The rocks exposed on the islands, and observed in drill cores are mainly gneiss, crystalline limestone, various intrusives, and altered derivates; a complex assemblage typical of Grenville proince, but with local peculiarities, notable concentrations of sodium, phosphorus, fluorine, uranium and columbium.

These rocks are arranged in a roughly elliptical ring about the Manitou Islands. The gneiss occurs on the outer edge of the ring and a diorite on the inner edge, while altered limestone and acidic dykes and sills occur between.

East of Newman Island the limestone acidid sill group has been brecciated and partially replaced by basic material containing columbium and uranium. The zone is roughly 400 feet wide, and usually consists of parallel lenticular masses with particularly high concentration of columbium and uranium. The general strike of this zone is east-west,though with local deviations. The dip appears to vary between vertical and 70° south.

On Big Manitou Island this assemblage appears to have folded into a synlinal structure, and a small mass of basic material rich in uranium and columbium has formed in the vicinity of the centre of fold.

At other localities notably north of Rankin Island, and on Calder, and Big Manitou Islands, scattered sections with notable quanitities of columbium and uranium have been found but as yet no continuous large masses have been uncovered.

MINERALOGY

The following minerals are present in the columbium-bearing rock, listed in common decreasing order of abundance :

acmite, feldspar, apatite, calcite, biotite, magnetite, pyrite, hematite, pyrochlore, monasite, fluorite.

Pyrochlore is the only columbium-bearing mineral in the rock; it also contains the majority if not all the uranium. The ratio of columbium to uranium is very variable. It is higher in the south section of Newman Zone, and lower in the centre and north side, and also on Big Manitou Island.

The pyrochlore occurs as minute grains (.005-.5 mm. dia) closely associated with acmite, biotite, calcite and apatite, and in generally broadly associated with magnetite.

GEOLOGY

The rocks exposed on the islands, and observed in drill cores are mainly gneiss, crystaline limestone, various intrusives, and altered derivitaves; a complex assemblage typical of the Grenville province, but with local peculiarities, notably concentrations of sodium, phosphorous, fluorine, uranium and columbium.

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Economic Geology

New man Zone

and in generally broadly associated with magnetite

ANALYSIS

Columbium Analysis

The Beaucage Mines Limited columbium deposit was the first pyrochlore-columbium deposit to be developed in North America which meant that there was no established columbium analytical procedure to follow. In the early stages this presented a difficult problem. Columbium assaying* was costly, results were slow in coming in, and in many cases later work showed them to be unreliable.

To alleviate this problem the geology Department of McGill University developed an X-ray fluorescence method of columbium analysis, during the spring of 1953. Results of this method, which used an internal standard, were consistent and it was chosen for all future work up to the pilot plant stage. After May 8, 1953, all samples were shipped to McGill for columbium analysis, and all earlier rejects of samples were re-assayed by them. Where rejects were missing the core was quartered and assayed. The dates on which assays were performed and name of the assayer are recorded, along with other data pertaining to the sample in the Assay Record Book.

Beginning on April 26, 1955 samples for columbium analysis were shipped to X-ray Assay Laboratories, Woodbridge, Ontario. McGill at this time were doing so much commercial work that they were swamped with samples and it was taking too long to receive their results. Before using the X-ray Assay Laboratories values 19 samples were shipped to them and to McGill

* Assayers - Milton Hersey
Harry Weller
Toronto Testing Laboratories
Union Carbide
Lakefield Laboratories

for comparitive checks (see appendix) and it was found that the X-ray Assay Laboratories results were highest by an average of 17.4%. After studying the rocks involved and the specific differences in the samples it was decided to reduce the X-Ray Assay Laboratories results by 15% for uniformity in the records.

During November 1955 Beaucage Mines Limited began doing their own columbium analyses at the pilot plant site. These are performed by a thiocyanate colorimetric method. Results of this method have been used in all pilot plant records, but were not used in mining records until after March 31, 1956. Thus all values recorded on the mine diamond drill sections, diamond drill logs, and plans are of the McGill standard except a very few muck and test samples in 4-7 stope, and the eastern part of 4-8 stope. Comparitive checks between X-Ray Assay Laboratories and Beaucage Laboratories indicate that the Beaucage results are 3.2% lower (results of 85 checks spread out over the period March 1 - August 7, 1956).

After two years of checking and development of analytical techniques it has been found that the McGill results are consistently low. For instance a comparison of results of 23 samples shows that the results of chemical determinations at the United States Geological Survey average 24% higher than the McGill results; that the results of 27 of X-Ray fluorescence determination at X-Ray Assay Laboratories average 21% higher than McGill; that the results of 7 chemical determination at Battelle Memorial Institute; Columbus, Ohio, average 7% higher; that the results of 4 chemical determination at the Mines Branch, Ottawa, average 27% higher; and that assays of the same 4 samples by X-Ray fluorescence also at the Mine Branch average 28% higher. Between November 1955 and February

1956 McGill modified their procedure so that now their results (as a result of 11 check analyses) average 2% higher than X-Ray Assay Laboratories; and 5% higher than Beaucage (11 checks).

The law of average suggests that the X-Ray Assay Laboratories results give values close to the absolute Cb_2O_5 content, and that the columbium grade figures on the mine plans should be raised by 15% and that possibly the mill results are 3% low. However, it is believed that a 50 pound pulvarized thoroughly mixed standard sample should be set up and after carefully determining the grade of this sample have regularly selected rejects of past mine and mill sample related to it by re-assaying. Then using the factor so produced change all values on mine plans, sections and logs so that they are all based upon a common standard. A great deal of work has been carried out on the problem of assaying pyrochlore (columbium mineral) bearing rocks during the last few years and it appears that the standard of this work has developed to the point where Beaucage should set up a standard and relate all future and past work to this standard.

