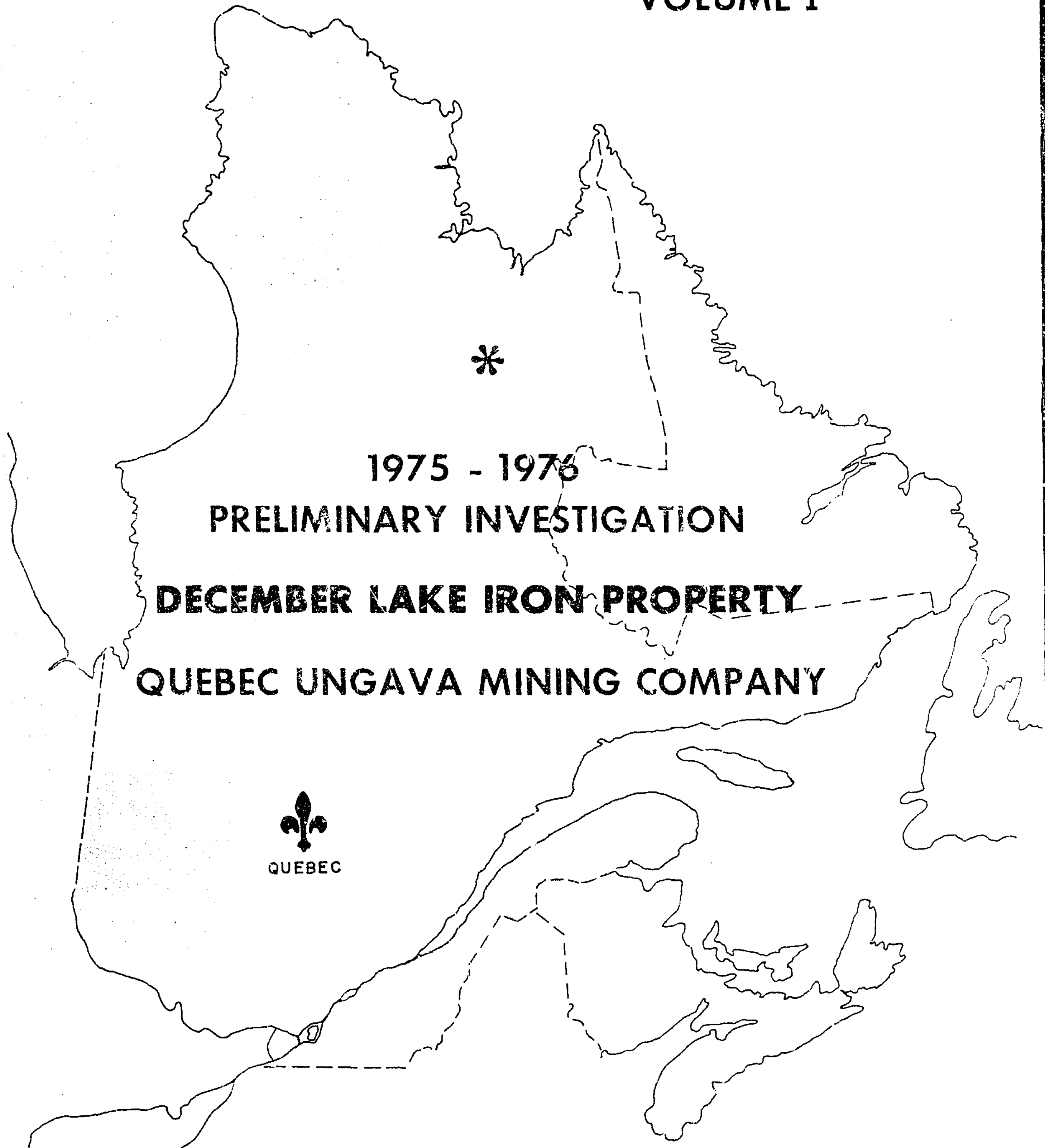
VOLUME I



1975 - 1976
PRELIMINARY INVESTIGATION
DECEMBER LAKE IRON PROPERTY
QUEBEC UNGAVA MINING COMPANY

H. E. NEAL & ASSOCIATES LTD.
TORONTO — CANADA

GM-33386

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DECEMBER LAKE IRON PROPERTY

QUEBEC UNGAVA MINING COMPANY

JUNE 1977

BY

H. E. NEAL & ASSOCIATES LTD.

TORONTO - CANADA

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1.0 SUMMARY

Preliminary investigations during 1975 and 1976 in the December Lake area have outlined two significant zones of magnetic iron formation reserves. The Main Zone contains 2,000 million tons of crude with 22.3% Magnetic Iron in a formation with a gentle dip of 6.5°. Metallurgical tests indicate that magnetic concentrates can be produced with 67 to 69% Fe at a grind of 90% -400 mesh. The Main Zone contains a drilled area with a length of 4.5 miles across a width of about 1.5 miles. A second zone at Blackie Lake contains 200 million tons of crude with 24.2% Magnetic Iron. Magnetic separation produced a super-concentrate with 70% Fe and 1.8% Silica at a grind of 92% -400 mesh.

The Main Zone contains 879 million tons of surface exposed crude with no rock stripping and only minor overburden. Adjacent to this is an additional 666 million tons under a layer of cap rock varying in depth from zero to a maximum of 150 feet. A third pit of Inferred crude is a further down-dip extension with 470 million tons to a maximum depth of stripping of 250 feet.

SUMMARY OF RESERVES

LONG TONS IN MILLIONS

	CRUDE	TOTAL STRIPPING	STRIPPING RATIO	CONCENTRATE TONS	*C.R.
Main Zone					
Pit 1 No Stripping	879	15	0.02:1	285	3.08
Pit 2 0-150 ft. Cap Rock	666	279	0.42:1	216	3.08
Pit 3 150-250 ft. Cap Rock	470	504	1.07:1	153	3.08
Pit 1 + 2	1,545	294	0.19:1	501	3.08
Pit 1 + 2 + 3	2,015	798	0.40:1	654	3.08
Blackie Lake Zone	207	101	0.49:1	70	2.94

* C.R. - Concentration Ratio based on:

Main Zone — 32.5% Weight Recovery

Blackie Lake — 34.0% Weight Recovery

Mine Life At 10,000,000 T.P. Year Product Rate

Pit 1 — 28 years — No Stripping

Pit 1 + 2 — 50 years — Stripping Ratio 0.19:1

Blackie — 70 years at 1,000,000 T.P. Year

CRUDE GRADE OF RESERVES

Main Zone	Sol Fe	Magnetic Fe
Pit 1	30.8	22.2
Pit 2	31.2	22.5
Pit 3	31.6	22.2
Total	31.1	22.3
Blackie Lake Zone	32.1	24.2

Quebec Ungava Mining Company holds title to the mineral rights on 369 claims covering 14,760 acres in New Quebec, Canada. This property is located 800 miles northeast of Montreal and 145 miles northwest of Schefferville (Knob Lake). The climate in this area is similar to Schefferville but with less rain and snowfall.

Field work was conducted during the field season of 1975 and 1976. This work consisted of geological mapping, magnetometer surveys, drilling and sampling. Preliminary metallurgical testwork was conducted primarily on drill core and a few field samples.

Three areas of interest consist of the Main Zone containing the major part of the reserves, Blackie Lake in the east central area and Hematite Lake in the extreme eastern part south of Hematite Lake.

Picket lines were cut and surveyed for the magnetometer surveys and as control for the geological mapping and drilling programs.

	1975	1976
Picket Lines	75.0 miles	44.7 miles
Magnetometer Survey	75.0 miles	44.7 miles

In 1975 the original claim group of 550 claims was mapped at a scale of 1" = 1,000 feet. In 1976 the eastern half of the Main Zone, Blackie and Hematite Lake areas were mapped at 1" = 500 feet from picket lines at 500 foot intervals.

The cherty magnetite member is of greatest economic interest and consists of a cherty iron formation (equivalent to taconite) with diffuse banded and disseminated magnetite. This formation averages 170 feet thick in the Main Zone ranging from 150 to 247 feet thick. This formation dips gently at an average of 6.5^{o} and it is overlain by a weathered cherty carbonate which is softer than the crude.

At Blackie Lake the iron formation is folded forming a corregated series of steeply dipping iron formation limbs of synclines and basins overlain by cap rock.

Hematite Lake zone is a broad basin which requires additional drilling before grade and tonnages can be outlined.

A second member called the cherty metallic iron formation contains a variable amount of magnetite and hematite. In the Main Zone it is 300 feet thick and underlies the cherty magnetite and separated from it by a 50 foot band of jasper. At Hematite Lake the cherty metallic is locally highly magnetic and responds well to metallurgical testwork. The extent and character of this formation requires much more testwork. This cherty metallic represents a large potential of future reserves.

Drilling Summary

A total of 14,685 feet of drilling was completed on 55 holes.

	No. Holes	Footage
Main Zone	43	10,658
Blackie Lake	7	2,210
Hematite Lake	5	1,817
	55	14,685

In the area of reserve calculations the drilling was completed along cross sections at 2,000 foot intervals with 2 to 6 holes in each cross section. More widely spaced cross sections were drilled west of the Main Zone and at Hematite Lake. See Geological Compilation Map at a scale of 1" = 2,000 feet.

Tonnage estimates were made using Geological Cross sections at a scale of 1" = 200 feet on which areas were measured by planimeter with volumes calculated by projecting halfway to adjacent sections.

Metallurgical Summary

All magnetic drill core was analysed for soluble iron and Satmagan magnetic iron in 10 foot intervals. Twenty-foot composites were prepared of material containing more than 15% magnetic for Davis Tube tests. Grindability, Work Index and magnetic separation tests were completed on these samples. In addition 8 composites were prepared according to zones for cherty magnetite, cherty metallic and a sample of jasper hematite. Two-stage grinding tests were made on these composites along with magnetic separation in a Jeffrey separator, flotation of the magnetic concentrate and selective flocculation-flotation tests for recovery of hematite.

Work Index:	Main Zone	17.9 Cherty Magnetite
	Blackie Lake	17.3 Cherty Magnetite
	Hematite Lake	17.7 Cherty Magnetite
	Main Zone	17.6 Cherty Metallic
	Hematite Lake	18.2 Cherty Metallic
		19.6 Jasper Hematite

Davis Tube Results - based on drill core sample averages of tests by cross sections and by footages. Tonnage estimates were only made on the 15% magnetic iron cut-off.

Cut-off Grade	Crude % SolFe	Crude % MagFe	D.T. Concentrate % Wt	D.T. Concentrate % SolFe	D.T. Concentrate % FeDist	Grind % -400M
Main Zone						
15%	31.3	22.5	33.1	68.0	71.9	91.0
17%	31.4	22.7	33.5	68.0	72.5	91.1
19%	31.4	23.1	34.0	68.0	73.6	91.2
Blackie Lake						
15%	32.0	24.5	34.9	70.3	76.7	95.5
Hematite Lake						
15%	32.2	25.2	36.4	69.3	78.3	93.9

Laboratory Magnetic Separation Tests
Cherty Magnetite

Grinding Power Input of 27.8 KWH/LT Crude

Zone	% SolFe	% MagFe	% Wt	% SolFe	% FeDist	Grind % -400 M
Main	30.9	23.3	32.8	67.5	71.6	91.1
Blackie	32.5	26.6	36.1	71.0	79.0	92.0
Hematite	32.8	25.1	34.1	71.8	74.6	89.0

Hematite Recovery

Selective flocculation and flotation tests were conducted on two samples of cherty metallic and one sample of jasper hematite.

The Hematite Lake cherty metallic responded well, the Main Zone cherty metallic gave poorer results than magnetic separation and the jasper hematite gave poor response.

	Crude		Concentrate		
Zone	% SolFe	% MagFe	% Wt	% SolFe	% SolFe Dist
Cherty Magnetite					
Main Zone	28.4	12.8			
Magnetic Sep.			19.1	67.0	45.1
Sel. Flocculation			69.2	37.8	92.0
Sel. Flocculation + Flotation			18.8	61.4	40.6
Hematite Lake	31.5	12.8			
Magnetic Sep.			18.2	67.8	54.1
Sel. Flocculation			55.3	51.6	89.3
Sel. Flocculation + Flotation			32.0	67.5	67.6
Jasper					
Main Zone	31.7	10.6			
Magnetic Sep.			16.0	66.6	33.6
Sel. Flocculation			89.0	35.2	94.5
Sel. Flocculation + Flotation				NOT TESTED	

Concentrate Analyses - Magnetic Concentrate

Element	Main Zone	Blackie Lake
% T Fe	67.5	70.1
% SiO_2	4.39	1.82
% P	0.015	0.012
% Mn	0.19	0.05
% Al_2O_3	0.053	0.032
% CaO	0.36	0.25
% MgO	0.23	0.068
% Na_2O	0.007	0.006
% K_2O	0.009	0.008
% S	0.0075	0.0135
% Ni	0.004	0.004
% Cr	0.003	0.003
% TiO_2	0.04	0.014
% Arsenic	0.0027	0.0026

Volume I contains the complete report along with Geological Cross Sections and Tonnage Cross Sections.

Volume II contains detailed test results by Lakefield Research of Canada and back-up data.

2.0 INTRODUCTION

Quebec Ungava Mining Company Inc. was incorporated under the laws of Quebec in 1974, as a wholly-owned subsidiary of Armco Steel Corporation. A total of 550 claims were staked in October, 1974 in Townships 5047 and 5048 in the December Lake area, New Quebec, and transferred into the name of Quebec Ungava Mining Company. The number of claims were reduced to 369 in October, 1976, based on the results of the 1975 and 1976 field programs.

The magnetic Iron Formation in the December - Hematite Lakes area has been known for many years. Exploration was first conducted in 1948 during a search for direct shipping iron ore. The ground was held subsequently by U.S. Steel Corporation and Dennison Mines Ltd. which did surface mapping and sampling.

The 1975 program started with a DC-3 air-lift in April/May of camp and drill equipment, diesel fuel and jet fuel. A camp was built on December Lake consisting of plywood tent bases, aluminum frames and tents. A Hughes 500 jet helicopter supported the movement of the drill and personnel. The program consisted of drilling 22 holes, geological mapping, magnetometer surveying and surface sampling. The field season extended from June 10 to September 4.

The 1976 program was similar to the 1975 work but added more detail by reducing the spacing of the drill sections from 4000 feet to 2000 feet. A total of 5530 feet was drilled in 1975.

Additional holes were drilled at Blackie Lake and 4 holes were drilled in the Hematite Lake area. The drilling consisted of 9155 feet in 33 holes. Detailed mapping and magnetometer surveys were conducted in the Blackie - Hematite Lake area and in the eastern part of the Main Zone. The field season extended from April 15 to September 20. Drilling started on May 15 and was completed on September 19, 1976.

All magnetite-bearing drill core and field samples were analysed for soluble and magnetic iron. Davis Tube tests and liberation studies were conducted on drill core composites.

H.E. Neal & Associates were responsible for the field program, compilation of data and for the supervision of the metallurgical testwork.

The capable, diligent and loyal support of the staff members and summer students are gratefully acknowledged. Those working during both programs included M.D. Smith, staff geologist and field supervisor; P. Atherton, senior assistant and staff geologist; R.S. Ferguson, senior assistant and staff geologist; M. Hubert and P. Loudon as geological senior assistants. Mr. D. McEnteer acted as senior geologist in 1975; J. Enochs served as senior assistant in 1975 and G. Lefrancois was senior assistant during the 1976 field season.

Heli-Quebec provided reliable helicopter support through the able services of their experienced pilots Terry Thompson and Ken Lawrence.

Heath and Sherwood were the drilling contractors for both programs. Their experience and reliability in supplying the drillers, cooks and drill supplies were greatly appreciated.

