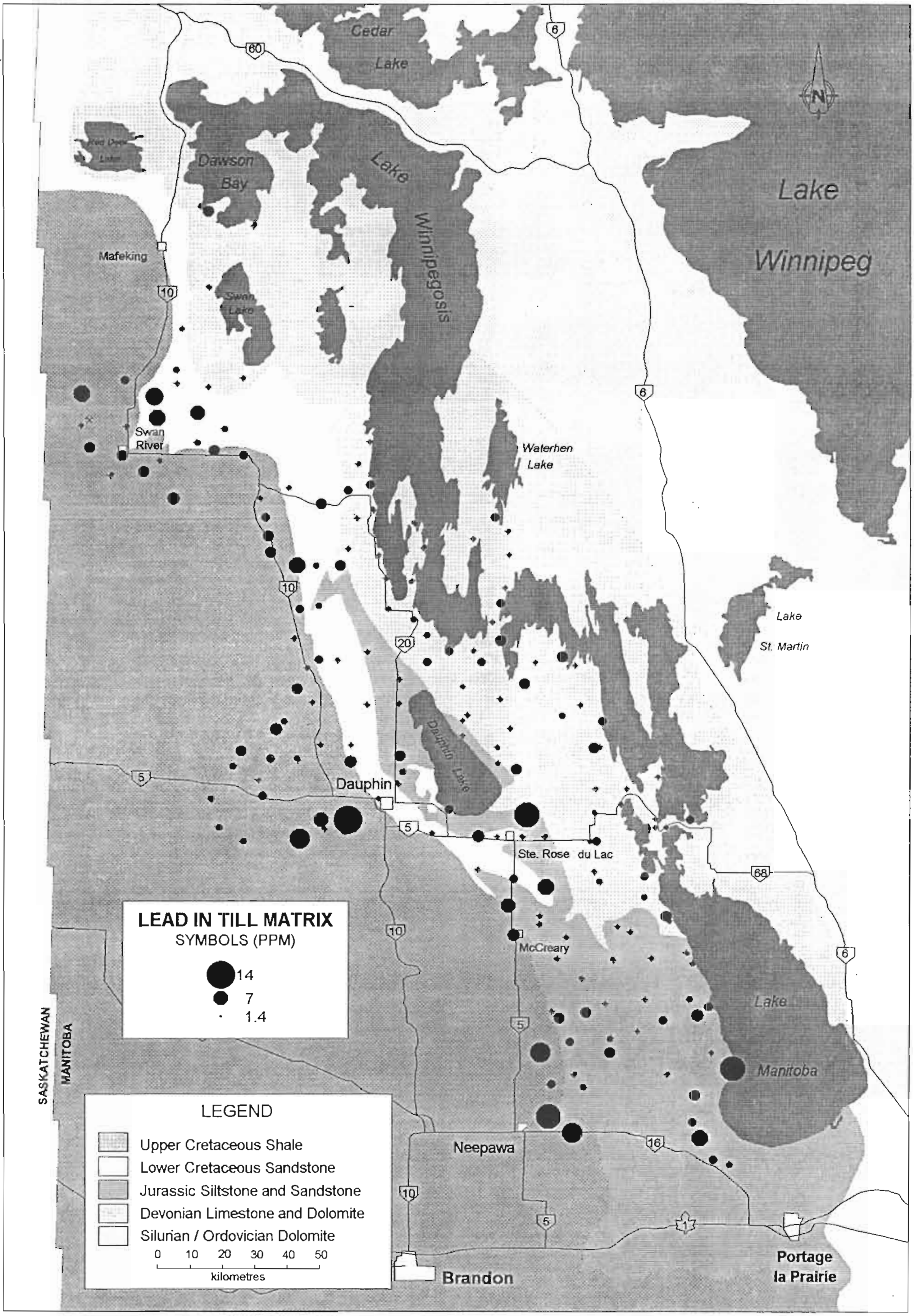


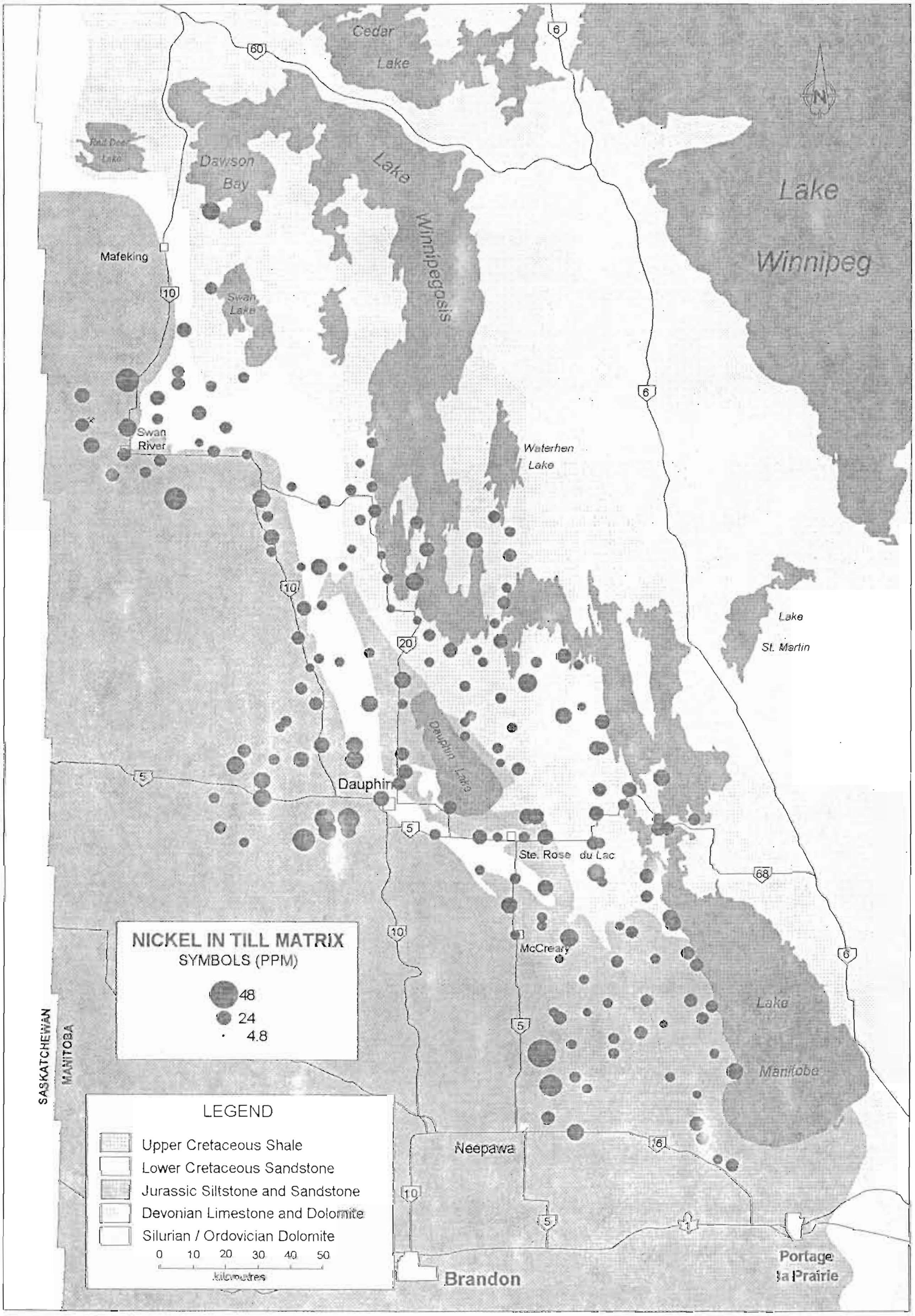
Cedar
Lake
Red Deer
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin
Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
CARBONATE IN TILL
SYMBOLS (%)
73
36.5
7.3
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



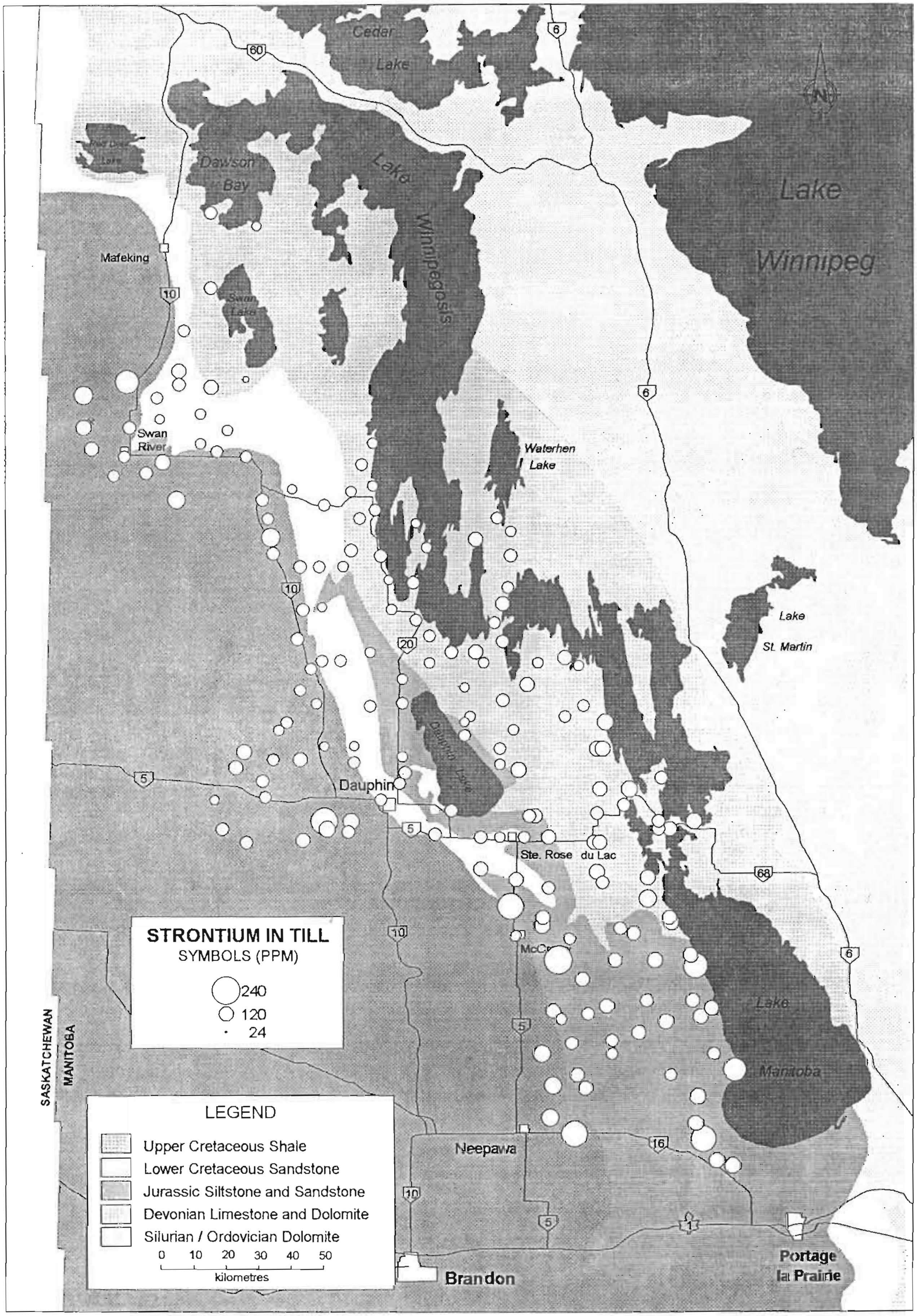
Cedar
Lake
Red Deer
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
CHROMIUM IN TILL
SYMBOLS (PPM)
91
45.5
9.1
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres


Ceder
Lake
Red Deer Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Mafeking
Swan Lake
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
COPPER IN TILL MATRIX
SYMBOLS (PPM)
140
20
4
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

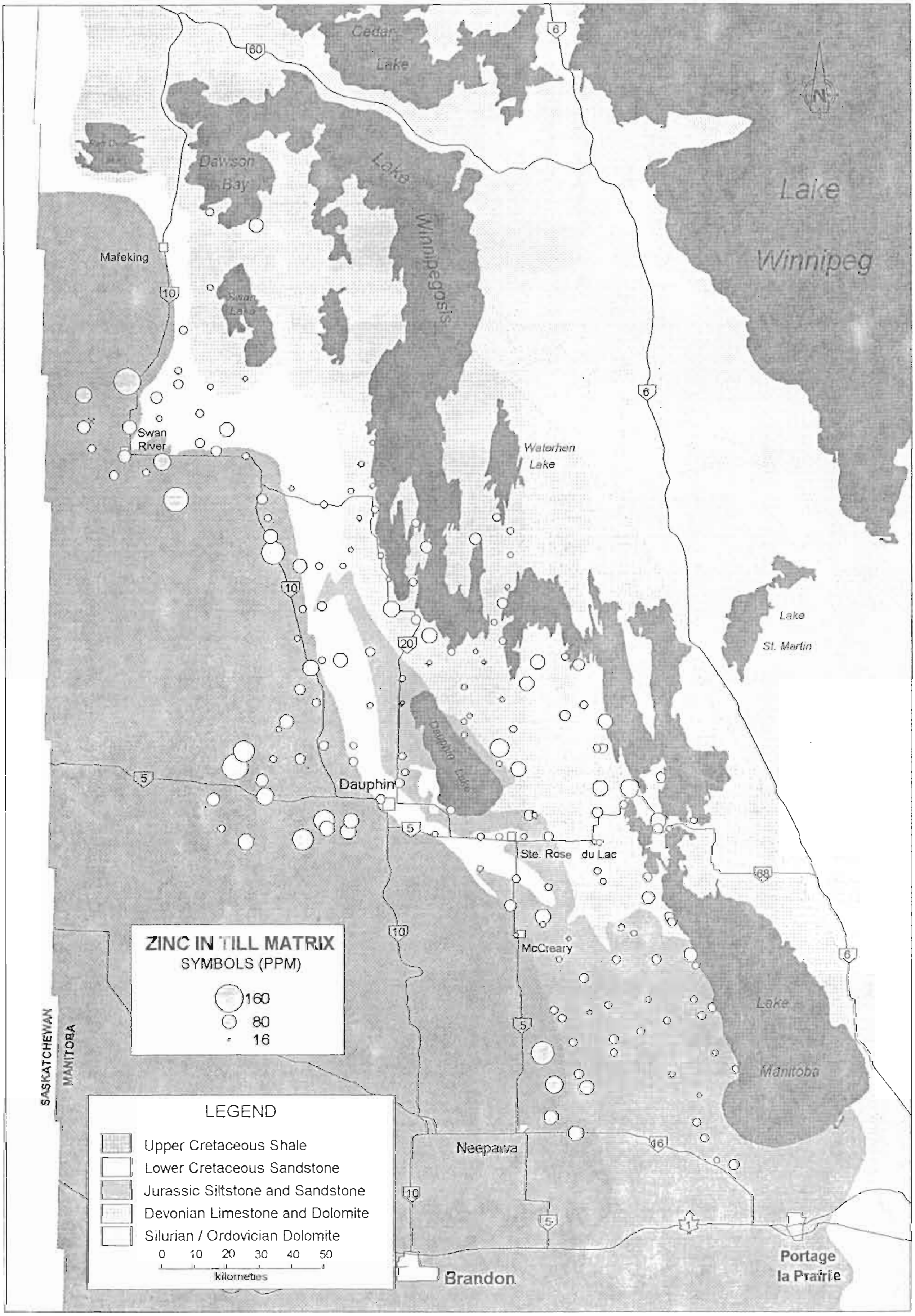

Cedar
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
LEAD IN TILL MATRIX
SYMBOLS (PPM)
14
7
1.4
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



Cedar Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Swan Lake
Mafeking
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
NICKEL IN TILL MATRIX
SYMBOLS (PPM)
48
24
4.8
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



Cedar
Lake
Dawson
Bay
Lake
Winnipegosis
Lake
Winnipeg
Mafeking
Swan
Lake
Swan
River
Waterhen
Lake
Lake
St. Martin
Dauphin
Ste. Rose du Lac
Lake
Manitoba
Neepawa
Brandon
Portage
la Prairie
SASKATCHEWAN
MANITOBA
STRONTIUM IN TILL
SYMBOLS (PPM)
240
120
24
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres



Cedar Lake
Dawson Bay
Lake Winnipegosis
Lake Winnipeg
Mafeking
Swan Lake
Swan River
Waterhen Lake
Lake St. Martin
Dauphin
Dauphin Lake
Ste. Rose du Lac
McCreary
Lake Manitoba
Neepawa
Brandon
Portage la Prairie
SASKATCHEWAN
MANITOBA
ZINC IN TILL MATRIX
SYMBOLS (PPM)
160
80
16
LEGEND
Upper Cretaceous Shale
Lower Cretaceous Sandstone
Jurassic Siltstone and Sandstone
Devonian Limestone and Dolomite
Silurian / Ordovician Dolomite
0 10 20 30 40 50
kilometres

APPENDIX D:
ELECTRON MICROPROBE INTERLABORATORY COMPARISON

December, 1995

ELECTRON MICROPROBE INTERLABORATORY COMPARISON

Fifty-one mineral grains were analyzed at the GSC, CANMET, and U of Manitoba.