Uranium Analysis

All samples obtained by Beaucage Mines Limited up until October 6, 1956, were assayed for uranium oxide by Milton Hersey Co. Ltd., Winnipeg, Manitoba. These were performed by a radiometric method. At this time chemical analyses were unsatisfactory as laboratories had considerable difficulty getting all the uranium into solution.

After October 6, 1956 all uranium analyses were performed at Beaucage by a beta radiometric method. These results were related to standard uranium samples obtained from the Mines Branch, Ottawa. Subsequent chemical checks (see appendix) with the Mines Branch indicates that the Beaucage results are 5.3% high. No changes in any reports or on any of the plans have been made on account of this figure.

Sample No.	Beaucage	McGill	X-Ray	USGS	Battelle	U.C.	T.S.L.	Mines Branch Col.	Mines Branch X-R Fl.
815		.85					1.24	1.08	1.02
865		.73					.88	.72	.82
882		.58					.68	.67	.69
889		.72					.92	1.18	1.17
915			.58				.66	.62	.63
928			1.18				1.35	1.42	1.32
984			1.17				1.20	1.29	1.32
1392			2.25				2.30	2.35	2.55
1458			.67				.72	.78	.81
2567			.80				.75	.73	.73
2587			.74				.65	.70	.78
96M			.62				.55	.53	.52
16M		.60	.83				.62	.72	.75
77M		.72	.93				.88		
2331		.72	.94				.85	.74	.80
2344		1.43	1.86				1.60		
3930	.59		0.64						
321M	.58		0.58						
322M	.72		0.68						
3931	.60		0.60						
3932	.58		0.67						
3933	.59		0.64						
323M	.55		0.64						
3934	.57		0.60						
3935	.58		0.63						
324M	.73		0.79						
325M	.60		0.68						
3936	.58		0.60						
376M	.74		0.79						
3937	.58		0.63						
3938	.63		0.62						
3939	.62		0.62						
3940	.62		0.61						
377M	.87		0.83						
378M	.78		0.74						
3942	.66		0.64						
3943	.67		0.64						
380M	.60		0.68						
381M	.69		0.67						
3944	.67		0.62						
382M	.64		0.66						
383M	.71		0.66						
3945	.63		0.64						
3946	.65		0.64						
3941	.63		0.66						
3947	.59		0.63						
3948	.62		0.64						
379M	.81		0.71						
384M	.61		0.63						
385M	.65		0.62						
386M	.64		0.65						
3949	.61		0.66						
3950	.60		0.66						
387M	.65		0.64						
388M	.62		0.66						

Sample No.	Beaucage	McGill	X-Ray	UGS	Battelle	U.C.	T.S.L.	Col.	X-R F1
3951	.55		0.62						
3952	.64		0.66						
3953	.63		0.65						
389M	.71		0.68						
390M	.61		0.64						
391M	.61		0.63						
392M	.64		0.65						
3954	.62		0.62						
3955	.63		0.62						
3956	.63		0.65						
393M	.62		0.64						
394M	.72		0.68						
3957	.67		0.70						
395M	.69		0.67						
396M	.62		0.63						
3958	.63		0.69						
3959	.63		0.65						
397M	.64		0.65						
3960	.61		0.61						
400M	.60		0.61						
3963	.60		0.62						
404M	.55		0.55						
3964	.58		0.60						
3965	.62		0.65						
407M	.60		0.63						
411M	.58		0.60						
3966	.60		0.61						
414M	.59		0.60						
3967	.58		0.62						
416M	.55		0.58						
3968	.57		0.59						
417M	.61		0.61						
3969	.54		0.62						
398M	.62								
3962	.61								
399M	.64								
401M	.59								
402M	.60								
403M	.55								
405M	.58								
406M	.61								
408M	.60								
3970	.52		0.52						
418M	.53		0.51						
419M	.50		0.46						
3971	.50		0.45						
3972	.47		0.45						
420M	.44		0.45						
421M	.43		0.42						
3973	.48		0.48						
3974	.48		0.027						
3975	.58		0.030						
3976	.81		0.82						
3977	.68		0.64						
3978	.89		0.92						
3979	.66		0.67						

Sample No.	Beaucage	McGill	X-Ray	USGS	Battelle	U.C.	T.S.L.	Col.	X-R Fl.
3980	.69		0.64						
3981	.81		0.76						
5216			0.01						
5217	TR								
3982	.72		0.65						
3983	.85		0.82						

		New McGill		
3691	.57	.63	.60	.60
3692	.53	.57	.53	.53
3693	.56	.62	.58	.58
3694	.57	.62	.60	.64
3695	.69	.70	.69	.71
3696		.75		.71
3697		.89		.80
3698	1.03	1.10		1.06
3700	.78	.84		.84
3801	.67	.67		.72
3822	.58	.59		.66

BEAUCAGE MINES LIMITED

COLUMBIUM ANALYSIS CHECKS

Sample No.	% Columbium					
	McGill	X-Ray	USGS	Battelle	U.C.	T.S.I.
78 Ins.	.38		.47		.68	.77
500	.64	.72				
1197		.75				
1198		.70				
561 Ins.	.15		.16		.29	.25
637	.30					
638	.31					
639	.29					
644	.37					
645	.37					
649	.50					
651	.50					
662	.26					
663	.26					
667	.34					
668	.35					
666	Tr					
602	Tr					
648	.50					
651	.50					
659	.36	.43				
660	.29	.52				
661	.48	.58				
683	.48					
684	.50					
693	1.00	1.14				
1200		1.16				
695	.90	1.09				
696	.65	.74				
697	.82	.95				
698	.50	.62				
699	.14	.14				
701	.40	.48				
691	.44	.48				
692	.95	1.08				
693	1.00	1.11				
694	1.08	1.35				
4043 Ins.	1.64					
1374	2.01	2.20				
1376		2.21				
1377		2.41				
3911 Ins.	1.24	1.57				
1379		1.47				
2645 Ins.	.63	.85				