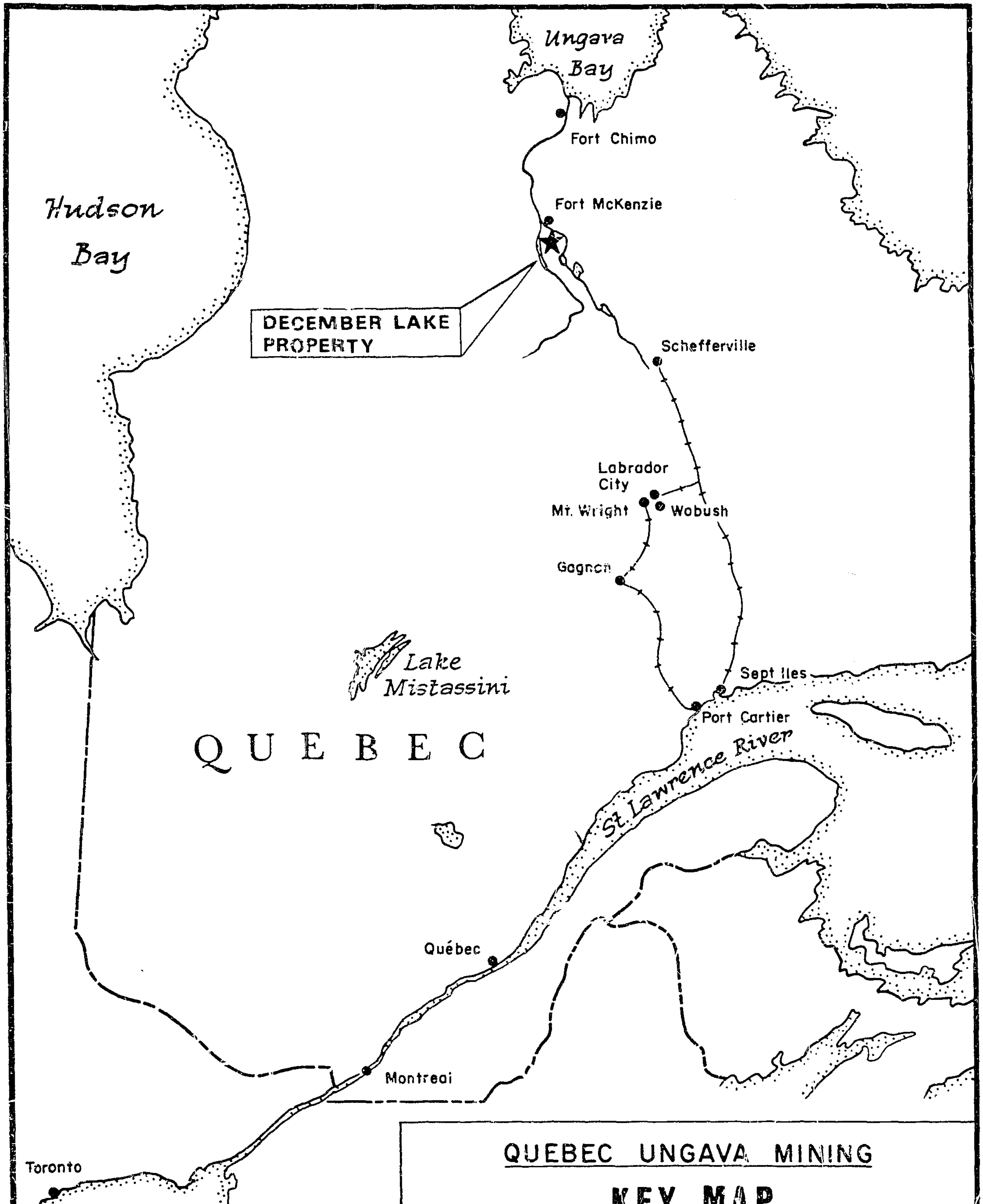
3.0 THE PROPERTY

Quebec Ungava Mining Company holds a contiguous block of 369 claims under Development Licences from the Government of Quebec. This group of claims is located 800 miles northeast of Montreal, Quebec, in the north central part of the Labrador Trough. Schefferville is located 145 miles southeast of the claims and Fort Chimo is 112 miles to the northeast on the Koksoak River. The Quebec North Shore and Labrador Railway extends from Schefferville to Sept Iles for a distance of 360 miles. The property lies 4 miles east of Cambrian Lake, a wide portion of the Kaniapiskau River which flows north to Ungava Bay.

See accompanying Key Maps.

The 369 claims are located in Townships 5047 and 5048. The Claim group is centred at approximately 56° 35' North Latitude and 69° West Longitude. The attached December Lake map shows the outline of the claims. The complete list of claim numbers is contained in the Appendix to Volume II. These claims were staked in October, 1974 by Mr. Ross Toms on behalf of Quebec Ungava Mining Company.

Access to the property is possible by charter aircraft based at both Schefferville and Fort Chimo. Scheduled jet aircraft service is available on a daily basis from Montreal to Schefferville on Quebecair. Nordair operates a scheduled jet aircraft service from Montreal to Fort Chimo on the basis of 3 to 4 flights per week. DC-3 aircraft on


Ungava Bay
Fort Chimo
Fort McKenzie
Hudson Bay
DECEMBER LAKE PROPERTY
Schefferville
Labrador City
Mt. Wright
Wabush
Gagnon
Lake Mistassini
Sept Iles
Port Cartier
QUEBEC
St Lawrence River
Québec
Montreal
Toronto
Hamilton
QUEBEC UNGAVA MINING
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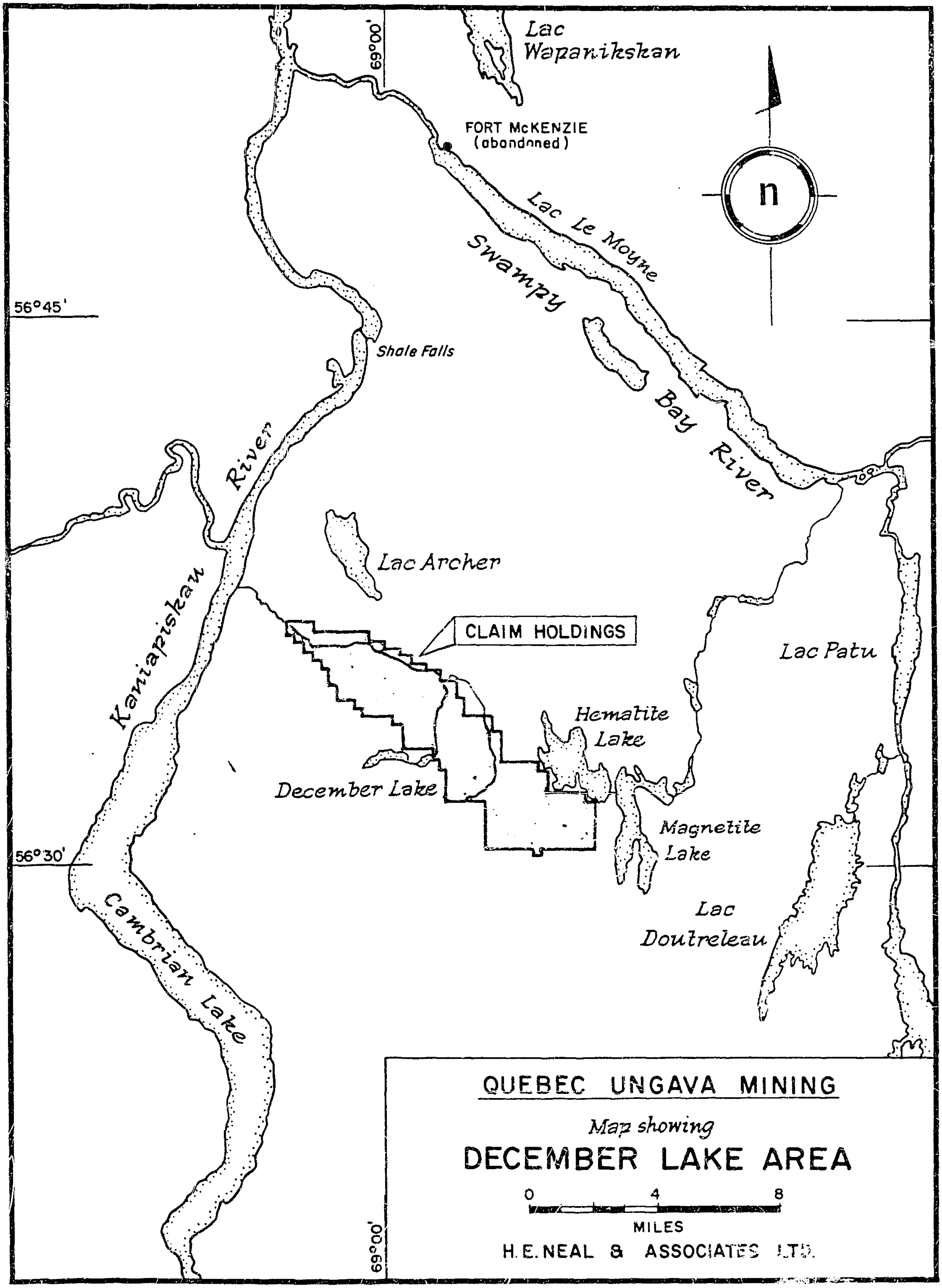


Lac Wapanikskan
69°00'
FORT McKENZIE (abandoned)
Lac Le Moyne
Swampy Bay River
n
56°45'
Shale Falls
Kaniapiskau River
Lac Archer
CLAIM HOLDINGS
Lac Patu
Hematite Lake
December Lake
Magnetite Lake
56°30'
Lac Doutreleau
Cambrian Lake
QUEBEC UNGAVA MINING
Map showing
DECEMBER LAKE AREA
0
4
8
MILES
H.E. NEAL & ASSOCIATES LTD.

wheels-skis operate from the Schefferville airport flying to many lakes in the area from December to May.

During the 1975 and 1976 field seasons, Laurentian Air Service provided Beaver and Otter aircraft on floats and skis for light freighting and servicing of the camp. DC-3 aircraft on wheels-skis were used for transportation of drill and camp equipment and fuel. A helicopter was under full-time charter during the drill season for moving the drill and personnel.

4.0 CLIMATE AND VEGETATION

Climatic data obtained from the Department of Environment, Canada are summarized for comparison below:

	Schefferville	Fort McKenzie	Fort Chimo
Elevation	1,681 ft.	250 ft.	117 ft.
No. years of Observation	24	12 (closed 1952)	24
Mean Daily Temp. °F.	23.8	23.1	22.5
Mean Daily Max. °F.	32.1	33.2	30.5
Mean Daily Min. °F.	15.4	12.9	14.4
No. Days With Frost	252	262	253
Mean Rainfall (inches)	15.6	13.2	9.8
Mean Snowfall (inches)	132.1	64.2	93.2
Total Precipitation	28.4	19.6	19.1
No. of Days with Measurable Rain	89	80	69
No. of Days with Measurable Snow	115	81	94

Fort McKenzie is an abandoned Hudson Bay Post located 20 miles north of December Lake on the northwest corner of Lake Le Moyne. A weather station operated at this location from 1940 to 1952.

The temperatures at the December Lake area and Schefferville are similar but the mean daily temperature at Schefferville is slightly higher. The noticeable difference is the lower rainfall at December Lake of 13.2 inches compared to 15.6 inches for Schefferville. Also, the 64 inch snowfall at Fort McKenzie is less than half the 132 inch snowfall at Schefferville. The days with rain and snow are also less at Fort McKenzie and during May to November the mean daily temperatures are about 2 to 3° F higher than Schefferville. This may be largely due to differences in elevation ranging from 1,681 feet at Schefferville to 250 feet at Fort McKenzie.

The accompanying monthly weather data compare these three stations in detail.

Spring break-up occurs earlier in the December Lake area than at Schefferville. This applies to the Kaniapiskau River and the larger lakes in the area. December Lake, which is at 1,225 feet elevation, is open between June 20 and 25 (based on two years of observations).

The area is at the limit of the tree-line, where the higher hills are treeless and the lower valleys contain medium-sized black spruce and tamarack. The vegetation on the hills is restricted to moss, grasses and dwarf shrubs. Alder and dwarf willow are found in swampy and burned areas. Small clumps of poplar are found in the creek and river bottoms and scattered white birch occur near the Kaniapiskau River. Most of the higher ground has been burned over although stands of black spruce up to 30 feet in height are common in the Blackie Lake - Hematite Lake area.

TABLE I

MONTHLY WEATHER DATA

22-23 years of observations

SCHEFFERVILLE Lat. 54° 48' N. Long. 66° 49' W. Elev. 1681' ASL

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Mean Daily Temp. (°F)	- 8.9	- 6.1	5.4	19.5	33.7	47.3	54.6	51.4	42.1	30.3	16.3	- 0.5	23.8
Mean Daily Max. Temp. (°F)	- 0.2	3.9	16.2	29.2	41.8	56.6	63.3	59.1	48.8	35.9	22.6	7.4	32.1
Mean Daily Min. Temp. (°F)	-17.6	-16.1	- 5.3	9.7	25.5	37.9	45.9	43.7	35.3	24.7	10.0	- 8.4	15.4
No. of Days with Frost	31	28	31	29	26	8	*	*	12	26	30	31	252.
Mean Rainfall (inches)	0.07	0.02	0.07	0.18	0.79	2.86	3.49	3.79	2.44	1.38	0.45	0.08	15.62
Mean Snowfall (inches)	15.9	14.8	14.3	12.4	9.7	2.5	T	0.7	8.2	14.3	21.4	17.9	132.1
Mean Total Precipitation (inches)	1.62	1.44	1.45	1.37	1.76	3.11	3.49	3.86	3.26	2.76	2.51	1.81	28.44
No. of Days with Measurable Rain	1	*	1	2	8	14	18	19	14	8	2	2	89
No. of Days with Measurable Snow	15	13	13	11	10	2	*	*	6	13	17	15	115

TABLE 2

MONTHLY WEATHER DATA

1940-1952 Period

FORT McKENZIE — Lat. 56° 53' N. Long. 69° 03' W. Elev. 250' ASL

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Mean Daily Temp. (°F)	-14.0	- 9.0	2.6	16.5	33.3	46.4	53.9	52.3	44.5	33.2	18.0	- 1.1	23.1
Mean Daily Max. Temp. (°F)	- 3.7	2.8	15.2	28.0	42.3	58.9	66.4	63.2	53.0	39.4	25.2	8.1	33.2
Mean Daily Min. Temp. (°F)	-24.2	-20.7	-10.0	5.0	24.3	33.8	41.3	41.3	36.0	27.0	10.7	-10.3	12.9
No. of Days with Frost	31	28	31	30	26	14	4	4	10	24	29	31	262
Mean Rainfall (inches)	0.00	0.03	0.01	0.15	1.15	1.58	3.37	3.10	2.26	1.32	0.19	0.02	13.18
Mean Snowfall (inches)	8.4	8.2	7.5	7.2	4.9	0.6	0.0	0.0	0.5	3.8	11.7	11.4	64.2
Mean Total Precipitation (inches)	0.84	0.85	0.77	0.87	1.64	1.64	3.37	3.10	2.31	1.70	1.36	1.16	19.61
No. of Days with Measurable Rain	0	*	1	2	7	11	16	16	16	10	1	*	80
No. of Days with Measurable Snow	11	11	11	7	7	1	*	0	1	6	12	14	81

TABLE 3

MONTHLY WEATHER DATA

Based on 23 to 24 years of observation

FORT CHIMO Lat. 58° 06' N. Long. 68° 25' W. Elev. 117' ASL

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Mean Daily Temp. (°F)	-10.1	- 9.1	1.1	15.3	32.1	44.6	52.5	50.8	42.2	31.3	17.8	1.1	22.5
Mean Daily Max. Temp. (°F)	- 2.0	0.0	10.6	24.1	39.2	53.9	62.5	59.2	48.9	36.5	24.0	8.5	30.5
Mean Daily Min. Temp. (°F)	-18.3	-18.3	- 8.4	6.3	24.8	35.3	42.4	42.3	35.4	26.0	11.5	- 6.4	14.4
No. of Days with Frost	31	28	31	29	26	11	1	1	10	25	29	31	253
Mean Rainfall (inches)	0.01	0.01	0.01	0.07	0.59	1.67	2.02	2.31	2.05	0.86	0.18	0.04	9.82
Mean Snowfall (inches)	12.5	12.4	10.5	7.8	6.0	1.6	T	0.0	2.5	10.2	14.3	15.4	93.2
Mean Total Precipitation (inches)	1.26	1.23	1.02	0.85	1.21	1.83	2.02	2.31	2.32	1.87	1.57	1.56	19.05
No. of Days with Measurable rain	*	*	*	1	5	11	13	15	15	7	2	*	69
No. of Days with Measurable Snow	11	11	12	10	7	2	0	0	2	10	14	15	94

5.0 TOPOGRAPHY AND DRAINAGE

The local topography consists of gently rounded hills and broad valleys which partly reflect the effect of glaciation. Bedrock is abundant in the central and eastern portions. The depth of glacial drift increases along the Ironey Creek valley to the west ranging in thickness from 80 feet on section 123+00W to 125 feet adjacent to the Kaniapiskau River.

