

Sample

MINNESOTA GEOLOGICAL SURVEY

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**ANALYTICAL RESULTS OF THE
PUBLIC GEOLOGIC SAMPLE PROGRAM,
1983-1985 BIENNIUM**



UNIVERSITY OF MINNESOTA

Saint Paul

1985



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PUBLIC GEOLOGIC SAMPLE PROGRAM,
1983-1985 BIENNIUM**

By

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The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, or handicap.

INTRODUCTION

In 1983 the Minnesota Geological Survey, in conjunction with the Minnesota Department of Natural Resources, Division of Minerals, began a geologic sample program whereby the general public was encouraged to submit samples of geologic material for identification and possible analysis. The program was roughly patterned after a similar program in Finland. The Finnish program has resulted in a heightened public interest in the mineral potential of that country and has resulted in the discovery of several ore deposits. It was for those reasons, as well as the potential increase in geologic knowledge that could result, that a similar program was initiated in Minnesota.

As originally conceived, the geologic sample program was to focus on samples submitted to the Minnesota Geological Survey by the general public. As part of its public service function, the Survey was to identify and classify rock or mineral samples that were collected in the state. If any of the samples were thought to have potential scientific or economic interest, they were to be submitted for chemical analyses or other appropriate tests. A copy of a brochure that was prepared to advertise the program is shown in Figure 1, and the sample submittal form that sets forth the operating conditions for the program is shown in Figure 2. The brochure and other publicity about the program led to requests for 238 submittal forms and to approximately 500 walk-in and telephone requests for additional information. Unfortunately, of the more than 700 inquiries, only 9 samples were ultimately judged suitable for additional chemical analysis (Table 1). The "suitability" rate of only slightly more than 1 percent was due to a number of factors. Many people only became aware of the program very late in the biennium. Other people who had samples of scientific or economic interest were unwilling to submit those samples to the Geological Survey for several reasons, including (a) the expense of mailing samples, (b) an unwillingness to part with a "prized" specimen, or (c) a lack of knowledge about mineral rights (i.e., a fear of jeopardizing their rights by revealing the location of a sample). However the great majority of samples were submitted by individuals who simply wanted them identified without concern as to possible scientific or economic value.

Because of the sluggish public response, the program was modified in early 1985 to include samples of scientific or economic interest that were submitted by personnel of the Minnesota Department of Natural Resources, Division of Minerals, or the Minnesota Geological Survey. This programmatic change led to the additional analysis of 304 samples from various components of the Early Proterozoic Animikie basin on the Mesabi and Cuyuna ranges and in east-central Minnesota (Tables 2, 3, 4, and 7) and from various poorly known rock units in southwestern (Tables 5 and 8) and southeastern Minnesota (Tables 6 and 9).

ANALYTICAL PROCEDURES

The so-called "ten-element exploration package" of analyses that are summarized in Tables 1-6 of this report were performed by Geochemical Services, Inc. (GSI) of Torrance, California, using inductively coupled plasma-atomic emission spectrometer methods and in the case of gold (Au) a HGA-500 atomic absorption graphite furnace. Both units were equipped with fully automatic sampling capabilities. GSI reports detection limits for the ten-elements in the package to be: gold (Au) 1 ppb; silver (Ag) 0.05 ppm; antimony (Sb) 1.0 ppm; arsenic (As) 1.0 ppm; copper (Cu) 1.0 ppm; lead (Pb) 1.0 ppm; mercury (Hg) 0.5 ppm; molybdenum (Mo) 1.0 ppm; thallium (Tl) 1.0 ppm; and zinc (Zn) 1.0 ppm.

The whole-rock analyses summarized in Tables 7-9 were performed by X-ray Assay Laboratories (XRAL) of Don Mills, Ontario, Canada, using standard x-ray fluorescence (XRF) techniques. XRAL reports that the standard oxide analyses are generally reproducible to ± 1 percent of the reported value. They also report detection limits of 10 ppm for the trace elements rubidium (Rb), strontium (Sr), yttrium (Y), zirconium (Zr), niobium (Nb), and barium (Ba).

SUMMARY

Although the Public Geologic Sample Program started slowly and did not bring in the numbers of samples anticipated from the public sector, it still produced a considerable amount of data that will be useful to the Minnesota Geological Survey, the Minnesota Department of Natural Resources, and the general public. Interest in the program increased toward the end of the biennium, and we expect that it will expand over the next few years and consequently produce significant data regarding the geology of Minnesota.

ARE YOU A PROSPECTOR AT HEART?



Then join a Minnesota treasure hunt!

Maybe you think of modern mineral exploration as big, high-tech business, requiring such things as airborne geophysics, satellite remote sensing, diamond drilling, and a lot of scientific expertise—it does.

But did you know that even today many discoveries of valuable metals and other minerals are made accidentally when someone picks up an unusual-looking rock, wonders what it is, and takes the trouble to find out? There is no substitute for an inquisitive eye and an inquiring mind. That is why the Minnesota Geological Survey wants to help you be a prospector.

FREE ROCK AND MINERAL IDENTIFICATION AND ANALYSIS

The Minnesota Geological Survey will provide free identification of any rock or mineral collected in Minnesota. We will make a preliminary examination, and if a specimen in our judgment is of potential scientific or economic interest, we will make a chemical analysis or run other appropriate tests. We will immediately report the preliminary identification of all specimens to you. If your specimen is selected for chemical analysis, we will report the results when tests are completed and send you a summary of other information we may have on the value and significance of the specimen. We reserve the right to issue a yearly report giving the location and results of all analyses made under this program, but you will receive your results directly from us in advance.



Samples of solid rock can be taken from bedrock outcrops and from construction sites and drill holes.

Minnesota Public Geologic Sample Program
Minnesota Geological Survey
2642 University Avenue
St. Paul, MN 55114-1057

Figure 1. Brochure prepared to advertise the Public Geologic Sample Program, which was printed on 8 1/2 x 11 inch sheets of colored paper; continued on following page.

ORDER FORM

I am interested in participating in the Minnesota Public Geologic Sample Program. Please send me _____ rock-sample submittal forms (one form per sample).

Name: _____

Address: _____

City: _____

State: _____ Zip: _____



Unconsolidated deposits of glacial drift are very thick in some parts of Minnesota.

closely associated with and derived from nearby outcrops. Samples are of less value if they are from streams and lakes or glacial drift deposits. Such deposits are unconsolidated and are likely to contain a variety of rock materials which are commonly rounded into pebbles and may have been transported many miles from their source. Still, these samples can be useful if their source can be located.

Rock samples will be analyzed if they (1) are from a locality, rock type, or formation potentially favorable for economic mineral deposits, (2) are visibly mineralized or show signs, such as staining or decomposition, of mineralization, or (3) are of potential scientific interest.

Sample size:

If possible, samples should comprise at least several ounces of material for analysis, preferably about half a pound, but please, due to space and handling limitations, limit your samples to less than 10 pounds. Other sizes are acceptable, but the Minnesota Geological Survey cannot guarantee the accuracy of analyses done on very small samples.

If you would like to participate in this program:

1. Obtain a rock-sample submittal form by sending in the order blank on the last page or call (612) 373-3372.
2. Send your sample(s) with the completed submittal form(s). (One form for each sample, please.) If you would like the unanalyzed portion of your sample returned to you, you must provide adequate postage with a completed return address label.
3. This offer does not apply to the identification of fossils or artifacts. You may be able to obtain help with these through the Science Museum of Minnesota.

It is important to describe the location where your sample was collected as accurately as possible. The best way is to use the township, range, section system, or exact latitude and longitude, both of which are found on U.S. Geological Survey topographic maps. If this is not possible, try to describe the location accurately by address and geographic description and provide a sketch map, as a state geologist may need to visit the locality of a scientifically interesting sample. The best samples for prospecting come directly from outcrops of bedrock, or "ledge" as it is sometimes called, or from material

ROCK HUNTERS' HINTS

1. Always ask for permission to collect rocks on private property.
2. Label rocks as they are collected and mark location on a map.
3. Be careful in all mines, quarries, and pits—they may have hazardous areas which should be avoided.
4. Proper equipment is important—especially a rock or masonry hammer.
5. Be sure to wear safety glasses when breaking rocks.

We expect, on the basis of past experience, that only a very small percentage of the specimens sent us will turn out to be of economic interest. After all, economic mineral deposits are rare, but each specimen will tell us, and you, a little more about Minnesota geology. So we can't lose, and who knows, someday you may strike it rich!

Send to: Minnesota Public Geologic Sample Program
Minnesota Geological Survey
2642 University Avenue
St. Paul, MN 55114-1057
(612) 373-3372

MINNESOTA PUBLIC GEOLOGIC SAMPLE PROGRAM

MINNESOTA ROCK-SAMPLE SUBMITTAL FORM

Name _____

Address _____

Phone _____

Location from which sample was taken
(by township, range and 1/4 section, if possible, or by location on county
or state highway map)

_____ County, Minnesota.

Property owner (if known) _____
If possible, please attach a sketch map marking the location where your
sample was found.

Type of sample

- | | |
|---|---|
| <input type="checkbox"/> outcrop of bedrock | <input type="checkbox"/> glacial drift |
| <input type="checkbox"/> drill hole in bedrock
depth _____ | <input type="checkbox"/> excavation in glacial drift
depth _____ |
| <input type="checkbox"/> excavation in bedrock
depth _____ | <input type="checkbox"/> lakeshores or streams |
| | <input type="checkbox"/> other (explain) |

Figure 2. Sample submittal form. See following page for operating conditions.

MINNESOTA PUBLIC GEOLOGIC SAMPLE PROGRAM

The undersigned submittor attests and agrees to the following conditions governing the Minnesota Public Sample Program of the Minnesota Geological Survey:

1. Samples must come from Minnesota, and an accurate location must be provided for each sample submitted.
2. Samples will be discarded by Minnesota Geological Survey 30 days after results of identification or analysis have been sent to submittor unless submittor has provided postage and an address label for sample return.
3. Minnesota Geological Survey reserves the right to limit the number of samples from one person or one address.
4. Minnesota Geological Survey makes no warranty and assumes no liability for the completeness or accuracy of the results, or for misidentification or misinterpretation.
5. Minnesota Geological Survey reserves the right to make public the results of any work done on any submitted samples. However, the submittor will be notified in advance.

I have read, understand and accept the foregoing conditions of offer, and have retained a copy for information.

Signed _____
(submittor)

Date _____

Table 1. Publicly Submitted Samples--10 Element Exploration Package

	1	2	3	4	5	6	7	8
Ag	0.693	0.4702	0.4097	0.4381	<0.048	<0.048	<0.049	<0.046
As	5.213	3.906	4.380	2.649	6.389	1.392	<0.996	<0.932
Au	0.0034	0.0037	0.0151	0.0480	<0.001	<0.001	<0.001	<0.001
Cu	63.91	9.235	106.1	99.60	17.24	9.565	7.302	6.272
Hg	<0.469	0.8287	0.5787	0.8807	<0.488	<0.486	<0.498	<0.466
Mo	1.553	3.509	11.32	4.528	1.732	3.408	2.458	1.986
Pb	2.889	8.667	4.678	44.76	11.49	1.509	5.991	2.579
Sb	<0.939	1.909	2.125	2.245	<0.976	<0.972	<0.996	<0.932
Tl	<0.939	<0.936	<0.889	<0.912	<0.976	<0.972	<0.996	<0.932
Zn	19.89	2.571	16.38	6.398	155.7	3.414	15.57	7.231
	9							
Ag	<0.046							
As	5.144							
Au	<0.001							
Cu	50.32							
Hg	0.9052							
Mo	0.7659							
Pb	<0.922							
Sb	3.291							
Tl	<0.922							
Zn	50.28							

1. GSP-13--Quartz vein and accompanying wall rock; Archean; outcrop sample, NE,SE, sec. 34, T71N, R23W, Koochiching County.
2. GSP-29--Quartz vein; Middle Proterozoic; outcrop sample, SE,SE, sec. 28, T64N, R9W, Lake County.
3. GSP-30--Quartz vein and pyrite-rich green rock; Middle Proterozoic; outcrop sample, SE,SE, sec. 28, T64N, R9W, Lake County.

Table 1 continued

4. GSP-31--Aplite dike, minor pyrite; Middle Proterozoic; outcrop sample, SE,SE, sec. 28, T64N, R9W, Lake County.
5. PGP-1--Altered biotite at margin of pegmatite; Archean; outcrop sample, SE,NE, sec. 26, T67N, R17W, St. Louis County.
6. PGP-2--Medial quartz vein in pegmatite; Archean; outcrop sample, SE,NE, sec. 26, T67N, R17W, St. Louis County.
7. PGP-3--Altered biotite at margin of pegmatite; Archean; outcrop sample, SE,NE, sec. 26, T67N, R17W, St. Louis County.
8. PGP-4--Pegmatite; Archean; outcrop sample, SE,NE, sec. 26, T67N, R17W, St. Louis County.
9. NS-1--Basalt rubble, copper-bearing; North Shore Volcanic Group (Keweenawan Supergroup), Middle Proterozoic; outcrop sample.