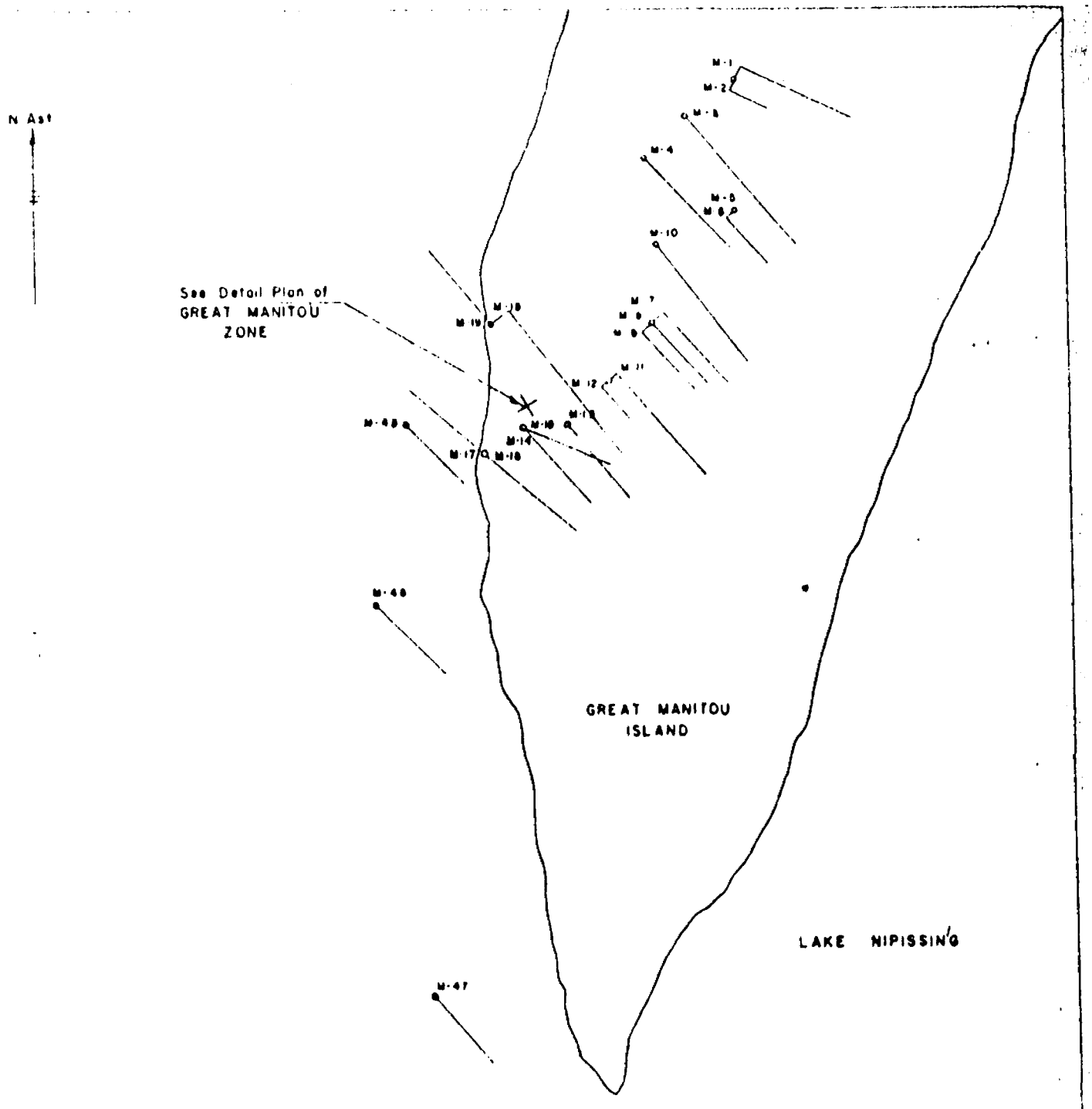
Sample No.	McGill	X-Ray	USGS	Battelle	U.C.	T.S.L.
1381		.83				
734 Ins.	.84	.86				
1383		.93				
1385	.76	.92				
1093		.98				
1558		.83				
1094		.31				
1559		.28				
1095		1.62				
1560		1.59				
1096		.15				
1561		.14				
2373		1.72				
2385		1..4				
2386		1.63				
2375		1.01				
2387		1.08				
2388		1.03				
710 Ins.	.96		1.15			1.86
3017 Ins.	.23		.27		.59	.39
3024 Ins.	.39		.50		1.10	1.05
3038 Ins.	.39		.51		.70	.73
3043 Ins.	.80		.96	.76	.92	
2421				.92		
2422				.77		
3005 Ins.	.60		.89		.77	
3024 Ins.	.39		.73	.53	1.10	
3196 Ins.	.48		.74	.63		
2423				.67		
2424				.54		
5313 Ins.	1.60		1.80			
3533 Ins.	1.56		1.40			
3704 Ins.	.52		.66			
4293 Ins.	2.20		2.2			
3792 Ins.	.48		.54	.52		
4711 Ins.				.54		
2418			.57			
3814 Ins.	.50		.76	.49		
2419			.80			
2420			.67			
3762 Ins.	.78		1.0	.86		
2415			1.0			
3767 Ins.	.62			.79		
3921 Ins.	1.03		1.3	.93		
2416			1.4			
3969 Ins.	.24		.36			
3984 Ins.	.81		.83			
4017 Ins.	.68		.63			
4094 Ins.	.51		.70			
2417			.77			
4109 Ins.	5.21		5.0			
3812 Ins.	.25	.30				
3813 Ins.	.50	.60				
3816 Ins.	.26	.34				
3111 Ins.						.58