Elevations range from 280 feet above sea level on Cambrian Lake to 1987 feet at a geodetic bench mark four miles west of December Lake. Local relief in the Main Zone is 500 to 600 feet from Ironey Creek to the footwall of the Cherty Magnetite. At Hematite and Blackie Lakes, the relief is about 400 feet. The erosional surface south of Ironey Creek on the Main Zone is a gentle regular slope rising from an average of 600 feet to 1,200 feet at the southern edge of Cherty Magnetite. North of Ironey Creek the slope rises steeply to a ridge of slate with an elevation of 1,300 feet at a distance of about 2,000 feet north of Ironey Creek.

The topography surrounding Hematite and Blackie Lakes is corrugated, caused by multiple steep folding and consists of ridges of iron formation surrounding valleys underlain chiefly by Cherty Carbonate.

To the west, the valley of the Kaniapiskau contains flat sand plains, terraces and dunes on both sides of the river. Broad sand plains occur on both sides of the river adjacent to the discharge of Ironey Creek into the Kaniapiskau River. North and south the slopes rise steeply on the east side of the river to 900 feet within two miles of the river.

Two drainage systems occur within the property. Blackie Lake and the area to the west drains into Ironey Creek which flows westward to the Kaniapiskau River. East of Blackie Lake, the flow is into Hematite Lake which drains eastward to Magnetite Lake then northward to the Swampy Bay River. The drainage system lies within the Kaniapiskau watershed which covers an area of 34,600 square miles from its headwaters west of Schefferville to the Koksoak River. Part of the headwaters are being diverted by dams into the watershed serving the James Bay hydro-electric project.

6.0 LOCAL RESOURCES

6.1 Construction Materials

6.1.1 Sand and Gravel

Limited amounts of sharp sand and gravel are localized in glacial moraines and eskers scattered across the claim group. Large sand and gravel deposits can be found in the Kaniapiskau River Valley at the west end of the claim group, where the depth of overburden is up to 150 feet thick. These deposits form flat terraces along the Kaniapiskau River immediately west of December Lake. These terraces could readily be developed for aircraft landing strips, construction camp sites and possible as townsite locations.

6.1.2 Timber

Small stands of spruce, tamarack and poplar trees are found in the low wet ground along creek valleys and lake shores. These stands are best developed in the Blackie-Hematite Lakes area. This timber grows to a maximum of 18 inches in diameter and could only be considered useful for minor early construction requirements.

6.2 Hydro-Electric Potential

The flow of water has been studied along the Kaniapiskau River by the Quebec Hydrographic Service in order to evaluate the hydro-electric potential. Shale Falls with a 60 foot drop is located 16 miles northwest of Hematite Lake.

Flow measurements have been continuously read at two adjacent automatic recording stations at Pyrite and Granite Falls on the Kaniapiskau River since 1962.

Pyrite Falls is 50 miles downstream from Shale Falls and 4 miles above Limestone Falls with a drop of 60 feet.

Granite Falls is 80 miles upstream from Shale Falls with a drop of 68 feet.

Data available to 1975 show the following flows:

Water Flow in Cubic Feet Per Second

1962-1975

	Pyrite Falls	Granite Falls
Average	62,600	35,200
Maximum	369,000	194,000
Minimum	8,180	5,550

It is not known whether these local power sources would be developed or whether power would be transmitted from other developments such as the James Bay Development Corporation.

Further enquiries will be necessary to investigate the future plans of Hydro Quebec for the development of the large potential hydro-electric resources in this area. The closest operations of the multi-billion dollar James Bay Development Corporation is 125 miles west of Schefferville where a road and control dams are currently being constructed. The road will link these control dams to the main power development near James Bay and then by paved road to the north-western Quebec road system.

7.0 WORK HISTORY OF THE PROPERTY

7.1 Prior to 1975 -

1947 - The December Lake area formed part of a Mining Concession of Fort Chimo Mines Limited granted to Frobisher Limited.

1948 and 1950

Dr. E.L. Evans, working for Fort Chimo Mines Limited, lead prospecting and geological party in search for Direct Shipping iron ores. Mr. R.H.B. Jones of Oliver Mining Company accompanied Dr. Evans in 1948.

1956 - Cambrian Lake East Sheet mapped by Geological Survey of Canada at scale of 1" = 4 miles, by S.M. Roscoe.

1960 - Property acquired and evaluated by U.S. Steel, dropped again in 1963.

1965 - 1,500 claims staked for Denison Mines Limited by Ross Toms.

1966 - Economic evaluation of the Hematite Lake area iron formations made by Watts, Griffis and McQuat for Denison Mines (Quebec) Limited - geological mapping and outcrop sampling on 1,500 claims - reduced to a prospecting permit area of 28.5 square miles in the western part of the claim group.

1969 - Cambrian Lake West Sheet mapped by Geological Survey of Canada at scale of 1" - 4 miles by W. Fahrig.

1974 - 550 claims staked for Quebec Ungava Mines Ltd. by Ross Toms.

7.2 1975 and 1976 Programs

In 1975 and 1976, H.E. Neal & Associates Ltd was engaged to make an economic evaluation of the claim group. Diamond drilling, geological mapping, magnetometer surveys, outcrop and core sampling were used to evaluate the magnetic iron formation.

The cherty-magnetite member was diamond drilled with emphasis on areas where thickness and grade warranted the drilling. Geological mapping was initiated at a scale of 1" = 1,000' in 1975 and detailed mapping was conducted in 1976 at a scale of 1" = 500'. A grid system was cut and chained to control the drilling and mapping programs.

Magnetometer readings were taken on all grid lines, usually at an interval of 50 feet or less.

The field crew normally consisted of a party chief, a geologist, two senior assistants and two junior assistants. There were 7 technical personnel in 1975 and 6 in 1976. The diamond drill crew consisted of a drill foreman and 4 drillers in 1975 and 4 drillers in 1976. Heath and Sherwood Drilling Company acted as drill contractor in 1975 and 1976.

Drill equipment and all field personnel were transported on the site by helicopter during both the 1975 and 1976 programs. Drill equipment, camp supplies, diesel and jet fuel were transported by DC-3 aircraft on to the ice at December Lake in April and May.

Both drill cores and relevant outcrop areas were sampled during the 1975 and 1976 field seasons.

Although the focus of investigation centred on the claim block, other iron formations in the Hematice Lake area were examined to determine whether significant cherty magnetite thicknesses were present.

After the 1975 and 1976 field programs were completed, an office compilation was made of all drilling, geophysical and geological data. In addition all core and outcrop samples were analyzed by an ore testing laboratory. Metallurgical testing was conducted on drill core and outcrop samples.

Drilling footage was as follows:

1975	5,533 feet
1976	9,155 feet
Total	14,688 feet

8.0 GEOLOGY

8.1 Regional Geology

The Labrador Trough extends continuously 600 miles north-northwest from the Grenville Front at Wabush (53°N, 67°W) to Lac Roberts on Hudson Strait (61°N, 71°W). It is divided into two lithotectonic zones which are continuous for the length of the Trough. The western zone is mainly miogeosynclinal sedimentary rock and the eastern zone is predominantly mafic intrusive and extrusive rocks. These zones overlie Archean basement granites and gneisses. The western edge of the Trough is well outlined and normally lies unconformibly on Archean granites, granodiorites and gneisses which vary in age from 2.1 to 2.7 billion years. Locally the western edge of the Trough is faulted against the basement rocks. The eastern edge of the Trough is not as clearly defined but it is assumed to be Archean granatoid gneisses dated at 2.4 billion years in age.

The rocks in the Labrador Trough are Aphebian in age ranging from 2.2 billion years for the basal sedimentary rocks to 1.9 billion years and younger for the Sokoman Formation. The rock sequence of the Labrador Trough is comprised of two and possible three sandstone - chemical precipitate - shale sequences which are separated by marginal unconformities. The first sequence includes all those sediments above the Archean basement but below the Wishart Formation. The second cycle is represented in the west part of the Trough by the Wishart, Ruth, Sokoman and Menihek Formations. The third cycle is not present in the claim area and it will not be discussed here.

8.2 Geology of the Claim Group

The rocks of the December Lake area are part of a local geosynclinal structure similar to the Knob Lake basin. The Cambrian Lake syncline parallels the trough for over 32 miles with the axis of this fold running through the area about 2 miles west of Hematite Lake. Compression from the northeast has caused tight folding in the Blackie and Hematite Lake areas causing a series of north trending ridges and valleys. In contrast the western limb of the structure is more gently folded with the outcrop pattern having a series of northerly dipping cuestas. Thrust faulting is not common within the claim area but it does occur to the northeast extensively on the eastern limb of the syncline and to a lesser extent the southwest.

The stratigraphic sequence is repeated in plan view at Blackie Lake due to erosion of the anticlines and subsequent exposure of the underlying serpentine carbonate. In the Blackie and Hematite Lake areas where folding has been most intense, the magnetite mineralization appears to be slightly coarser grained. This is in contrast to the less folded western portion where the magnetite is finer grained and primary sedimentary features have been preserved.

The low metamorphic grade of the minerals present suggests sub-green schist rank metamorphism. Since these mineral assemblages are found throughout the area, the metamorphism is regional rather than a local one caused by compression.

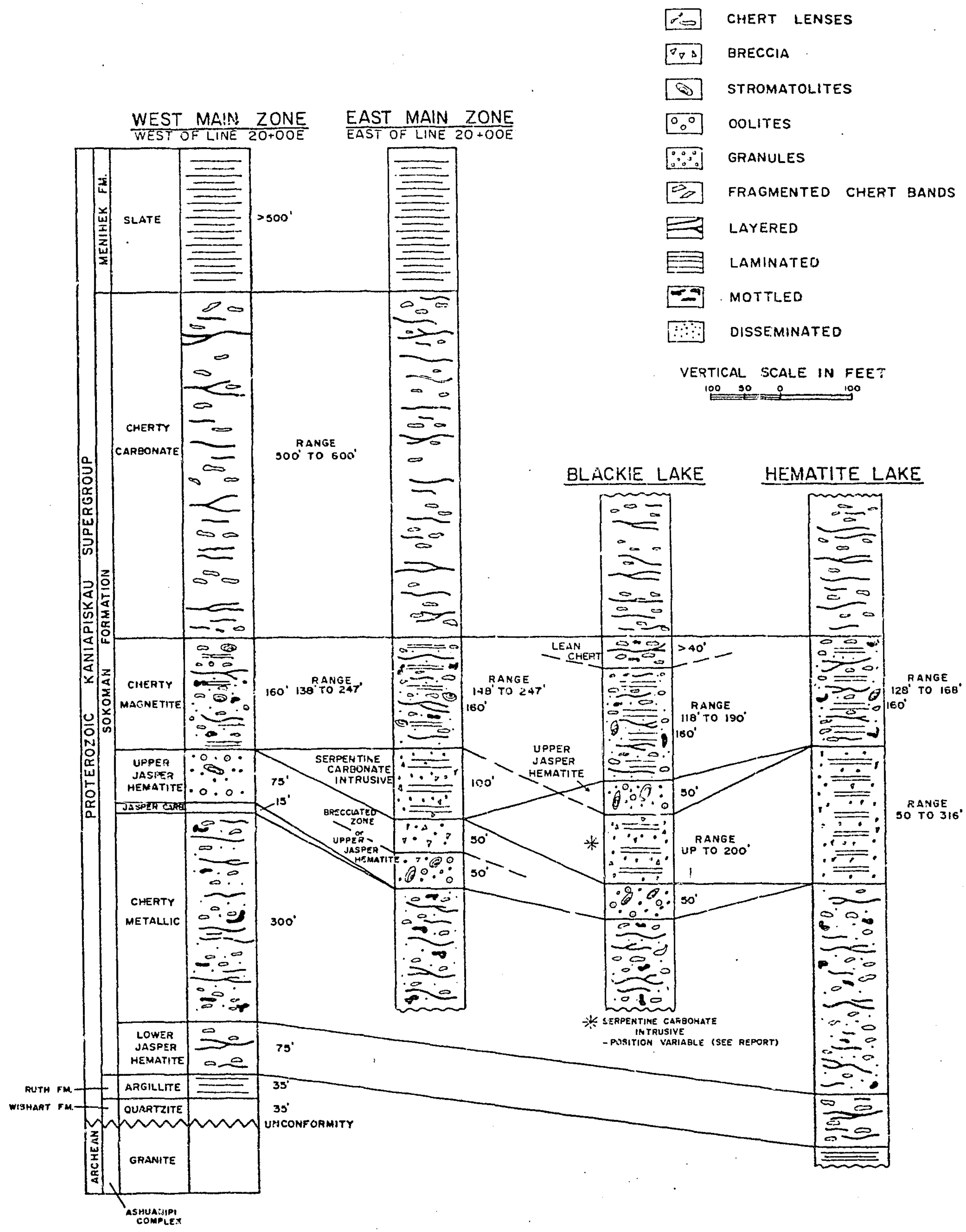
The oldest rocks in the survey area are those of the Ashuanipi Complex consisting of a coarse-grained pink granite to sheared pink granite. A typical mineral assemblage consists of quartz, microclinc, plagioclase, and biotite. The shearing appears to have occured during folding of the Trough.

The Ashuanipi Complex is unconformably overlain by rocks of the Kaniapiskau Supergroup of which the Knob Lake Group is part. There are various subgroups and formations within this group but only one, the Ferriman Subgroup is present in the survey area. There is a complete stratigraphic section through the Ferriman Subgroup in the claim area consisting of quartzite, argillite, iron formation and slate. The Knob Lake Group is overlain by the metogabbros and metabasalts of the Montagnais Group. This group is not present in the December-Hematite Lakes area.

Post Kaniapiskau intrusion of Serpentine Carbonates and carbonate breccias occur throughout the central and east part of this area. These intrude rocks of the Ferriman Subgroup and are thought to be Post Precambrian.

The accompanying Stratigraphic Column illustrates the variation of stratigraphy between the Main Zone, Blackie Lake and Hematite Lake zones.

STRATIGRAPHIC COLUMN



H. E. NEAL & ASSOCIATES LTD

Ferriman Subgroup

Wishart and Ruth Formations

The Wishart and Ruth Formations are mapped as one geological unit for the purpose of this report. The Wishart Formation in this area consists of a lower white, grey to brownish-grey quartzite and buff coloured dolomitic sandstone and an upper hematitic, reddish-brown glassy massive quartzite. The Ruth Formation is also divided into two argillite members. The lower argillite is a dark grey, rusty weathered slatey to massive argillaceous rock. The upper argillite is a brownish, thinly laminated, shaley to massive argillaceous rock. The combined thickness of the two formations is sixty to seventy feet.

Sokoman Formation

Lower Jasper Hematite Member

This member is a red to reddish grey rock with lensitic, medium, irregularly banded jasper surrounded by massive hematite. The measured average thickness is seventy-five feet. Magnetic iron content is very low but the average soluble iron content is quite high for this area, between 35 and 40 percent. This member was observed only in the West Main Zone and the Hematite Lake area. The footwall of the cherty metallic was not present in the central part of the claims. The top of this member was only intersected in Hole 75-2.