All three analytical routines were designed for rapid, inexpensive analysis with accuracy and precision degraded from standard research practice. An analytical routine which was adequate for diamond exploration but which minimized cost was sought.

At GSC, background counts were included, but machine time was reduced by setting amperage at 200 nA.

At CANMET, amperage was set at 40 nA, but machine time was reduced by setting background levels at constant levels obtained from every fiftieth grain.

Operating conditions at U of M are presently not available, but may be discussed with Ron Chapman.

Users of this test should note that many discrepancies likely are due to heterogeneity of the grains.

The test indicates satisfactory precision between labs, with the exception of elevated potassium results from CANMET. This observation may or may not be significant and may relate to the choice of reference materials and analytical protocols at GSC and U of M.

H. Thorleifson, GSC, 613-992-3643

	Tentative ID	NA2Og	Na2Oc	NA2Om	SIO2g	SiO2c	SIO2m	K2Og	K2Oc	K2Om
1	Almandine	0.00	0.00	0.00	36.64	38.48	37.80	0.00	0.03	0.00
2	Almandine	0.04	0.01	0.01	35.56	37.58	36.30	0.00	0.02	0.00
3	Almandine	0.00	0.01	0.00	36.66	38.33	37.80	0.00	0.00	0.00
4	Almandine	0.00	0.01	0.00	35.75	37.42	37.00	0.01	0.00	0.00
5	Almandine	0.00	0.01	0.00	35.10	37.12	36.60	0.00	0.03	0.02
6	G3	0.02	0.04	0.04	37.21	39.24	38.60	0.00	0.00	0.00
7	Almandine	0.00	0.01	0.00	36.30	37.79	37.80	0.00	0.00	0.01
8	Almandine	0.00	0.00	0.00	36.22	37.92	37.10	0.00	0.00	0.00
9	G1	0.05	0.08	0.06	40.61	42.10	42.10	0.01	0.00	0.01
10	Almandine	0.00	0.00	0.00	36.05	38.51	37.70	0.00	0.03	0.00
11	Almandine	0.02	0.02	0.03	36.17	38.45	37.70	0.00	0.01	0.00
12	Spessartine	0.02	0.03	0.04	34.93	36.61	36.20	0.00	0.06	0.00
13	Cr-diopside	0.68	0.59	0.68	51.10	51.90	52.20	0.01	0.00	0.01
14	Fe-tourmaline	1.99	1.92	2.10	33.87	34.01	34.00	0.07	0.37	0.06
15	Fe-tourmaline	2.13	2.14	2.25	33.80	34.23	33.90	0.07	0.34	0.04
16	Fe-tourmaline	2.06	2.00	2.11	34.15	34.52	34.40	0.07	0.41	0.08
17	Fe-tourmaline	1.72	1.65	1.75	35.24	35.37	35.70	0.05	0.21	0.03
18	Fe-tourmaline	2.14	1.93	2.03	35.14	35.87	35.70	0.05	0.19	0.05
19	Fe-tourmaline	1.38	1.32	1.44	34.81	35.78	35.50	0.03	0.17	0.03
20	Mg-tourmaline	1.48	1.37	1.47	34.78	35.48	35.90	0.05	0.22	0.04
21	Fe-tourmaline	1.81	1.72	1.84	34.38	35.22	35.40	0.05	0.22	0.04
22	Quartz	0.00	0.00	0.00	89.52	100.05	100.00	0.00	0.00	0.01
23	Almandine	0.00	0.01	0.01	36.23	38.16	37.80	0.01	0.01	0.01
24	Almandine	0.00	0.01	0.00	36.24	38.52	37.90	0.00	0.02	0.02
25	Almandine	0.00	0.02	0.00	36.43	38.91	38.50	0.00	0.00	0.00
26	Almandine	0.00	0.00	0.00	36.36	38.61	38.30	0.00	0.02	0.00
27	Almandine	0.00	0.00	0.00	35.35	37.29	37.10	0.00	0.02	0.00
28	Almandine	0.00	0.01	0.00	35.98	37.78	37.10	0.00	0.01	0.00
29	Almandine	0.00	0.01	0.00	36.48	37.86	37.50	0.00	0.01	0.00
30	Almandine	0.01	0.03	0.00	36.56	37.84	37.50	0.00	0.01	0.00
31	Almandine	0.00	0.00	0.00	36.29	38.05	37.30	0.00	0.04	0.00
32	Almandine	0.00	0.00	0.00	37.03	38.69	38.20	0.01	0.00	0.01
33	Fe-rutile	0.09	0.02	0.00	0.26	0.26	0.21	0.05	0.36	0.03
34	Goethite	0.16	0.04	0.01	2.48	2.39	2.37	0.03	0.40	0.02
35	Fe-rutile	0.10	0.01	0.00	0.40	0.54	0.45	0.04	0.38	0.05
36	Fe-tourmaline	1.94	1.92	2.05	33.11	34.20	33.70	0.06	0.34	0.07
37	Fe-tourmaline	1.63	1.64	1.72	34.99	35.88	35.10	0.04	0.17	0.04
38	Fe-tourmaline	1.88	1.79	1.91	35.46	36.13	36.00	0.05	0.20	0.05
39	Fe-tourmaline	1.80	1.76	1.79	33.98	34.82	34.70	0.06	0.24	0.06
40	Fe-tourmaline	1.66	1.57	1.67	35.04	35.78	35.40	0.05	0.30	0.05
41	Goethite	0.20	0.07	0.00	2.55	2.24	2.18	0.06	0.21	0.03
42	Garnet	0.00	0.01	0.01	37.67	38.80	39.00	0.00	0.00	0.02
43	Almandine	0.00	0.01	0.00	35.79	36.75	37.10	0.01	0.02	0.00
44	Almandine	0.00	0.00	0.02	36.35	37.87	37.10	0.01	0.03	0.00
45	G9	0.04	0.05	0.02	40.66	41.23	41.60	0.01	0.00	0.00
46	Epidote	0.00	0.02	0.00	33.40	38.37	37.60	0.01	0.02	0.00
47	Goethite	0.17	0.09	0.00	4.27	4.79	4.97	0.05	0.84	0.10
48	Goethite	0.16	0.02	0.00	4.54	4.93	4.78	0.04	0.74	0.04
49	Fe-tourmaline	1.96	1.87	2.07	33.41	35.46	35.00	0.06	0.32	0.05
50	Fe-tourmaline	1.91	1.80	1.98	34.15	35.63	35.50	0.06	0.21	0.03
51	Fe-tourmaline	1.72	1.77	1.71	33.58	35.06	34.60	0.05	0.24	0.04

g=GSC; c=CANMET; m=U of M

	Tentative ID	FEOg	FeOc	FEOm	AL2O3g	Al2O3c	AL2O3m	CAOg	CaOc	CAOm
1	Almandine	25.33	25.77	25.60	21.12	21.38	21.40	7.92	8.06	7.22
2	Almandine	25.73	26.52	25.20	20.55	21.01	20.50	6.63	6.41	6.67
3	Almandine	28.28	28.74	27.00	20.85	20.88	21.00	7.00	7.16	7.00
4	Almandine	31.82	32.34	31.20	20.14	20.48	20.40	6.84	7.01	6.94
5	Almandine	29.58	29.92	30.00	19.86	20.09	20.30	6.18	6.27	6.20
6	G3	23.35	23.63	23.20	20.96	20.99	21.40	6.10	6.20	6.19
7	Almandine	29.22	29.84	29.20	20.78	20.74	21.00	7.13	7.25	7.20
8	Almandine	26.71	27.45	26.10	20.81	20.73	20.90	9.52	9.66	9.51
9	G1	7.95	7.95	7.92	20.92	20.39	21.30	4.74	4.72	4.70
10	Almandine	27.73	27.80	27.50	20.62	20.91	21.10	7.63	7.81	7.70
11	Almandine	29.42	29.93	29.40	20.68	20.98	21.10	4.57	4.65	4.66
12	Spessartine	18.32	18.69	18.00	19.85	19.77	20.10	0.26	0.25	0.28
13	Cr-diopside	4.49	5.70	4.56	3.41	3.24	3.42	22.34	20.60	22.10
14	Fe-tourmaline	13.63	13.52	13.10	32.84	32.03	33.00	0.41	0.39	0.42
15	Fe-tourmaline	14.23	14.63	14.80	31.38	32.06	32.90	0.34	0.16	0.21
16	Fe-tourmaline	14.25	14.35	14.20	30.47	29.98	30.70	0.69	0.64	0.67
17	Fe-tourmaline	7.32	7.28	7.34	34.31	33.36	34.70	0.42	0.39	0.43
18	Fe-tourmaline	7.05	7.54	7.91	32.48	32.78	33.80	0.14	0.13	0.20
19	Fe-tourmaline	11.22	11.34	10.90	34.21	33.78	34.70	0.21	0.14	0.16
20	Mg-tourmaline	7.14	7.18	7.49	33.55	32.80	34.20	1.07	1.09	1.10
21	Fe-tourmaline	8.95	9.01	9.29	33.68	32.76	34.30	0.34	0.29	0.28
22	Quartz	0.23	0.18	0.23	0.01	0.01	0.00	0.01	0.00	0.01
23	Almandine	30.06	30.90	31.40	20.69	20.90	21.20	6.57	6.46	6.09
24	Almandine	28.33	28.79	28.50	20.59	20.70	20.90	6.48	6.51	6.50
25	Almandine	26.29	26.40	26.80	20.71	20.71	21.10	7.09	7.41	7.25
26	Almandine	27.86	28.52	28.50	20.79	20.92	20.90	6.59	6.71	6.58
27	Almandine	36.90	37.96	38.00	20.30	20.36	20.50	3.54	3.60	3.51
28	Almandine	33.91	34.60	34.90	20.60	20.59	20.70	3.29	3.38	3.29
29	Almandine	29.06	29.64	29.40	20.24	20.48	20.50	8.92	9.02	8.82
30	Almandine	28.13	28.49	29.00	20.61	20.80	21.10	10.01	10.02	9.66
31	Almandine	32.15	32.82	32.50	20.67	21.01	20.90	6.40	6.53	6.40
32	Almandine	29.14	29.85	29.60	21.24	21.51	21.20	3.93	3.74	4.22
33	Fe-rutile	27.47	28.17	30.60	0.29	0.27	0.27	0.12	0.13	0.09
34	Goethite	76.42	68.27	69.80	2.01	1.81	1.81	0.25	0.21	0.21
35	Fe-rutile	27.50	23.73	27.50	0.34	0.37	0.34	0.18	0.21	0.18
36	Fe-tourmaline	14.57	14.66	14.50	32.99	32.45	33.30	0.30	0.28	0.30
37	Fe-tourmaline	9.81	9.61	9.30	34.28	32.70	34.30	0.23	0.29	0.30
38	Fe-tourmaline	9.59	10.02	9.60	33.56	32.36	34.00	0.17	0.12	0.16
39	Fe-tourmaline	10.42	10.31	10.20	33.22	32.50	33.50	0.68	0.65	0.68
40	Fe-tourmaline	7.81	7.89	7.71	34.13	32.83	34.30	0.77	0.75	0.78
41	Goethite	72.29	70.43	72.20	1.88	1.70	1.42	0.17	0.17	0.14
42	Garnet	22.64	23.13	22.70	21.54	21.30	21.70	7.84	7.91	7.78
43	Almandine	33.15	33.79	33.70	20.29	20.06	20.40	6.88	6.96	6.86
44	Almandine	31.29	31.60	31.80	20.64	20.75	21.10	3.98	4.02	4.05
45	G9	7.34	7.60	7.47	19.63	19.34	19.70	4.89	4.97	5.02
46	Epidote	4.06	11.70	10.60	23.06	22.92	23.00	22.26	23.53	23.00
47	Goethite	76.59	68.48	73.10	1.09	1.37	1.17	0.55	0.62	0.47
48	Goethite	76.01	66.55	73.00	0.90	0.86	0.55	0.50	0.55	0.50
49	Fe-tourmaline	9.76	9.69	9.69	33.18	32.88	34.10	0.35	0.31	0.36
50	Fe-tourmaline	10.44	10.98	10.80	32.45	31.85	33.10	0.31	0.29	0.32
51	Fe-tourmaline	13.43	13.84	13.60	33.50	33.24	34.30	0.12	0.07	0.09