BEAUCAGE MINES LIMITED

URANIUM ANALYSIS CHECKS

% Uranium Oxide

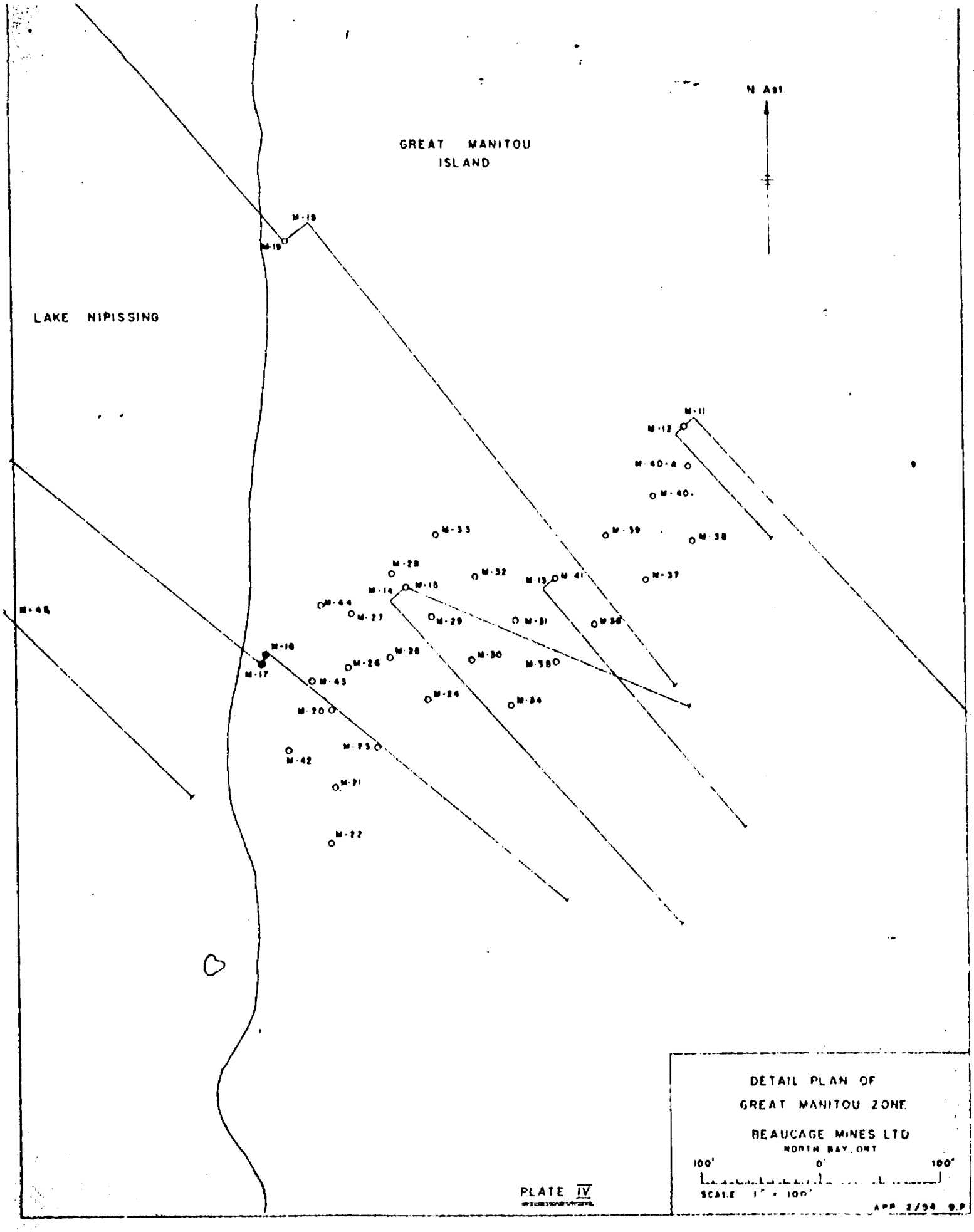
Sample No.	INSP	T.T.L.	Mines Branch Chem.	Mines Branch Calc.	Eq gamma	Eq beta	T.S.L.	Prob. ThO_2
2969	.081	Tr	.077	.074	.076	.075	.051	
3742	.028		.023	.028	.030	.029	Tr	
3766	.069	Tr	.059	.064	.067	.066	.031	
3815	0.136	.02	0.12	0.12	0.141	0.135		
3909	0.186	.02	0.18	0.17	0.164	0.168		
4072	0.10	.03	0.094	0.10	0.094	0.097		
4163	0.033	Tr	0.029	0.034	0.029	0.031		
3151	.102						.098	
3194	.08						.072	
3533	.01						nil	
3610	.005						nil	
3737	.015						Tr	
781			.044					
782			.026					
783			.062					
784			.029					
Bulk Sample			.15	.15				
53	.10			.06	.06	.06		
62	.10			.086	.090	.088		
996	.05			.060	.063	.062		
1106	nil			.032	.034	.033		
1751	.042			.037	.044	.041		
1921	.046			.050	.042	.046		
1926	.068			.070	.075	.072		
2873	.138			.11	.124	.117		
2874	.049			.047	.045	.046		
2888	.08			.072	.081	.077		
2889	.136			.11	.129	.121		
1967	.08			.077	.086	.082		
2230	.16						.19	
815	.015		.012	0.016	0.016	0.016	.019	
865	.083		.083	0.083	0.074	0.078	.082	
882	.046		.041	0.045	0.045	0.045	.043	
889	.065		.058	0.059	0.073	0.067	.059	0.036
915	.072		.072	0.068	0.079	0.074	.061	0.03
928	.07		.070	0.073	0.073	0.073	.064	
984	.111		.12	0.12	0.12	0.12	.12	
1392	.106		.11	0.10	0.108	0.105	.080	
1458	.059		.054	0.054	0.063	0.059	.042	
2567	.041		.035	0.037	0.039	0.038	.043	
2587	.068		.063	0.065	0.067	0.066	.066	
96M	.062		.055	0.059	0.061	0.060	.065	
3163	.075		.070	0.069	0.074	0.072	.074	
3164	.08						.085	
3165	.043		.037	0.043	0.045	0.044	.037	
3166	.047						.052	



PLAN OF
GREAT MANITOU ZONE
BEAUCAGE MINES LTD.
NORTH BAY, ONT.