Cherty Metallic Member

The cherty metallic member is a massively bedded with layered to laminated magnetite and hard blue hematite surrounding layers and lenses of chert and jasper. This unit is 300 feet thick with a variable magnetite content. Hole 75-02 in Section 0+00 of the Main Zone is the only drill hole which intersected this member. A vertical intersection of 306 feet was drilled from 163 to 471 feet. The upper 140 feet of this member is weakly to strongly magnetic with an average of 12.6% magnetic iron and 27.5% soluble iron. The lower 168 feet of Hole 75-02 contains about 5% magnetic iron with a soluble iron of 27% to 30%.

At Hematite Lake the cherty metallic member is generally more magnetic. Hole 75-15 contained 160 feet with an average of 24% magnetic iron and 34% soluble iron. South of Section 60S numerous outcrops were sampled and showed a variable magnetic iron content ranging from 7% to 34%.

An anticlinal exposure 2,700 feet east of Hole 75-15 was sampled giving an average of 27% magnetic iron for four samples. Chert in the upper portion of the unit is white, green, red and black, with the jasper content increasing towards the base of the unit. The magnetite content is low near the base consisting chiefly of hematite and jasper. Carbonate occurs as scattered beds in this member. The upper contact with the cherty magnetite is gradational and difficult to distinguish in outcrop.

Jasper Carbonate Member

This member is not continuous throughout the property and it is restricted to the southwest part of the claims where it forms a transition zone between the Upper Jasper Hematite and the underlying Cherty Metallic Member. This unit consists of two submembers. The upper submember consists of alternating lenses of vuggy weathered carbonate and chert with thick bedded jasper and chert. The lower submember consists of massive pink chert and jasper with concoidal fracture of diffuse bedding and some relict oölites. Measured average thickness is fifteen feet. The contact with the Cherty Metallic Member is transitional and it is marked with an increase of magnetite and/or hematite.

Upper Jasper Hematite Member

This unit is a very hard thick bedded to massive grey to reddish chert. It is a massive to oölitic textured rock with the oölites up to ¼" in diameter. Jasper occurs as irregular layers and lenses. The hard brittle rock forms exposures with a spalled to rounded appearance. The rock is composed mainly of jasper and hematite with some pink chert and carbonate. Magnetite enriched zones usually occur where the unit has been brecciated, but thin magnetic layers can also be found inter-layered with hematite layers at Blackie Lake. The thickness ranges from fifty to one hundred feet in the Main Zone and greater than one hundred feet at Blackie Lake. The member is not continuous throughout the property and it is not found at Hematite Lake which may be due to changes in the depositional environment. The lower contact which is based on textural changes and magnetic content is relatively sharp. The upper contact with the cherty magnetite is normally sharp with the appearance of abundant jasper and a drop in the magnetite content.

Cherty Magnetite Member

This member is of the greatest economic interest on the property. It consists mainly of aphanitic magnetite and chert with hematite and carbonate in lesser amounts. It is feebly to strongly magnetic with a soluble iron content of 30% to 35% with the magnetic iron ranging from 20% to 26%. Magnetite occurs as fine-grained, irregular diffuse layers and grains of disseminated crystals. The chert is an aphanitic light grey, dark green to black chert with red chert and jasper in increasing amounts as the lower contact is approached. Hematite occurs in much the same manner as the magnetite, with carbonate occurring as euhedral rosettes usually less than 1" in diameter and in thin layers and laminae. Silicates are also common as discrete spots and in thin layers and laminae. The overall average thickness of the unit is 160 feet. There is an overlying lean chert member between 50 and 100 feet thick which occurs at Blackie Lake and locally in the Main Zone. The texture is the same as the cherty magnetite with some oolites and granules. Magnetite is not common in the lean chert unit but occurs occasionally as disseminated grains and patches.

The Main Zone contains the largest exposure of the cherty magnetite iron formation in the claim group. Relatively flat lying cherty magnetite has been proven by drilling and geological mapping from line 161+00E to line 30+00W. The average dip of the unit in the central portion (40E to 80W) is 6.5 degrees to the north and ranges from

8° to 12° from section 101W to 243W. East of 40E the cherty magnetite dips 3° to 5° northward for 2,800 feet north of the baseline then the dip steepens sharply. The flat dip of this member combined with a northerly sloping erosional surface combine to form a wide surface exposure of 5,000 - 6,000 feet with local narrowing to 3,400 feet wide at 20W. The thickness of the cherty magnetite in this zone ranges from 150 feet to 247 feet.

West of 113+00W on the baseline, erosion has removed the cherty magnetite exposing the upper jasper hematite member in a window 8,700 feet long and 2,000 feet to 3,700 feet wide. South of the window the cherty magnetite is widely exposed and relatively thin west of 133+00W. North of the window the cherty magnetite is a poorly exposed narrow band that follows a ridge of hills 1,400 feet north of the baseline at line 123+00W and line 143+00W and north of Ironey Creek west of line 163+00W. Due to this window and lower grades in the west end and erosion in the east end the area of indicated ore is restricted to the area between line 133+00W and 120+00E. In this zone the lower contact is sharp when the unit is underlain by the serpentine carbonate but gradational and arbitrary when underlain by the upper jasper hematite or cherty metallic members.

In the Blackie Lake Zone, the cherty magnetite outcrops on the eroded limbs of the anticline and synclines. The greatest extent of this member is in two north-south trending synclines on the east and central parts of the zone. These two synclines are asymetric with the east limbs being vertical or overturned while the west limbs dip east at around 30°. The cherty magnetite on these two synclines outcrops from line 70+00S to north of line 40+00N. The west syncline has more lean chert and lower grades than the east syncline. The thickness in this zone ranges from 120 to 230 feet with an average of 166 feet. West of the west syncline the cherty magnetite occurs in a widely exposed area of small anticlines and synclines with axes trending north-south. The ridges and valleys in this zone correspond to the anticline and synclines respectively. The lower contact is similar to that in the Main Zone.

At Hematite Lake, the cherty magnetite is exposed on the hill south of 50+00 South and it forms part of a broad syncline that plunges north to the lake. Smaller folds occur on the limbs of this larger syncline and are reflected by the magnetometer results. Magnetic profiles and drill hole evidence suggest that the cherty magnetite is not overlain by an appreciable thickness of cherty carbonate. The thickness of the cherty magnetite in this zone varies from 128 to 159 feet as intersected in DDH 76-30 and DDH 76-31. In the vicinity of DDH 76-32 and DDH 76-33 the cherty magnetite is reduced in thickness to 56 feet due to the underlying serpentine carbonate in the centre of the main Hematite Lake syncline.

Outcrops at the south end of the Hematite Lake syncline and on both limbs show extensive leaching and oxidation with accompanying low magnetic iron values in the oxidized areas. Seven outcrop samples of cherty magnetite taken during 1975 and 1976 south of section 40+00S contain an average of 15.3% magnetic iron and 32.12 soluble iron. They range in value from 5.0% to 24.5% magnetic iron indicating the variation of oxidation. This alternation is well illustrated in DDH 75-15 on section 50+00S where the entire cherty magnetite is oxidized from surface to 125 feet to limonite-hematite and contains little or no magnetite. Core recovery is poor in this oxidized area. This leaching and oxidation with a loss or reduction of magnetite appears to occur only where the cherty magnetite is exposed on surface. The magnetic content is higher and normal where the cherty magnetite is overlain by cap rock as illustrated in DDH 76-30 and DDH 76-31 where the average magnetic iron is 25.9%. Additional drilling is required in the Hematite Lake area in order to outline the grade and extent of the cherty magnetite. In this area the lower contact forms a sharp contact with the underlying serpentine carbonate.

Cherty Carbonate Member

This is the uppermost member of the Sokoman Formation in the December-Hematite Lake area. It is a thick-bedded, blocky to lensitic unit that is normally highly weathered and decomposed. The cherty carbonate consists of white to light grey chert with rusty brown hematite and limonite staining. The carbonate consists chiefly of siderite with a lesser amount of ferro-dolomite. The carbonate occurs as yellow to brown coloured rosettes and lenses. Magnetite is normally absent in this unit but both the magnetite and hematite content increases as the lower contact is approached. The lower contact with the cherty magnetite is gradational and it is usually marked where the magnetite content is greater than the amount of carbonate. The unit is estimated to be 500 to 600 feet thick although it was not fully intersected by drilling. The cherty carbonate has been intruded locally in the Main Zone. Here it becomes brecciated containing cherty carbonate fragments ranging chiefly from less than 1/16 inch up to 2 inches in a dark grey fine grained hard matrix which is probably of felsic volcanic composition.

The cherty carbonate weathers readily forming a pitted surface due to the alteration of the carbonate. The soft rotten nature of the weathered rock gave poor core recovery in most places. Core recovery in the cherty carbonate varied from 37% to 80% in the Main Zone. This weathering extends to a depth of at least 225 feet on Section 0+00 and normally extends from surface to within a few feet from the top of the cherty magnetite where the rock is more competent due to a sharp decrease in carbonate content. Similarily at Blackie Lake the weathering is up to 70 feet deep and may extend to the top of the cherty magnetite or to within 50 feet where the depth of cap rock is more than 100 feet thick. At Hematite Lake the cherty carbonate is highly weathered with the core recovery varying from 41% to 75%. The depth of weathering in DDH 76-32 was in the entire 125 feet of cap rock and for 102 feet in DDH 76-31 to within 15 feet of the cherty magnetite. The cherty carbonate will be much softer for drilling and blasting than the cherty magnetite.

Menihek Formation

The overlying Menihek Formation consists of maroon siltstone, fine-grained sandstone and light grey to black slate. Where observed on the claim area the unit is a light grey to black thin-bedded, schistose slate. Bedding and schistosity are generally parallel but where they differ the schistosity is steeper dipping. The bedding is wavey to sinusoidal. The thickness of the formation is estimated to be greater than 500 feet. The lower contact where seen is sharp. North of Ironey Creek the formation forms an escarpment from line 0+00 westward to the Kaniapiskau River where it turns northward parallel to this river. East of line 0+00 the slate forms a less prominent ridge and swings southward across Ironey Creek and intersects line 60+00E at 3,500 feet north. This is part of a synclinal structure which causes the underlying iron formation to dip steeply in the north-eastern part of the Main Zone.

Post Kaniapiskau Volcanics

Serpentine Carbonate Intrusive

This intrusive is generally a soft fine-grained rock which varies from olive green to brownish black in colour. It may be massive, brecciated or foliated. The rock is often composed of pea-sized, black lapilli of serpentinized or carbonatized olivine or altered olivine-free melilitite with a calcite matrix. The unit has been identified by Dressler (1973, Quebec Department of Mines) as an olivine-meliletite tuff, but field evidence indicates that it shows more of an intrusive nature than extrusive.

In the Main Zone east of line 20+00E the intrustive occurs as a sill which is extremely variable in thickness and it can reach a thickness of greater than 100 feet. It occurs below the cherty magnetite and locally may intrude and replace part of it (DDH 76-18, 76-05). This intrusive also occurs above, below or replacing the upper jasper hematite. It is a fine to coarse grained, talcy carbonaceous rock. North of the baseline at line 117+25E the unit is brecciated containing jasper and chert fragments in a calcite matrix. A carbonatite breccia occurs south of the baseline at line 139+00E which consists of fragments of jasper and serpentine carbonate intrusive in a calcite matrix. Thin stringers of the intrusive are found to locally intrude the cherty magnetite throughout the Main Zone. These intrusions are fine-grained layered to laminated, dark green, soft serpentine carbonate with some ivory-coloured calcite. They range in thickness from a fraction of an inch to less than one foot.

At Blackie Lake the serpentine carbonate occurs below the cherty magnetite or below the upper jasper hematite or possibly within the upper jasper hematite. The brecciated chert and jasper is more abundant in this zone along the baseline. It appears that the unit is thicker here than on the Main Zone with projected thicknesses up to 200 feet.

At Hematite Lake this intrusive is more prominent forming both dikes and sills. In this zone the cherty metallic and lower jasper hematite are intruded. Fragments of quartzite found in one outcrop in this zone shows that the intrusive cuts the entire sequence. The intrusive increases in thickness from 8.7 feet in DDH 75-15 on Section 50+00S to greater than 316 feet in DDH 76-33 on Section 30+00S. On this section the cherty magnetite is a normal thickness of 128 feet in DDH 76-30 to 173 feet in DDH 76-31 in the centre of the broad syncline. In DDH 76-33 the serpentine carbonate has "belled" up and reduced the thickness of the cherty magnetite to 56 feet. Here the serpentine carbonate may form part of a dike which is evident on strike to the south. The lower contact with the cherty metallic is marked by a 30 foot band of brecciated chert and jasper in a calcite matrix.

The accompanying Geological Compilation Map at a scale of 1" = 2000 feet provides an over-view of the geology of the December Lake area and the distribution of the Cherty Magnetite.

9.0 MAGNETOMETER SURVEY

A magnetometer survey was carried out during the 1975 and 1976 field seasons in order to delineate the cherty magnetite member. It was hoped originally that the magnetic profiles of the cherty carbonate cap rock and jasper hematite member underlying the magnetite member would differ sufficiently to allow accurate delineation of the hanging wall and footwall contacts. However, due to the magnetite content of the lower parts of the cherty carbonate and the top of the jasper hematite, it was not generally possible to determine the contact by magnetic profile alone. At Blackie Lake and Hematite Lake, due to the steeper dip of the iron formation and stratigraphically deeper erosion, the magnetic profiles were very useful in aiding the geological interpretation.

Magnetometer readings were taken at 100 foot intervals, decreasing to 50 and 25 foot intervals in anomolous areas along cut and chained picket lines. In 1975 the grid system was cut with cross lines every 2000 feet for survey control. This grid interval was decreased to a cross line every 500 feet in 1976 at Blackie and Hematite Lakes.

The baseline on each ore zone was picketed every 100 feet and a grid base station established at the junction of each 2000 foot cross line with the baseline. Diurnal corrections were made by rereading these diurnal base stations during the course of surveying the cross lines.

Since the magnetometer was standardized to a local intensity, any anomoly is relative only to these baseline stations and it is not an absolute gamma value.

A Scintrex MF-1 fluxgate magnetometer reading the vertical magnetic component was used in the 1975 and 1976 surveys. This instrument was calibrated at the factory before each field season. A calibration base station was set up on a stump behind the December Lake camp (not on cherty magnetite iron formation) and the instrument was checked daily at about the same hour. The instrument was initially adjusted on magnetic iron formation to give readings on the 10,000 gamma scale. This allowed the operator to read to plus or minus 100 gammas. In the interest of uniformity, the same two operators did more than 90% of the total survey.

Magnetometer Survey:	1975:	75.0 miles
	1976:	44.7 miles

The magnetic response of the Main Zone is different than the Blackie and Hematite Lake areas, so the Main Zone will be discussed separately.

<u>Main Zone</u>

The Main Zone is mainly a gently dipping structure in which the magnetite iron formation underlies cherty carbonate cap rock and overlies jasper hematite member. Although both the carbonate and hematite members are essentially devoid of magnetite, the magnetic profile and horizontal magnetic gradient plots do not readily identify the hanging wall and footwall contacts. The only constant factor is that the magnetic profile is very irregular over the exposed cherty magnetite member and less irregular over non-magnetic material. On most magnetic profile plots across the Main Zone, the magnetic profile does not decrease with increasing cap rock thickness. Other factors influencing the magnetic profile is the minor folding within magnetic member, the variation of thickness and the depth below the cap rock.

Blackie and Hematite Zones

In both of these areas, the iron formation has been highly folded due to compression from the northeast. Erosion has exposed the anticlinal cores of the serpentine carbonate intrusive which underlies the cherty magnetite. This contact between the cherty magnetite and the serpentine carbonate is sharp where the dip is steep on the eastern limbs of the synclines. However on the western limbs of these synclines where the dips are more gentle, the magnetic profiles do not show a sharp break but a more gradual change. It is also difficult to differentiate between the serpentine carbonate and the jasper hematite members. The magnetic profile over the cherty magnetite is more irregular at Blackie and Hematite Lake than in the Main Zone. At Hematite Lake, the cherty metallic member underlying the cherty magnetite contains a variable magnetic content and has a similar magnetic profile.