Table 2. East-Central Minnesota--10 Element Exploration Package

	1	2	3	4	5	6	7	8
Ag	2.673	0.6869	0.1216	0.3134	0.2085	0.2084	0.1650	<0.047
As	525.7	75.47	4.956	3.788	<0.912	<0.896	<0.905	<0.943
Au	0.0324	0.0053	0.0018	0.0016	0.0022	0.0017	0.0019	0.0011
Cu	5916	429.2	133.6	172.3	88.68	108.7	95.13	34.27
Hg	14.54	2.596	2.745	1.026	1.408	1.341	0.7854	0.9374
Mo	108.9	65.79	2.748	13.39	3.912	5.082	2.727	1.351
Pb	40.45	12.12	10.54	5.955	9.707	6.373	3.797	5.303
Sb	97.36	14.09	<0.976	<0.905	<0.912	<0.896	<0.905	<0.943
Tl	1.273	2.782	2.562	<0.905	1.937	1.708	3.035	<0.943
Zn	323.1	227.6	44.43	43.57	19.53	26.13	40.22	2.109
	9	10	11	12	13	14	15	16
Ag	0.2770	1.394	0.8197	0.7777	0.8489	0.1038	0.1064	0.1132
As	<0.899	<0.919	55.33	13.62	<0.932	162.0	1.303	6.629
Au	0.0014	0.0062	0.0054	0.0073	0.0056	0.0345	0.0027	0.0068
Cu	380.7	324.0	253.3	509.0	425.1	79.01	39.86	18.58
Hg	1.015	1.790	0.4919	1.180	0.5996	0.9391	0.7181	0.8611
Mo	5.973	2.860	8.707	14.65	5.436	10.21	1.113	0.8348
Pb	10.16	9.674	22.12	46.18	23.29	10.77	4.674	3.821
Sb	<0.899	<0.919	0.9670	2.198	1.733	4.091	1.125	<0.899
Tl	<0.899	<0.919	<0.905	<0.912	<0.932	<0.961	<0.896	<0.899
Zn	14.90	12.63	115.0	716.4	14.17	61.24	44.50	48.46
	17	18	19	20	21	22	23	24
Ag	<0.048	<0.046	<0.044	<0.043	<0.048	<0.046	<0.046	0.1428
As	11.84	<0.936	<0.896	<0.862	3.795	3.371	<0.922	2.964
Au	0.0020	0.0024	0.0012	<0.001	<0.001	<0.001	<0.001	0.0036
Cu	44.04	34.86	141.4	16.88	7.872	6.702	44.53	194.2
Hg	0.6619	0.6386	<0.448	<0.431	<0.480	<0.464	<0.461	0.4908
Mo	6.916	0.6505	0.8172	<0.431	4.380	<0.464	<0.461	13.61
Pb	1.557	5.386	2.782	1.995	3.603	5.795	2.144	12.73
Sb	<0.968	1.615	<0.896	<0.862	<0.961	<0.929	<0.922	<0.862
Tl	<0.968	<0.936	<0.896	<0.862	<0.961	<0.929	<0.922	<0.862
Zn	19.33	59.28	119.1	166.9	17.57	177.6	87.03	37.64

Table 2 continued

	25	26	27	28	29	30	31	32
Ag	0.1052	0.2981	0.6280	0.1925	0.2367	0.0913	0.1688	0.1774
As	<0.929	3.212	<0.922	1.555	3.185	<0.943	3.338	<0.984
Au	<0.001	<0.001	0.0027	<0.001	<0.001	0.0016	0.0031	0.0015
Cu	55.77	150.7	227.0	97.38	195.8	79.05	92.92	306.9
Hg	<0.464	0.8548	0.5930	0.5131	0.8278	0.9212	0.4812	2.039
Mo	2.714	7.141	12.33	1.641	3.469	5.014	8.687	1.318
Pb	9.689	10.00	23.72	28.63	12.98	7.834	8.050	4.414
Sb	<0.929	<0.957	<0.922	<0.865	<0.859	<0.943	<0.874	<0.984
Tl	<0.929	<0.957	<0.922	<0.865	<0.859	<0.943	<0.874	<0.984
Zn	150.4	170.6	67.36	136.3	86.24	111.6	202.9	63.33
	33	34	35	36	37	38	39	40
Ag	0.3032	0.4231	0.3218	0.2683	0.1453	0.2376	0.2146	0.1749
As	42.06	3.909	6.702	23.85	31.07	12.30	4.269	19.04
Au	<0.001	<0.001	<0.001	0.0044	0.0012	0.0016	<0.001	<0.001
Cu	97.61	174.5	152.2	69.19	58.10	142.4	163.9	129.6
Hg	1.845	3.507	1.317	<0.438	<0.473	1.361	1.711	0.5803
Mo	6.378	7.421	1.319	1.847	2.264	1.555	1.203	1.906
Pb	5.368	9.682	10.92	16.23	11.72	10.48	5.693	5.960
Sb	1.401	1.726	1.602	2.163	<0.946	<0.868	1.125	<0.909
Tl	<0.976	<0.943	<0.868	<0.877	<0.946	<0.868	<0.922	<0.909
Zn	573.2	317.3	599.8	475.5	799.9	567.3	31.10	245.7
	41	42	43	44	45	46	47	48
Ag	0.3825	0.7368	0.7447	0.6496	2.367	0.8106	0.0675	<0.046
As	<0.976	2.019	10.59	5.069	4.636	9.762	19.93	319.9
Au	<0.001	0.0029	0.0038	0.0169	0.0080	0.0219	0.0025	0.0076
Cu	159.5	165.6	219.0	160.9	687.7	428.0	15.46	28.09
Hg	2.669	1.694	1.122	1.474	6.452	0.7872	0.5527	<0.466
Mo	1.449	1.551	2.593	1.599	4.216	8.034	1.671	1.902
Pb	16.22	12.59	11.57	4.165	40.11	12.96	6.366	6.734
Sb	<0.976	<0.954	<0.968	<0.912	<0.899	<0.925	<0.922	<0.932
Tl	<0.976	<0.954	<0.968	<0.912	<0.899	<0.925	<0.922	<0.932
Zn	802.4	89.45	887.8	58.72	2620.	429.0	32.13	41.16

Table 2 continued

	49	50	51	52	53	54	55	56
Ag	0.3087	0.1854	1.273	0.1570	0.1096	0.1479	0.0501	0.1041
As	111.5	<0.932	66.92	<0.968	<0.896	0.2004	<0.943	3.253
Au	0.143	0.0028	0.0136	0.0041	0.0322	0.2309	0.0169	0.0031
Cu	190.3	43.87	2417.	491.9	369.6	46.43	35.68	71.78
Hg	1.595	2.470	2.401	2.381	0.9243	0.2156	0.8295	0.4603
Mo	3.690	1.261	0.9043	0.7300	2.133	0.1738	1.448	1.150
Pb	14.74	29.88	28.69	1.719	12.62	15.77	22.78	5.203
Sb	<0.909	<0.932	<0.919	<0.968	<0.896	<0.110	<0.943	<0.915
Tl	<0.909	1.363	<0.919	<0.968	<0.896	0.2264	1.828	3.957
Zn	335.1	23.58	25.72	228.7	41.10	12.89	93.80	86.04
	57	58	59	60	61	62	63	64
Ag	0.0954	<0.045	0.2255	0.0723	0.1654	0.1608	0.1066	0.0943
As	<0.943	<0.919	1.748	1.408	<0.939	<0.984	<0.968	2.783
Au	0.0026	0.0019	0.0024	0.0039	0.0078	0.0022	0.0016	0.0014
Cu	46.21	23.03	40.74	77.67	167.5	123.7	90.71	84.78
Hg	1.249	<0.459	<0.444	2.570	0.9748	1.338	<0.484	0.8895
Mo	1.961	1.136	1.307	2.318	2.037	1.035	1.251	0.7645
Pb	12.43	5.485	6.748	7.571	13.63	4.545	2.182	6.504
Sb	<0.943	<0.919	<0.889	<0.957	<0.939	<0.984	<0.968	<0.902
Tl	3.798	1.620	1.512	<0.957	<0.939	<0.984	<0.968	<0.902
Zn	50.72	55.38	51.67	95.67	96.03	164.4	46.75	86.55
	65	66	67	68	69	70	71	72
Ag	0.0575	0.0830	0.3683	<0.047	0.8596	<0.049	<0.048	<0.048
As	<0.899	2.174	2.629	1.458	81.31	7.148	6.443	27.92
Au	0.0028	<0.001	0.0209	0.0020	<0.001	<0.001	<0.001	0.0014
Cu	188.4	34.47	131.6	28.13	183.0	3.985	27.99	17.97
Hg	1.149	0.6916	1.237	<0.478	<0.488	<0.496	<0.480	<0.488
Mo	2.274	1.625	2.261	0.8670	7.328	1.057	1.692	5.688
Pb	5.637	3.334	23.12	3.457	6.366	2.270	3.997	5.071
Sb	<0.899	<0.972	<0.943	<0.957	<0.976	<0.992	<0.961	<0.976
Tl	<0.899	1.985	<0.943	<0.957	<0.976	<0.992	<0.961	1.898
Zn	45.67	39.37	79.83	90.80	42.35	19.23	5.736	155.0

Table 2 continued

	73	74	75	76	77	78	79	80
Ag	<0.047	0.5693	<0.050	<0.045	<0.048	<0.049	<0.048	0.7442
As	4.293	5.958	11.91	15.15	111.3	17.48	8.871	9.527
Au	0.0011	0.0063	<0.001	<0.001	<0.001	0.0019	<0.001	0.0120
Cu	2.304	64.40	3.395	18.34	53.03	8.593	19.16	154.0
Hg	<0.478	1.934	<0.500	<0.454	0.9042	<0.490	0.4881	5.397
Mo	1.423	171.0	3.181	8.424	4.217	2.051	1.301	6.765
Pb	3.491	27.87	2.936	3.834	33.11	45.74	4.083	8.107
Sb	<0.957	1.506	<1.00	<0.909	<0.961	1.978	<0.968	3.408
Tl	<0.957	<0.992	<1.00	<0.909	<0.961	<0.980	<0.968	<1.00
Zn	41.09	37.34	18.87	16.47	27.91	12.15	29.82	70.16
	81	82	83	84	85	86	87	88
Ag	0.8955	<0.050	<0.045	<0.048	<0.048	0.0536	<0.050	0.2472
As	21.56	3.845	59.34	15.36	8.166	87.53	<1.00	<0.847
Au	0.0020	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	0.0033
Cu	141.0	27.46	4.511	3.850	4.802	56.42	8.759	80.11
Hg	<0.500	<0.500	1.244	0.6984	<0.488	<0.462	<0.500	<0.423
Mo	21.76	4.888	4.271	2.445	2.655	18.34	2.130	2.475
Pb	25.01	4.763	4.251	9.217	3.414	25.02	2.663	22.12
Sb	<1.00	<1.00	<0.912	<0.961	<0.976	<0.925	<1.00	<0.847
Tl	<1.00	<1.00	<0.912	<0.961	<0.976	<0.925	<1.00	<0.847
Zn	12.03	6.781	5.175	23.73	27.15	200.3	37.37	43.50
	89	90	91	92	93	94	95	96
Ag	<0.044	0.832	<0.047	<0.048	<0.050	<0.044	<0.046	<0.044
As	<0.886	<0.988	27.81	37.76	12.51	11.04	3.594	6.106
Au	0.0548	0.0042	0.0039	0.0013	<0.001	<0.001	<0.001	<0.001
Cu	145.2	48.15	11.41	4.973	3.973	5.160	2.924	15.16
Hg	<0.443	<0.494	0.8539	<0.488	<0.500	<0.449	0.9845	0.7095
Mo	7.095	12.21	7.046	2.310	2.551	2.151	3.360	1.573
Pb	4.828	30.27	5.234	1.993	<1.00	1.472	1.527	5.209
Sb	<0.886	1.333	<0.954	2.243	<1.00	1.062	2.410	2.140
Tl	<0.886	<0.988	<0.954	<0.976	<1.00	<0.899	<0.922	1.267
Zn	23.77	131.7	60.87	23.20	22.44	34.56	82.45	74.24

Table 2 continued

	97	98	99	100	101	102	103	104
Ag	0.0556	<0.047	0.0447	0.2282	<0.043	<0.047	<0.042	0.2044
As	<0.986	<0.954	7.278	<0.919	50.00	2757.	279.7	<0.932
Au	<0.001	<0.001	<0.001	0.0062	<0.001	0.0480	<0.001	<0.001
Cu	39.43	6.931	4.331	1033.	14.20	15.04	21.17	7.711
Hg	<0.484	0.9357	1.813	<0.459	1.354	<0.477	0.5863	1.269
Mo	1.728	3.990	1.664	4.478	1.842	1.120	5.708	2.921
Pb	5.881	1.444	<0.856	127.0	3.387	11.17	14.92	17.94
Sb	1.913	1.652	1.166	2.776	1.592	2.116	3.145	<0.932
Tl	1.588	<0.954	<0.856	1.052	<0.862	<0.951	<0.859	4.057
Zn	71.54	8.940	12.25	413.2	22.93	10.36	29.50	52.47
	105	106						
Ag	1.115	<0.047						
As	54.57	20.39						
Au	0.0025	<0.001						
Cu	190.5	4.190						
Hg	0.8763	4.132						
Mo	5.765	0.7548						
Pb	30.68	1.617						
Sb	9.030	<0.959						
Tl	<0.974	1.550						
Zn	291.1	27.31						

1. AB-27-214.3--Sulfide and quartz-bearing vein; unnamed massive graphitic rock, Early Proterozoic; sample depth 214.3 ft., drill hole SE,SE, sec. 19, T47N, R26W, Aitkin County.
2. AB-27-218--Graphitic argillite, brecciated; unnamed unit, Early Proterozoic; sample depth 218.0 ft., drill hole SE,SE, sec. 19, T47N, R26W, Aitkin County.
3. EL1-38-0--Slate/graywacke, graphitic; Thomson Formation, Early Proterozoic; sample depth 38 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
4. EL1-56-1--Siltstone, pyritic; Thomson Formation, Early Proterozoic; sample depth 56.1 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.