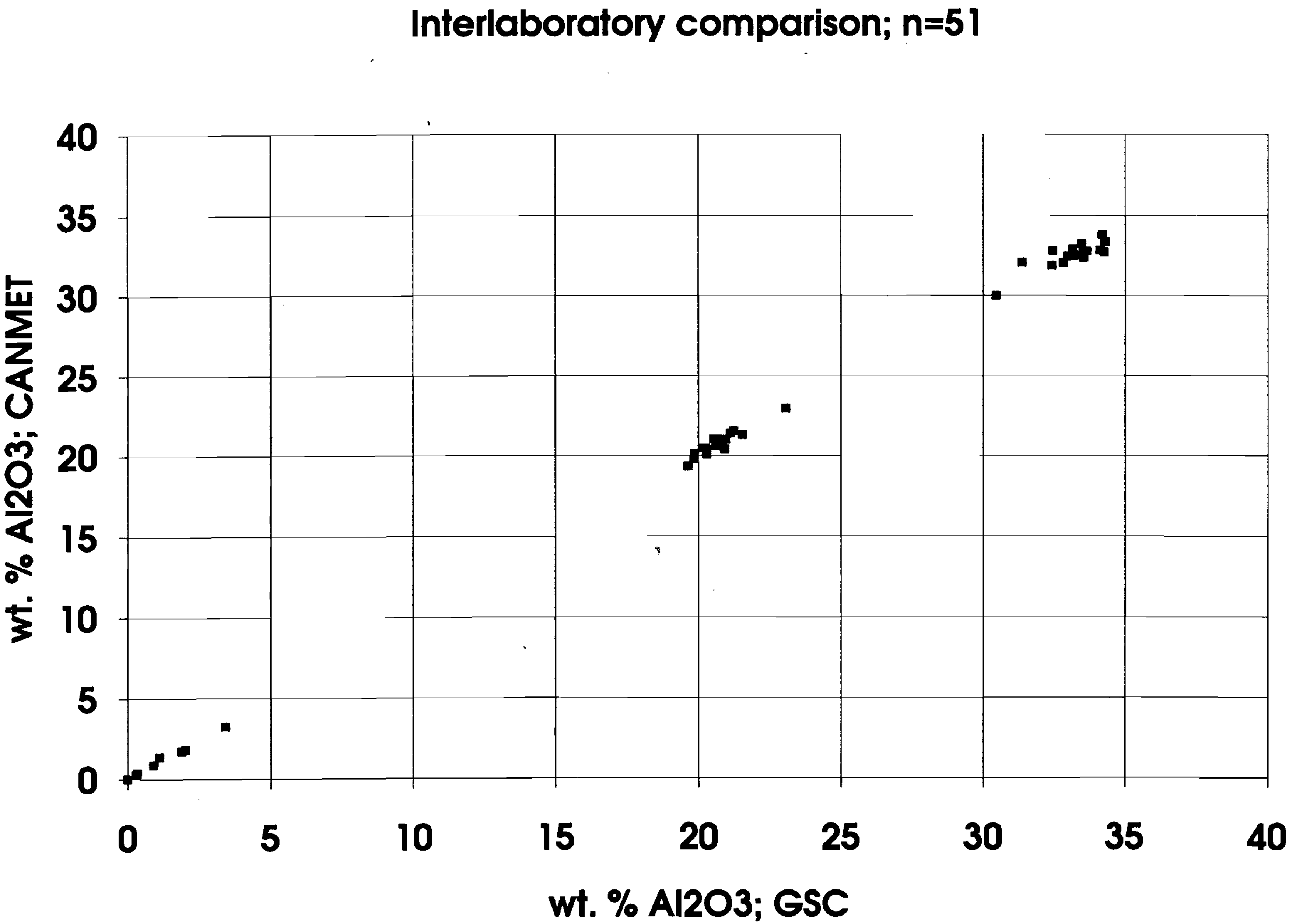
g=GSC; c=CANMET; m=U of M

	Tentative ID	MNOg	MnOc	MNOm	MGOg	MgOc	MGOm	TIO2g	TiO2c	TIO2m
1	Almandine	2.61	2.63	2.51	4.47	4.63	4.39	0.09	0.09	0.03
2	Almandine	7.88	8.21	7.87	1.37	1.53	1.29	0.03	0.02	0.00
3	Almandine	0.58	0.60	0.58	4.88	5.05	4.67	0.12	0.08	0.10
4	Almandine	0.96	1.01	1.04	2.15	2.26	1.99	0.06	0.06	0.01
5	Almandine	4.91	5.19	4.93	1.48	1.55	1.39	0.04	0.04	0.03
6	G3	0.58	0.62	0.54	8.94	9.33	8.65	0.27	0.24	0.23
7	Almandine	1.78	1.85	1.72	3.01	3.16	2.85	0.07	0.06	0.00
8	Almandine	2.41	2.45	2.42	2.38	2.53	2.17	0.09	0.07	0.07
9	G1	0.29	0.25	0.32	21.63	22.03	20.80	0.90	0.84	0.70
10	Almandine	1.49	1.51	1.44	4.00	4.39	3.91	0.08	0.07	0.00
11	Almandine	1.79	1.90	1.84	4.88	5.07	4.55	0.20	0.15	0.25
12	Spessartine	22.96	23.74	23.10	0.92	0.93	0.85	0.13	0.14	0.03
13	Cr-diopside	0.13	0.10	0.11	15.03	16.51	14.70	0.09	0.06	0.01
14	Fe-tourmaline	0.11	0.07	0.05	1.88	1.84	1.79	0.55	0.49	0.51
15	Fe-tourmaline	0.07	0.00	0.06	1.92	1.49	1.29	1.18	0.46	0.38
16	Fe-tourmaline	0.06	0.01	0.02	2.80	2.79	2.59	1.26	1.13	0.97
17	Fe-tourmaline	0.13	0.07	0.11	4.93	4.93	4.81	1.03	0.96	0.93
18	Fe-tourmaline	0.10	0.07	0.12	5.13	5.31	4.77	0.79	0.80	0.84
19	Fe-tourmaline	0.11	0.07	0.05	2.29	2.31	2.18	0.28	0.26	0.24
20	Mg-tourmaline	0.03	0.00	0.01	5.73	5.63	5.48	0.79	0.75	0.73
21	Fe-tourmaline	0.10	0.02	0.05	3.92	4.16	3.75	1.19	1.07	1.10
22	Quartz	0.01	0.00	0.04	0.01	0.01	0.00	0.02	0.00	0.02
23	Almandine	0.70	0.72	0.70	3.48	3.66	3.44	0.07	0.06	0.01
24	Almandine	1.18	1.22	1.11	4.77	4.91	4.54	0.13	0.13	0.12
25	Almandine	0.73	0.73	0.73	6.17	6.52	5.79	0.12	0.15	0.16
26	Almandine	0.61	0.60	0.57	5.28	5.47	5.07	0.07	0.06	0.09
27	Almandine	0.24	0.25	0.19	1.37	1.43	1.23	0.06	0.07	0.03
28	Almandine	0.68	0.76	0.78	3.54	3.64	3.33	0.02	0.03	0.00
29	Almandine	0.62	0.64	0.64	2.84	2.90	2.62	0.10	0.10	0.02
30	Almandine	0.63	0.60	0.57	2.38	2.52	2.29	0.24	0.22	0.06
31	Almandine	0.20	0.20	0.20	2.62	2.78	2.51	0.12	0.09	0.04
32	Almandine	0.24	0.26	0.22	6.74	7.11	6.29	0.11	0.09	0.11
33	Fe-rutile	0.81	0.83	0.96	0.10	0.09	0.08	65.47	63.91	60.90
34	Goethite	0.88	0.96	0.67	0.44	0.40	0.35	0.07	0.15	0.04
35	Fe-rutile	0.64	0.67	0.64	0.20	0.18	0.15	65.82	67.27	64.10
36	Fe-tourmaline	0.14	0.08	0.12	0.85	0.85	0.83	0.69	0.63	0.67
37	Fe-tourmaline	0.04	0.01	0.03	3.45	3.86	3.53	0.61	0.75	0.61
38	Fe-tourmaline	0.10	0.07	0.05	3.93	3.81	3.79	0.53	0.46	0.40
39	Fe-tourmaline	0.05	0.01	0.05	3.78	3.84	3.55	0.81	0.75	0.70
40	Fe-tourmaline	0.05	0.00	0.01	5.02	5.00	4.78	0.62	0.55	0.48
41	Goethite	0.17	0.23	0.19	0.55	0.51	0.44	0.10	0.10	0.00
42	Garnet	0.49	0.48	0.48	7.94	8.23	7.72	0.10	0.09	0.19
43	Almandine	0.44	0.43	0.36	1.58	1.63	1.46	0.09	0.10	0.06
44	Almandine	1.49	1.55	1.44	4.38	4.58	4.28	0.04	0.04	0.06
45	G9	0.43	0.40	0.40	20.60	21.01	19.90	0.21	0.16	0.17
46	Epidote	0.12	0.15	0.17	3.25	0.03	0.00	0.03	0.05	0.00
47	Goethite	3.04	2.97	2.66	0.50	0.51	0.49	0.06	0.12	0.00
48	Goethite	3.25	3.18	2.25	0.89	0.90	0.81	0.07	0.07	0.00
49	Fe-tourmaline	0.08	0.02	0.08	3.63	3.85	3.52	1.09	1.00	0.95
50	Fe-tourmaline	0.12	0.14	0.09	4.07	3.84	3.92	0.47	0.44	0.51
51	Fe-tourmaline	0.50	0.55	0.51	0.66	0.60	0.57	0.28	0.24	0.23

g=GSC; c=CANMET; m=U of M

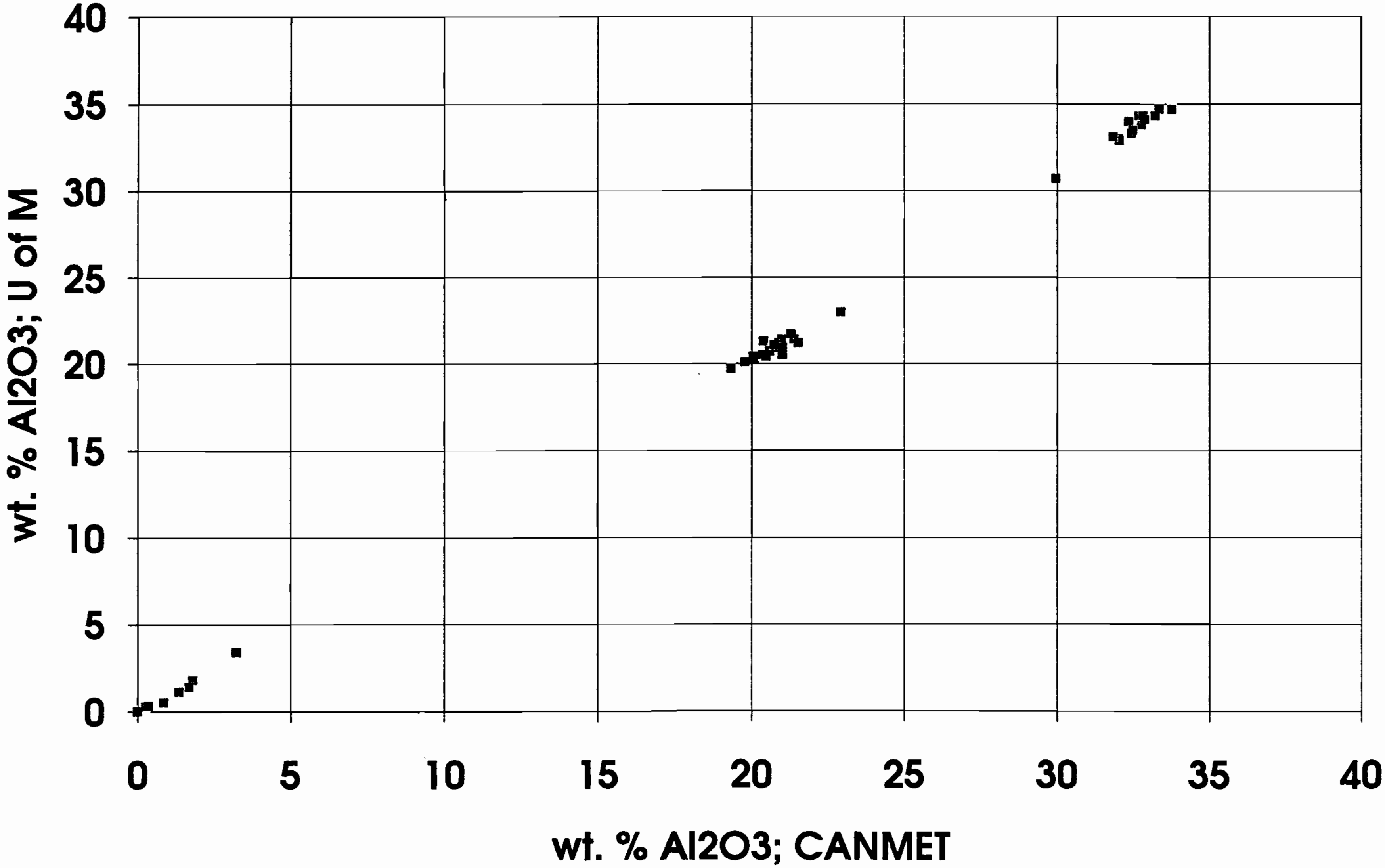
	Tentative ID	CR2O3g	Cr2O3c	CR2O3m	TOTALg	Totalc	Totalm
1	Almandine	0.03	0.00	0.03	98.21	101.07	98.98
2	Almandine	0.04	0.00	0.02	97.83	101.32	97.86
3	Almandine	0.04	0.00	0.02	98.41	100.86	98.17
4	Almandine	0.05	0.02	0.02	97.78	100.59	98.60
5	Almandine	0.04	0.01	0.00	97.19	100.23	99.47
6	G3	0.09	0.05	0.01	97.52	100.32	98.86
7	Almandine	0.04	0.00	0.01	98.33	100.70	99.79
8	Almandine	0.05	0.00	0.00	98.19	100.81	98.27
9	G1	1.35	1.25	1.29	98.45	99.60	99.20
10	Almandine	0.05	0.02	0.01	97.65	101.05	99.36
11	Almandine	0.03	0.02	0.03	97.76	101.17	99.56
12	Spessartine	0.03	0.01	0.00	97.42	100.24	98.60
13	Cr-diopside	0.68	0.57	0.67	97.96	99.26	98.46
14	Fe-tourmaline	0.03	0.00	0.00	85.38	84.64	85.03
15	Fe-tourmaline	0.00	0.00	0.00	85.12	85.51	85.83
16	Fe-tourmaline	0.01	0.00	0.00	85.82	85.83	85.74
17	Fe-tourmaline	0.01	0.00	0.00	85.16	84.21	85.80
18	Fe-tourmaline	0.03	0.00	0.00	83.05	84.61	85.42
19	Fe-tourmaline	0.02	0.00	0.00	84.56	85.16	85.20
20	Mg-tourmaline	0.07	0.00	0.00	84.69	84.53	86.42
21	Fe-tourmaline	0.02	0.00	0.03	84.44	84.46	86.08
22	Quartz	0.01	0.00	0.00	89.82	100.24	100.31
23	Almandine	0.04	0.02	0.01	97.85	100.90	100.67
24	Almandine	0.05	0.02	0.05	97.77	100.82	99.64
25	Almandine	0.03	0.01	0.04	97.57	100.86	100.37
26	Almandine	0.04	0.01	0.01	97.60	100.91	100.02
27	Almandine	0.04	0.02	0.03	97.80	101.00	100.59
28	Almandine	0.04	0.01	0.00	98.06	100.81	100.10
29	Almandine	0.02	0.01	0.02	98.28	100.65	99.52
30	Almandine	0.05	0.01	0.04	98.62	100.55	100.22
31	Almandine	0.05	0.02	0.00	98.50	101.53	99.85
32	Almandine	0.05	0.01	0.00	98.49	101.26	99.85
33	Fe-rutile	0.12	0.12	0.13	94.78	94.16	93.27
34	Goethite	0.05	0.05	0.03	82.79	74.67	75.31
35	Fe-rutile	0.04	0.03	0.00	95.26	93.38	93.41
36	Fe-tourmaline	0.02	0.00	0.00	84.67	85.41	85.54
37	Fe-tourmaline	0.02	0.00	0.00	85.10	84.92	84.93
38	Fe-tourmaline	0.02	0.00	0.00	85.29	84.94	85.96
39	Fe-tourmaline	0.01	0.00	0.00	84.81	84.88	85.23
40	Fe-tourmaline	0.03	0.00	0.00	85.18	84.66	85.18
41	Goethite	0.07	0.06	0.03	78.04	75.70	76.63
42	Garnet	0.05	0.01	0.05	98.27	99.95	99.65
43	Almandine	0.06	0.02	0.04	98.29	99.76	99.98
44	Almandine	0.02	0.00	0.00	98.20	100.44	99.85
45	G9	5.08	4.79	4.89	98.89	99.55	99.17
46	Epidote	0.05	0.01	0.00	86.24	96.78	94.37
47	Goethite	0.03	0.04	0.00	86.35	79.82	82.96
48	Goethite	0.04	0.03	0.00	86.40	77.83	81.93
49	Fe-tourmaline	0.02	0.00	0.00	83.54	85.40	85.82
50	Fe-tourmaline	0.02	0.00	0.00	84.00	85.18	86.25
51	Fe-tourmaline	0.02	0.00	0.00	83.86	85.61	85.65