10.0 GROUND CONTROL AND SURVEY METHODS

10.1 Line Cutting Program

Ground control on the claim group was provided by baselines and picket lines over the areas of interest. During both field programs, contract linecutters and company personnel were engaged in cutting and chaining picket lines. The 1975 field season started after break-up and line cutting continued until the end of August. In 1976, the Blackie and Hematite zones were covered with a 500 foot grid, starting April 19th and all cutting was completed by the end of May. The present baselines in all three areas were extended from ones originally established in 1966. The baseline in the Main Zone was recut and crosslines cut grid north-south every 2000 feet. All lines were chained and picketed, with footages marked on pickets every 100 feet. In 1976, short fill-in lines were cut north of the baseline at Line 50E, 70E and 90E.

Total Picket Lines:	1975:	75.0 miles
	1976:	44.7 miles
	Total	119.7 miles

10.2 Map Control and Survey Methods

The base maps for the field work at a scale of 1" = 1,000' were available from the Quebec Hydrographic Survey. These base maps were based on ½ mile air photos taken around 1950. Topographic control in the claim area is provided by bench marks 4 miles west of December Lake and 4 miles south and north of Hematite Lake. In 1975, base maps on a scale of 1" = 1,000 feet were used for plotting outcrops and drill holes. In 1976, the 1" = 1,000 feet Hydrographic Survey maps were enlarged to 1" = 500 feet and redrafted as a base for plotting the geology and drill hole locations. The base-lines and picket-lines were used for ground control for the geological mapping, magnetometer survey and the location of drill holes.

Geological mapping was done using ½ mile air photos blown up to 1" = 1,000 feet to aid the geologists to locate outcrop positions when traversing between picket lines. Transparent overlays were used to plot outcrops on the 1" = 1,000 feet photographic blowups outside of the area of picket lines. Traverses were by the pace and compass method, traversing east-west at 500 foot intervals between the north-south grid lines and north-south between east-west trending picket lines. On the east half of the Main Zone and at Blackie and Hematite Lake, where detailed mapping was carried out, traverse interval was from 200 to 250 feet, with outcrops tied into the picket lines.

10.3 Helicopter Support For Ground Control

During both the 1975 and 1976 field seasons, a helicopter was used to locate end positions of lines and irregularly cut picket lines.

Several picket lines were also located with the use of the helicopter. A high visibility target was located on the ground at the end of the picket line being located. The helicopter was flown at low speed from the baseline along the line towards the target. High visibility flagging tied to nails were dropped at second intervals in order to have a marker point every 100 feet on the ground. Ground crews then walked the line locating the flagging, then blazed and chained the line. This method proved to be accurate and faster than cutting picket lines in thick bush.

11.0 SAMPLING PROGRAM

11.1 Core Sampling

All core was collected from all the holes drilled in the 1975 and 1976 programs. The core recovery was excellent in the cherty magnetite, jasper hematite, cherty metallic, serpentine carbonate and often the base of the cherty carbonate. The core recovery in the cherty carbonate was in the range of 40 to 80% which would normally be unacceptable except this soft weathered portion was non-magnetic except close to the cherty magnetite contact where the core recovery was near 100%.

All core was placed in 5 foot core boxes holding 25 feet. A preliminary log was made of the drill-site and all core was carefully transported to core racks at the camp. The holes were then logged in detail with the magnetic and iron-bearing sections marked for sampling. The magnetic content was determined by a hand-tester measuring the magnetic attraction calibrated against specimens with a known magnetic iron. All core was photographed in colour initially using colour slides but in 1976 most of the photography was in Kodacolor providing colour prints.

All cherty magnetite and other magnetic sections were sampled in 10 foot intervals and at geological contacts. The cherty metallic and jasper hematite were sampled in 20 foot intervals.

The core sections for sampling were split in half longitudionally in a Longyear splitter. Half of the core was bagged as an 'A' Sample for analyses and metallurgical testwork. The second half bearing the same sample number marked 'B' was also bagged as a save sample. The 'A' series for analyses were packed in plywood boxes and shipped to Lakefield Research. The 'B' series of samples were shipped to Toronto for storage rather than risk spillage from the core boxes on the property.

Core samples sent for assay:	1975	-	296
	1976	-	574

The soluble iron and Satmagan magnetic iron analyses determined by Lakefield Research are plotted on the geological cross sections and are listed on the diamond drill logs.

11.2 Outcrop Sampling

Sampling of cherty magnetite and cherty metallic members was used to supplement drill hole data, particularly the cherty metallic member at Hematite Lake. Large outcrop areas were sampled after the area had been mapped. Each sample averaged 30 to 50 pounds taken over horizontal widths of up to 100 feet. Based on previous sampling statistics for a similar iron formation, roughly one inch cubes were collected. These pieces were chipped from larger blocks in order to avoid the oxidized surface layer. All sample locations were selected to obtain a true cross section of the sampled member and in several cases the sample interval traversed several outcrops. Sample locations are plotted on the Geological Maps at a scale of 1" = 500 feet.

Outcrop Samples:	1975	-	19
	1976	-	46

These samples along with a hundred pound sample of cherty metallic from Hematite Lake were sent to Lakefield Research for analyses.

12.0 DIAMOND DRILLING

12.1 Drilling Summary

During the 1975 and 1976 field seasons, a diamond drilling program was carried out on all three zones, in order to determine the grade, thickness, continuity and dip of the cherty magnetite member. Drilling footage is summarized below:

Drilling Footage	1975		1976	
	No. of holes	Footage	No. of holes	Footage
Main Zone	19	4573	24	6085
Blackie Lake	2	541	5	1669
Hematite Lake	1	416	4	1401
TOTAL	22	5530	33	9155

Elapsed time required to drill the above footages was 78 days in 1975, from June 16 to September 2, and 127 days in 1976, from May 15 to September 19.

12.2 Drilling Operations

Drilling operations were contracted to Heath and Sherwood Drilling during the 1975 and 1976 programs. Drilling equipment consisted of a Boyles BBS-15 drill with a standard screw-feed head. Longyear supply and pressure pumps, consisting of Royal Bean Model 410 pumps and Petter diesel engines were used. This equipment was purchased new from the drilling contractor. Standard AW rods were used with AXT diamond coring bits, resulting in a core diameter of 1-3/16".

Drilling rates depended on hardness or competence of the formation. In 1975, overall drilling rate was 90 feet per drilling day. In 1976, the overall rate was 127 feet per drilling day. Bit life varied with the rock formation, but overall bit life for the AXT coring bits was 13 feet per bit in 1975 and 15 feet per bit in 1976. Drilling in the cherty magnetite horizon averaged 151 feet per 24 hours on the Main Zone, 135 feet per 24 hours at Blackie Lake and 143 feet per 24 hours at Hematite Lake. Coring was slow and often difficult in the leached-out cherty carbonate cap-rock. The cherty magnetite member, being more competent cored well. However, the base of the cherty magnetite and the underlying jasper hematite member proved to be very hard to penetrate due to the high jasper content.

The Main Zone, with the greatest tonnage potential, was delineated with 43 vertical drill holes. Seven holes were drilled at Blackie Lake and five holes were drilled in the Hematite Lake zone. All holes drilled during 1975 were vertical and 3 holes drilled in 1976 at Blackie and Hematite were angled at 60 degrees to horizontal to better intersect moderately dipping limbs of synclines.

Drill water is locally a problem after mid-June on the Main Zone, but holes can be located almost anywhere in late May and June since there is plentiful melt-water. Once the melt-water has gone, water lines of up to 3,000 feet are required in some areas.

The iron formation in the Blackie and Hematite areas is folded and drainage is usually restricted to synclinal basins, with plenty of water in the drilling areas.

A time distribution of the drilling program is as follows:

	1975	1976
Drilling	66%	61%
Moving between drill sites	25%	34%
Delays	9%	5%

Drilling methods were conventional. Most holes were cased to bed rock using BX casing. The cherty carbonate horizon was badly leached close to surface and chemical additives were used to hold the hole open. No mud drilling was used although soap was added to the water to improve the rate of drilling.

Core recovery varied greatly, dependent usually on the carbonate leaching in near surface rocks or on fracturing. Core recovery in the cherty carbonate horizon averaged 64% on the Main Zone, 82% at Blackie Lake and 63% at Hematite Lake. Any non-fractured rocks with appreciable magnetite or hematite content cored at better than 90%. The core recovery in the Cherty Magnetite was close to 100% under normal conditions.

Increased core recovery in this cherty carbonate would have required mud drilling or chip drilling by a more costly reverse circulation dual-tube method.

The working schedule consisted of two 12 hour shifts, 7 days per week. The drill crew consisted of a foreman, 2 drillers and 2 helpers in 1975 and a runner-foreman, a driller and 2 helpers in 1976.

12.3 Helicopter Support

The drill crews and the drill itself were transported in the field by a Hughes 500-C turbine helicopter. The drill equipment was dismantled into 750 pound loads and carried by steel slings and nets beneath the helicopter between drill sites. A drill move normally took 24 round trips with an average flying time of 4 hours, for a total of 55 man hours using a 5 man crew. Transport of drilling supplies and personnel was also done by helicopter.

12.4 Compilation of Drill Hole Data

The accompanying Tables 1 and 2 contain the details regarding the 1975 and 1976 drill hole locations, drilling dates, depth of hole and overburden.

TABLE 4

1975 DIAMOND DRILLING

Hole No.	Zone	Location	Started	Finished	Depth In Ft.	Accumulated Footage	Depth Overburden
75-01	Main	0+00W, 10+18N	June 16	June 21	387	387.0	32.0
75-02	Main	03+08E, 12+50S	June 22	June 27	487	874.0	0.0
75-03	Main	00+56W, 28+82S	June 28	June 30	229	1,103.0	4.0
75-04	Main	81+72W, 6+49N	July 1	July 4	255	1,358.0	26.0
75-05	Main	80+00W, 27+24N	July 5	July 7	278.5	1,636.5	23.4
75-06	Main	79+56W, 12+46S	July 8	July 9	199	1,835.5	0
75-07	Main	163+00W, 39+00N	July 10	July 13	449.5	2,285.0	7.0
75-08	Main	161+78W, 10+00N	July 14	July 16	134	2,419.0	48.2
75-09	Main	243+00W, 13+19S	July 17	July 22	478	2,897.0	7.4
75-10	Main	162+21W, 5+00S	July 23	July 25	158	3,055	46.4
75-11	Main	125+39W, 12+00S	July 26	July 27	119	3,174	19.5
75-12	Main	80+84E, 11+25N	July 28	July 30	348	3,522	6.0
75-13	Main	80+90E, 8+18S	Aug. 1	Aug. 2	215	3,737	0
75-14	Main	121+60E, 6+08S	Aug. 3	Aug. 4	146	3,883	0
75-15	Hematite Lake	53+00S, 10+00W	Aug. 5	Aug. 10	416	4,299	5.1
75-16	Blackie Lake	52+00S, 8+50W	Aug. 11	Aug. 16	321	4,620	10.0
75-17	Blackie Lake	40+00S, 62+75W	Aug. 17	Aug. 19	220	4,840	5.0

<u>1975 DIAMOND DRILLING</u> (continued)

Hole No.	Zone	Location	Started	Finished	Depth In Ft.	Accumulated Footage	Depth Overburden
75-18	Main	44+50E, 3+50S	Aug. 20	Aug. 21	136	4,976	4.3
75-19	Main	42+25W, 4+50S	Aug. 22	Aug. 23	163	5,139	4.0
75-20	Main	141+50W, 22+00S	Aug. 24	Aug. 24	45	5,184	0
75-21	Main	202+00W, 11+00N	Aug. 25	Aug. 30	227	5,411	31.0
75-22	Main	122+65W, 11+55N	Aug. 31	Sept. 2	119	5,530	80.0

TABLE 5

1976 DIAMOND DRILLING

Hole No.	Zone	Location	Started	Finished	Depth In Ft.	Accumulated Footage	Depth Overburden
76-01	Main	20+00E, 17+50N	May 15	May 17	189	189	12.0
76-02	Main	00+48W, 21+12N	May 19	May 22	358	547	31.5
76-03	Main	20+10W, 15+00N	May 24	May 26	231	778	24.5
76-04	Main	40+16W, 17+00N	May 27	May 31	256	1,034	80.0
76-05	Main	40+46W, 26+34N	June 1	June 4	329	1,363	35.0
76-06	Main	60+92W, 30+00N	June 6	June 9	320	1,683	36.0
76-07	Main	101+58W, 27+73N	June 10	June 13	332	2,015	20.0
76-08	Main	01+53W, 49+00N	June 14	June 16	266	2,281	0
76-09	Main	40+00E, 21+61N	June 17	June 19	348.6	2,629.6	25.0
76-10	Main	59+86E, 36+77N	June 22	June 24	278.0	2,907	6.4
76-11	Main	00+28W, 31+40N	June 26	June 30	471	3,378.5	6.0
76-12	Main	79+56E, 26+00N	July 1	July 4	268	3,646.6	2.5
76-13	Main	00+79E, 11+35N	July 5	July 7	163	3,809.6	30.0
76-14	Main	101+54E, 32+55N	July 8	July 12	323	4,132.6	10.0
76-15	Main	59+60E, 26+23N	July 13	July 14	160	4,292.6	26.0
76-16	Main	20+82E, 27+85N	July 16	July 18	283.5	4,576.1	5.0
76-17	Main	59+22E, 17+00N	July 20	July 21	216	4,792.1	6.3

1976 DIAMOND DRILLING (continued)

Hole No.	Zone	Location	Started	Finished	Depth In Ft.	Accumulated Footage	Depth Overburden
76-18	Main	60+00E, 0+60N	July 23	July 24	197	4,989.1	14.0
76-19	Main	20+65E, 10+10S	July 25	July 27	163	5,152.1	12.0
76-20	Main	20+42W, 8+30S	July 28	July 29	167	5,319.1	5.0
76-21	Main	60+27W, 14+55S	July 29	July 31	163	5,482.1	5.0
76-22	Main	101+10W, 12+10S	Aug. 1	Aug. 2	103	5,585.1	4.0
76-23	Main	19+42W, 29+11N	Aug. 3	Aug. 5	337.5	5,922.6	10.0
76-24	Main	70+30E, 3+60S	Aug. 9	Aug. 11	162	6,084.6	15.0
76-25	Blackie Lake	30+00S, 6+87W	Aug. 12	Aug. 15	357.5	6,442.1	35.0
76-26	Blackie Lake	30+00S, 31+00W	Aug. 16	Aug. 20	315	6,757.1	13.0
76-27	Blackie Lake	50+40S, 29+76W	Aug. 21	Aug. 22	247	7,004.1	5.0
76-28	Blackie Lake	19+83S, 26+20W	Aug. 23	Aug. 26	405	7,409.1	7.5
76-29	Blackie Lake	00+50N, 9+50W	Aug. 27	Aug. 29	345	7,754.1	7.2
76-30	Hematite Lake	29+50S, 12+00E	Sept. 2	Sept. 5	311	8,065.1	21.5
76-31	Hematite Lake	30+06S, 32+45W	Sept. 6	Sept. 10	482	8,547.1	19.0
76-32	Hematite Lake	30+00S, 10+00W	Sept. 12	Sept. 15	136	8,683.1	11.0
76-33	Hematite Lake	30+00S, 11+00W	Sept. 16	Sept. 19	472	9,155.1	11.0

13.0 TONNAGE AND GRADE ESTIMATE

13.1 Summary

The December Lake area contains two zones of Drill Indicated and Inferred cherty magnetite iron formation reserves. The largest is the Main Zone containing 2,000 million tons of crude with 22.3% Magnetic Iron, in a formation gently dipping at 6.5°. These reserves arecontained over a length of 4.5 miles and across a width of about 1.5 mile. The Blackie Lake zone contains 200 million tons of Drill Indicated crude with 24% Magnetic Iron in two narrower synclinal structures called East and West Pits.