Table 2 continued

5. EL1-95-4--Phyllite, pyritic; Thomson Formation, Early Proterozoic; sample depth 95.3 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
6. EL1-128-8--Slate, graphitic; Thomson Formation, Early Proterozoic; sample depth 128.7 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
7. EL1-137-11--Graywacke; Thomson Formation, Early Proterozoic; sample depth 137.9 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
8. EL1-191-5--Slate, graphitic; Thomson Formation, Early Proterozoic; sample depth 191.4 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
9. EL2-40--Slate, graphitic; Thomson Formation, Early Proterozoic; sample depth 40.2 ft., drill hole 2, sec. 8, T46N, R20W, Carlton County.
10. MGS-1--Massive sulfide in graphitic schist; Thomson Formation, Early Proterozoic; sample depth 271 ft., drill hole Mg-5, NE,SW,SE, sec. 7, T46N, R20W, Carlton County.
11. MGS-2--Massive sulfide in graphitic schist; Thomson Formation, Early Proterozoic; sample depth 332 ft., drill hole Mg-5, NE,SW,SE, sec. 7, T46N, R20W, Carlton County.
12. MGS-3--Massive sulfide in graphitic schist; Thomson Formation, Early Proterozoic; sample depth 346 ft., drill hole Mg-5, NE,SW,SE, sec. 7, T46N, R20W, Carlton County.
13. MGS-4--Massive sulfide in graphitic schist; Thomson Formation, Early Proterozoic; sample depth 81 ft., drill hole Mg-7, NE,SW,SW, sec. 8, T46N, R20W, Carlton County.
14. MGS-5--Slate and chert, altered, near quartz vein; Thomson Formation, Early Proterozoic; outcrop sample, NE,SW,NW, sec. 15, T47N, R19W, Carlton County.
15. MGS-7--Quartz monzonite from breccia zone; Thomson Formation, Early Proterozoic; outcrop sample, NE,NE,NW, sec. 9, T45N, R20W, Pine County.
16. AN-Mg-2-317--Lapilli tuff; Thomson Formation, Early Proterozoic; sample depth 317 ft., drill hole Mg-2, SE,SW,SW, sec. 22, T46N, R21W, Carlton County.
17. 47-19-15-1d--Brecciated chert in wall rock near quartz vein; Thomson Formation, Early Proterozoic; outcrop sample, NE,SW,NW, sec. 15, T47N, R19W, Carlton County.
18. 45-20-4-6-1--Graywacke and slate, brecciated; Thomson Formation, Early Proterozoic; outcrop sample, NE,NE,NW, sec. 9, T45N, R20W, Pine County.

Table 2 continued

19. C-A-16101--Glen Township Formation, Early Proterozoic; sample interval 58.0-58.6 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
20. C-A-16102--Glen Township Formation, Early Proterozoic; sample interval 169.5-170.0 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
21. C-A-16103--Glen Township Formation, Early Proterozoic; sample interval 229.5-230.0 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
22. C-A-16104--Glen Township Formation, Early Proterozoic; sample interval 483.0-483.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
23. C-A-16105--Glen Township Formation, Early Proterozoic; sample interval 623.0-623.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
24. C-A-16106--Glen Township Formation, Early Proterozoic; sample interval 627.5-628.0 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
25. C-A-16107--Glen Township Formation, Early Proterozoic; sample interval 676.5-677.0 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
26. C-A-16108--Glen Township Formation, Early Proterozoic; sample interval 707.0-707.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
27. C-A-16109--Glen Township Formation, Early Proterozoic; sample interval 745.0-745.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
28. C-A-16110--Glen Township Formation, Early Proterozoic; sample interval 750.0-750.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
29. C-A-16111--Glen Township Formation, Early Proterozoic; sample interval 763.0-763.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
30. C-A-16112--Glen Township Formation, Early Proterozoic; sample interval 780.0-780.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
31. C-A-16113--Glen Township Formation, Early Proterozoic; sample interval 783.0-783.5 ft.,
drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.

Table 2 continued

32. C-A-16114--Glen Township Formation, Early Proterozoic; sample interval 792.0-792.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
33. C-A-16115--Glen Township Formation, Early Proterozoic; sample interval 926.2-926.7 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
34. C-A-16116--Glen Township Formation, Early Proterozoic; sample interval 929.8-930.3 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
35. C-A-16117--Glen Township Formation, Early Proterozoic; sample interval 938.1-938.7 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
36. C-A-16118--Glen Township Formation, Early Proterozoic; sample interval 943.8-944.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
37. C-A-16119--Glen Township Formation, Early Proterozoic; sample interval 950.0-950.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
38. C-A-16120--Glen Township Formation, Early Proterozoic; sample interval 957.2-958.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
39. C-A-16121--Glen Township Formation, Early Proterozoic; sample interval 961.8-962.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
40. C-A-16122--Glen Township Formation, Early Proterozoic; sample interval 967.8-968.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
41. C-A-16123--Glen Township Formation, Early Proterozoic; sample interval 986.2-968.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
42. C-A-16124--Glen Township Formation, Early Proterozoic; sample interval 1019.0-1019.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
43. C-A-16125--Glen Township Formation, Early Proterozoic; sample interval 1060.0-1060.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
44. C-A-16126--Glen Township Formation, Early Proterozoic; sample interval 1086.9-1087.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.

Table 2 continued

45. C-A-16127--Glen Township Formation, Early Proterozoic; sample interval 1118.0-1119.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
46. C-A-16128--Glen Township Formation, Early Proterozoic; sample interval 1169.3-1170.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
47. C-A-16129--Glen Township Formation, Early Proterozoic; sample interval 1197.4-1198.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
48. C-A-16130--Glen Township Formation, Early Proterozoic; sample interval 1216.0-1216.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
49. C-A-16131--Glen Township Formation, Early Proterozoic; sample interval 1218.0-1218.8 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
50. C-A-16132--Glen Township Formation, Early Proterozoic; sample interval 1306.0-1306.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
51. C-A-16133--Glen Township Formation, Early Proterozoic; sample interval 1364.1-1364.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
52. C-A-16134--Glen Township Formation, Early Proterozoic; sample interval 1495.3-1495.8 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
53. C-A-16135--Glen Township Formation, Early Proterozoic; sample interval 1503.0-1503.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
54. C-A-16136--Glen Township Formation, Early Proterozoic; sample interval 1506.0-1506.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
55. C-A-16137--Glen Township Formation, Early Proterozoic; sample interval 1510.7-1511.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
56. C-A-16138--Glen Township Formation, Early Proterozoic; sample interval 1705.2-1705.8 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
57. C-A-16139--Glen Township Formation, Early Proterozoic; sample interval 1783.8-1784.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.

Table 2 continued

58. C-A-16140--Glen Township Formation, Early Proterozoic; sample interval 1791.7-1792.3 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
59. C-A-16141--Glen Township Formation, Early Proterozoic; sample interval 1823.7-1824.4 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
60. C-A-16142--Glen Township Formation, Early Proterozoic; sample interval 1836.5-1837.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
61. C-A-16143--Glen Township Formation, Early Proterozoic; sample interval 1854.0-1855.0 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
62. C-A-16144--Glen Township Formation, Early Proterozoic; sample interval 1646.9-1647.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
63. C-A-16145--Glen Township Formation, Early Proterozoic; sample interval 1703.0-1703.6 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
64. C-A-16146--Glen Township Formation, Early Proterozoic; sample interval 1708.8-1709.3 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
65. C-A-16147--Glen Township Formation, Early Proterozoic; sample interval 1857.8-1858.3 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
66. C-A-16148--Glen Township Formation, Early Proterozoic; sample interval 1873.0-1873.5 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
67. C-A-16149--Glen Township Formation, Early Proterozoic; sample interval 1884.5-1884.9 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
68. C-A-16150--Glen Township Formation, Early Proterozoic; sample interval 1906.4-1906.9 ft., drill hole A-6, SE,SE, sec. 20, T46N, R25W, Aitkin County.
69. 9-114-140--Chert, pyrite-bearing; Trommald Formation, Early Proterozoic; sample depth 140 ft., drill core 114, NE,SW,SW,SE, sec. 30, T47N, R28W, Crow Wing County.
70. 13-331-110--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 110 ft., drill core 331, SW,NW,SE,SE, sec. 30, T47N, R28W, Crow Wing County.

Table 2 continued

71. 14-224-100--Slate, ferruginous; Trommald Formation, Early Proterozoic; sample depth 100 ft., drill core 224, SW,SW,NE,SW, sec. 30, T47N, R28W, Crow Wing County.
72. 15-27-140--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 140 ft., drill core 27, lot 8, sec. 25, T47N, R29W, Crow Wing County.
73. 17-5-180--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 180 ft., drill core 5, NE,SW,NE,SE, sec. 24, T47N, R29W, Crow Wing County.
74. 18-1-225--Slate, graphitic, pyritic; Rabbit Lake Formation, Early Proterozoic; sample depth 225 ft., drill core 1, sec. 17, T136N, R26W, Crow Wing County.
75. 22-584-125--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 125 ft., drill core 584, SW,SW,SE,SE, sec. 3, T46N, R29W, Crow Wing County.
76. 23-492-80--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 80 ft., drill core 492, SW,SW,NW, sec. 3, T46N, R29W, Crow Wing County.
77. 29-477-90--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 90 ft., drill core 477, SW,SW,SE,SE, sec. 3, T46N, R29W, Crow Wing County.
78. 30-467-42--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 42 ft., drill core 467, SW,SW,SE,SE, sec. 3, T46N, R29W, Crow Wing County.
79. 32-415-45--Metavolcanic rock; Rabbit Lake Formation, Early Proterozoic; sample depth 45 ft., drill core 415, SW,SW,SE,SE, sec. 3, T46N, R29W, Crow Wing County.
80. 34-525-125--Slate, graphitic; Rabbit Lake Formation, Early Proterozoic; sample depth 125 ft., drill core 525, SW,SW,SE,SE, sec. 4, T46N, R29W, Crow Wing County.
81. 38-103-180--Slate, graphitic; Rabbit Lake Formation, Early Proterozoic; sample depth 180 ft., drill core 103, SW,SW,SE,SE, sec. 20, T47N, R28W, Crow Wing County.
82. 39-104-190--Quartzite, pyritic; Mahnomen Formation, Early Proterozoic; sample depth 190 ft., drill core 104, sec. 20, T47N, R28W, Crow Wing County.
83. 40-106-120--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 220 ft., drill core 106, sec. 20, T47N, R28W, Crow Wing County.