SCALE 100' 0' 100' 200' 300' 400'
1" = 400'

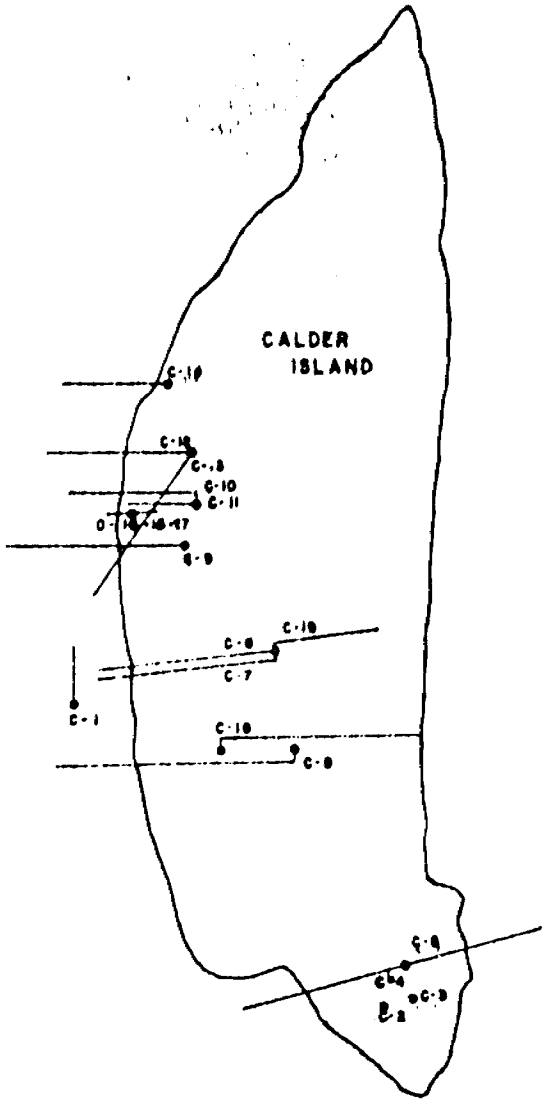
PLATE III


N Azi.
GREAT MANITOU ISLAND
LAKE NIPISSING
M-11
M-12
M-40-A
M-40
M-39
M-38
M-33
M-28
M-32
M-13
M-41
M-37
M-14
M-18
M-44
M-27
M-29
M-31
M-36
M-45
M-16
M-17
M-26
M-25
M-30
M-35
M-43
M-24
M-34
M-20
M-23
M-42
M-21
M-22
DETAIL PLAN OF
GREAT MANITOU ZONE
BEAUCAGE MINES LTD
NORTH BAY, ONT.
100' 0' 100'
SCALE 1" = 100'
APR 2/54 B.P.
PLATE IV

GREAT MANITOU ISLAND

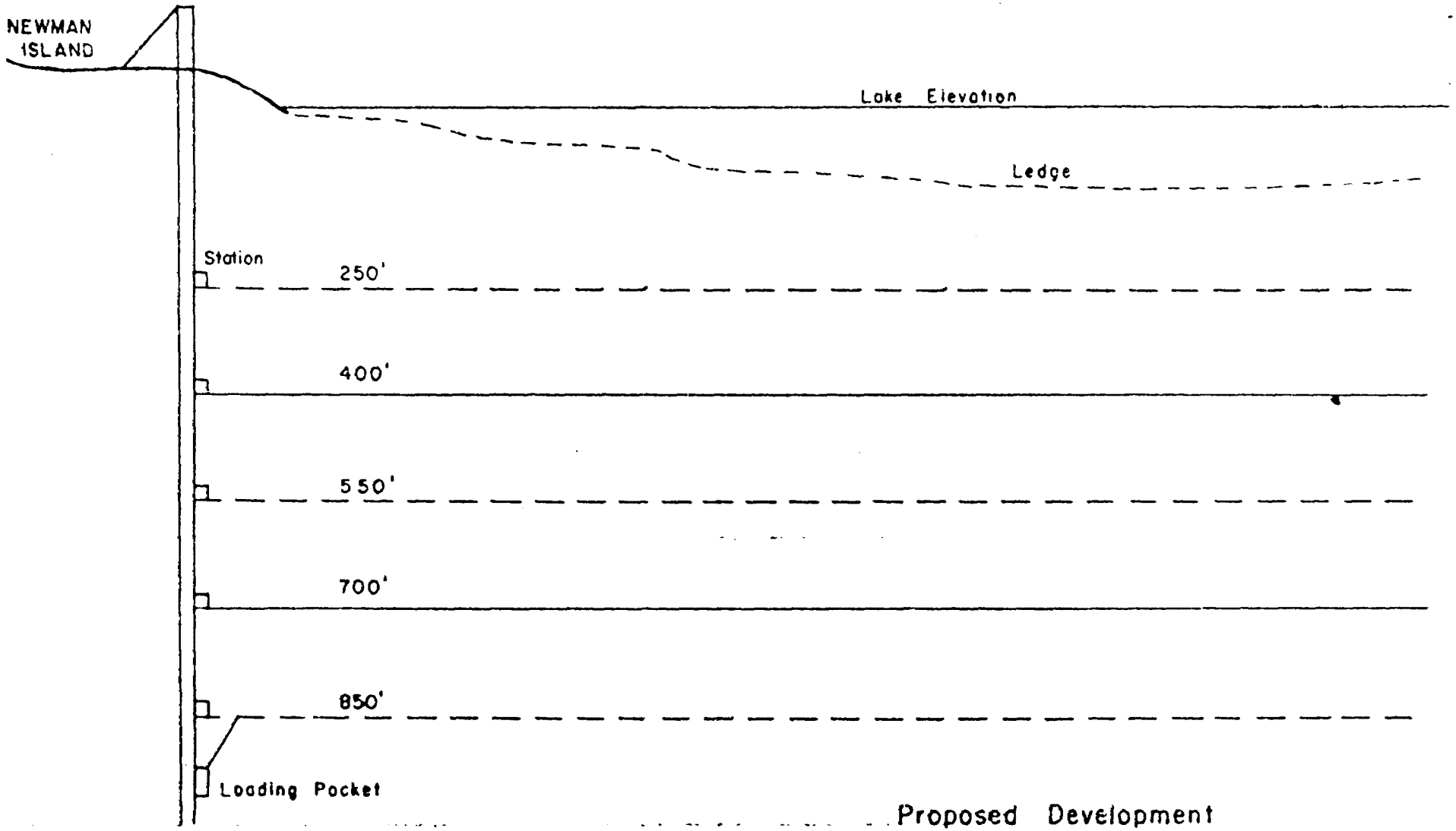
N. Azi.