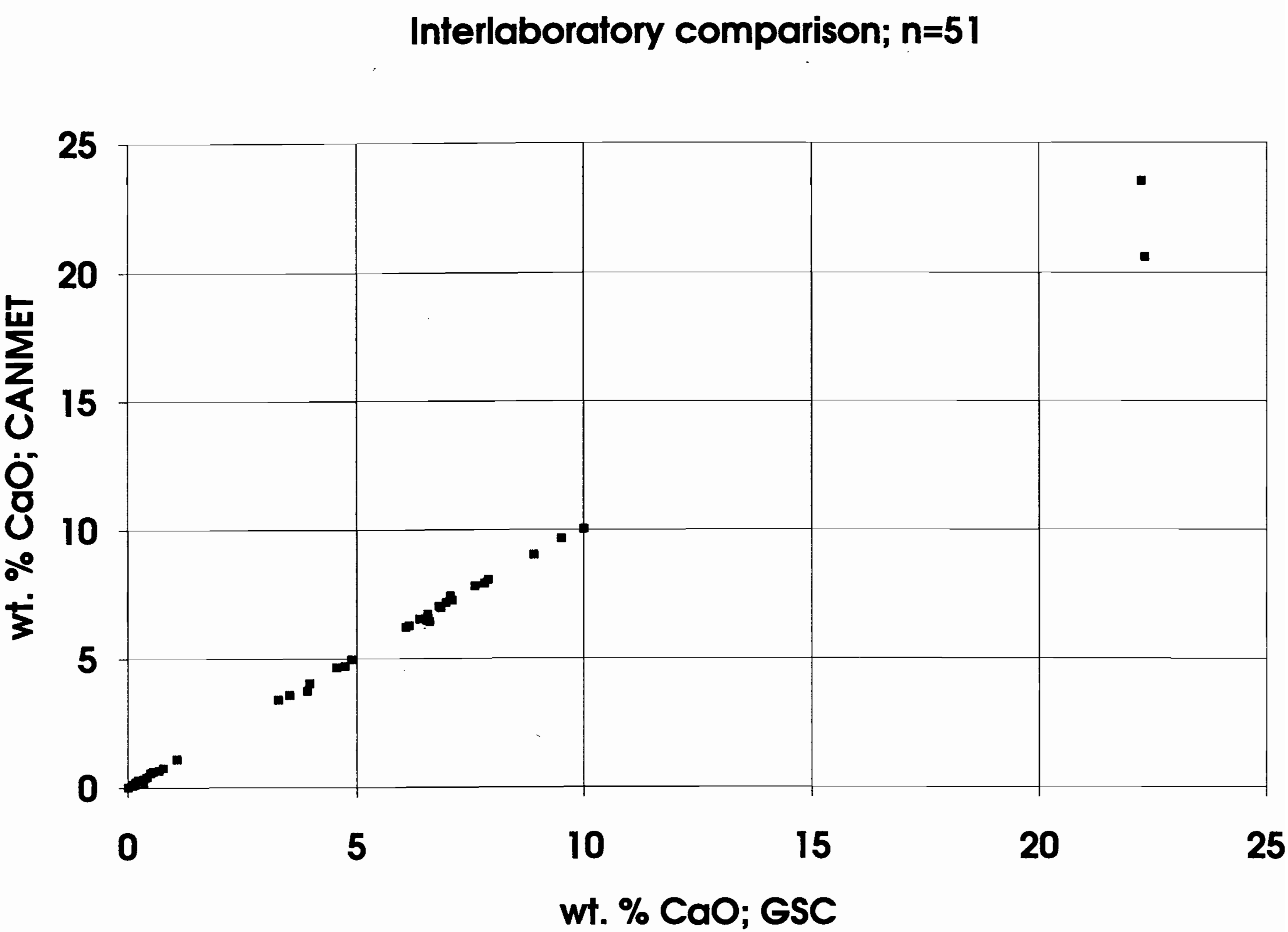
g=GSC; c=CANMET; m=U of M



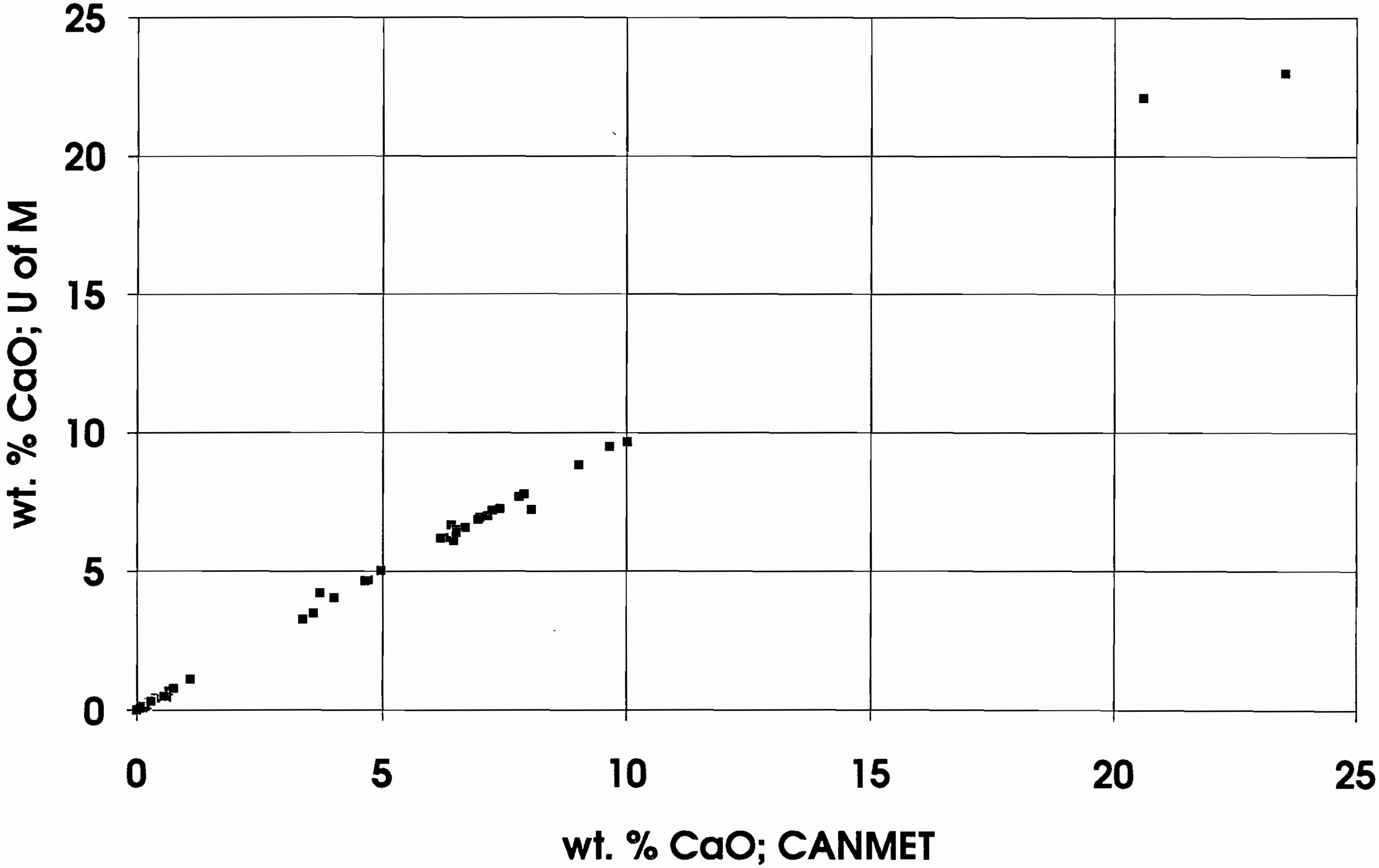
Interlaboratory comparison; n=51
wt. % Al2O3; CANMET
wt. % Al2O3; GSC
0
5
10
15
20
25
30
35
40

Interlaboratory comparison; n = 51

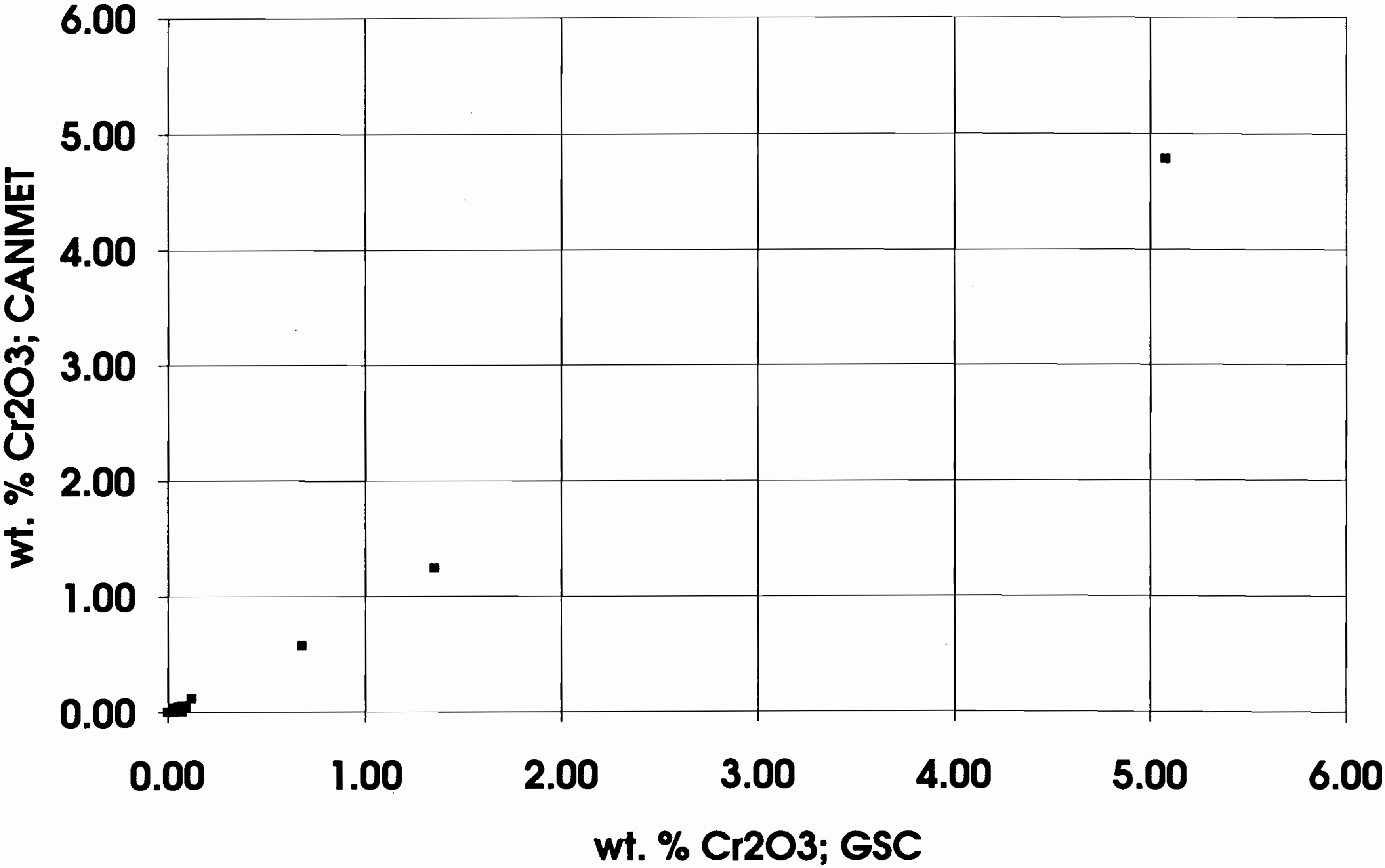


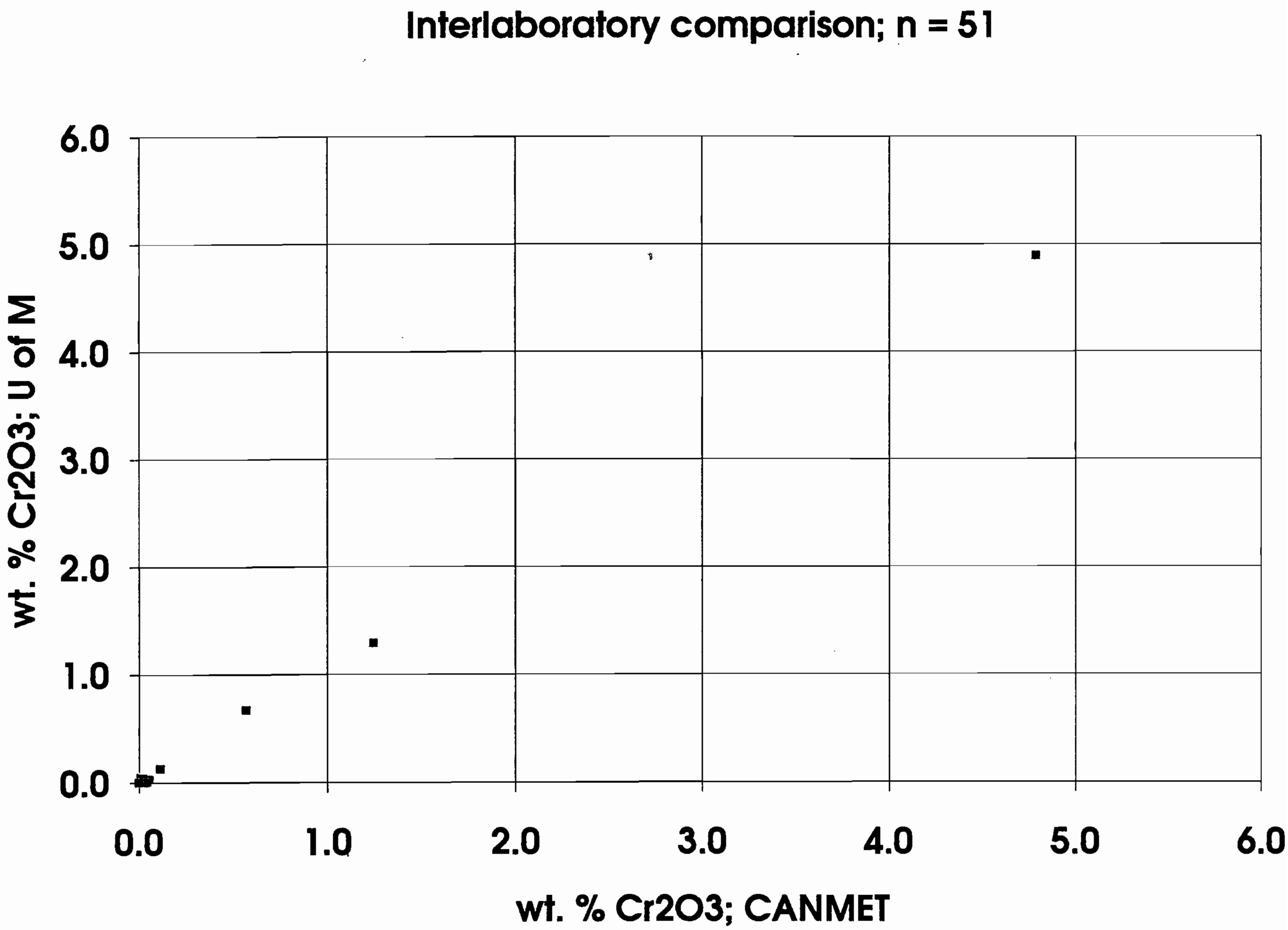

Interlaboratory comparison; n=51
25
20
15
10
5
0
wt. % CaO; CANMET
0
5
10
15
20
25
wt. % CaO; GSC