Table 2 continued

84. 40-106-310--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 310 ft., drill core 106, sec. 20, T47N, R28W, Crow Wing County.
85. 41-108-140--Slate, dark green; Rabbitt Lake Formation, Early Proterozoic; sample depth 140 ft., drill core 108, sec. 20, T47N, R28W, Crow Wing County.
86. 101-20-105--Chert, pyrite-bearing veins; Trommald Formation, Early Proterozoic; sample depth 105 ft., drill core 20, locality unknown, Crow Wing County.
87. N-521--Phyllite, tourmaline-bearing; Mahnomen Formation, Early Proterozoic; sample depth 521.3 ft., Northland Property (U of M), NW,SE,NW,NW, sec. 28, T42N, R28W, Crow Wing County.
88. N-551--Graywacke, pyrite-bearing; Mahnomen Formation, Early Proterozoic; sample depth 551.5 ft., Northland Property (U of M), NW,SE,NW,NW, sec. 28, T42N, R28W, Crow Wing County.
89. N-594--Carbonate, rock, oolitic, granular; Mahnomen Formation, Early Proterozoic; sample depth 594.1 ft., Northland Property (U of M), NW,SE,NW,NW, sec. 28, T42N, R28W, Crow Wing County.
90. N-713--Graywacke, pyrite-bearing; Mahnomen Formation, Early Proterozoic; sample depth 713.0 ft., Northland Property (U of M), NW,SE,NW,NW, sec. 28, T42N, R28W, Crow Wing County.
91. A-55--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 55.0 ft., Northland Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.
92. A-122--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 122.0 ft., Arko Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.
93. A-273--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 273 ft., Arko Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.
94. H-29--Phyllite; Trommald Formation, Early Proterozoic; sample depth 29.3 ft., North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
95. H-63--Iron-formation, banded, granular; Trommald Formation, Early Proterozoic; sample depth 63.1 ft., North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.

Table 2 continued

96. H-229--Slate and chert, intercalated; Trommald Formation, Early Proterozoic; sample depth 229.0 ft., North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
97. H-475--Slate and graywacke, intercalated; Mahnomen Formation, Early Proterozoic; sample depth 475.0 ft., North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
98. M-287--Iron-formation, acmite-bearing; Trommald Formation, Early Proterozoic; sample depth 287.0 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
99. M-325--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 325.6 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
100. M-436--Pyrite- calcite- and stilpnomelane-bearing vein; Trommald Formation, Early Proterozoic; sample depth 436.7 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
101. M-549--Slate; Mahnomen Formation, Early Proterozoic; sample depth 549.6 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
102. M-700--Iron-formation, nongranular; Trommald Formation, Early Proterozoic; sample depth 700 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
103. M-759--Graywacke, pyrite-rich; Trommald Formation, Early Proterozoic; sample depth 759.6 ft., Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
104. EL2-36--Graywacke; Thomson Formation, Early Proterozoic; sample depth 35.8 ft., drill hole 2, sec. 8, T46N, R20W, Carlton County.
105. 18965-278--Slate, carbonaceous, pyrite-bearing; unnamed formation, Early Proterozoic; sample depth 278.6 ft., drill hole 18965, NW,SW, sec. 9, T136N, R25W, Crow Wing County.
106. 18226-286--Iron-formation, nongranular, carbonate-bearing, recrystallized; unnamed formation, Early Proterozoic; sample depth 268.0 ft., drill hole 18226, NE,NW, sec. 19, T45N, R28W, Crow Wing County.

Table 3. Gunflint Range--10 Element Exploration Package

	1	2	3	4	5	6	7	8
Ag	0.0779	0.1144	0.1991	0.1306	<0.046	0.1183	0.0956	<0.048
As	16.11	0.883	2.476	10.95	8.471	<0.902	7.239	6.386
Au	0.0013	0.0020	0.0030	<0.001	0.0014	<0.001	0.0014	0.0043
Cu	4.260	9.776	82.85	7.849	8.737	9.899	6.265	9.795
Hg	2.411	0.5462	0.6715	2.094	1.914	1.091	1.268	1.527
Mo	2.217	3.167	4.119	5.706	4.402	3.980	4.258	5.439
Pb	1.584	1.407	10.03	1.416	1.543	1.315	<0.880	1.835
Sb	<0.957	<0.883	<0.957	<0.871	<0.936	<0.902	<0.880	<0.968
Tl	<0.957	1.099	3.784	<0.871	<0.936	<0.902	1.346	<0.968
Zn	3.838	0.883	71.37	6.616	20.18	5.837	3.883	6.962
	9	10	11	12	13			
Ag	0.0658	<0.047	0.1504	0.0675	0.0657			
As	1.659	17.71	10.18	2.864	2.304			
Au	0.001	<0.0016	0.0025	0.0030	<0.001			
Cu	3.293	139.3	3.559	31.37	8.802			
Hg	9.740	1.563	1.428	0.6741	1.155			
Mo	2.213	2.307	1.259	2.516	3.356			
Pb	<0.902	<0.943	<0.915	<0.939	<0.936			
Sb	<0.902	1.447	<0.915	1.586	1.620			
Tl	<0.902	<0.943	<0.915	<0.939	2.064			
Zn	27.07	16.44	7.030	6.294	5.703			

1. G-67-7--Argillite, hornblende-hornfels facies; Rove Formation, Early Proterozoic; outcrop sample, NW,NE, sec. 35, T65N, R4W, Cook County.
2. G-67-8--Argillite, hornblende-hornfels facies; Rove Formation, Early Proterozoic; outcrop sample, NW,NE, sec. 35, T65N, R4W, Cook County.
3. G-71--Iron-formation, volcanoclastic, grunerite grade; Gunflint Iron Formation, Upper slaty member, Early Proterozoic; outcrop sample, SE,SW, sec. 24, T65N, R4W, Cook County.

Table 3 continued

4. G-119--Iron-formation, grunerite grade; Gunflint Iron Formation, Upper cherty member, Early Proterozoic; outcrop sample, SE,NW, sec. 24, T65N, R4W, Cook County.
5. G-130--Iron-formation, grunerite grade; Gunflint Iron Formation, Lower cherty member, Early Proterozoic; outcrop sample, SW,NW, sec. 24, T65N, R4W, Cook County.
6. G-161--Iron-formation, pyroxene grade; Gunflint Iron Formation, Upper cherty member, Early Proterozoic; outcrop sample, SW,NE, sec. 24, T65N, R4W, Cook County.
7. G-199--Iron-formation, pyroxene grade; Gunflint Iron Formation, Upper cherty member, Early Proterozoic; outcrop sample, SE,SE, sec. 22, T65N, R4W, Cook County.
8. G-223--Iron-formation, pyroxene grade; Gunflint Iron Formation, Upper slaty member, Early Proterozoic; outcrop sample, SE,SE, sec. 23, T65N, R4W, Cook County.
9. G-357--Iron-formation, pyroxene grade, olivine-rich; Gunflint Iron Formation, Lower cherty member, Early Proterozoic; outcrop sample, SE,SE, sec. 28, T65N, R4W, Cook County.
10. G-358--Iron-formation, pyroxene grade, olivine-rich; Gunflint Iron Formation, Early Proterozoic; outcrop sample, SE,SE, sec. 28, T65N, R4W, Cook County.
11. G-372--Iron-formation, pyroxene grade; Gunflint Iron Formation, Lower slaty member, Early Proterozoic; outcrop sample, SW,NE, sec. 27, T65N, R4W, Cook County.
12. G-PM-1--Iron-formation, pyroxene grade (olivine-magnetite-sulfide-rich); Gunflint Iron Formation, Lower cherty member, Early Proterozoic; outcrop sample, Paulson mine, SW,NE, sec. 27, T65N, R4W, Cook County.
13. G-45--Iron-formation, grunerite grade; Gunflint Iron Formation, Upper slaty member, Early Proterozoic; outcrop sample, SE,NE, sec. 24, T65N, R4W, Cook County.

Table 4. Mesabi Range--10 Element Exploration Package

	1	2	3	4	5	6	7	8
Ag	<0.046	<0.046	<0.046	<0.046	<0.047	<0.046	<0.047	0.0525
As	17.25	7.126	11.45	7.751	11.12	15.24	4.783	11.96
Au	0.0015	0.0022	0.0017	0.0013	0.0021	0.0012	0.0024	0.0011
Cu	21.32	25.56	17.56	18.74	12.23	12.89	19.89	13.26
Hg	0.9782	1.139	1.187	1.916	0.5342	0.6412	<0.472	<0.467
Mo	1.382	0.8796	0.8885	0.8973	2.295	1.467	1.196	2.027
Pb	2.108	3.991	3.507	3.475	2.823	3.001	5.035	3.069
Sb	0.934	1.071	<0.933	1.218	1.314	0.9964	1.302	<0.935
Tl	<0.934	<0.937	<0.933	<0.922	<0.954	<0.932	<0.945	<0.935
Zn	18.38	27.14	20.61	30.95	14.86	15.58	26.12	16.92
	9	10	11	12	13	14	15	16
Ag	0.3060	0.0821	<0.047	0.0519	<0.048	<0.047	<0.045	<0.046
As	40.37	13.04	11.33	15.60	22.84	16.16	16.85	25.52
Au	0.0021	0.0019	0.0013	0.0025	0.0017	0.0024	0.0016	0.0035
Cu	14.82	31.40	50.34	65.72	33.38	20.12	17.37	47.65
Hg	0.5239	1.030	0.7819	0.5497	0.7474	<0.476	0.6433	1.675
Mo	8.095	2.801	1.586	2.191	2.015	1.793	2.644	5.082
Pb	22.21	12.32	6.988	26.21	5.002	4.081	9.318	8.287
Sb	1.432	1.542	<0.948	2.837	<0.966	1.711	<0.909	<0.932
Tl	<0.926	<0.950	1.526	1.777	<0.966	<0.952	<0.909	<0.932
Zn	14.01	244.5	45.45	09.6	17.93	14.52	10.99	16.08
	17	18	19	20	21	22	23	24
Ag	0.1324	0.1146	<0.047	0.535	<0.047	<0.047	0.0468	<0.047
As	34.83	16.25	5.593	20.90	17.71	36.22	9.565	9.749
Au	0.0021	0.0028	0.0016	0.0019	0.0013	0.0017	0.0014	0.0020
Cu	24.37	8.895	5.325	12.67	7.555	9.069	14.60	13.60
Hg	1.393	1.019	<0.471	0.7792	0.7222	2.226	0.7494	1.024
Mo	1.473	3.053	1.211	1.315	1.425	1.210	1.604	1.065
Pb	8.653	8.674	<0.943	3.101	1.777	3.836	10.63	2.566
Sb	<0.948	1.064	1.162	1.626	1.183	1.589	1.036	1.044
Tl	<0.948	<0.932	<0.943	<0.948	<0.940	<0.946	0.928	1.038
Zn	26.51	8.983	6.295	18.35	13.56	9.994	15.19	13.81

Table 4 continued

	25	26	27	28	29	30	31	32
Ag	<0.045	0.3249	0.2992	0.9453	0.5122	1.045	0.5893	1.242
As	15.65	21.53	20.78	16.49	29.98	18.83	11.52	15.53
Au	0.0027	0.0074	0.0039	0.0111	0.0063	0.0110	0.0058	0.0097
Cu	14.82	119.0	78.08	151.1	79.98	138.7	118.0	149.4
Hg	0.5100	<0.446	<0.460	1.225	0.8407	1.070	0.7630	0.4586
Mo	0.7635	5.786	6.270	10.18	7.018	5.886	4.560	14.15
Pb	3.624	18.22	17.98	28.25	21.41	21.83	22.91	52.33
Sb	<0.903	2.843	3.626	3.081	7.182	3.962	3.337	4.372
Tl	<0.903	<0.892	1.078	0.896	<0.919	0.9755	1.130	1.518
Zn	20.02	321.9	158.7	772.9	350.6	651.5	364.0	523.2
	33	34	35	36	37	38	39	40
Ag	0.7686	0.5981	0.9604	1.059	0.2634	0.2244	0.1144	0.1692
As	18.94	28.69	9.865	13.82	8.092	4.976	2.325	2.998
Au	0.0053	0.0051	0.0066	0.0095	0.0066	0.0027	0.0029	0.0021
Cu	185.3	108.9	128.6	138.7	90.14	84.59	43.58	64.09
Hg	0.4623	0.4832	0.5543	0.7728	0.7079	<0.451	<0.435	<0.448
Mo	10.41	10.21	4.945	10.48	0.7183	1.019	0.5989	0.5799
Pb	27.62	31.06	22.87	32.86	18.87	12.10	14.39	21.00
Sb	4.232	9.166	3.183	4.354	2.339	1.350	1.228	1.525
Tl	1.035	1.386	1.361	<0.912	<0.892	<0.902	<0.871	<0.897
Zn	239.6	236.5	564.1	618.4	103.9	138.0	86.76	99.30
	41	42	43	44	45	46	47	48
Ag	0.9529	0.2481	0.1844	0.1901	0.3724	0.0960	<0.044	0.1126
As	20.93	5.973	<0.917	11.28	19.38	10.38	<0.888	8.952
Au	0.0209	0.0051	0.0036	0.0030	0.0069	0.0034	0.0032	0.0039
Cu	127.9	60.70	23.14	86.32	100.4	99.46	161.6	75.73
Hg	0.7574	<0.461	0.7050	<0.455	<0.457	0.5448	<0.444	0.7489
Mo	6.578	7.962	<0.458	3.287	13.34	1.319	<0.444	5.551
Pb	43.80	54.98	42.85	17.45	18.93	10.27	5.401	9.378
Sb	4.351	1.872	<0.917	1.522	3.860	2.753	<0.888	1.346
Tl	<0.922	<0.923	<0.917	<0.910	<0.915	<0.898	<0.888	<0.913
Zn	459.0	198.4	466.7	207.8	162.3	110.7	212.4	100.1