LAKE NIPISSING



PLAN OF
CALDER ZONE
BEAUCAGE MINES LTD.
SOUTH BAY ONT.
SCALE

Plate V



Proposed Development

BEAUCAGE MINES LTD.

1954

400' & 700' Levels To Be Driven First

27/3/54

Hole #	Hole	Length	Ore Intersection From	To	Length	% U_3O_8	% Cb_2O_5
M-20	90°	79'	4	52	48'	.157	.29
M-21	90°	79'					
M-22	90°	25'					
M-23	90°	81'					
M-24	90°	30'					
M-25	90°	180'	22	68	46'	.087	.28
			130	140	10'	.10	.22
M-26	90°	169'	6	30	24'	.15	.32
M-27	90°	79'	8	39	31'	.06	.38
M-28	90°	65'	22	37	15'	.03	.57
M-29	90°	154'	87	105	18'	.21	.48
M-30	90°	179'					
M-31	90°	81'					
M-32	90°	216'					
M-33	90°	140'					
M-34	90°	42'					
M-35	90°	115'					
M-36	90°	104'	42	48	6'	.10	.22
M-37	90°	142'					
M-38	90°	64'					
M-39	90°	70'					
M-40	90°	65'					
M-40A	90°	55'					
M-41	90°	54'					
M-42	90°	151'					
M-43	90°	88'					

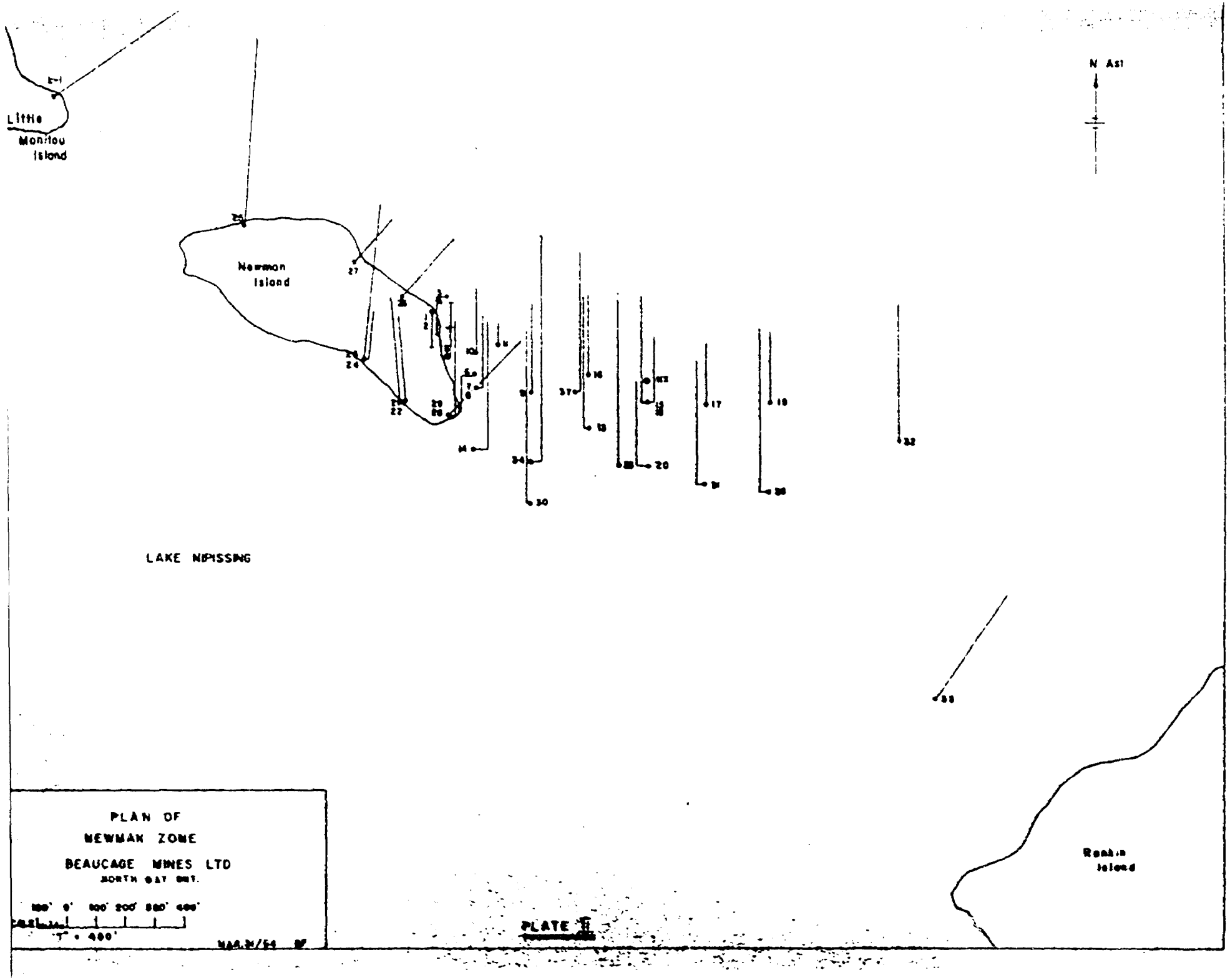
Hole #	Hole	Length	Ore Intersection From	To	Length	% U_3O_8	% Cb_2O_5
M-44	90°	80'					
M-45	45°	318'					
M-46	45°	385'					
M-47	45°	340'					
M-48	45°	398'					