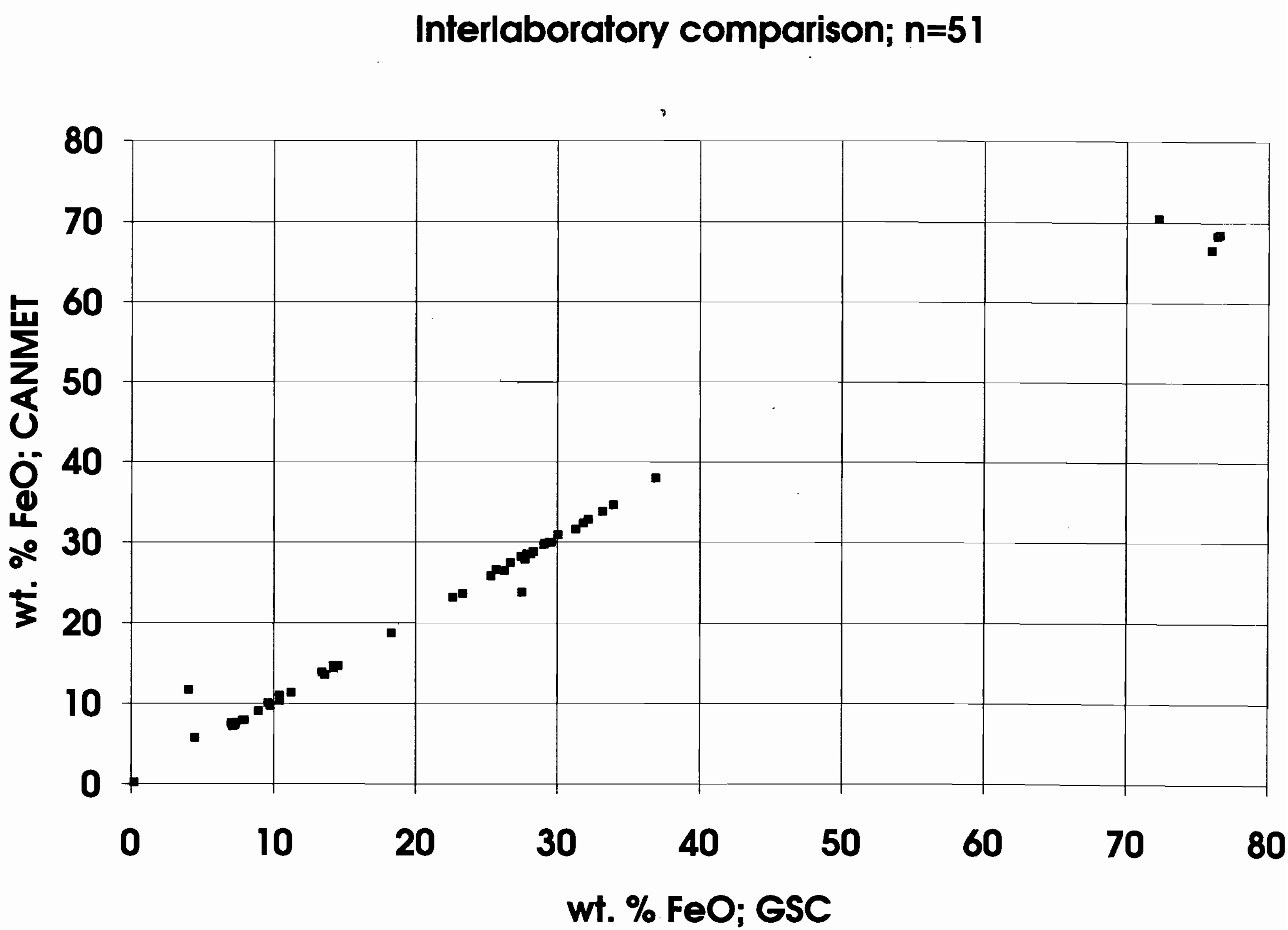
Interlaboratory comparison; n = 51



Interlaboratory comparison; n=51

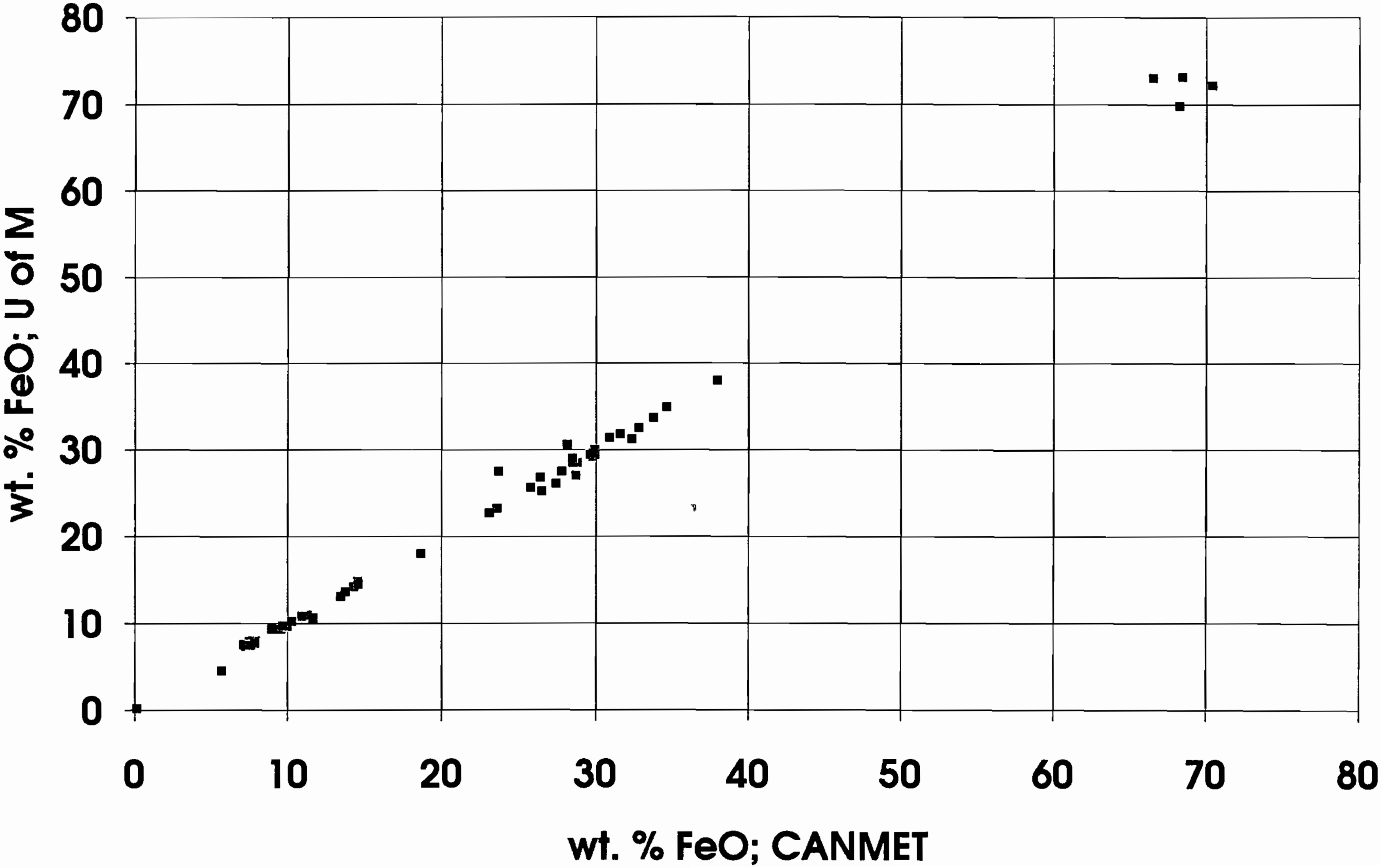


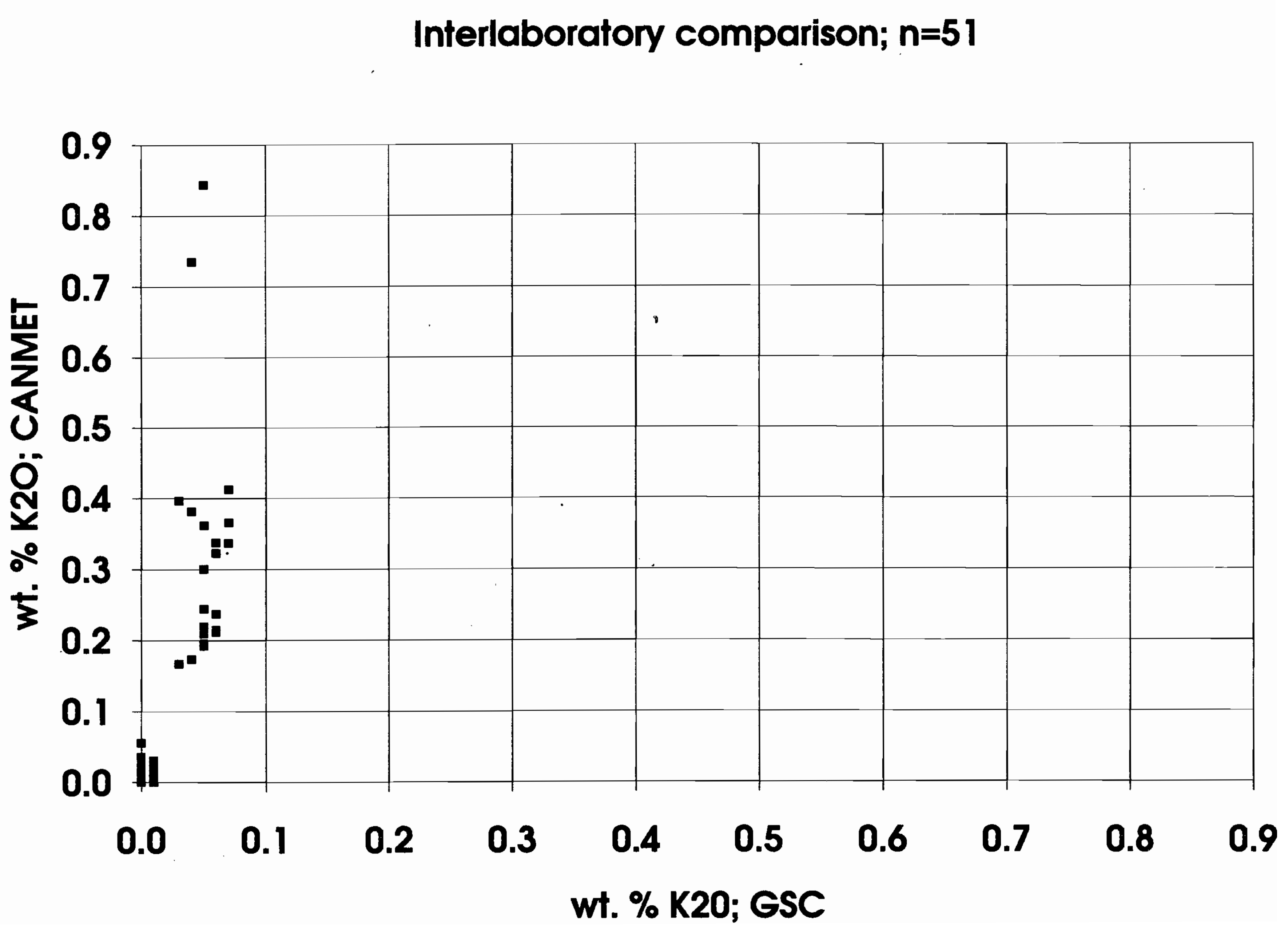

Interlaboratory comparison; n = 51
wt. % Cr2O3; U of M
wt. % Cr2O3; CANMET
0.0
1.0
2.0
3.0
4.0
5.0
6.0

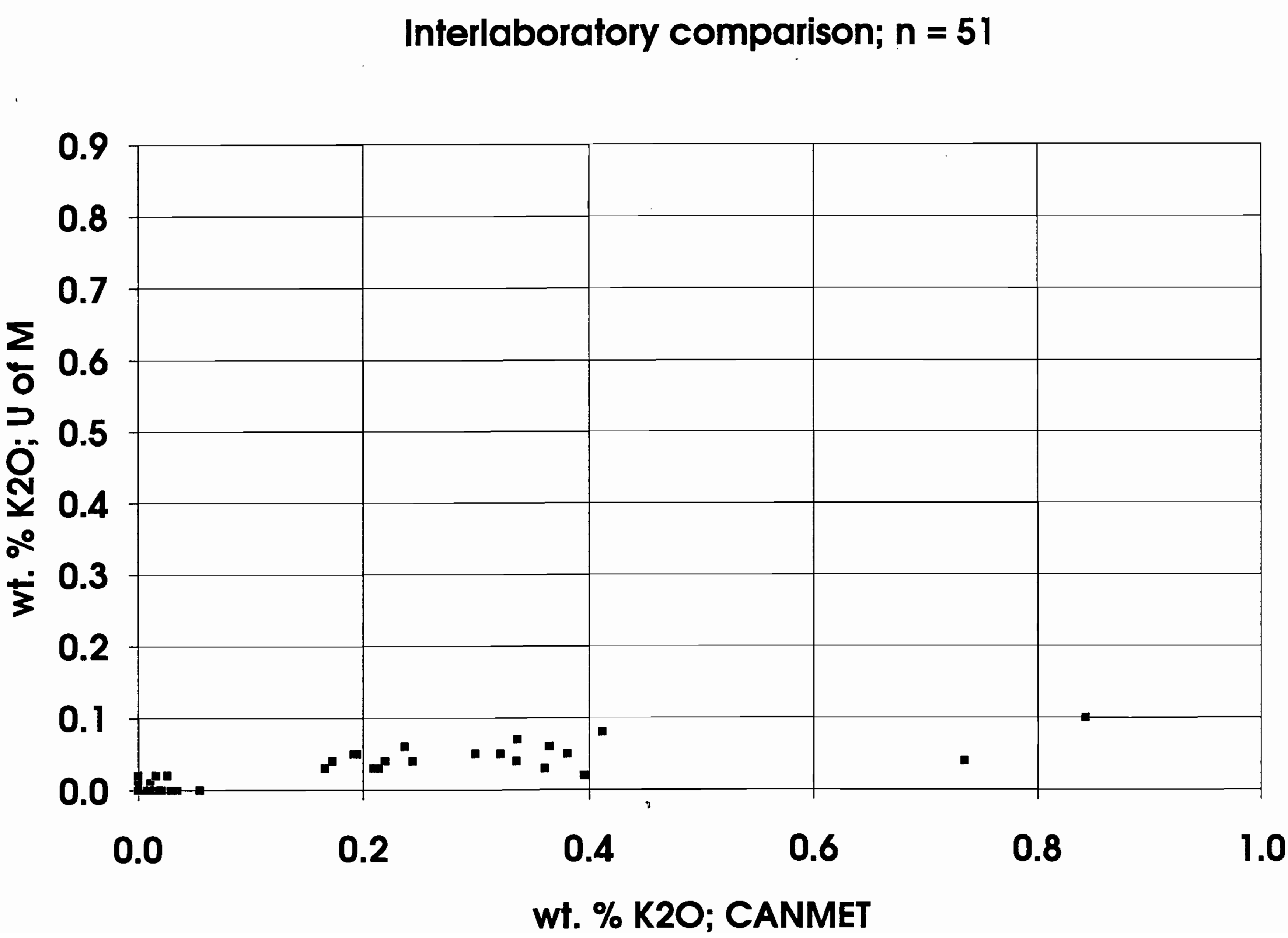


Interlaboratory comparison; n=51
wt. % FeO; CANMET
0
10
20
30
40
50
60
70
80
wt. % FeO; GSC