Table 4 continued

	49	50	51	52	53	54	55	56
Ag	0.1897	0.1529	<0.044	0.4715	0.3542	0.4911	0.4447	0.2575
As	14.11	7.150	5.666	20.14	6.461	4.985	4.836	<0.970
Au	0.0093	0.0036	0.0019	0.0049	0.0058	0.0070	0.0066	0.0010
Cu	133.1	105.7	43.62	98.93	94.66	127.5	95.05	103.0
Hg	<0.447	<0.450	<0.441	<0.430	<0.451	<0.446	0.5314	<0.485
Mo	7.797	2.690	<0.441	4.604	2.308	2.821	3.270	1.056
Pb	28.85	15.23	12.78	4.443	2.967	3.903	3.259	4.118
Sb	2.075	<0.900	1.280	1.954	1.835	1.747	1.497	<0.970
Tl	<0.894	<0.900	<0.882	<0.861	<0.903	<0.893	<0.908	<0.970
Zn	131.4	138.2	121.3	289.1	274.9	278.6	211.6	17.96
	57	58	59					
Ag	0.1216	0.1953	0.1127					
As	<0.972	<0.956	<0.959					
Au	<0.001	<0.001	<0.001					
Cu	46.29	18.06	24.36					
Hg	1.018	1.068	3.489					
Mo	2.099	1.086	0.6945					
Pb	2.428	5.105	4.900					
Sb	<0.972	<0.956	<0.959					
Tl	<0.972	<0.956	1.540					
Zn	21.91	54.38	70.35					

1. 5-844--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 844-850 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
2. 5-885---Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 885-890 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
3. 5-905--Iron-formation, granular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 905-914 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.

Table 4 continued

4. 5-914--Iron-formation, nongranular; Biwabik Iron Formation, Intermediate slate, Early Proterozoic; sample interval 914-924 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
5. 5-924--Iron-formation, granular; Biwabik Iron Formation, Lower cherty member, Early Proterozoic; sample interval 924-930 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
6. 5-930--Iron-formation, granular; Biwabik Iron Formation, Lower cherty member, Early Proterozoic; sample interval 930-935 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
7. 2-1665--Iron-formation, nongranular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1665-1670 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
8. 2-1645--Iron-formation, nongranular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1645-1650 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
9. 2-1627--Iron-formation, granular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1627-1633 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
10. 2-1620--Iron-formation, granular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1620-1624 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
11. 2-1617--Iron-formation, granular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1617-1620 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
12. 2-1614--Argillite, carbonaceous; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 1614-1617 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
13. 2-1990--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 1990-1995 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.

Table 4 continued

14. 2-1995--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 1995-2003 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
15. 2-2008--Iron-formation, granular; Biwabik Iron Formation, Lower cherty member, Early Proterozoic; sample interval 2008-2013 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
16. 2-2003--Iron-formation, nongranular, Biwabik Iron Formation, Intermediate slate, Early Proterozoic; sample interval 2003-2008 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
17. 7-1061--Iron-formation, nongranular; Biwabik Iron Formation, Intermediate slate, Early Proterozoic; sample interval 1061-1067 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
18. 7-1067--Iron-formation, granular; Biwabik Iron Formation, Lower cherty member, Early Proterozoic; sample interval 1067-1069 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
19. 7-1085--Iron-formation, granular; Biwabik Iron Formation, Lower cherty member, Early Proterozoic; sample interval 1085-1090 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
20. 7-1056--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 1056-1061 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
21. 7-1045--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 1045-1050 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
22. 7-985--Iron-formation, nongranular; Biwabik Iron Formation, Lower slaty member, Early Proterozoic; sample interval 985-990 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
23. 7-800--Iron-formation, granular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 800-805 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.

Table 4 continued

24. 7-820--Iron-formation, granular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic, sample interval 820-825 ft., drill hole IRRRB-7, sec. 36, T57N, R22W, Itasca County.
25. 7-840--Iron-formation, nongranular; Biwabik Iron Formation, Upper slaty member, Early Proterozoic; sample interval 840-845 ft., drill hole IRRRB-7, sec. 36, T57N, R22W, Itasca County.
26. B-1364--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1364 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
27. B-1384--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1384 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
28. B-1388--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1388 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
29. B-1460--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1460 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
30. B-1504--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1504 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
31. B-1524--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1524 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
32. B-1534--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1534 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
33. B-1546--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1546 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
34. B-1577--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1577 ft., drill hole IRRRB-2, SW,SE, sec. 22, T58N, R16W, St. Louis County.
35. Bu-201--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 201 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.

Table 4 continued

36. Bu-246--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 246 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
37. Bu-274--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 274 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
38. Bu-300--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 300 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
39. Bu-334--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 334 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
40. Bu-358--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 358 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
41. Bu-418--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 418 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
42. Bu-428A--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 427.9 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, St. Louis County.
43. Bu-428B--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 428.1 ft., drill hole IRRRB-5, SE,NW, sec. 36, T58N, R20W, Itasca County.
44. K-482--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 482 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
45. K-604--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 604 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
46. K-695--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 695 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
47. K-745--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 745 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.
48. C-267--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 267 ft., drill hole IRRRB-7, NE,SE, sec. 36, T57N, R22W, Itasca County.

Table 4 continued

49. C-670--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 670 ft., drill hole IRRRB-8, SE,NE, sec. 36, T55N, R24W, Itasca County.
50. C-860--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 860 ft., drill hole IRRRB-8, SE,NE, sec. 36, T55N, R24W, Itasca County.
51. C-1103--Argillite, carbonaceous; Virginia Formation, Early Proterozoic; sample depth 1103 ft., drill hole IRRRB-8, SE,NE, sec. 36, T55N, R24W, Itasca County.
52. 17700-573--Argillite, hornblende-hornfels facies; Virginia Formation, Early Proterozoic; sample depth 573 ft., drill hole 17,700, NE,NW,NW, sec. 34, T59N, R14W, St. Louis County.
53. 17700-624--Argillite, hornblende-hornfels facies; Virginia Formation, Early Proterozoic; sample depth 624 ft., drill hole 17,700, NE,NW,NW, sec. 34, T59N, R14W, St. Louis County.
54. 17700-625--Argillite, hornblende-hornfels facies; Virginia Formation, Early Proterozoic; sample depth 625 ft., drill hole 17,700, NE,NW,NW, sec. 34, T59N, R14W, St. Louis County.
55. 17700-658--Argillite, hornblende-hornfels facies; Virginia Formation, Early Proterozoic; sample depth 658 ft., drill hole 17,700, NE,NW,NW, sec. 34, T59N, R14W, St. Louis County.
56. I4A--Metabasalt, pyritic; unnamed formation, Archean; outcrop sample, SW,SW,NW,NW, sec. 33, T60N, R21W, Itasca County.
57. I10A--Conglomerate, stretched quartzose pebbles in biotite-rich matrix; unnamed formation, Archean; outcrop sample, SE,SE,SE, sec. 3, T60N, R24W, Itasca County.
58. I17A--Breccia/conglomerate, intermediate clast composition, pyritic; unnamed formation, Archean; outcrop sample, NW,SW,NW, sec. 1, T60N, R24W, Itasca County.
59. I8C--Iron-formation, laminated, pyritic; unnamed formation, Archean; outcrop sample, NE,SW,NE, sec. 2, T60N, R24W, Itasca County.

Table 5. Southwestern Minnesota--10 Element Exploration Package

	1	2	3	4	5	6	7	8
Ag	0.0752	<0.048	0.0725	0.0747	0.0840	0.1217	<0.049	0.1671
As	7.404	1.218	<0.992	5.218	5.309	11.12	11.03	5.485
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	<0.001
Cu	3.672	2.828	3.139	3.320	2.648	3.746	2.483	2.445
Hg	1.867	1.732	1.883	1.316	0.8990	1.442	2.213	1.449
Mo	1.160	0.9561	<0.496	<0.464	<0.464	<0.471	1.001	0.7694
Pb	4.854	2.862	5.062	5.722	19.82	3.868	11.69	4.577
Sb	<0.929	<0.965	<0.992	<0.929	<0.929	<0.943	<0.980	<0.899
Tl	3.164	4.321	1.289	2.279	4.819	<0.943	1.134	3.301
Zn	5.187	<0.965	<0.992	<0.929	5.455	3.422	.879	4.200
	9	10	11	12	13	14	15	16
Ag	0.1240	0.0994	<0.048	<0.044	<0.047	<0.046	<0.046	<0.048
As	7.693	<0.957	1.638	1.493	<0.946	1.231	<0.922	<0.976
Au	<0.001	<0.001	0.0010	0.0010	<0.001	0.0025	0.0011	0.0021
Cu	1.714	3.198	5.180	2.423	2.206	3.508	3.595	5.978
Hg	1.480	1.116	1.236	0.8999	0.8584	0.7059	0.6018	1.022
Mo	<0.451	<0.478	2.372	1.183	1.111	0.464	1.139	3.538
Pb	4.887	6.876	1.206	2.643	2.982	3.721	3.813	2.049
Sb	3.437	1.032	<0.968	<0.880	<0.946	<0.929	<0.922	1.378
Tl	2.746	2.282	<0.968	<0.880	<0.946	<0.929	<0.922	<0.976
Zn	<0.902	<0.957	3.948	1.883	<0.946	<0.929	0.9726	4.990
	17	18	19	20	21	22	23	24
Ag	<0.047	<0.045	0.3673	0.2708	0.1518	<0.043	<0.046	<0.046
As	2.359	<0.902	<0.957	1.005	2.091	<0.865	<0.929	<0.939
Au	0.0011	0.0015	<0.001	<0.001	0.0017	<0.001	0.0018	<0.001
Cu	7.584	7.129	7.677	5.608	4.189	3.582	3.851	3.938
Hg	1.020	0.8106	1.516	0.7360	0.4604	<0.432	0.5774	<0.469
Mo	3.644	3.952	4.608	2.654	1.763	2.193	3.495	2.573
Pb	3.903	1.303	<0.957	8.711	<0.899	1.012	1.250	1.231
Sb	<0.946	2.214	1.136	<0.880	<0.899	2.380	1.744	<0.939
Tl	<0.946	<0.902	<0.957	<0.880	<0.899	<0.865	<0.929	<0.939
Zn	2.716	1.430	<0.957	2.049	<0.899	1.701	2.142	4.051

Table 5 continued

	25	26	27	28	29	30	31	32
Ag	<0.049	<0.048	<0.045	<0.043	<0.046	0.0478	0.0529	<0.043
As	<0.984	<0.968	<0.915	<0.874	<0.929	<0.871	<0.972	<0.874
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	3.887	5.850	5.635	6.055	2.483	4.760	4.798	1.653
Hg	<0.492	<0.484	1.315	0.4849	<0.464	<0.435	0.6638	<0.437
Mo	1.238	2.776	3.534	2.437	1.577	2.757	2.891	1.447
Pb	3.388	1.598	1.467	2.054	6.557	1.149	4.049	2.165
Sb	2.637	3.200	3.257	1.945	2.515	<0.871	<0.972	1.053
Tl	<0.984	<0.968	<0.915	<0.874	<0.929	<0.871	<0.972	<0.874
Zn	13.71	4.952	1.751	4.306	6.109	2.152	2.005	3.503
	33	34	35	36	37	38	39	40
Ag	<0.047	<0.047	0.0451	<0.045	0.0935	<0.044	<0.046	<0.046
As	<0.957	3.059	<0.892	<0.912	1.648	<0.889	1.530	2.222
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015
Cu	3.401	3.428	1.910	3.046	4.128	12.06	1.206	2.297
Hg	<0.478	<0.473	0.8990	<0.456	<0.441	<0.444	0.6876	<0.466
Mo	2.284	1.467	0.9875	1.750	1.994	0.6121	0.7221	<0.466
Pb	1.957	7.539	5.739	<0.912	2.504	2.220	5.276	2.697
Sb	2.898	4.592	3.875	<0.912	<0.883	<0.889	1.459	3.306
Tl	<0.957	<0.946	<0.892	<0.912	<0.883	<0.889	<0.939	0.9354
Zn	3.446	29.69	16.28	3.192	2.796	7.874	1.576	<0.932
	41	42	43	44	45	46	47	48
Ag	<0.045	<0.046	0.0525	<0.045	<0.045	0.1152	0.0506	0.1147
As	<0.909	<0.939	<0.936	<0.919	7.377	3.788	1.750	1.669
Au	<0.001	0.0068	0.0012	0.0028	<0.001	0.0010	<0.001	<0.001
Cu	2.445	322.1	12.25	10.01	5.632	35.10	14.24	27.01
Hg	<0.454	0.7384	<0.468	0.5051	1.313	<0.497	0.7300	<0.493
Mo	0.7915	2.003	1.655	<0.459	1.930	1.555	0.6176	0.8273
Pb	1.153	<0.939	7.657	1.885	1.581	23.90	2.609	17.61
Sb	3.330	1.007	1.970	1.673	<0.912	3.643	<0.974	1.203
Tl	<0.909	<0.939	<0.936	<0.919	<0.912	<0.994	1.208	<0.986
Zn	<0.909	10.71	4.166	6.932	4.519	13.06	19.82	51.85