The Main Zone contains 879 million tons of crude available with no rock stripping and minor overburden. An additional 666 million tons are available under a maximum depth of 150 feet of cap rock with a combined Stripping Ratio of 0.19 LT Waste to 1 LT Crude. An Inferred tonnage of 249 million tons is projected down dip from the drilled cross sections extending a pit from 150 feet to 250 feet maximum depth of cap rock.

The Stripping Ratio for the Blackie Lake reserves is 0.49 LT Waste: 1 LT Crude. This zone produces a super-grade magnetic concentrate with 70% Fe compared to 67-69% Fe for the Main Zone at a grind of close to 90% -400 mesh without cationic flotation.

TABLE 6

SUMMARY OF TONNAGE ESTIMATE

MAIN ZONE AND DECEMBER LAKE ZONE

DRILL INDICATED AND INFERRED

AT 15% MAGNETIC IRON CUT-OFF

In Millions Of Long Tons

	CRUDE GRADE		TONNAGE IN LONG TONS			STRIPPING RATIO
	% SolFe	% MagFe	Crude	Waste	Overburden	LT Waste:LT Crude
MAIN ZONE						
Pit No. 1 - No Rock Stripping Indicated Tons	30.8	22.2	879.08	-	15.13	0.02 : 1
Pit No. 2 - To 150 ft Rock Stripping Indicated Tons	31.2	22.5	666.21	249.44	29.61	0.42 : 1
Pit No. 3 - 150 to 250 ft Rock Stripping Inferred Tons	31.6	22.2	470.42	445.96	58.30	1.07 : 1
Pit No. 1 + Pit No. 2	31.0	22.3	1,545.29	249.44	44.74	0.19 : 1
Total Pits 1 + 2 + 3	31.1	22.3	2,015.71	695.40	103.04	0.40 : 1
BLACKIE LAKE ZONE						
East Pit - Indicated	32.4	24.6	173.41	89.61	-	0.52 : 1
West Pit - Indicated	30.8	22.3	33.36	11.12	-	0.33 : 1
Total Blackie Lake	32.1	24.2	206.77	100.73	-	0.49 : 1

TABLE 7

SUMMARY OF GRADE AND TONNAGE ESTIMATE

MAIN ZONE BY CROSS SECTIONS

AT 15% MAGNETIC IRON CUT-OFF

CROSS-SECTION	CRUDE GRADE		TONNAGE IN MILLIONS OF LONG TONS								
	% SolFe	% MagFe	PIT NUMBER 1			PIT NUMBER 2			PIT NUMBER 3		
			Crude	Waste	OVB	Crude	Waste	OVB	Crude	Waste	OVB
123+00W	31.87	21.26	30.311	-	3.406	-	-	-	99.006	78.617	1.132
101+00W	31.92	21.33	70.062	-	-	44.845	22.648	-	29.317	42.214	-
81+00W	31.30	22.56	124.055	-	1.981	71.668	29.749	6.083	41.231	54.520	-
60+00W	31.83	23.17	122.843	-	-	82.097	25.813	4.598	31.287	35.652	1.157
40+00W	31.59	21.66	108.962	-	8.075	81.199	26.313	11.180	55.605	-	56.014
20+00W	31.81	23.07	63.177	-	-	99.261	32.298	3.382	58.918	62.112	-
0+00W	31.68	22.68	107.779	-	-	40.816	13.665	3.382	37.267	37.380	-
20+00E	31.59	22.64	93.192	-	-	65.898	26.313	-	53.239	57.708	-
40+00E	31.22	23.15	16.445	-	-	44.247	25.749	-	41.526	53.535	-
60+00E	31.03	21.48	-	-	-	23.779	13.213	0.983	9.583	6.522	-
70+00E	26.72	20.64	33.197	-	0.207	39.042	10.051	-	4.732	6.493	-
80+00E	30.26	23.14	17.513	-	-	73.351	23.631	-	8.710	11.203	-
101+00E	29.64	23.27	63.436	-	1.468	-	-	-	-	-	-
117+25E	28.50	21.30	17.610	-	-	-	-	-	-	-	-
TOTAL			879.082	-	15.136	666.206	249.942	29.608	470.421	445.955	58.303
AVERAGE GRADE % Sol Fe				30.8			31.2			31.6	
% Mag Fe				22.2			22.5			22.2	
STRIPPING RATIO - WASTE : CRUDE				.02:1			0.42:1			1.07:1	

The accompanying Table 6 contains the details of the Summary Of Tonnage Estimate for both zones. Table 7 contains the Summary Of Grade And Tonnage Estimate - Main Zone By Cross Sections.

Vast tonnages of similar cherty magnetite might be expected to continue for several thousand feet down dip but they are not included since the Stripping Ratio is considered to be uneconomical in this area at the present time. Future drilling would be required to verify the grade and dip of the formation. Unknown reserves of cherty magnetite are present in the Hematite Lake zone where tonnages could not be calculated due to insufficient drilling.

Other long range potential reserves of recoverable iron units occur in the cherty metallic member underlying the present reserves. These consist of 300 feet of cherty metallic iron formation in the Main Zone and at Hematite Lake. The 50 feet of jasper hematite separating the cherty magnetite and the cherty metallic is not presently considered to be of potential value.

13.2 Method Of Grade Calculation

13.2.1 Main Zone

The average grade of soluble iron and magnetic iron was calculated on the basis of footage intersection averaged for each cross-section. These analyses were obtained from the 20-foot composites used for

Davis Tube testwork and which are tabulated on the Geological Cross Sections at a scale of 1" = 200 feet. These cross-sections were reduced to page size for inclusion in this report. Individual analyses for each 10 foot sample were originally plotted on the geological cross-sections at a scale of 1" = 100 feet. The weighted average by footage was used due to the widely spaced drill holes on most cross-sections which were 2,000 feet apart. The overall grade of the deposit was calculated by weighting the analyses by the tonnage calculated for each cross-section. A cut-off grade of 15% magnetic iron was used for establishing the sample interval. Crude grades were also calculated without tonnages for cut-off of 17% and 19% magnetic iron based on the Davis Tube test results. See Chapter 14.4.

13.2.2 Blackie Lake Zone

The average grade was calculated by footage of samples containing over 15% magnetic iron for the 4 drill holes within the pits. Two drill holes in the west syncline were not used since they occur in the northern part where the cap rock was considered to be too deep to provide a reasonable Stripping Ratio of less than 0.5:1. Hole 75-17 was also not used since it intersected the cherty magnetite in an isolated and untested area 2,200 feet west of the Blackie Lake West Pit.

13.3 Method Of Tonnage Estimation

The Geological Cross Sections at a scale of 1" = 200 feet were used for outlining the pit limits for the reserve estimates. The following criteria were used:

a) Minimum thickness of 20 feet of cherty magnetite at the footwall limit.

b) Pit slope of 50^{o}; the west limb dip-slope of about 30^{o} was followed at Blackie Lake.

c) Tonnage factors in cubic feet per long ton:

Cherty magnetite	10.5
Cherty carbonate	11.0
Overburden	18.0

d) Pit No. 1 - no rock stripping.

Pit No. 2 - from cherty carbonate contact to a maximum depth of 150 feet of cap rock.

Pit No. 3 - from 150 feet to a maximum depth of 250 feet of cap rock.

e) The bottom of the pit in the Main Zone was assumed to follow the dip slope of the base of the cherty magnetite. This practice is followed in the Mesabi Range where the formation dips are similar.

f) A minimum pit bottom width of 200 feet was used for Blackie Lake.

g) Cut-off grade of 15% magnetic iron - internal waste was included in the grade and tonnage estimate. The upper and lower contacts made a natural break at close to 15% magnetic iron with very little internal waste.

h) Areas of cherty magnetite along the footwall were disregarded where the thickness of the formation was not known. This applied primarily in the areas of wide exposures to the southeast of the Main Zone.

i) A cut-off stripping ratio was not established since an economical study was not made. A visual maximum cut-off of 1:1 stripping ratio was used at Blackie Lake to arbitrarily keep the overall stripping ratio below 0.5:1. Additional tonnage could be included with more waste stripping.

The pit limbs were established in each cross-section then the areas of cherty magnetite, waste and overburden were measured by a planimeter. The areas on each cross-section were projected half-way to the adjacent sections to obtain the volumes from which the tonnage was calculated. Projections were normally 1,000 feet west and east except on Section 70+00E where 500 feet projections were used.

A set of Pit Cross Sections was prepared outlining the areas of crude, waste and overburden used in the tonnage estimate. These sections are duplicates of the Geological Cross Sections. The depth of overburden was used only from the drill hole data.

13.4 Description Of Pit Reserves

All calculated reserves consist of crude cherty magnetite iron formation which is the most important economical unit.

13.4.1 Main Zone

Pit No. 1 - This pit is based on no rock stripping and only a small amount of overburden. It contains the exposed magnetic iron formation from a 20 foot depth at the footwall to an average thickness of 160 feet at the edge of the cherty carbonate hanging wall. In the central part the dip is 6.5° to the north with local minor folding which increases the dip to a maximum of 11°. A gap of 1,500 feet exists in Pit No. 1 between 50+00E and 65+00E due to an anticlinal fold which steepens the dip 2,600 feet north of the base-line at DDH76-15 and by the effect of the serpentine-carbonate intrusive in 76-18. A separate pit is outlined east of Section 65+00E to Section 124+00E.

Towards the west end of Pit No. 1 the cherty magnetite has a narrower surface expression due to the erosion and exposure of a window of underlying jasper hematite. Pit No. 1 terminates to the west at Section 133+00W due to the increased stripping caused by the rising topography and lack of drill hole data. At Section 202+00W the cherty magnetite with +15% magnetic iron is only 60 feet thick and 78 feet at DDH 75-09 on Section 243+00W. Drilling in 1976 south of the base-line provided valuable information on the thickness of the central part of the pit. This pit would provide plant feed for over 25 years at the rate of 10,000,000 TP yearof product without rock stripping apart from access roads and facilities.

Pit No. 2 - This pit extends from the edge of the cap rock to a vertical depth of 150 feet of cap rock. It would be mined after Pit No. 1 was largely exhausted. These reserves are drill indicated since several drill holes penetrated the cap rock and the entire thickness of the cherty magnetite. The thickness of the crude varies from 150 to 247 feet with an average thickness used in reserve calculations of 170 feet. The rock stripping consists of soft weathered cherty carbonate.

Pit No. 2 parallels Pit No. 1 and extends from 90+00E to 112+00W across an average width of about 2,000 feet ranging from 1,000 to 3,000 feet.

<u>Pit No. 3</u> - This pit outlines a tonnage of Inferred crude representing a down-dip projection on the average of about 1,000 feet from Pit No. 2. In the case of Section 0+00 DDH 76-02 is in Pit No. 3 and on 40+00E DDH 76-09 is also in Pit No. 3. This pit parallels Pit No. 2 plus a 2,000 foot extension on the west end where there was insufficient drill data for an Indicated tonnage estimate.

13.4.2 Blackie Lake Zone

The cherty magnetite occurs in two parallel synclines containing steeply dipping eastern flanks and western limbs that dip easterly at approximately 30°. The entire cherty magnetite is not included in the pits either due to the increased thickness of the cap rock or due to a lack of drill hole data north of the East Pit. The crude from this zone produces a magnetic concentrate with 70% Fe.

<u>East Pit</u> - This pit extends from the southern limit of the syncline at 70+00S to 10+00N across a width of 1,500 to 2,000 feet. Blackie Lake covers about one third of the upper central part of the pit and it will require draining and diversion of the water. The bottom of this pit is irregular at the north end due to the steep dips on the east side and the central anticlines. The maximum depth of cap rock

is about 200 feet. Thethickness of the cherty magnetite varies from 120 to 180 feet.

West Pit - This just extends from 75+00S to 45+00S across a width of 1,500 feet. Additional tonnage occurs to the north at the expense of a higher Stripping Ratio.

13.5 Additional Potential Reserves

Vast potential tonnages of crude magnetic iron formation occur within the claim group. They have not been included in the reserves due to a higher Stripping Ratio, lack of drilling to prove the grade and thickness or because of low weight recovery of magnetite requiring additional recovery of hematite.

13.5.1 Cherty Magnetite Member

Main Zone

a) Down-Dip Extension of Pit No. 3 - Based on drilling to date, the central and western part of this zone has a consistent dip of 5 to 10° which may continue down dip beyond the 250 foot thickness of cap rock at the northern edge of Pit No. 3. Additional drilling and economic analyses will dictate the amount of rock stripping that can be tolerated.

b) East Syncline - a projected 50 million tons of crude may occur below the valley of Ironey Creek between Sections 117+00E and 149+00E north of the base-line. The cap rock reaches a maximum of 275 feet on Section 117+00E. The presence of Ironey Creek may make this unattractive.

c) Western Extension - west of Section 133+00W the rock stripping increases due to the topography rising to the north. The potential here is rather poor due to a thinning of the cherty magnetite.

d) South-east Area - East of about 120+00E is a broad lobe of cherty magnetite exposures. Similar lobes occur south and east of Core Tray Lake. In all of these areas, the thickness of the cherty magnetite is not known and it would require considerable drilling to establish additional reserves. This material would be attractive if a depth of 100 feet could be developed with no rock stripping.

e) Blackie Lake - The West Pit could only be extended at the expense of increasing the Stripping Ratio. The East Pit was only projected 1,000 feet north of DDH 76-29 although a synclinal structure extends for another 3,000 feet north of the East Pit.

Folded structures and broad exposures of cherty magnetite occur west of the West Pit in the vicinity of DDH 75-17. This hole intersected 73 feet of material containing 25% magnetic iron representing the complete thickness of the cherty magnetite in this area.

f) Hematite Lake - The 1976 drilling demonstrated that the area south of Hematite Lake is largely underlain by cherty magnetite with a thickness up to 159 feet (DDH 76-31). The area in the centre at DDH 76-33 is cut off by the serpentine carbonate leaving 56 feet of cherty magnetite. This zone covers an area of 5,000 feet by 7,000 feet and could represent a potential of several hundred million tons providing detailed drill results are positive.

13.5.2 Cherty Metallic Member

Main Zone - Future reserves of this member are present in this zone in a 300 foot thickness underlying the jasper hematite which forms a 50 foot layer below the cherty magnetite. Whether the cherty metallic can be included in future reserves will only be determined by the economics of treatment of this horizon with a lower magnetite content requiring additional recovery of hematite.

Hematite Lake - DDH 75-15 contained a 160 foot thickness of cherty metallic with 24% magnetic iron below a capping of 220 feet of waste. The outcrop area south of 60+00S consists of a wide area of material with a variable magnetite content. Metallurgical testing of Composite 131 (sample 217A) indicated a concentrate with 67.5% Fe at a Concentration

Ratio of 3.1:1 could be produced by selective flocculation and flotation. Magnetic separation alone gave a weight recovery of 18% or a Concentration Ratio of 5.5:1. More surface sampling, drilling and metallurgical testing will be required before this material can be included in future reserves.

14.0 METALLURGY

14.1 General Statement

The 1975 and 1976 drill programs provided the first opportunity to conduct metallurgical testwork on drill core from the December Lake iron formation. The cherty magnetite was sampled in 10 foot intervals while the cherty metallic and jasper hematite with variable magnetite and hematite content were sampled chiefly in 20 foot intervals.

The initial testwork consisted of soluble iron analyses and magnetic iron analyses by Satmagan on all drill core and field samples. Twenty-foot composites of all magnetic samples were tested by Davis Tube at a standard grind with a 400 mesh screen analysis for each sample. The twenty-foot interval was chosen to produce a better average from the Davis Tube test and to reduce the number of tests required. Similar tests were made for each field sample.