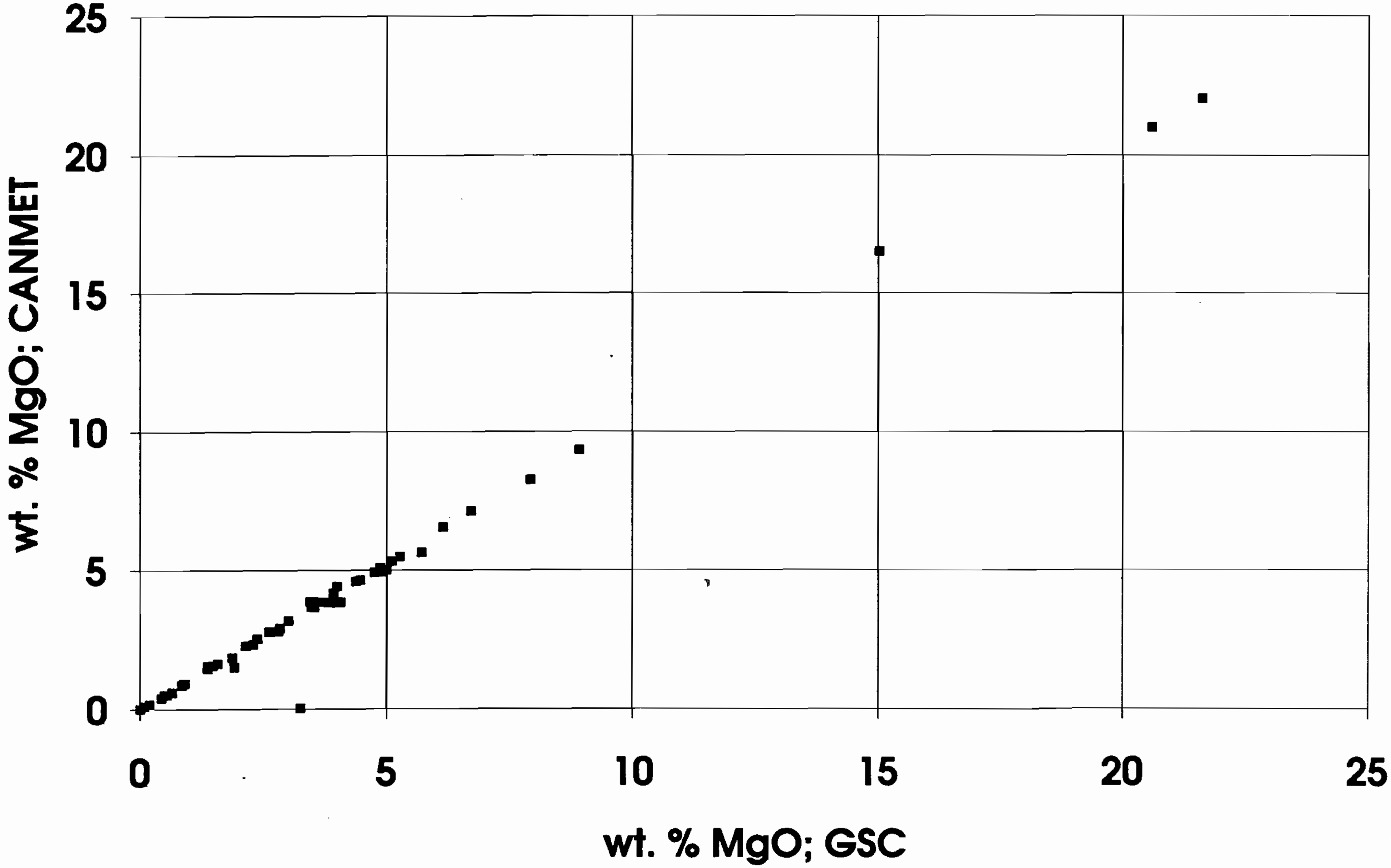
Interlaboratory comparison; n = 51

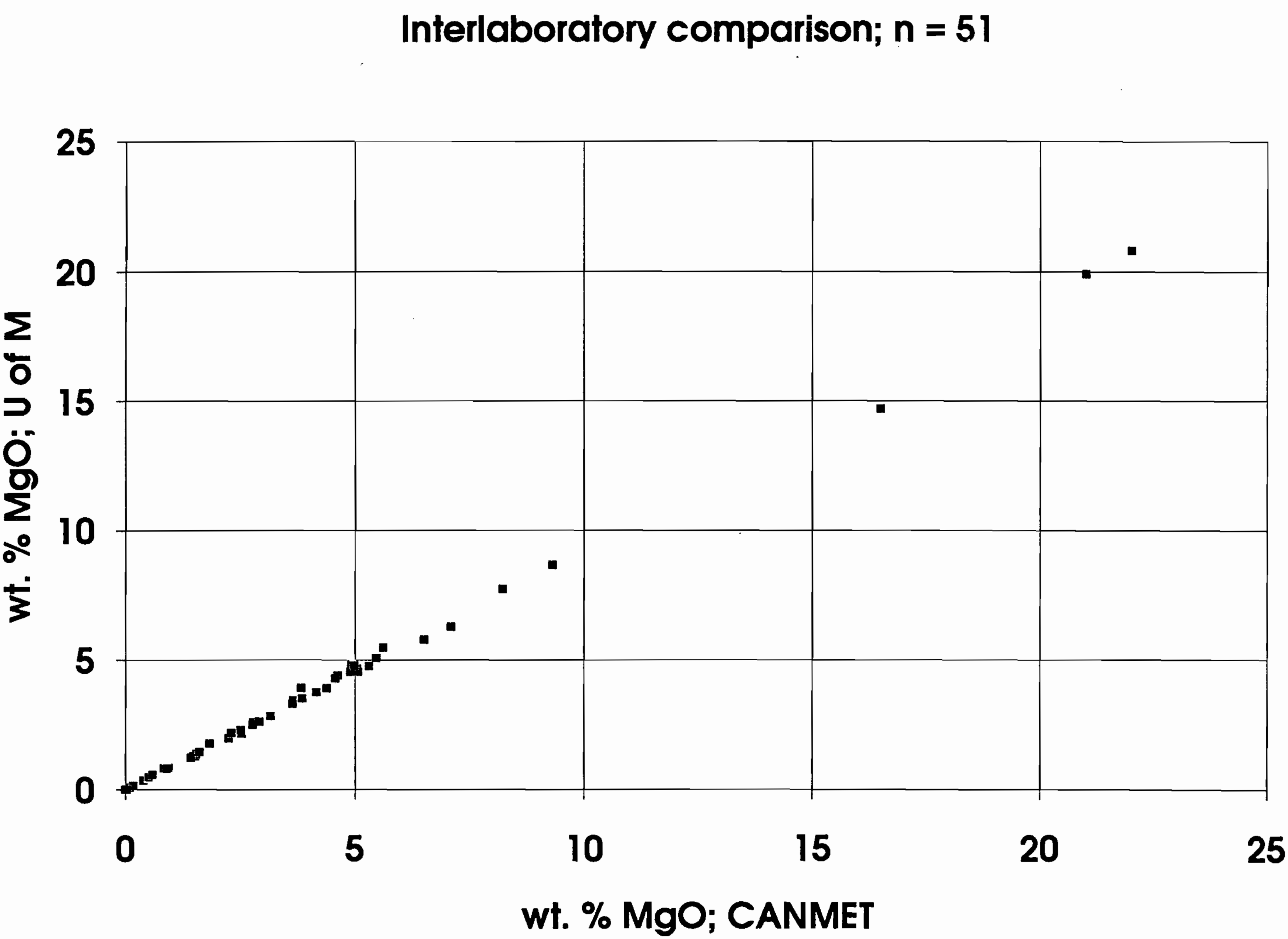


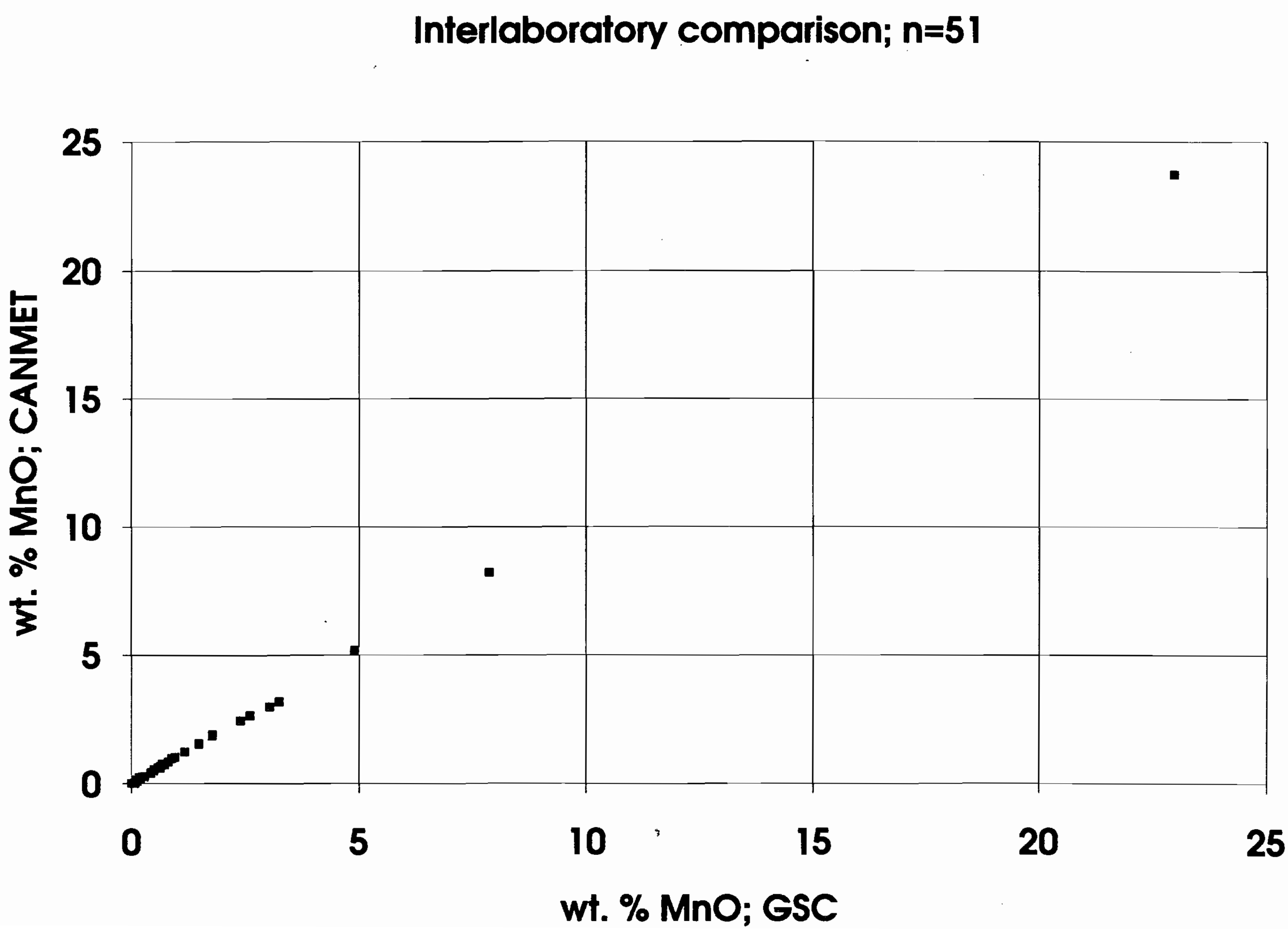

Interlaboratory comparison; n=51
wt. % K2O; CANMET
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
wt. % K20; GSC


Interlaboratory comparison; n = 51
wt. % K2O; U of M
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.2
0.4
0.6
0.8
1.0
wt. % K2O; CANMET

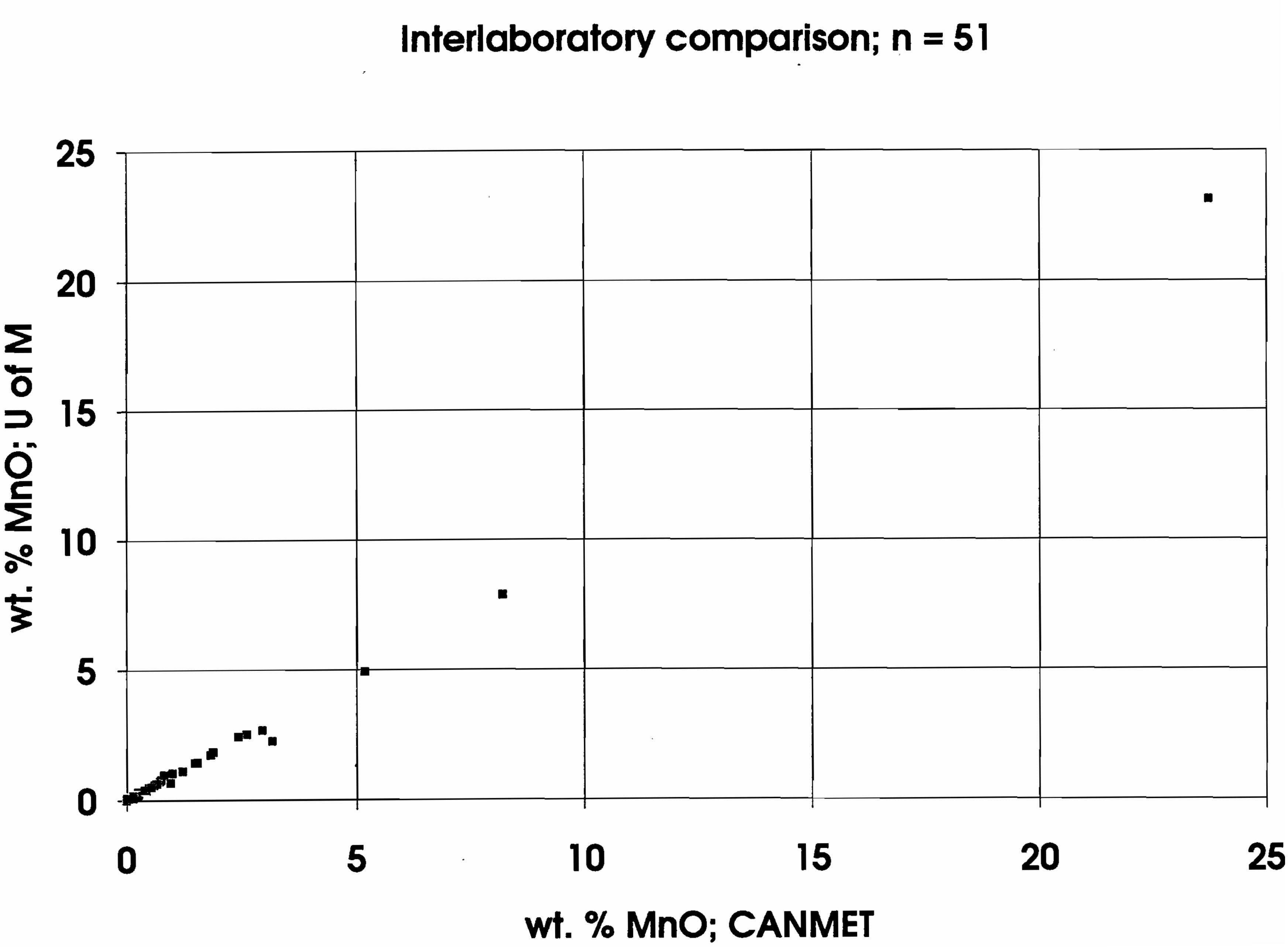
Interlaboratory comparison; n=51



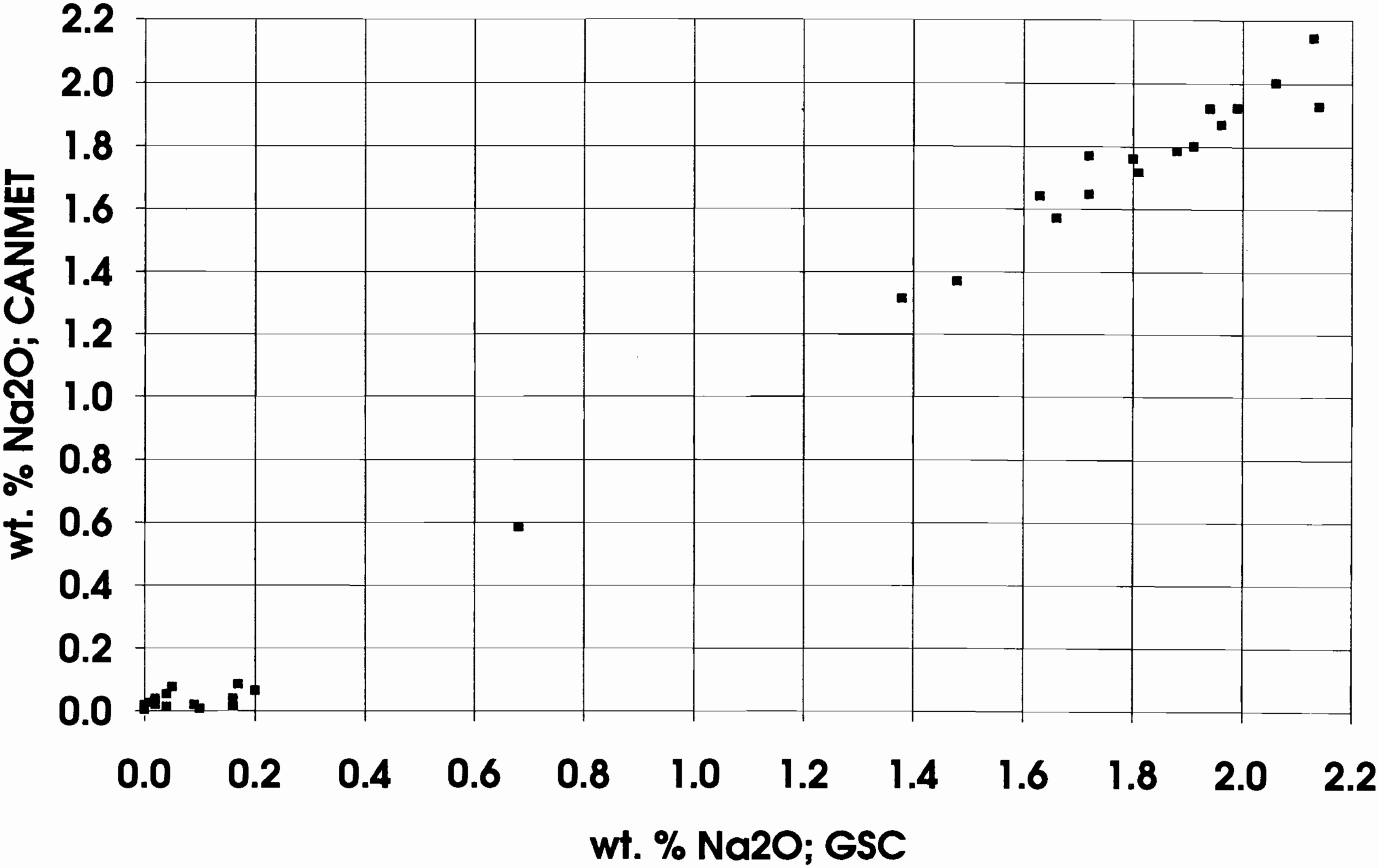

Interlaboratory comparison; n = 51
wt. % MgO; U of M
wt. % MgO; CANMET
0
5
10
15
20
25