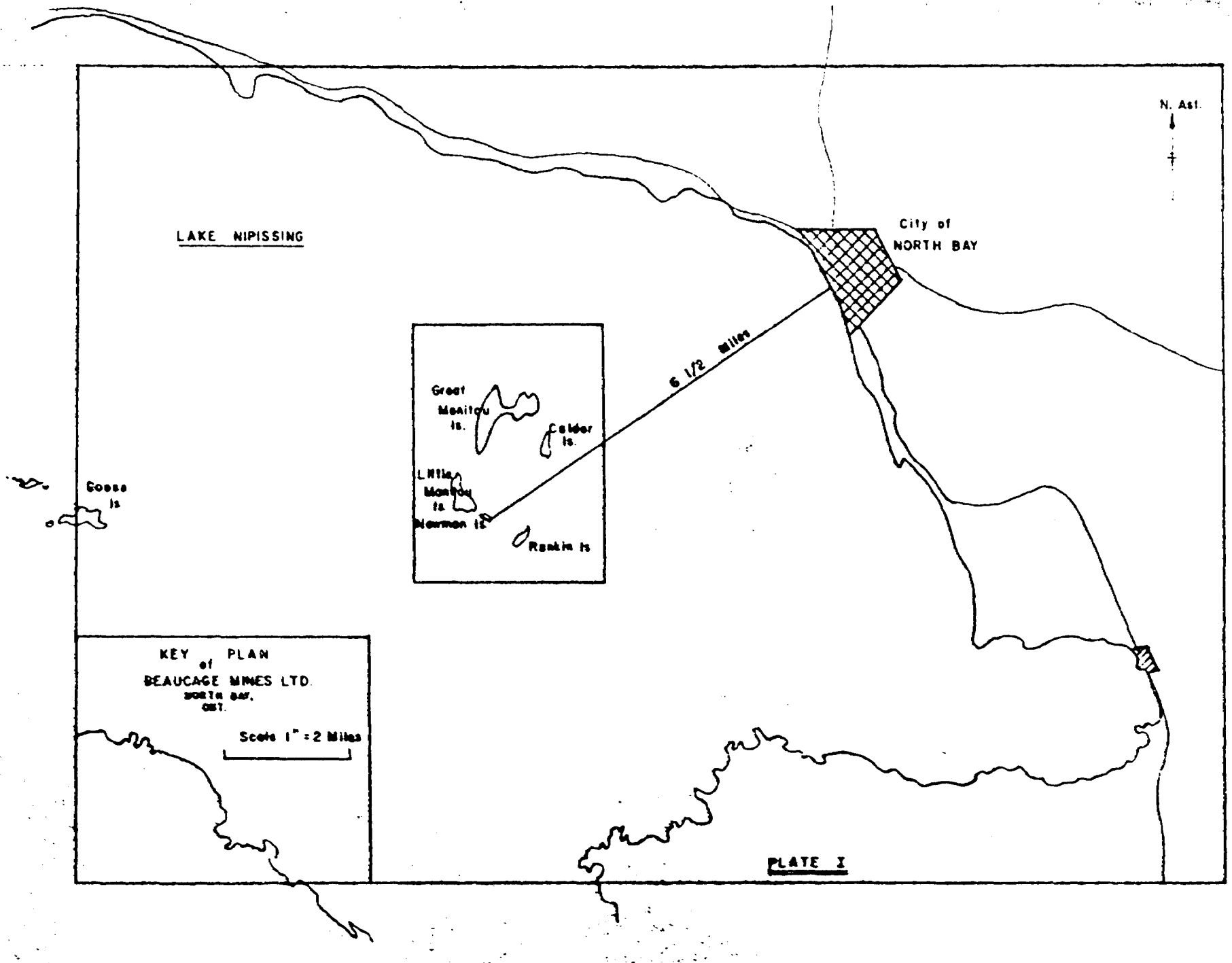
Hole #	Hole	Length	Ore Intersection From	To	Length	% U_3O_8	% Cb_2O_5
M-20	90°	79'	4	52	48'	.157	.29
M-21	90°	79'					
M-22	90°	25'					
M-23	90°	81'					
M-24	90°	30'					
M-25	90°	180'	22	68	46'	.087	.28
			130	140	10'	.10	.22
M-26	90°	189'	6	30	24'	.15	.32
M-27	90°	79'	8	39	31'	.06	.38
M-28	90°	65'	22	37	15'	.03	.57
M-29	90°	154'	87	105	18'	.21	.48
M-30	90°	179'					
M-31	90°	81'					
M-32	90°	216'					
M-33	90°	140'					
M-34	90°	42'					
M-35	90°	115'					
M-36	90°	104'	42	48	6'	.10	.22
M-37	90°	142'					
M-38	90°	54'					
M-39	90°	70'					
M-40	90°	65'					
M-40A	90°	55'					
M-41	90°	54'					
M-42	90°	151'					
M-43	90°	88'					