Eight larger composites weighing from 50 to 80 pounds were prepared from 1975 drill core and one surface sample for more detailed metallurgical testing. These composites are identified as follows:

Composite No.	Location	Rock Type	Drill Holes
125	Main Zone East 80+00E to 117+25E	Cherty Magnetite	75-12 (20-160) 75-13 (2- 90) 75-14 (2- 50)
126	Main Zone Central 0+00 to 40+00E	Cherty Magnetite	75-01 (51-230) 75-02 (2-108) 75-03 (4-105) 75-18 (5- 40)
127	Main Zone West 40+00W to 81+00W	Cherty Magnetite	75-04 (26-168) 75-05 (94-252) 75-06 (0-156) 75-19 (4-144)
128	Blackie Lake	Cherty Magnetite	75-16 (170-300) 76-17 (82-155)
129	Hematite Lake	Cherty Metallic (Magnetic)	75-15 (220-380)
130	Main Zone	Cherty Metallic	75-01 (295-345) 75-02 (163-487) 75-12 (220-330) 75-14 (70-130)
131	Hematite Lake	Cherty Metallic	Surface Sample 217A
132	Main Zone	Jasper Hematite	75-02 (109-163) 75-08 (48- 89)

These eight composites were used for grindability tests, Davis Tube, flotation and selective flocculation-flotation tests to illustrate the grade of concentrates that could be produced from various zones and types of iron formation.

Mineralogical work was restricted to an examination of a selective flocculation-flotation concentrate of composite 130 - cherty metallic from the Main Zone.

Detailed chemical analyses were made of magnetic concentrates from the Main Zone, Blackie Lake and concentrates from the cherty metallic member.

The following metallurgical data in this report contains background and highlights of the detailed testwork by Lakefield Research. The complete reports by Lakefield Research are contained in Volume II.

14.2 Metallurgical Test Program

14.2.1 Analytical Testwork

All drill core intersections of iron formation containing magnetite or hematite were split in half longitudinally in 10 foot intervals or less if at geological contacts. Some non-magnetic sections of cherty metallic and jasper hematite were sampled in 20 foot intervals or larger since they are not of immediate economic interest. One half of each sample was bagged and numbered and marked 'A' for analyses; the other half with the same number and marked 'B' was retained as a save sample.

All 'A' series of samples were sent to Lakefield Research of Canada at Lakefield, Ontario, for soluble iron and magnetic iron analyses.

The magnetic iron was measured initially by the Satmagan instrument to determine the intervals for more detailed Davis Tube tests.

All samples were Crushed to -¼ inch; seven-eighths was riffled out, bagged and saved for future testing. The remaining one-eighth was roll crushed in stages to -20 mesh. The -20 mesh sample was riffled, part kept for future composites, the remainder pulverized to minus 100 mesh in a shatter box mill for analysis for soluble iron and magnetic iron by Satmagan. The Standard HCl-Dichromate soluble iron analyses were made.

14.2.2 Davis Tube Tests

Initially Davis Tube tests were made on eight drill core samples from the early drilling in 1975 to obtain a preliminary determination of the magnetic iron content of the iron formation. These results were also used to calibrate the Satmagan which was used for analysis of all drill core samples. A field scale for measuring the magnetic content was also calibrated from these results. See Programs Report No. 1 of Lakefield Research in Volume II.

At the end of each field season, after soluble and magnetic iron analyses were received, composites of normally 20 foot intervals were prepared for samples with more than 10% magnetic iron.

The -20 mesh save samples were used for Davis Tube tests either individually or composited according to selected footage intervals. A 100 gram sample of -20 mesh material was prepared and dry ground in an Abbéjar mill for a fixed time. Early tests were run at 16 and 32 minutes grinding time, then the majority of the samples were ground for 24 minutes in order to produce a Davis Tube concentrate with 67 to 69% soluble iron.

A wet screen analysis was made of each ground product on a 400 mesh screen measuring the +400 mesh weight and reporting the % -400 mesh. This grind is normally finer than the magnetic concentrate but this product is too small for a sieve analysis.

Davis Tube Procedure:

Sample Weight:	10 grams
Waterflow:	400 ml per minute
Tube oscillations:	100 strokes per minute
Current to poles:	2.0 amperes
Retention time:	5 minutes

The head sample was analysed for soluble iron. The Davis Tube concentrate was dried, weighed and analysed for soluble iron. The magnetic iron was calculated from the weight and assay of the concentrate.

14.2.3 Grindability

Grindability and Work Index determinations were made on the eight composites described previously and prepared from the 1975 drill core.

Procedure

2000 grams of -10 mesh composite sample was ground at 66% solids in a standard laboratory ball mill with 28 pounds of steel balls. Grinds were made for different times in order to illustrate the effect of fineness of grind in the grade of the Davis Tube concentrate.

The ground product was filtered, dried and three portions were riffled out. One was used for screen analysis using sieves and a cyclo-sizer and for surface area using a Permeran instrument manufactured by Outokumpu Oy for measuring square centimetres per gram. A third portion was used for a standard Davis Tube test. The ball mill has been calibrated to provide power input related to the grinding time. The Work Index was calculated from the K_{80} of the feed and product along with the power input based on the grinding time. A mill constant has been established for this ball mill based on calibration from results from commercial mills.

14.2.4 Liberation

As part of the Grindability testwork, different grinding times gave different fineness of grind which was related to the grade of the Davis Tube concentrate.

14.2.5 Selective Flocculation And Flotation

A series of flocculation tests were conducted on composites 130 and

131 of cherty metallic from drill holes in the Main Zone and from outcrops at Hematite Lake. Tests were also conducted in a preliminary way on composite 132 of jasper hematite from the Main Zone. The purpose was to investigate the possible recovery of hematite from low magnetic samples.

The following variables were tested: grind, pH, concentration of sodium silicate, sodium carbonate, starch and the type of starch.

Flotation tests were made on deslimed products of composites 130 and 131. After primary grinding the sample was deslimed in two stages, reground, conditioned with starch to depress the iron and the gangue was floated with Aerosurf MG-98, an amine collector and MIBC as frother.

14.2.6 Flotation Of Magnetic Concentrate

Cationic silica flotation was tested to determine the amount of up-grading after magnetic separation without further regrinding. Tests were made on Composites 125 and 129 of cherty magnetite. Similarly MG-98 was used as the amine collector and MIBC as the frother. Batch tests were conducted without cleaning or scavenger stages and recirculation of products which would normally be expected to slightly improve the iron recovery.

14.3 Grindability and Liberation Results

Work Index - A series of one-stage grinding tests were conducted on 2000 gram samples of minus 10 mesh samples of composites 125 to 132. The feed and ground products were screened on sieves and a wet cyclosizer was used to determine the K_{80} size modules (size in microns for 80% passing). The Work Index was calculated using The Third Theory Of Comminution by F.C. Bond based on known power input into a standard ball mill. Davis Tube tests and screen analyses were run on the ground products.

A second series of tests consisted of two-stage grinding tests using 2000 gram charge in a ball mill and applying 13.9 KWH/LT. The product was concentrated with a laboratory Jeffrey magnetic separator. The concentrate was reground in the same ball mill with 13.9 KWH/LT and cleaned twice with the Jeffrey separator.

The metallurgical results were similar to the previous one-stage grinding tests and Davis Tube tests with slightly less power comsumption. A total of 27.8 KWH/LT of feed was used for each sample.

See Progress Report No. 6 of Lakefield Research for the detailed results contained in Volume II.

Table 8 contains the results of one-stage grinding tests and accompanying Work Index and Davis Tube concentrate grades.

Table 9 contains the two-stage grinding and magnetic concentration tests using the laboratory Jeffrey separator and showing the grinding power used.

The accompanying Grade-Recovery Versus Grind graph illustrates that in the cherty magnetite a grind of 90% -400 mesh produces a Davis Tube concentrate with 67.7% Sol Fe in the Main Zone and a grind of 92% -400 mesh produces a Davis Tube concentrate with 70% Sol Fe for Blackie Lake and Hematite Lake. The cherty metallic has a similar grindability and a grade of concentrate but at a much lower iron recovery. The jasper hematite has a higher Work Index and poorer liberation with only 33% iron recovery.

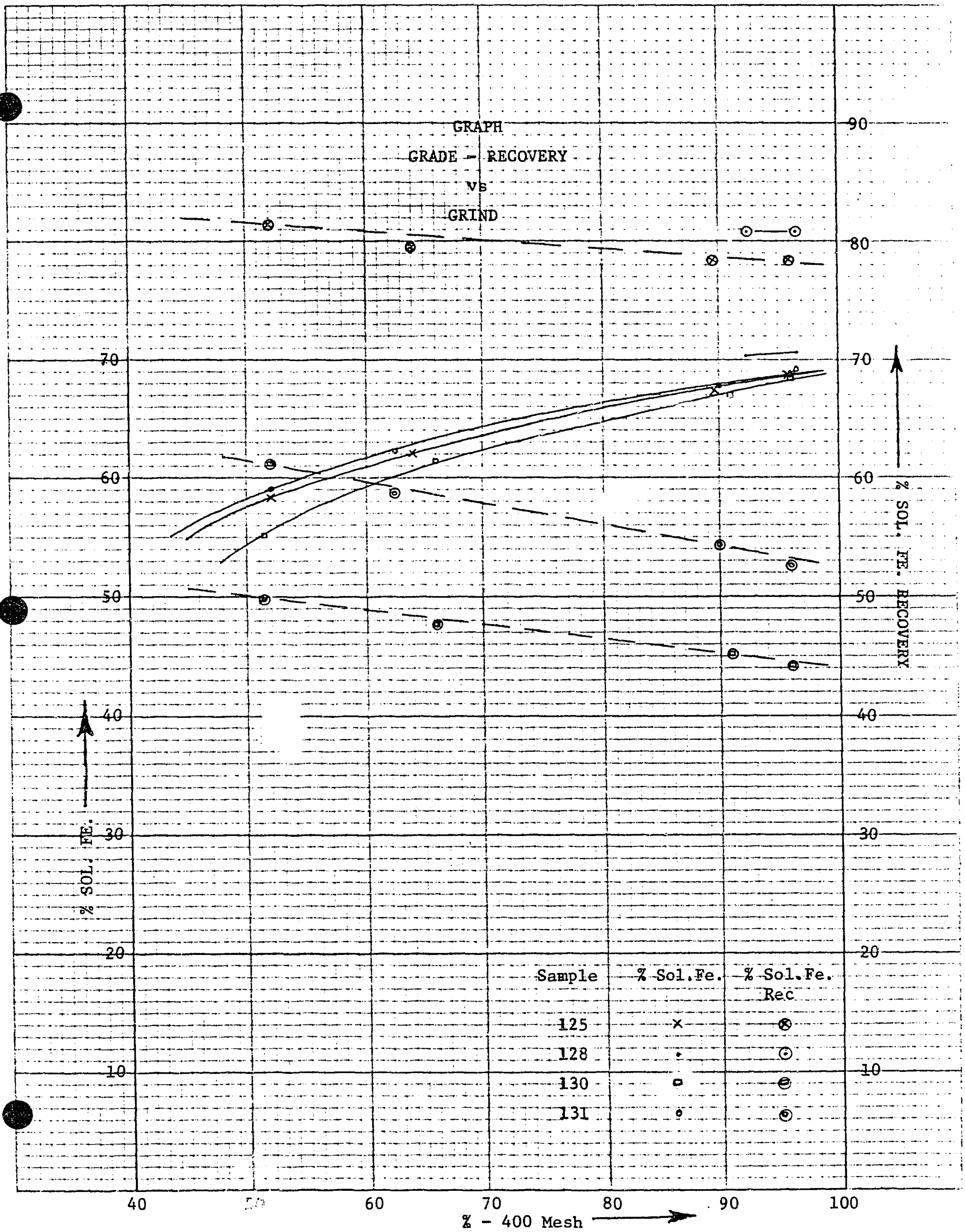

GRAPH
GRADE - RECOVERY
VS
GRIND
% SOL. FE.
% SOL. FE. RECOVERY
% - 400 Mesh
40
50
60
70
80
90
100
10
20
30
40
50
60
70
80
90
Sample
% Sol.Fe.
% Sol.Fe. Rec
125
128
130
131

TABLE 8

WORK INDEX AND DAVIS TUBE RESULTS

(One-Stage Grinding Tests)

Composite No.	Grind in Minutes per 2 Kilo	% -400 Mesh	K_{80} Microns	Work Index	Davis Tube Concentrate		
					% Wt	% SolFe	% SolFe Dist
125	0	-	1128.0	-	-	-	-
Main Zone	40	52	79.2	14.9	40.3	58.2	81.4
East	60	64	57.8	18.2	36.9	62.0	79.5
	90	89.5	29.0	17.9	33.5	67.3	78.3
	120	96	22.0	20.3	32.8	68.8	78.4
126	0	-	1089.0	-	-	-	-
Main Zone	90	89.5	29.0	17.9	33.3	67.8	72.8
Central	120	96	21.0	20.3	32.9	69.0	73.2
127	0	-	1209.0	-	-	-	-
Main Zone	90	89	29.0	17.9	32.3	68.0	71.1
West	120	96	22.0	20.3	31.8	68.9	70.9
128	0	-	1017.0	-	-	-	-
Blackie	90	92.2	26.5	17.3	36.3	70.2	80.9
Lake	120	96.5	20.5	19.9	36.1	70.6	80.9
129	0	-	1168.0	-	-	-	-
Hematite	90	92	28.0	17.7	34.9	69.5	76.0
Lake	120	96	22.0	20.3	34.2	69.9	74.7
Ch.							
Metallic							
130	0	-	1209.0	-	-	-	-
Main Zone	40	51.5	81.9	15.4	25.6	55.2	49.8
Ch.	60	66	55.8	17.8	22.0	61.6	47.7
Metallic	90	91	28.0	17.6	19.1	67.0	45.1
	120	96	21.0	19.8	18.3	68.5	44.1
131	0	-	1168.0	-	-	-	-
Hematite	40	52	76.6	14.7	32.7	59.0	61.2
Lake	60	62.5	57.8	18.3	29.7	62.3	58.7
Surface	90	90	29.0	18.2	25.2	67.8	54.2
	120	96	23.5	21.0	24.2	68.4	52.6
132	0	-	1017.0	-	-	-	-
Main Zone	90	86	32.0	19.6	16.1	65.4	33.2
Jasper	120	94	25.0	22.2	16.0	66.[illegible]	33.6
Hematite							

TABLE 9

EFFECT OF GRIND AND GRADE

(Two-Stage Grinding Tests)

Composite No.	Grinding Power KWH/LT	Grind % -400M	Jeffrey Concentrate % Wt.	%SolFe	% SolFe Dist.
125 Main Zone East	27.8	89.6	33.5	67.3	75.9
126 Main Zone Central	27.8	98.6	33.5	67.8	72.5
127 Main Zone West	27.8	85.2	31.4	67.5	67.1
128 Blackie Lake	27.8	92.0	36.1	71.0	79.0
129 Hematite Lake	27.8	89.0	34.1	71.8	74.6

These magnetic concentrates were up-graded by cationic flotation as discussed under a separate heading.

14.4 Summary Of Davis Tube Tests

Davis Tube tests were made on 20 foot composites of drill core containing more than 10% magnetic iron as determined by the Satmagan. Eight composites of drill core and one field sample were prepared for grindability and liberation tests. These test results are reported in Section 14.3.

Main Ore Zone

Soluble Iron, Magnetic Iron (calculated from Davis Tube tests), Davis Tube Concentrates and Grind were calculated for each drill hole and weighted by footage intersection for each Geological Cross Section for the proposed pits. Calculations were made for Magnetic Iron Cut-offs of 15%, 17% and 19%. Tonnage calculations were only made for the 15% cut-off since the change of grade was only slight. All samples were ground for 24 minutes in an Abbe pebble mill.