Table 5 continued

	49	50	51	52	53	54	55	56
Ag	0.6746	0.0516	0.2173	0.928	0.953	0.1417	<0.049	<0.048
As	4.629	19.60	1.827	1.245	12.07	2.223	<0.994	1.522
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0012
Cu	30.03	13.98	28.87	15.75	18.19	5.921	12.44	23.25
Hg	<0.489	2.127	<0.486	<0.480	<0.478	2.234	5.005	<0.486
Mo	0.5496	0.8093	5.991	<0.480	0.5272	1.327	<0.497	0.7593
Pb	28.84	15.18	26.92	5.729	21.21	13.50	7.751	25.89
Sb	2.908	<0.990	1.424	<0.961	<0.957	<0.990	<0.994	<0.972
Tl	<0.978	<0.990	<0.972	<0.961	<0.957	<0.990	<0.994	<0.972
Zn	73.67	33.85	60.55	50.65	58.81	20.10	23.48	54.18
	57	58	59	60	61	62	63	64
Ag	0.1111	0.0915	0.1243	0.1587	0.0905	0.0568	0.1453	<0.048
As	2.517	15.00	3.288	4.376	3.381	1.127	10.35	6.895
Au	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	10.73	19.03	21.86	33.66	8.678	21.23	23.82	14.66
Hg	<0.492	<0.484	0.5391	<0.482	6.386	<0.494	<0.495	<0.486
Mo	<0.492	<0.484	1.042	1.570	<0.494	0.6331	<0.495	0.5347
Pb	11.18	21.24	18.37	20.40	8.828	16.10	17.02	14.50
Sb	<0.984	1.047	<0.959	1.190	<0.988	<0.988	<0.990	<0.972
Tl	<0.984	1.118	<0.959	<0.965	3.599	2.321	<0.990	<0.972
Zn	51.25	55.10	43.57	85.38	18.17	59.71	53.81	61.15
	65	66	67	68	69	70		
Ag	0.0799	<0.048	0.8643	0.1160	0.1857	<0.049		
As	3.011	<0.961	12.99	24.21	26.40	7.222		
Au	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001		
Cu	31.84	4.453	26.35	30.22	34.18	16.46		
Hg	<0.497	6.184	<0.479	<0.482	<0.480	<0.492		
Mo	1.079	<0.480	2.241	28.10	25.52	1.648		
Pb	17.64	2.985	46.62	12.47	15.10	18.13		
Sb	<0.994	<0.961	6.262	1.610	1.941	1.349		
Tl	<0.994	1.414	1.037	3.606	<0.961	<0.984		
Zn	33.79	17.01	73.30	114.0	152.7	46.43		

Table 5 continued

1. PSM-7--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample, NE,NW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
2. PSM-9--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample, NE,NW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
3. MSQ-3b--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
4. MSQ-3c--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
5. MSQ-3d--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
6. MSQ-3e--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
7. MSQ-3f--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
8. MSQ-3g--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
9. MSQ-3h--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
10. MSQ-3w--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample 3 ft. above base, abandoned commercial quarry, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.

Table 5 continued

11. MSQ-8--Quartzite, pale red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 8 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
12. MSQ-9--Quartzite, dark red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 9 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
13. MSQ-10--Siltstone, pale red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 10.5 ft. above base, NW,NW, sec. 9, T106N, R46W, Pipestone National Monument, Pipestone County.
14. MSQ-15--Siltstone, pale red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 15 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
15. MSQ-17--Mudstone (catlinite-pipestone), silt-rich; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 17 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
16. MSQ-20--Quartzite, moderate red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 20.5 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
17. MSQ-23--Quartzite, moderate red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 23 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
18. MSQ-24--Conglomerate, quartz-pebble; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 24 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
19. MSQ-50--Quartzite, moderate red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 50 ft. above base, NW,NW,sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
20. MSQ-60--Quartzite, moderate red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 60 ft. above base, NW,NW, sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.

Table 5 continued

21. MSQ-61--Quartzite, moderate red; Sioux Quartzite, Early Proterozoic; abandoned quarry sample 61 ft. above base, NW,NW,sec. 12, T106N, R46W, Pipestone National Monument, Pipestone County.
22. MFG-849--Quartzite, coarse-grained; Sioux Quartzite, Early Proterozoic; outcrop sample, Cottonwood County basin, Jeffers quadrangle, Cottonwood County.
23. MFG-944--Matrix of a quartz-pebble conglomerate; Sioux Quartzite, Early Proterozoic; outcrop sample, NE,SW, sec. 27, T101N, R30W, near New Ulm, Nicollet County.
24. MFG-946--Matrix of a quartz-pebble conglomerate; Sioux Quartzite, Early Proterozoic; outcrop sample, NE,SW, sec. 27, T101N, R30W, near New Ulm, Nicollet County.
25. MFG-952--Siltstone, pale red; Sioux Quartzite, Early Proterozoic; outcrop sample, SW,SW, sec. 35, T101N, R30W, near New Ulm, Nicollet County.
26. SX-2--Gritstone, coarse-grained; Sioux Quartzite, Early Proterozoic; outcrop sample, SW,SW, sec. 35, T101N, R30W, near New Ulm, Nicollet County.
27. SX-8A--Conglomerate, quartz-pebble; Sioux Quartzite, Early Proterozoic; outcrop sample, Cottonwood County basin, Sanborn SE quadrangle, Nicollet County.
28. SX-60B--Conglomerate, rhyolite-pebble; Sioux Quartzite, Early Proterozoic; outcrop sample, NE,SW, sec. 13, T106N, R47W, near Salem Church, Pipestone County.
29. SQ-3-172--Siltstone, laminated; Sioux Quartzite, Early Proterozoic; sample depth 172.5 ft., drill hole 3, SE,SE,NW, sec. 6, T107N, R35W, Cottonwood County.
30. SQ-3-592--Quartzite, coarse-grained, and gritstone, intergradational; Sioux Quartzite, Early Proterozoic; sample depth 592.5 ft., drill hole 3, SE,SE,NW, sec. 6, T107N, R35W, Cottonwood County.
31. SQ-3-949--Conglomerate, basal; Sioux Quartzite, Early Proterozoic; sample depth 949 ft., drill hole 3, SE,SE,NW, sec. 6, T107N, R35W, Cottonwood County.
32. SQ-3-958--Regolith, silicified; sub-Sioux, Early Proterozoic(?); sample depth 958 ft., drill hole 3, SE,SE,NW, sec. 6, T107N, R35W, Cottonwood County.

Table 5 continued

33. SQ-6-343--Gritstone; Sioux Quartzite, Early Proterozoic; sample depth 343.7 ft., drill hole 6, SW,SW,NE, sec. 7, T107N, R34W, Cottonwood County.
34. SQ-6-420--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; sample depth 420 ft., drill hole 6, SW,SW,NE, sec. 7, T107N, R34W, Cottonwood County.
35. SQ-6-425--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; sample depth 425.5 ft., drill hole 6, SW,SW,NE, sec. 7, T107N, R34W, Cottonwood County.
36. SQ-6-429--Quartzite, coarse-grained; Sioux Quartzite, Early Proterozoic; sample depth 429.7 ft., drill hole 6, SW,SW,NE, sec. 7, T107N, R34W, Cottonwood County.
37. SQ-13-149--Gritstone, fine-grained, and intercalated quartz-pebble conglomerate; Sioux Quartzite, Early Proterozoic; sample depth 149.0 ft., drill hole 13, NE,NW,NW, sec. 23, T107N, R33W, Cottonwood County.
38. SQ-13-169--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; sample depth 169.0 ft., drill hole 13, NE,NW,NE, sec. 23, T107N, R33W, Cottonwood County.
39. PSM-1A--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample, NE,NW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
40. PSM-10A--Mudstone (catlinite-pipestone), deep red; Sioux Quartzite, Early Proterozoic; quarry sample, NE,NW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
41. PSM-10B--Mudstone (catlinite-pipestone) pale red; Sioux Quartzite, Early Proterozoic; quarry sample, NE,NW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
42. ML1-111--Gabbro, coarse-grained; age unknown; sample depth 111.0 ft., drill hole ML-1, NE,NW,NW,NW, sec. 12, T115N, R44W, Yellow Medicine County.
43. SK1-934--Sandstone, clayey; unnamed formation, Cretaceous; sample depth 934 ft., drill hole SK-1, NE,NE,NW,NW,NW, sec. 26, T104N, R42W, Nobles County.

Table 5 continued

44. SK1-1105--Serpentine zone in diorite; Precambrian, unknown age; sample depth 1105 ft., drill hole SK-1, NE,NE,NW,NW,NW, sec. 26, T104N, R42W, Nobles County.
45. PSM-16--Mudstone (catlinite-pipestone); Sioux Quartzite, Early Proterozoic; quarry sample, SE,SW, sec. 1, T106N, R46W, Pipestone National Monument, Pipestone County.
46. KS1-1--Shale; unknown formation, Late Cretaceous; sample depth 168 ft., drill hole SQ-1, SE,SW, sec. 18, T109N, R31W, Brown County.
47. SK1-2--Siltstone; unknown formation, Late Cretaceous; sample depth 213 ft., drill hole SQ-1, SE,SW, sec. 18, T109N, R31W, Brown County.
48. SK4-1--Shale; unknown formation, Late Cretaceous; sample depth 494 ft., drill hole SQ-4, SE,SW, sec. 8, T104N, R36W, Jackson County.
49. KS5-1--Shale, silty; unknown formation, Late Cretaceous; sample depth 401 ft., drill hole SQ-5, SE,SE, sec. 11, T102N, R36W, Jackson County.
50. KS7-1--Siltstone, sulfide-bearing; unknown formation, Late Cretaceous; sample depth 840 ft., drill hole SQ-7, SE,SW, sec. 34, T105N, R43W, Murray County.
51. KS8-1--Shale; unknown formation, Late Cretaceous; sample depth 176.5 ft., drill hole SQ-8, SW,NW, sec. 11, T107N, R31W, Watonwan County.
52. KS10-1--Regolith derived from siltstone; unknown formation, pre-Late Cretaceous; sample depth 534 ft., drill hole SQ-10, NE,SE, sec. 4, T104N, R35W, Jackson County.
53. KS11-1--Shale; unknown formation, Late Cretaceous; sample depth 339 ft., drill hole SQ-11, SW,SW, sec. 6, T105N, R37W, Cottonwood County.
54. KS11-2--Sandstone; unknown formation, Late Cretaceous; sample depth 396 ft., drill hole SQ-11, SW,SW, sec. 6, T105N, R37W, Cottonwood County.
55. KS11-3--Siltstone; unknown formation, Late Cretaceous; sample depth 473 ft., drill hole SQ-11, SW,SW, sec. 6, T105N, R37W, Cottonwood County.
56. KS11-4--Shale; unknown formation, Late Cretaceous; sample depth 539 ft., drill hole SQ-11, SW,SW, sec. 6, T105N, R37W, Cottonwood County.