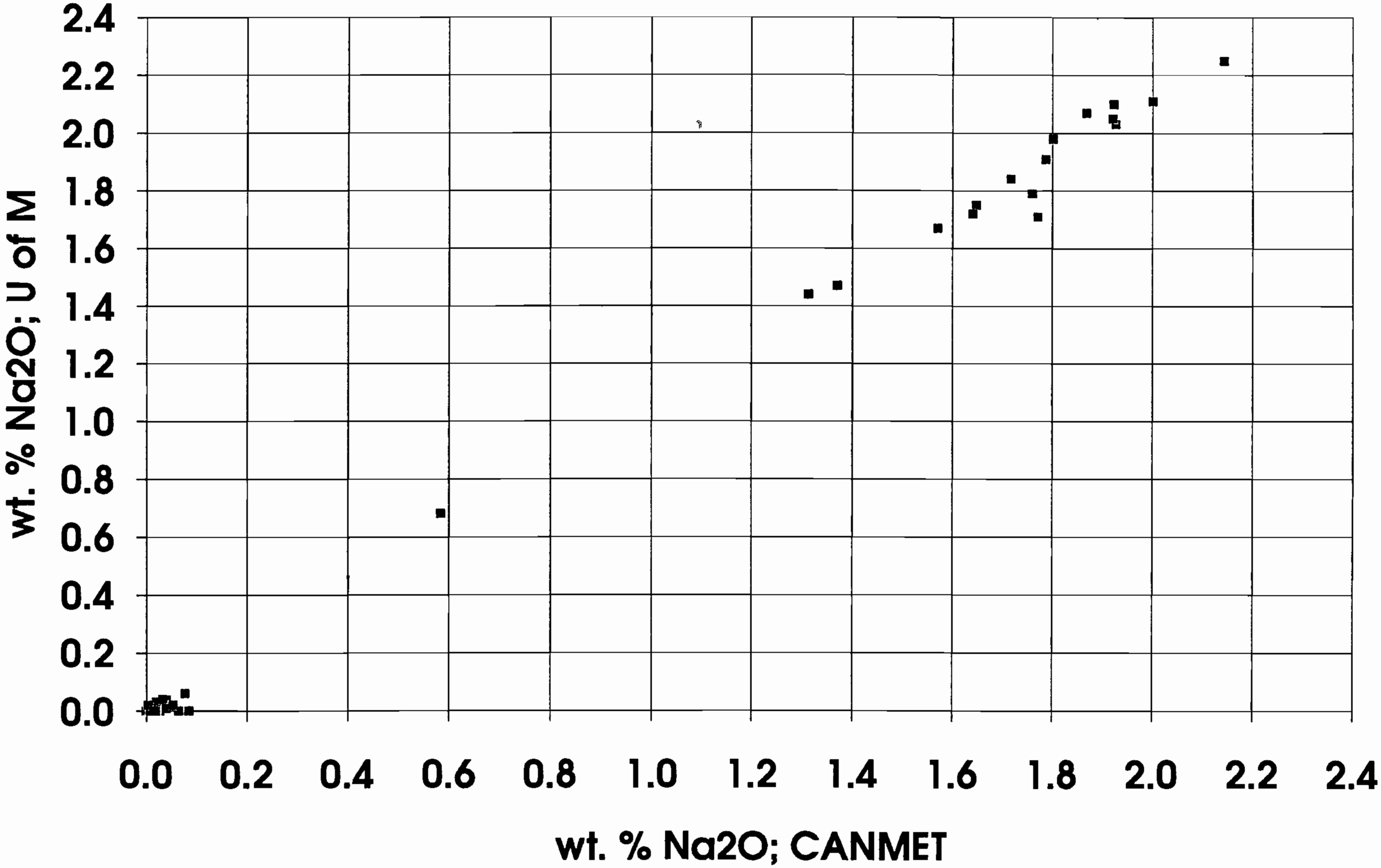
Interlaboratory comparison; n=51
wt. % MnO; CANMET
wt. % MnO; GSC
0
5
10
15
20
25


Interlaboratory comparison; n = 51
wt. % MnO; U of M
wt. % MnO; CANMET
0
5
10
15
20
25