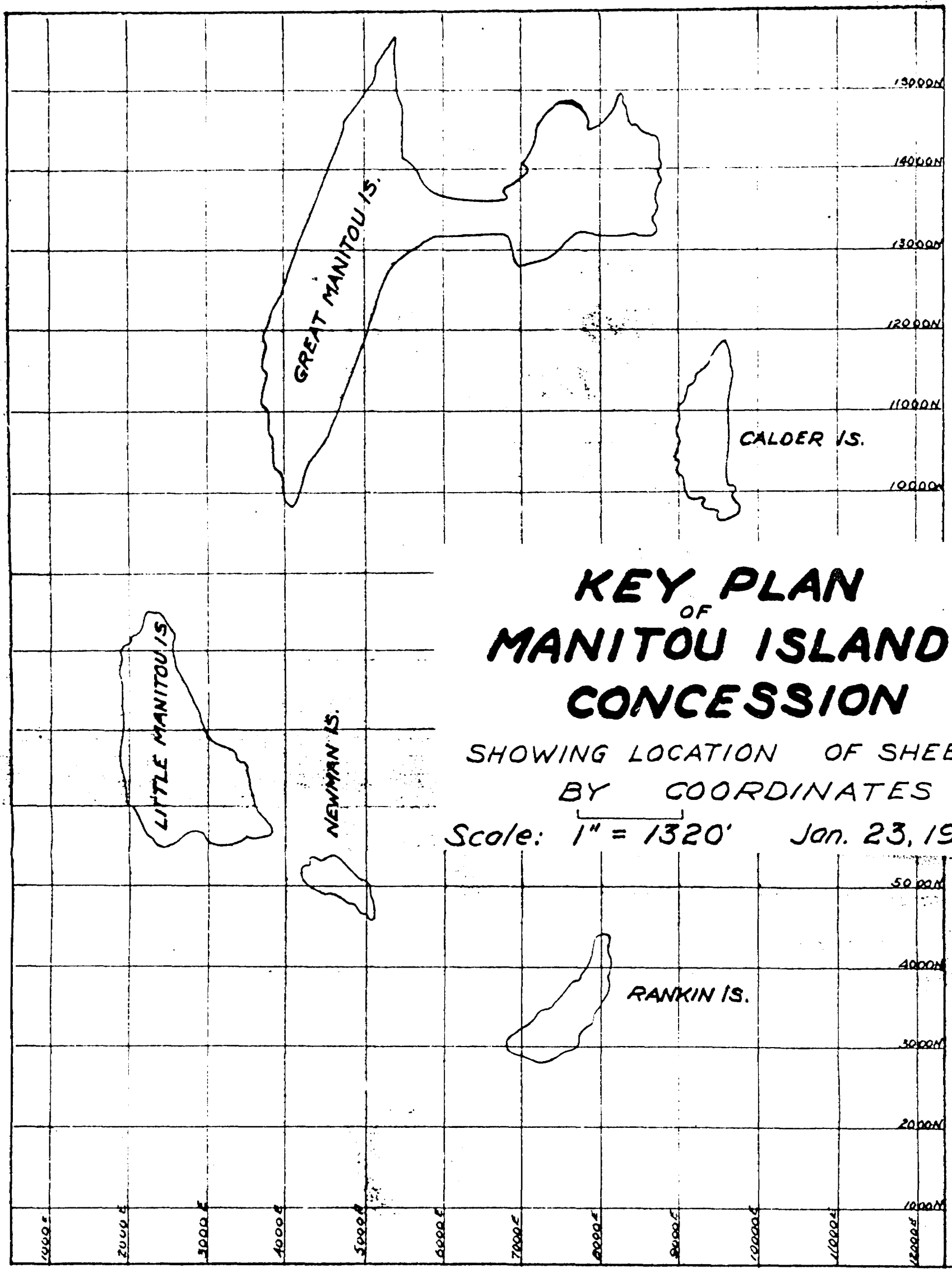
Hole #	Hole	Length	Ore Intersection From	To	length	% U_3O_8	% Cr_2O_3
M-44	90°	80'					
M-45	45°	318'					
M-46	45°	385'					
M-47	45°	340'					
M-48	45°	398'					

Hole #	Hole	Length	Ore Intersection From	To	Length	% U_3O_8	% Cb_2O_5
K-20	90°	79'	4	52	48'	.157	.29
K-21	90°	79'					
K-22	90°	25'					
K-23	90°	81'					
K-24	90°	30'					
K-25	90°	180'	22	68	46'	.087	.28
			130	140	10'	.10	.22
K-26	90°	189'	6	30	24'	.15	.32
K-27	90°	79'	8	39	31'	.06	.38
K-28	90°	65'	22	37	15'	.03	.57
K-29	90°	154'	87	105	18'	.21	.48
K-30	90°	179'					
K-31	90°	81'					
K-32	90°	216'					
K-33	90°	140'					
K-34	90°	42'					
K-35	90°	115'					
K-36	90°	104'	42	48	6'	.10	.22
K-37	90°	142'					
K-38	90°	64'					
K-39	90°	70'					
K-40	90°	65'					
K-40A	90°	55'					
K-41	90°	54'					
K-42	90°	151'					
K-43	90°	88'					

Hole #	Hole	Length	Ore Intersection From	To	Length	% V_2O_5	% Cb_2O_5
[illegible]	90°	80'					
[illegible]	45°	318'					
[illegible]	45°	385'					
[illegible]	45°	340'					
[illegible]	45°	398'					


Little
Manitou
Island
N Ast
Newman
Island
LAKE NIPISSING
Rankin
Island
PLAN OF
NEWMAN ZONE
BEAUCAGE MINES LTD
NORTH BAY ONT.
"I" = 400'
PLATE II


N. Ast.
LAKE NIPISSING
City of
NORTH BAY
6 1/2 miles
Great
Manitou
Is.
Calder
Is.
Little
Manitou
Is.
Norman Is
Rankin Is
Goose
Is
KEY PLAN
of
BEAUCAGE MINES LTD.
Scale 1" = 2 Miles
PLATE I



KEY PLAN OF MANITOU ISLANDS CONCESSION

SHOWING LOCATION OF SHEETS BY COORDINATES

Scale: 1" = 1320' Jan. 23, 1953