Table 5 continued

57. KS11-5--Shale/siltstone; unknown formation, Late Cretaceous; sample depth 513 ft., drill hole SQ-11, SW,SW, sec. 6, T105N, R37W, Cottonwood County.
58. KS12-1--Shale; unknown formation, Late Cretaceous; sample depth 340 ft., drill hole SQ-12, SE,SW, sec. 29, T105N, R37W, Cottonwood County.
59. KS12-2--Shale, sitly; unknown formation, Late Cretaceous; sample depth 466 ft., drill hole SQ-12, SE,SW, sec. 29, T105N, R37W, Cottonwood County.
60. KS12-3--Siltstone; unknown formation, Late Cretaceous; sample depth 493 ft., drill hole SQ-12, SE,SW, sec. 29, T105N, R37W, Cottonwood County.
61. KS12-4--Shale; unknown formation, Late Cretaceous; sample depth 517 ft., drill hole SQ-12, SE,SW, sec. 29, T105N, R37W, Cottonwood County.
62. KS13-1--shale, silty; unknown formation, Late Cretaceous; sample depth 131 ft., drill hole SQ-13, SE,NE, sec. 23, T107N, R33W, Watonwan County.
63. KS04-11--Shale; unknown formation, Late Cretaceous; sample depth 52 ft., drill hole SP4204T-1, NE,NE, sec. 8, T111N, R41W, Lyon County.
64. KS09-21--Shale; unknown formation, Late Cretaceous; sample depth 62 ft., drill hole SP4209T-2, SE,SE, sec. 32, T112N, R41W, Lyon County.
65. SKTR-A4--Shale; Dakota Formation, Late Cretaceous Cenomanian; outcrop sample, NE,SW, sec. 8, T127N, R29W, Morrison County.
66. SKTR-A1--Nodule; Dakota Formation; Late Cretaceous Cenomanian; outcro sample, NE,SW, sec. 8, T127N, R29W, Morrison County.
67. KSBH--Shale; Carlile Shale, Late Cretaceous Turonian; sample depth 75 ft., drill hole R2-85-29, SE,SE, sec. 33, T120N, R47W, Grant County, South Dakota.
68. KSFP--Shale; Carlile Shale, Late Cretaceous Turonian; sample depth 110 ft., drill hole R2-85-29, SE,SE, sec. 33, T120N, R47W, Grant County, South Dakota.
69. KSLT-NP--Shale; unknown formation, Late Cretaceous; sample depth 10 ft., north pit, NE,NW, sec. 1, T125N, R49W, Traverse County.
70. KSLT-SP Shale; unknown formation, Late Cretaceous; sample depth 10 ft., south pit, SE,NW, sec. 23, T124N, R49W, Big Stone County.

Table 6. Southeastern Minnesota--10 Element Exploration Package

	1	2	3	4	5
Ag	<0.044	<0.045	0.5282	<0.046	0.0470
As	1.346	<0.912	14.06	8.440	2.701
Au	<0.001	0.0025	0.0064	<0.001	0.0016
Cu	14.91	65.74	1075.	68.88	41.67
Hg	<0.448	0.5923	0.7915	<0.464	<0.448
Mo	1.325	1.123	2.942	1.367	1.138
Pb	1.268	1.548	3.227	2.399	<0.896
Sb	2.995	2.996	2.902	<0.929	<0.896
Tl	<0.896	<0.912	<0.915	<0.929	<0.896
Zn	<0.896	18.51	15.15	54.61	57.60

1. B01-1258--Sandstone, coarse-grained; Mt. Simon Formation, Upper Cambrian; SK-1, sample depth 1258 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
2. B01-1335--Gabbro, coarse-grained, sulfide-bearing; Precambrian, unknown age; sample depth 1335 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
3. B01-1360--Shear zone in gabbro, sulfide-rich; Precambrian, unknown age; sample depth 1360 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
4. B01-1357--Gabbro, titanium-oxide-bearing; Precambrian, unknown age; sample depth 1357 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
5. B01-1598--Gabbro, titanium-oxide-bearing; Precambrian, age unknown; sample depth 1598.0 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.

Table 7. East-central Minnesota--Whole Rock Analyses

	1	2	3	4	5	6	7	8
SiO ₂	66.1	24.1	75.0	28.9	56.6	34.0	12.3	50.7
Al ₂ O ₃	13.9	6.73	5.08	4.13	14.6	12.0	2.61	0.56
CaO	7.04	34.6	4.81	18.6	13.6	0.43	1.11	0.10
MgO	1.99	1.35	2.12	7.44	1.73	1.83	1.38	0.35
Na ₂ O	2.65	1.00	1.05	0.69	1.24	0.26	0.38	0.20
K ₂ O	0.26	1.33	0.77	0.84	0.42	4.15	0.51	0.04
Total Fe as Fe ₂ O ₃	6.60	2.43	3.91	11.4	5.13	40.0	20.4	46.7
MnO	0.08	0.35	0.17	0.47	0.25	0.17	50.1	0.70
TiO ₂	0.77	0.63	0.32	0.25	0.59	1.47	0.82	0.06
P ₂ O ₅	0.21	0.26	0.13	0.15	0.37	0.20	0.23	0.10
Cr ₂ O ₃	0.04	0.02	0.02	<0.01	0.03	0.01	0.01	0.05
LOI	0.62	27.6	6.62	27.4	5.39	4.85	10.4	0.77
H ₂ O+	0.5	0.9	0.7	0.4	0.8	3.5	7.2	0.5
CO ₂	0.21	26.7	6.05	28.3	4.48	0.42	0.82	0.11
S	---	0.01	0.02	0.01	---	0.06	0.16	0.01
FeO	4.6	1.7	3.1	9.5	3.5	2.6	0.6	0.5
Rb	20	40	40	40	20	<10	<10	<10
Sr	470	1160	300	1030	230	130	20	<10
Y	20	20	20	30	20	10	<10	<10
Zr	220	230	50	50	110	100	<10	<10
Nb	30	10	30	10	30	40	10	20
Ba	100	80	190	120	100	1430	43	200

Table 7 continued

	9	10	11	12	13	14	15	16
SiO ₂	22.3	49.5	24.2	20.0	36.6	26.3	31.9	29.5
Al ₂ O ₃	1.40	0.65	1.63	2.08	2.02	2.54	2.28	1.05
CaO	1.74	0.85	0.53	2.45	3.85	5.74	3.60	4.45
MgO	2.04	0.70	0.69	4.17	3.51	2.30	2.19	2.15
Na ₂ O	0.25	10.1	0.32	0.54	0.34	0.17	0.50	0.30
K ₂ O	0.83	0.17	1.29	0.73	0.68	0.01	0.61	0.27
Total Fe as Fe ₂ O ₃	30.4	31.6	65.7	38.2	33.4	25.7	35.0	43.9
MnO	30.3	3.11	3.72	11.4	5.60	14.6	7.11	5.62
TiO ₂	0.33	0.06	0.10	0.15	0.09	0.12	0.13	0.06
P ₂ O ₅	0.11	0.02	0.14	0.22	0.10	0.24	0.12	1.19
Cr ₂ O ₃	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
LOI	9.00	2.08	2.23	21.6	14.5	22.8	17.2	12.0
H ₂ O+	0.3	0.2	0.3	2.5	3.2	1.4	2.8	2.3
CO ₂	9.73	1.49	3.03	22.1	13.3	24.4	16.0	13.3
S	TR.	---	---	TR.	---	---	---	0.03
FeO	0.4	0.2	8.7	24.2	22.9	20.2	20.0	32.0
Rb	<10	<10	20	<10	20	<10	30	<10
Sr	<10	<10	<10	<10	<10	<10	10	10
Y	<10	<10	<10	<10	<10	20	<10	<10
Zr	<10	<10	<10	<10	<10	<10	10	<10
Nb	30	20	40	10	40	20	30	20
Ba	4880	880	220	130	130	190	160	190

Table 7 continued

	17	18	19	20	21	22	23	24
SiO ₂	26.6	33.0	31.3	37.5	49.2	16.4	33.6	44.2
Al ₂ O ₃	2.80	4.85	3.13	2.61	16.4	2.69	3.80	2.81
CaO	3.36	2.84	2.37	1.21	6.26	0.17	0.38	1.92
MgO	2.23	2.72	2.10	2.12	2.58	0.56	2.01	2.86
Na ₂ O	0.59	0.72	0.63	0.46	3.32	0.26	0.22	0.34
K ₂ O	0.59	0.88	0.70	0.33	3.70	0.37	0.04	0.31
Total Fe as Fe ₂ O ₃	36.8	37.2	51.0	44.5	7.19	53.7	49.2	34.2
MnO	8.41	4.41	0.53	0.64	0.14	14.9	4.05	4.53
TiO ₂	0.13	0.21	0.12	0.10	2.33	0.15	0.24	0.14
P ₂ O ₅	0.97	0.10	1.75	0.26	1.05	0.93	0.06	0.06
Cr ₂ O ₃	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
LOI	18.2	13.7	7.16	11.7	7.77	10.5	7.16	8.85
H ₂ O+	3.1	5.3	4.0	2.5	1.4	8.4	2.8	2.8
CO ₂	16.8	8.66	3.47	12.4	6.46	0.02	4.56	7.18
S	---	0.01	0.06	0.17	---	0.01	TR.	---
FeO	21.7	16.2	18.2	24.9	5.6	<0.1	9.8	13.3
Rb	<10	30	<10	<10	50	<10	<10	<10
Sr	10	10	10	<10	290	60	<10	10
Y	<10	<10	<10	<10	50	10	<10	<10
Zr	<10	<10	<10	<10	290	<10	20	<10
Nb	40	20	30	30	50	40	20	20
Ba	270	130	170	160	940	1830	270	190

Table 7 continued

	25	26	27	28	29	30	31	32
SiO ₂	59.3	61.9	43.8	25.4	25.0	87.8	47.7	63.1
Al ₂ O ₃	15.3	17.9	30.0	1.57	2.87	3.80	3.98	16.0
CaO	0.40	0.12	0.06	1.04	0.97	0.15	0.09	0.05
MgO	1.88	2.35	2.14	3.23	4.17	0.22	1.05	2.60
Na ₂ O	0.25	0.21	0.25	0.19	0.21	0.14	0.19	0.18
K ₂ O	4.62	5.41	10.0	0.15	0.77	0.12	0.06	3.68
Total Fe as Fe ₂ O ₃	11.7	6.57	3.53	36.0	39.1	4.05	41.0	10.4
MnO	0.01	0.02	<0.01	8.32	6.47	0.09	0.12	0.03
TiO ₂	0.65	0.68	1.15	0.08	0.15	0.08	0.14	0.54
P ₂ O ₅	0.18	0.08	0.06	0.20	0.32	0.04	0.50	0.04
Cr ₂ O ₃	0.02	0.02	0.02	<0.01	<0.01	0.01	0.01	0.02
LOI	6.00	4.54	9.16	24.4	20.6	3.08	5.54	3.54
H ₂ O+	2.4	2.0	2.0	1.0	3.2	2.1	5.5	3.2
CO ₂	0.36	0.36	0.02	2.62	19.7	0.23	0.06	<0.01
S	2.91	1.30	0.06	0.10	---	0.01	---	---
FeO	4.0	3.4	1.3	29.5	26.1	0.4	4.3	7.4
Rb	140	150	240	<10	40	10	20	110
Sr	30	10	60	<10	<10	<10	10	10
Y	<10	30	30	10	10	<10	10	<10
Zr	60	90	170	<10	<10	10	20	110
Nb	20	10	20	20	30	10	40	20
Ba	730	960	1600	270	1180	250	200	1220

Table 7 continued

	33	34	35
SiO ₂	60.6	60.8	59.4
Al ₂ O ₃	20.2	19.7	2.87
CaO	0.16	0.11	8.97
MgO	2.04	1.55	2.13
Na ₂ O	0.26	0.23	0.13
K ₂ O	5.60	6.32	0.19
Total Fe as Fe ₂ O ₃	6.61	7.43	13.6
MnO	0.01	0.01	0.52
TiO ₂	0.68	0.65	0.06
P ₂ O ₅	0.05	0.07	0.05
Cr ₂ O ₃	0.01	0.01	0.02
LOI	3.77	3.39	12.5
H ₂ O+	2.8	2.5	1.2
CO ₂	<0.01	<0.01	12.7
S	---	0.01	0.01
FeO	3.9	2.7	11.4
Rb	220	260	20
Sr	30	80	200
Y	<10	20	10
Zr	110	110	<10
Nb	10	10	10
Ba	720	990	60

1. 45-20-18-1C--Concretion, epidote-cored; Thomson Formation, Early Proterozoic; outcrop sample, SE,NW,SE, sec. 18, T45N, R20W, Pine County.
2. 48-16-4-1F--Concretion, calcite-cored; Thomson Formation, Early Proterozoic; outcrop sample, SW,SW,SW, sec. 4, T48N, R16W, Carlton County.
3. 49-16-19-2C--Concretion, dolomite-cored; Thomson Formation, Early Proterozoic; outcrop sample, SW,SW,NW, sec. 19, T48N, R16W, Carlton County.

Table 7 continued

4. 49-17-13-2--Concretion, dolomite-cored; Thomson Formation, Early Proterozoic; outcrop sample, SW,SE,SE, sec. 13, T49N, R17W, Carlton County.
5. 129-29-19-1--Concretion, calcite-cored; Little Falls Formation, Early Proterozoic; outcrop sample, SE,NE,NE, sec. 19, T12N, R29W, Morrison County.
6. M-100--Phyllite, reddish-gray; Rabbit Lake Formation, thin-bedded facies, Early Proterozoic; sample depth 100.0 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
7. M-182--Iron-formation, black, porous; Trommald Formation, thick-bedded facies, Early Proterozoic; sample depth 182.0 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
8. M-209--Iron-formation, granular, oxidized; Trommald Formation, thick-bedded facies, Early Proterozoic; sample depth 209.7 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
9. M-256--Iron-formation, nongranular, laminated red and gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 256.2 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
10. M-287--Iron-formation, oolitic, acmite-bearing; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 287.0 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
11. M-311--Iron-formation, hematitic, massive; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 311.1 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
12. M-325--Iron-formation, nongranular; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 325.6 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
13. M-341--Tuff, light greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 341.1 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.