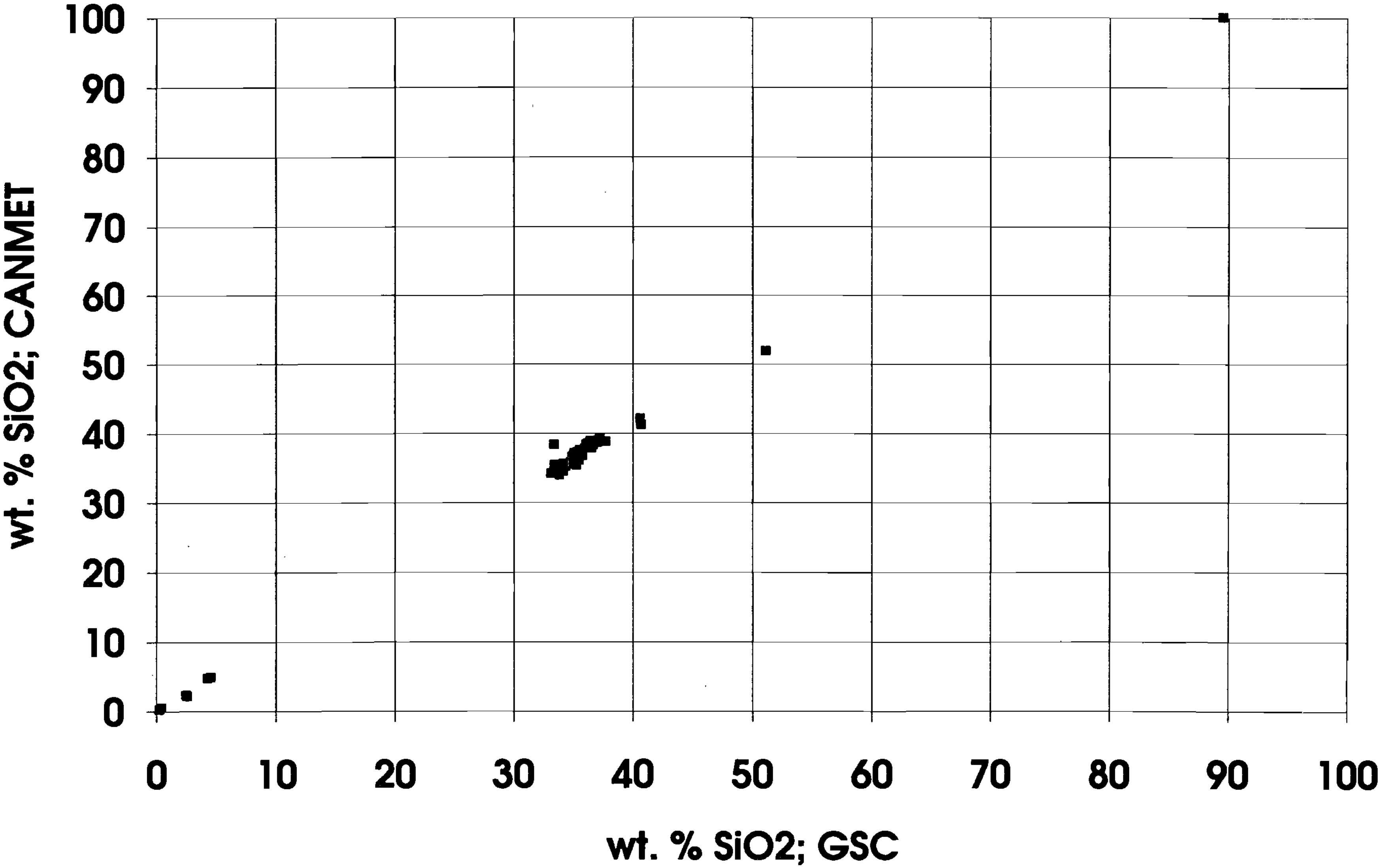
Interlaboratory comparison; n=51



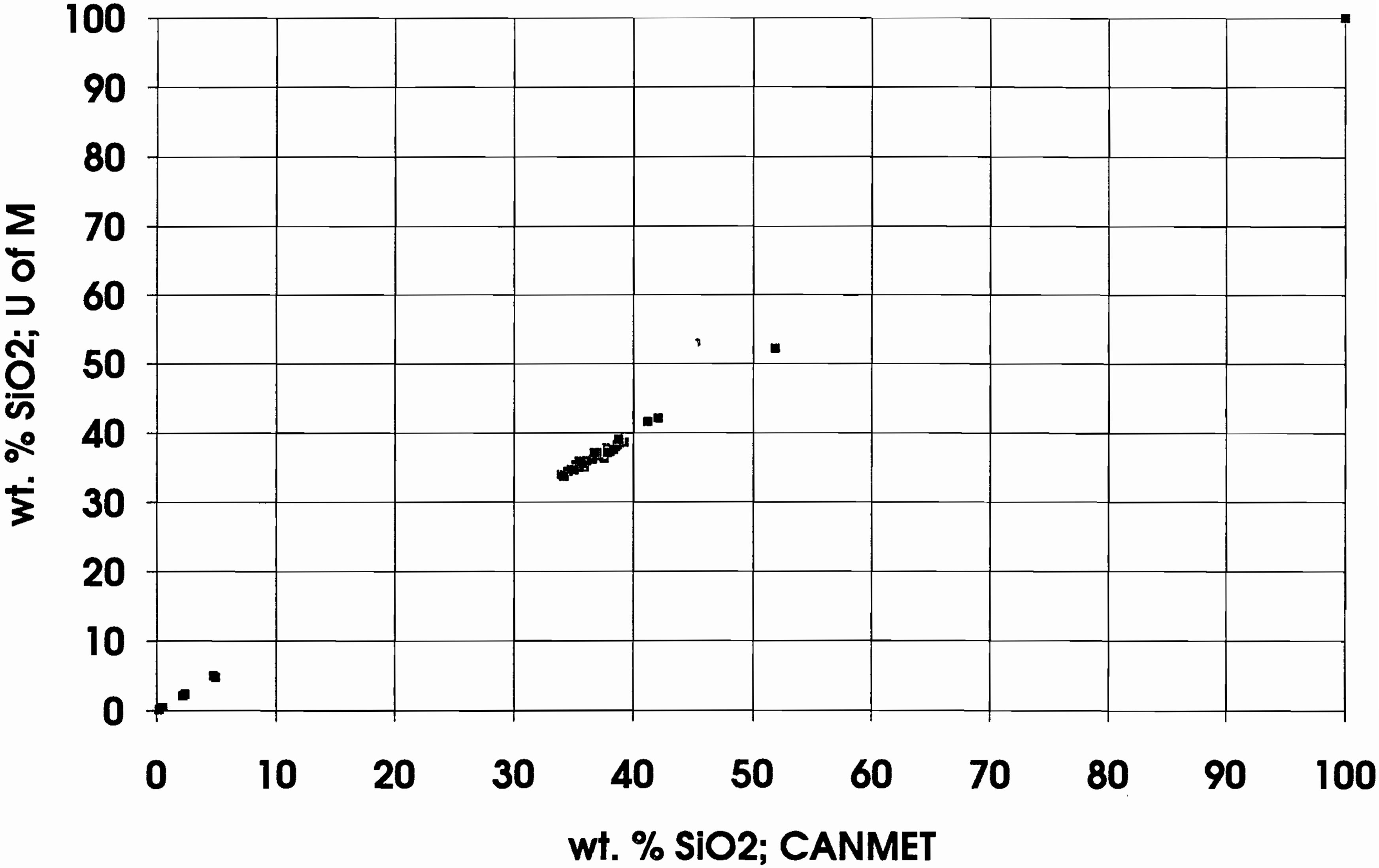
Interlaboratory comparison; n = 51

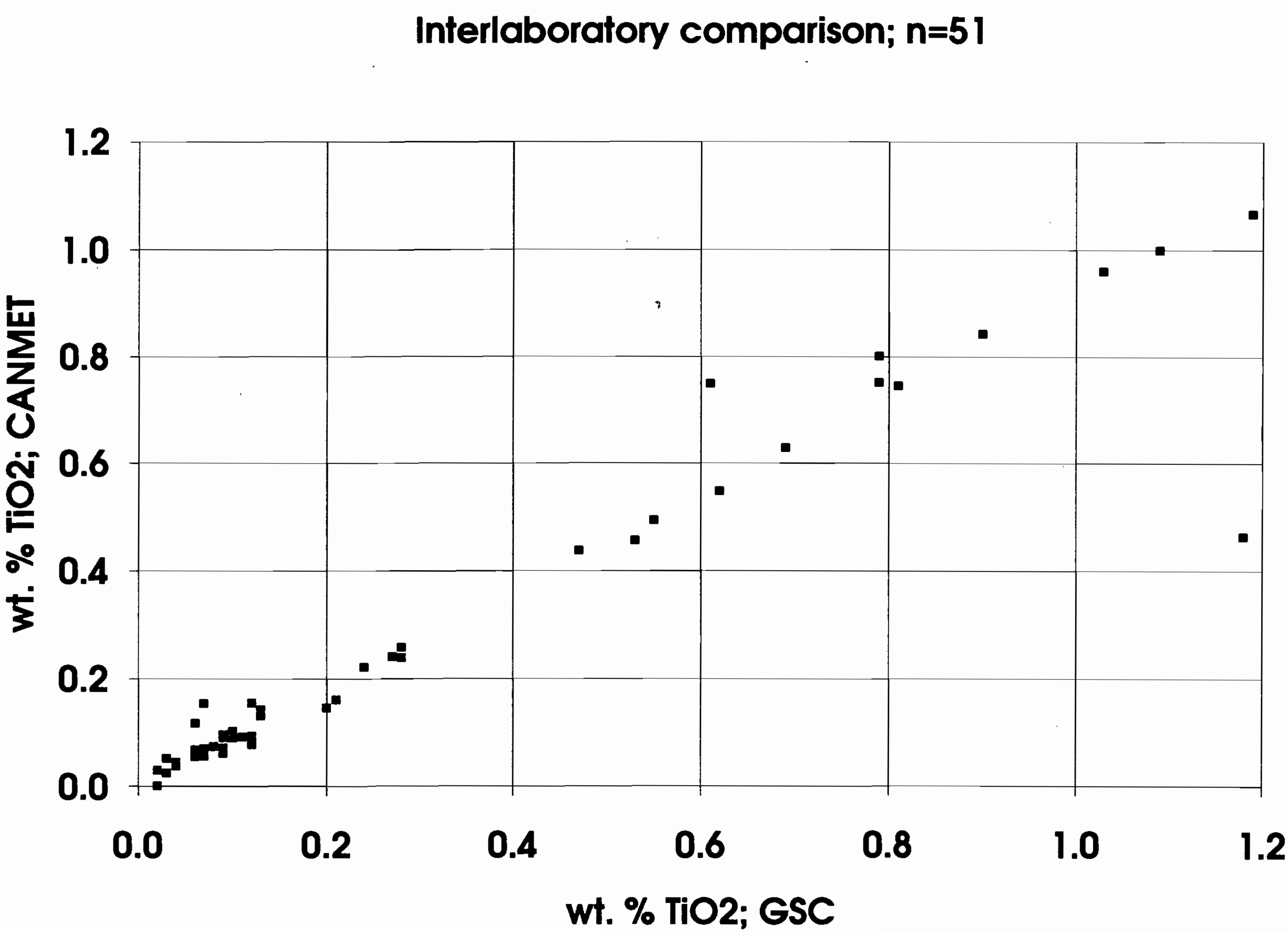


Interlaboratory comparison; n=51

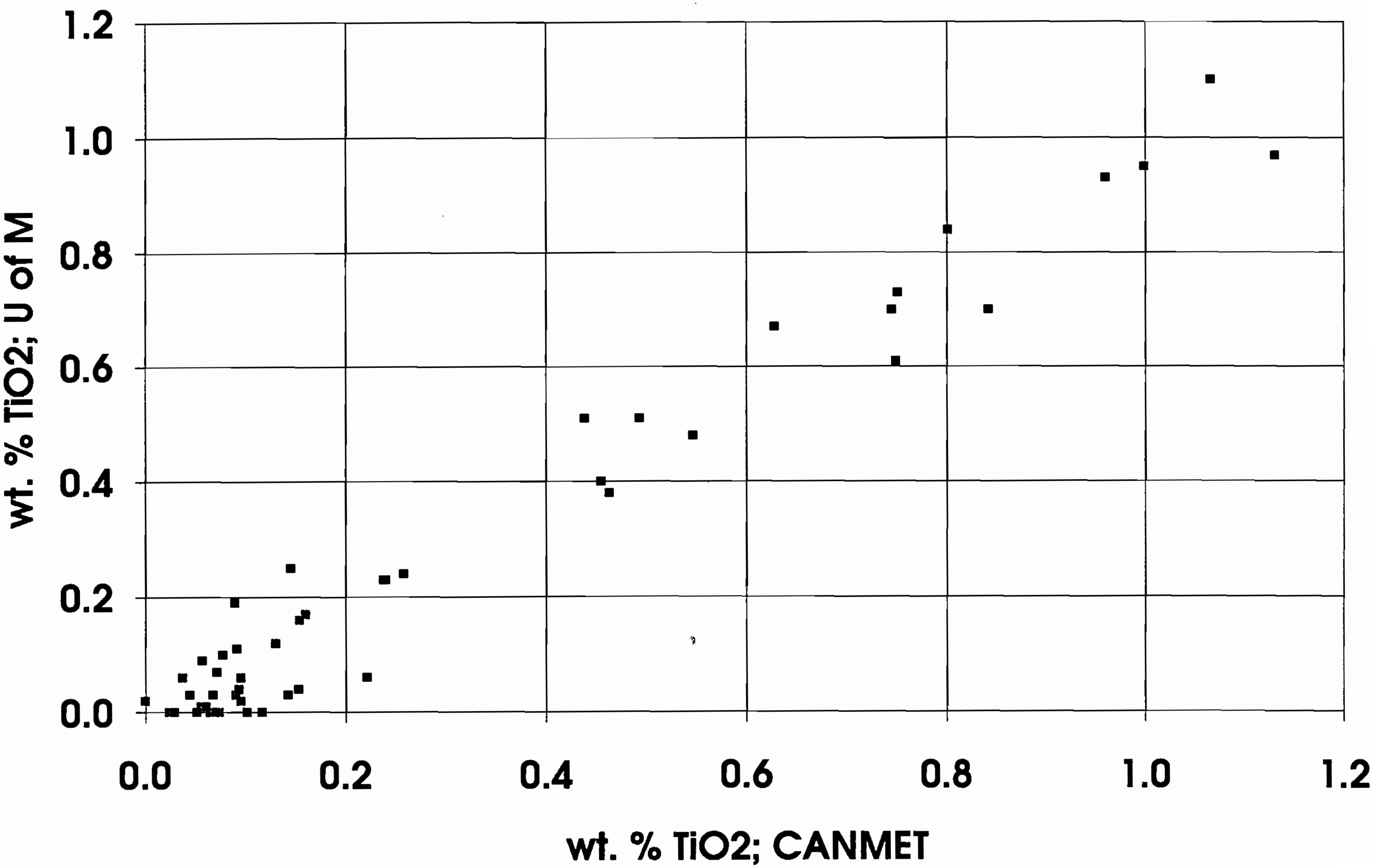


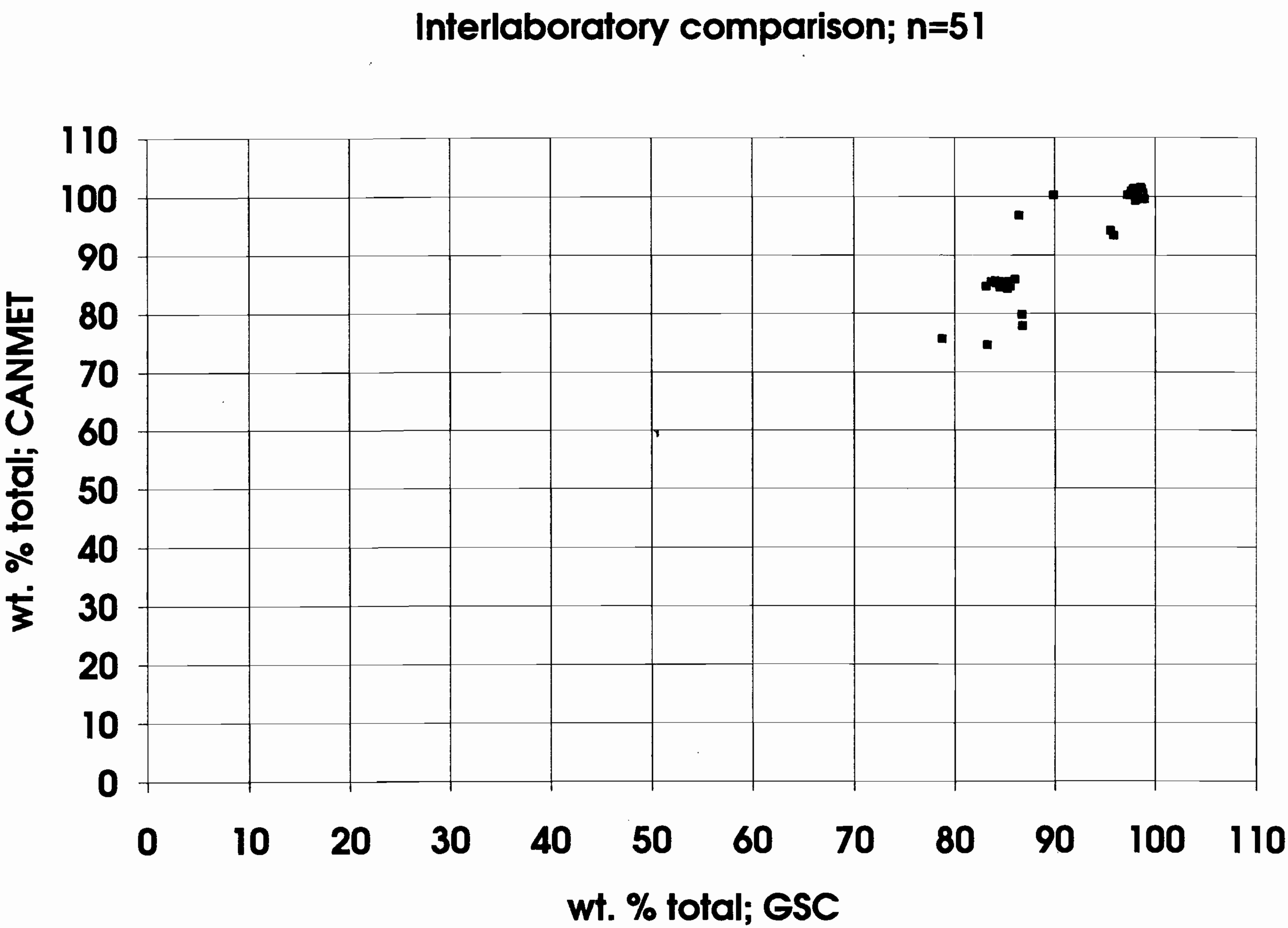
Interlaboratory comparison; n = 51



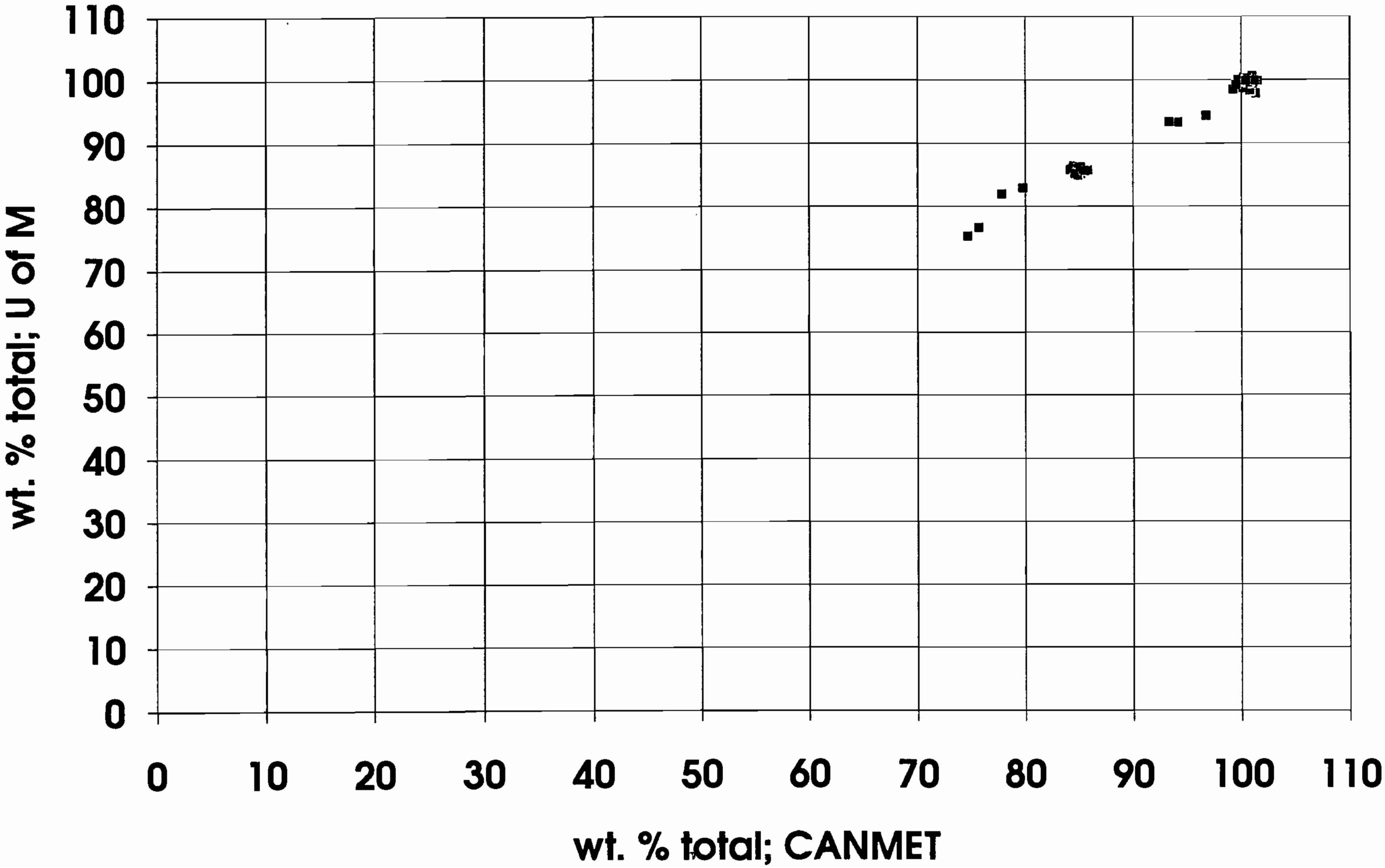

Interlaboratory comparison; n=51
wt. % TiO2; CANMET
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
wt. % TiO2; GSC

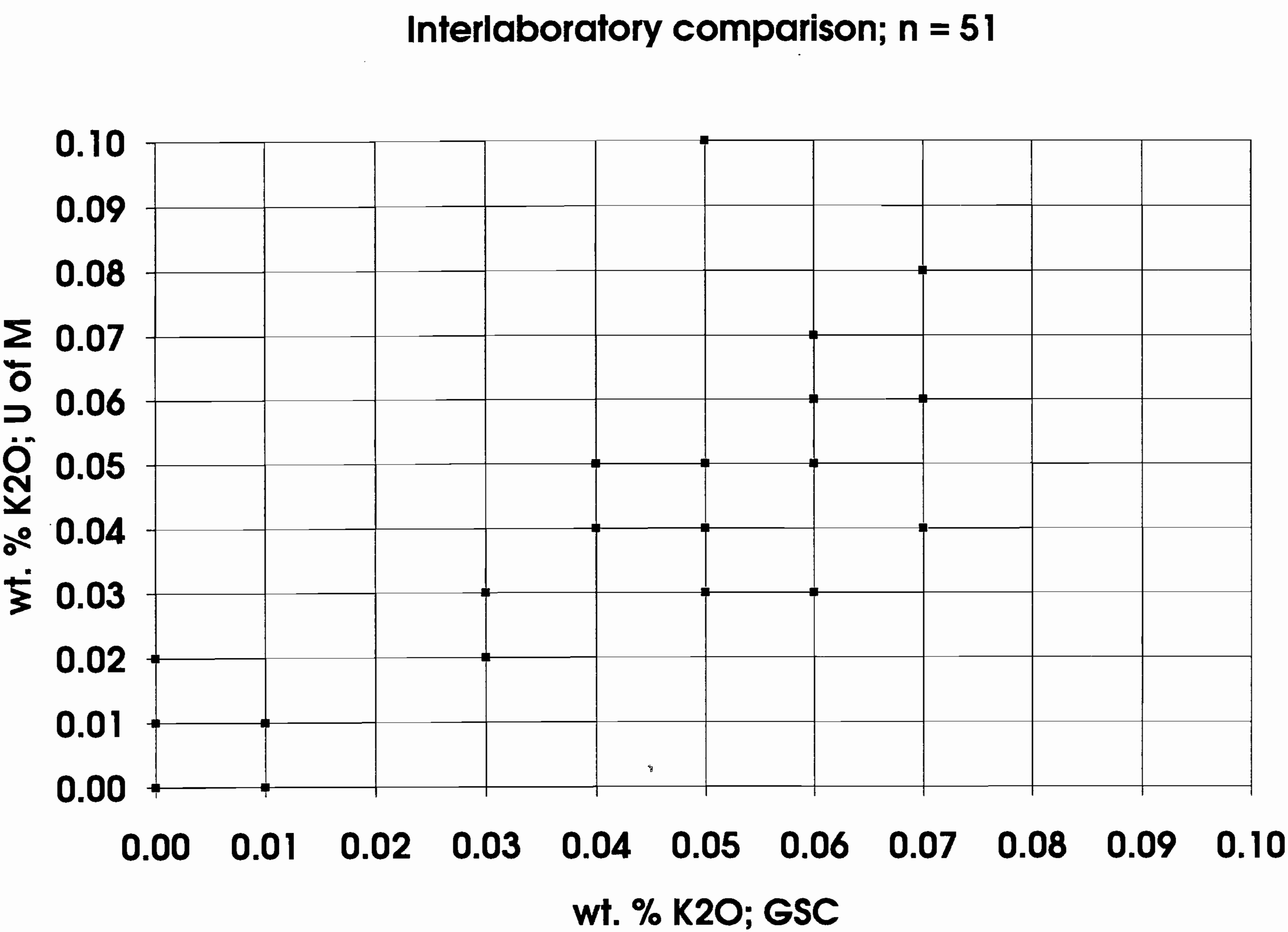
Interlaboratory comparison; n = 51




Interlaboratory comparison; n=51
wt. % total; CANMET
110
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100
110
wt. % total; GSC

Interlaboratory comparison; n = 51




Interlaboratory comparison; n = 51
wt. % K2O; U of M
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
wt. % K2O; GSC

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