Table 7 continued

14. M-383--Phyllite, light-gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 383.2 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
15. M-425--Iron-formation, nongranular; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 425.1 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
16. M-500--Iron-formation, nongranular, dark green; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 500.0 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
17. M-549--Slate, ferruginous, dark-green; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 549.8 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
18. M-612--Slate, dark greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 612.9 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
19. M-700--Iron-formation, nongranular, dark greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 700.0 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
20. M-734--Slate-graywacke, dark greenish gray; Mahnomens Formation, thin-bedded facies, Early Proterozoic; sample depth 734.3 ft., drill hole, Merritt Property (U of M), NW,SW,SW,SW, sec. 33, T47N, R29W, Crow Wing County.
21. RM-MLCH-9-116--Andesite porphyry; Thomson Formation, Early Proterozoic; sample depth 116.0 ft., drill hole 9, SW,SW,NW, sec. 4, T47N, R18W, Carlton County.
22. A-55--Iron-formation, nongranular, dark greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 55.0 ft., drill hole, Arko Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.
23. A-78--Iron-formation, granular, hematitic; Trommald Formation, thick-bedded facies, Early Proterozoic; sample depth 78.0 ft., drill hole, Arko Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.

Table 7 continued

24. A-273--Iron-formation, nongranular, dark greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 273.0 ft., Arko Property (U of M), NE,NW,NE,NE, sec. 9, T46N, R29W, Crow Wing County.
25. EL1-38--Graywacke/slate, graphitic; Thomson Formation, Early Proterozoic; sample depth 38.0 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
26. EL1-137--Graywacke, Thomson Formation, Early Proterozoic; sample depth 137.9 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
27. EL1-191--Slate, graphitic; Thomson Formation, Early Proterozoic; sample depth 191.5 ft., drill hole 1, sec. 8, T46N, R20W, Carlton County.
28. H-17--Argillite, oxidized; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 17.5 ft., drill hole, North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
29. H-29--Phyllite, greenish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 29.3 ft., drill hole, North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
30. H-42--Phyllite, light reddish gray; Trommald Formation, thin-bedded facies, Early Proterozoic; sample depth 42.2 ft., drill hole, North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
31. H-63--Iron-formation, granular, hematitic; Trommald Formation, thick-bedded facies, Early Proterozoic; sample depth 63.1 ft., drill hole, North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
32. H-95--Phyllite, medium-gray; Mahnomen Formation, thick-bedded facies, Early Proterozoic; sample depth 95.0 ft., drill hole, North Hillcrest Property (U of M), NE,NE,SW,SW, sec. 9, T46N, R29W, Crow Wing County.
33. N-371--Phyllite, light-gray; Mahnomen Formation, Early Proterozoic; sample depth 371.0 ft., drill hole Northland Property (U of M), NW,SW,NW,NW, sec. 20, T47N, R28W, Crow Wing County.

Table 7 continued

34. N-521-- Phyllite, medium-gray, tourmaline bearing; Mahnomen Formation, Early Proterozoic; sample depth 521.3 ft., drill hole, Northland Property (U of M), NW,SW,NW,NW, sec. 20, T47N, R28W, Crow Wing County.
35. N-594--Iron carbonate, oolitic, granular; Mahnomen Formation, Early Proterozoic; sample depth 594.1 ft., drill hole, Northland Property (U of M), NW,SW,NW,NW, sec. 20, T47N, R28W, Crow Wing County.

Table 8. Southwestern Minnesota--Whole Rock Analyses

	1	2	3	4	5	6	7	8
SiO ₂	53.2	11.5	51.1	47.3	49.9	47.1	38.5	58.2
Al ₂ O ₃	7.97	1.93	7.43	12.8	15.2	14.9	0.86	17.1
CaO	0.93	9.23	8.79	9.80	8.00	11.0	1.69	3.79
MgO	4.11	5.24	16.0	8.95	5.36	6.11	2.95	3.32
Na ₂ O	0.28	0.30	1.06	2.15	3.56	2.21	0.25	7.43
K ₂ O	1.58	0.49	0.14	0.54	1.16	1.33	0.44	0.25
Total Fe as Fe ₂ O ₃	21.5	47.6	13.9	14.9	12.4	13.5	56.3	6.89
MnO	2.06	4.69	0.22	0.18	0.20	0.21	0.04	0.10
TiO ₂	0.46	0.33	0.39	1.63	1.34	1.05	0.22	0.72
P ₂ O ₅	0.14	0.16	0.06	0.24	0.41	0.15	0.16	0.20
Cr ₂ O ₃	0.04	<0.01	0.16	0.03	0.01	0.04	0.02	0.01
LOI	8.23	18.1	0.93	0.85	1.62	1.62	-1.23	1.93
H ₂ O+	3.3	1.4	0.7	0.8	1.0	1.0	0.5	1.5
CO ₂	0.05	17.4	0.92	0.35	0.48	0.56	0.03	0.03
S	2.05	1.34	0.52	0.22	0.23	0.04	---	---
FeO	10.7	19.6	10.8	9.7	6.3	7.1	18.5	4.1
Rb	100	<10	20	20	10	20	<10	10
Sr	10	20	140	240	670	340	<10	180
Y	20	<10	<10	20	30	10	<10	30
Zr	50	<10	<10	30	180	80	<10	160
Nb	20	30	10	20	30	20	40	30
Ba	470	230	90	160	400	280	160	100

Table 8 continued

	9	10	11	12	13	14	15	16
SiO ₂	41.8	47.7	49.4	48.0	55.1	64.8	6.16	47.4
Al ₂ O ₃	5.78	0.12	16.4	12.9	14.9	8.33	0.69	24.0
CaO	4.52	2.01	9.61	11.8	7.57	10.7	2.39	0.38
MgO	25.8	1.35	7.74	6.55	4.56	0.48	2.56	2.26
Na ₂ O	0.34	0.21	2.83	2.44	4.57	0.31	0.26	0.32
K ₂ O	0.05	<0.01	1.07	0.56	2.30	1.29	0.03	9.73
Total Fe as Fe ₂ O ₃	12.9	49.2	10.5	13.7	7.07	2.63	58.9	6.93
MnO	0.18	0.03	0.15	0.22	0.11	0.06	0.48	0.07
TiO ₂	0.36	0.02	0.66	1.03	0.81	0.22	0.04	0.81
P ₂ O ₅	0.04	0.18	0.06	0.09	0.50	0.04	0.62	0.19
Cr ₂ O ₃	0.43	0.03	0.03	0.02	0.02	0.01	0.01	0.78
LOI	6.70	-0.92	1.77	1.93	1.23	9.39	28.2	6.54
H ₂ O+	5.4	0.2	1.6	1.4	0.7	2.3	2.3	2.3
CO ₂	0.04	0.59	0.13	0.35	0.71	7.87	27.5	1.52
S	0.02	---	0.07	0.79	0.08	1.48	4.28	1.39
FeO	6.5	14.1	6.3	6.6	4.0	0.6	40.5	3.4
Rb	10	<10	50	30	60	10	<10	240
Sr	20	<10	100	210	1870	320	30	<10
Y	10	<10	<10	10	20	10	<10	30
Zr	<10	<10	30	60	440	60	<10	20
Nb	10	40	10	30	10	10	40	<10
Ba	40	130	330	100	1280	760	260	2080

Table 8 continued

	17
SiO ₂	49.3
Al ₂ O ₃	14.3
CaO	12.2
MgO	6.29
Na ₂ O	2.19
K ₂ O	0.22
Total Fe as Fe ₂ O ₃	13.5
MnO	0.21
TiO ₂	1.12
P ₂ O ₅	0.11
Cr ₂ O ₃	0.04
LOI	0.77
H ₂ O+	0.8
CO ₂	<0.01
S	0.02
FeO	10.4
Rb	20
Sr	110
Y	10
Zr	50
Nb	30
Ba	80

1. E1-963--Iron-formation, nongranular, dark-green; unnamed formation, Early Proterozoic(?); sample depth 963.3 ft., drill hole E-1, SW,SE, sec. 7, T112N, R46W, Lincoln County.
2. E1-1057--Iron-formation, granular, dark-gray; unnamed formation, Early Proterozoic(?); sample depth 1057.0 ft., drill hole E-1, SW,SE, sec. 7, T112N, R46W, Lincoln County.
3. ML1-111--Gabbro, coarse-grained; Precambrian, age unknown; sample depth 111.0 ft, drill hole ML-1, NE,NW,NW,NW, sec. 12, T115N, R44W, Yellow Medicine County.

Table 8 continued

4. ML1-253-- Gabbro, coarse-grained; Precambrian, age unknown; sample depth 253.0 ft., drill hole ML-1, NE,NW,NW,NW, sec. 12, T115N, R44W, Yellow Medicine County.
5. SK1-1080--Diorite; Precambrian, age unknown; sample depth 1080.0 ft., drill hole SK-1, NE,NE,NW,NW, sec. 26, T104N, R42W, Nobles County.
6. SK1-1131--Diabase; Precambrian, age unknown; sample depth 1131.0 ft., drill hole SK-1, NE,NE,NW,NW, sec. 26, T104N, R42W, Nobles County.
7. D1-497--Iron-formation, laminated chert and magnetite; unnamed formation, Early Proterozoic; sample depth, 497.0 ft., drill hole D-1, SW,NW, sec. 11, T129N, R47W, Traverse County.
8. D4-227--Felsic volcanic rock, porphyritic; unnamed formation, Early Proterozoic(?); sample depth 227.7 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
9. D4-527-- Iron-formation, nongranular, garnet grade; unnamed formation, Early Proterozoic(?); sample depth 527.2 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
10. D4-585--Iron-formation, nongranular; unnamed formation, Early Proterozoic(?); sample depth 585.6 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
11. D4-661--Metadiabase; unnamed formation, Early Proterozoic(?); sample depth 661.7 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
12. D4-1014--Metabasalt; unnamed formation, Early Proterozoic(?); sample depth 1014.9 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
13. D4-1149--Gneiss, tonalitic; unnamed formation, Archean(?); sample depth 1149.5 ft., drill hole D-4, SW,NW, sec. 12, T129N, R47W, Traverse County.
14. E1-798--Siltstone/graywacke; unnamed formation, Early Proterozoic(?); sample depth 798.8 ft., drill hole E-1, SW,SE, sec. 7, T112N, R46W, Lincoln County.
15. E1-901--Iron-carbonate rock, brown, massive; unnamed formation, Early Proterozoic(?); sample depth 901.6 ft., drill hole E-1, SW,SE, sec. 7, T112N, R46W, Lincoln County.

Table 8 continued

16. E1-957--Schist, micaceous; unnamed formation, Early Proterozoic(?); sample depth 957.7 ft., drill hole E-1, SW,SE, sec. 7, T112N, R46W, Lincoln County.
17. JSL-3--Metabasalt, weakly foliated; Precambrian, unknown age; outcrop sample, SE,SW,SE,SE, sec. 17, T115N, R43W, Yellow Medicine County.

Table 9. Southeastern Minnesota--Whole Rock Analyses

	1	2	3
SiO ₂	46.7	35.9	31.7
Al ₂ O ₃	13.9	9.58	6.98
CaO	8.94	9.22	8.61
MgO	6.03	5.20	6.95
Na ₂ O	3.69	1.87	1.14
K ₂ O	0.37	0.42	0.10
Total Fe as Fe ₂ O ₃	14.0	28.3	34.0
MnO	0.24	0.40	0.53
TiO ₂	2.20	4.36	7.35
P ₂ O ₅	1.32	2.59	1.76
Cr ₂ O ₃	0.02	<0.01	<0.01
LOI	1.54	0.23	-0.84
H ₂ O+	1.5	1.0	0.8
CO ₂	0.31	0.25	0.08
S	---	0.17	0.26
FeO	10.7	17.5	23.7
Rb	30	20	10
Sr	440	210	110
Y	40	20	<10
Zr	240	20	10
Nb	30	20	30
Ba	360	140	90

1. BO1-1390--Diabase, fine-grained; Precambrian, age unknown; sample depth 1390 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
2. BO1-1425--Gabbro, coarse-grained; Precambrian, age unknown; sample depth 1425 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.
3. BO1-1598--Gabbro, titanium-oxide-bearing; Precambrian, age unknown; sample depth 1598 ft., drill hole BO-1, SE,SW,SW,NW, sec. 22, T101N, R8W, Fillmore County.