Effect of Magnetic Cut-off Grade

Main Zone

Cut-off Grade	Footage	Crude			Davis Tube Conc.		Grind
		% SolFe	%MagFe	% Wt	% SolFe	% SolFe Rec'y	% -400M
15%	4221.8	31.32	22.51	33.12	68.02	71.9	91.0
17%	4072.1	31.38	22.74	33.45	68.03	72.5	91.1
19%	3770.3	31.42	23.11	34.01	68.01	73.6	91.2

The Davis Tube results by Cross Sections for the Main Zone are found in the accompanying Table 10, 15% cut-off; Table 11,17% cut-off, Table 12, 19% cut-off. Table 13, contains the Davis Tube results by Drill Holes for Blackie Lake and Hematite Lake since there were insufficient drill holes on each section for average calculations by cross sections.

Table 10

1975-1976

SUMMARY OF DAVIS TUBE RESULTS

MAIN ZONE

CUT-OFF AT 15% MAGNETIC IRON

CROSS SECTION	DRILL HOLE FOOTAGE	CRUDE ASSAY SolFe	CRUDE ASSAY Calc MagFe	DAVIS TUBE CONCENTRATE % Wt	DAVIS TUBE CONCENTRATE % SolFe	DAVIS TUBE CONCENTRATE % Fe Rec'y	GRIND % -400 Mesh
123+00W	56.0	31.87	21.26	31.49	67.52	66.71	91.1
101+00W	199.0	31.92	21.33	31.36	68.06	67.85	89.0
81+00W	456.0	31.30	22.56	33.44	67.79	72.42	92.1
60+00W	333.8	31.83	23.17	34.08	68.00	72.81	90.3
40+00W	520.0	31.59	21.66	31.88	67.95	68.57	92.3
20+00W	503.0	31.81	23.07	33.86	68.13	72.49	90.6
0+00W	756.0	31.68	22.68	33.23	68.25	71.59	91.6
20+00E	483.3	31.59	22.64	33.74	67.16	71.73	89.1
40+00E	188.0	31.22	23.15	33.85	68.40	74.16	90.8
60+00E	150.0	31.00	21.58	30.98	69.58	69.27	89.9
70+00E	83.0	26.72	20.64	31.14	66.23	77.19	90.8
80+00E	389.7	30.26	23.14	33.66	68.76	76.56	91.1
101+00E	56.0	29.64	23.27	34.65	67.14	78.49	92.8
117+25E	48.0	28.50	21.30	31.60	67.50	74.84	96.0
AVERAGE	4,221.8	31.32	22.51	33.12	68.02	71.92	91.01

TABLE 11

1975-1976

SUMMARY OF DAVIS TUBE RESULTS

MAIN ZONE

CUT-OFF AT 17% MAGNETIC IRON

CROSS SECTION	DRILL HOLE FOOTAGE	CRUDE ASSAY		DAVIS TUBE CONCENTRATE			GRIND
		SolFe	Calc MagFe	% Wt	% SolFe	% Fe Rec'y	% -400 Mesh
123+00W	56.0	31.87	21.26	31.49	67.52	66.71	91.1
101+00W	179.0	32.07	21.95	32.32	67.96	68.49	89.0
81+00W	456.0	31.3	22.56	33.44	67.79	72.42	92.1
60+00W	333.8	31.83	23.17	34.08	68.0	72.81	90.3
40+00W	520.0	31.59	21.66	31.88	67.95	68.57	92.3
20+00W	485.0	31.89	23.33	34.26	68.12	73.18	90.6
0+00W	741.0	31.68	22.81	33.41	68.28	72.01	91.6
20+00E	457.3	31.71	22.97	34.26	67.10	72.50	89.5
40+00E	188.0	31.22	23.15	33.85	68.40	74.16	90.8
60+00E	121.0	31.35	23.03	33.16	70.59	74.66	90.1
70+00E	63.0	27.17	21.10	31.34	67.53	77.89	90.8
80+00E	368.0	30.21	23.54	34.28	68.71	77.97	91.1
101+00E	56.0	29.64	23.27	34.65	67.14	78.49	92.8
117+25E	48.0	28.50	21.30	31.60	67.50	74.84	96.0
AVERAGE	4,072.1	31.38	22.74	33.45	68.03	72.52	91.1

TABLE 12

1975-1976

SUMMARY OF DAVIS TUBE RESULTS

MAIN ZONE

CUT-OFF AT 19% MAGNETIC IRON

CROSS SECTION	DRILL HOLE FOOTAGE	CRUDE ASSAY SolFe	CRUDE ASSAY Calc MagFe	DAVIS TUBE CONCENTRATE % Wt	DAVIS TUBE CONCENTRATE % SolFe	DAVIS TUBE CONCENTRATE % Fe Rec'y	GRIND % -400 Mesh
123+00W	56.0	31.87	21.26	31.49	67.52	66.71	91.1
101+00W	96.0	32.02	23.84	35.21	67.78	74.53	89.1
81+00W	456.0	31.30	22.56	33.44	67.79	72.42	92.1
60+00W	286.0	31.88	24.11	35.46	68.0	75.64	90.2
40+00W	501.0	31.80	21.83	32.13	68.95	69.67	92.3
20+00W	445.0	32.06	23.83	35.03	67.99	74.29	90.7
0+00W	701.5	31.70	23.09	33.77	68.36	72.82	91.7
20+00E	419.3	31.68	23.58	35.26	66.95	74.52	89.6
40+00E	173.0	31.24	23.68	34.64	68.41	75.90	90.8
60+00E	101.5	30.97	23.98	34.40	69.71	77.43	90.2
70+00E	63.0	27.17	21.20	31.34	67.53	77.89	90.8
80+00E	368.0	30.21	23.54	34.28	68.77	78.03	91.1
101+00E	56.0	29.64	23.27	34.65	67.14	78.49	92.8
117+25E	48.0	28.50	21.30	31.60	67.50	74.84	96.0
AVERAGE	3,770.3	31.42	23.11	34.01	68.01	73.62	91.2

TABLE 13

1975-1976

SUMMARY OF ALL DAVIS TUBE RESULTS

BLACKIE & HEMATITE LAKE ZONES

HOLE NO.	FOOTAGE INTERVAL	SAMPLE LENGTH (Ft.)	CRUDE ASSAY SolFe	CRUDE ASSAY Calc MagFe	DAVIS TUBE CONCENTRATE % Wt	DAVIS TUBE CONCENTRATE % SolFe	DAVIS TUBE CONCENTRATE % Fe Rec'y	GRIND % -400 Mesh
BLACKIE LAKE								
76-25*	90-230	140	32.2	25.2	35.8	70.4	78.3	95.5
76-26	170-230	60	31.3	23.6	33.1	71.2	75.3	97.7
76-27*	80-200	120	30.8	22.3	31.6	70.4	72.6	96.4
76-28	220-340	120	32.3	21.6	30.6	70.5	67.4	96.3
76-29*	130-311	181	32.7	23.2	33.5	69.0	70.4	94.8
75-16*	170-300	130	32.2	26.2	37.0	70.8	81.4	94.6
75-17	82-155	73	31.3	25.4	35.2	71.4	80.3	94.0
AVERAGE		824	31.98	24.5	34.88	70.35	76.73	95.5
HEMATITE LAKE								
76-30	110-210	100	33.4	27.1	39.0	69.5	81.1	93.3
76-31	150-309	159	31.5	25.2	36.8	68.5	80.0	92.5
75-15	220-380	160	31.8	24.0	34.2	70.2	75.5	95.6
AVERAGE		419	32.23	25.2	36.39	69.34	78.29	93.9

* Used in Average Grade Calculations for Blackie Lake Tonnage Estimate

14.5 Flotation Of Magnetic Concentrates

The magnetic concentrates obtained from two stage grinding and magnetic separation by the laboratory Jeffrey Separator as described under Section 14.3 were further up-graded by cationic flotation. No regrind of the magnetic concentrate was made before flotation.

The flotation consisted of conditioning the concentrate and floating the gangue with MG-83, an amine collector and a frother (MIBC). No recirculation of scavenger middlings was used.

The three Main Zone samples were up-graded 0.8% Fe with an accompanying loss of 3% Fe Recovery. The high-grade concentrates from Blackie and Hematite Lakes were up-graded slightly but with a loss of 10% to 12% of Fe Recovery. Regrinding and a scavenger circuit for the tailings might improve the recovery.

Flotation Of Magnetic Concentrates

Composite No.	Flotation Conc.			Magnetic Conc		
	% Wt.	% SolFe	% SolFe Rec'y	% Wt.	% SolFe	% SolFe Rec'y
125	31.8	67.7	73.0	33.5	66.9	75.9
126	32.4	68.4	70.7	33.5	67.8	72.5
127	28.8	69.0	62.3	31.4	68.2	67.1
128	31.2	71.4	68.9	36.1	70.9	79.0
129	28.3	70.6	62.7	34.1	69.6	74.6

Additional testwork will be required to evaluate the grind requirements and the effect of closed circuit flotation tests.

14.6 Hematite Recovery-Selective Flocculation and Flotation

Testwork was conducted on Composites 130, 131 and 132 which contained low magnetic iron and normal soluble iron in the range of 28.4% to 31.7%.

Preliminary testwork was directed towards the recovery of hematite from the cherty metallic and jasper hematite samples which are low in magnetic iron and 28.4% to 31.7% soluble iron. These rock types represent several billion tons forming about 300 feet of thickness underlying the cherty magnetite member which is of greater economic interest. This low magnetic material forms the high ridge south of Hematite Lake and influences the number of claims to be held.

The results of this preliminary study show that the cherty metallic samples from outcrops south of Hematite Lake respond better than equivalent material underlying the cherty magnetite tonnage in the Main Zone. The reason for better response is not known except the Hematite Lake sample contained more soluble and magnetic iron. Concentrates produced by selective flocculant and flotation are about 10 to 13% lower in Iron Recovery, lower in iron grade (67% versus 69-70% Fe). The selective flocculation and flotation process is more complex and requires more operating costs due to reagents than magnetic separation.

The Jasper Hematite is not considered of sufficient interest to warrant further work or to hold ground specifically for its future use since this formation is harder, finer-grained and shows poorer response to both magnetic separation and selective flocculation.

Testwork to date:

Composite No.	Selective Flocculation	Selective Flocculation and Flotation
130	23	7
131	9	8
132	3	-

Several variables were tested including grind, pH, concentration of sodium silicate, sodium carbonate and starch and type of starch.

Much more testwork would be required in order to refine the test conditions which was considered to be beyond the present scope of this test program.

The following table illustrates the comparison of response of the cherty metallic and jasper hematite to various methods of trestment.

Composite No.	Crude		Concentrate		
	% SolFe	% MagFe	% Wt	% SolFe	% SolFe Rec'y
130 (Ch.Metallic)	28.4	12.8			
Magnetic Separation			19.1	67.0	45.1
Sel. Flocculation			69.2	37.8	92.0
Sel. Floc. & Flotation			18.8	61.4	40.6
131 (Ch.Metallic)	31.5	12.8			
Magnetic Separation			18.2	67.8	54.2
Sel. Flocculation			55.3	51.6	89.3
Sel. Floc. & Flotation			32.0	67.5	67.6
132 (Jasper)	31.7	10.6			
Magnetic Separation			16.0	66.6	33.6
Sel. Flocculation			89.0	35.2	94.5
Sel. Floc. & Flotation			NOT TESTED		

Composite 131 - Cherty Metallic from Hematite Lake surface sample responded well to Selective-Flocculation followed by flotation producing 13.4% more Fe recovery than Magnetic separation.

Composite 130 - Cherty Metallic from Main Zone was lower in Sol Fe and Magnetic Fe than Composite 131 and gave best results for Magnetic Separation and although the Weight Recovery was low at 19%, the magnetic recovery was better than either the Selective-Flocculation or Selective Flocculation and Flotation.

Composite 132 - This very fine grained Jasper Hematite from the Main Zone produced a magnetic concentrate with only 33.6% Sol Fe Recovery at 66.6% Fe and low Weight Recovery. Selective flocculation showed very little up-grading. No flotation tests were done at this time due to the poor up-grading by selective flocculation.

14.7 Analyses Of Concentrates

The following concentrates were analyzed:

A - Composite of Main Zone Magnetic Concentrate, Composites 125, 126, 127.

B - Composite 128 - Blackie Lake Magnetic Concentrate.

C - Composite 130 - Main Zone Cherty Metallic Concentrate from Selective Flocculation followed by Flotation.

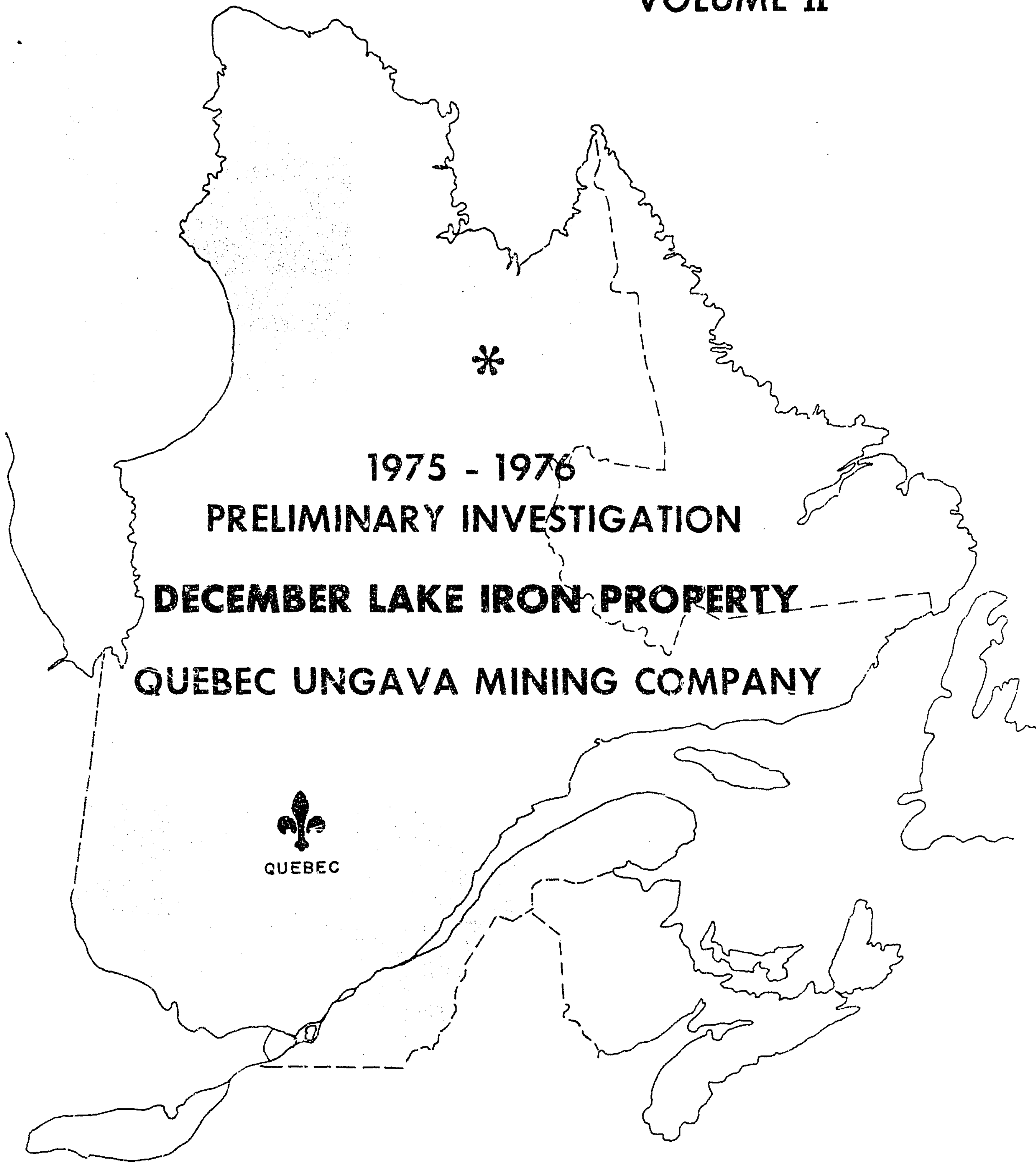
D - Composite 131 - Hematite Lake Cherty Metallic surface sample - Concentrate from Selective Flocculation followed by Flotation.

		A	B	C	D
Iron	% Total	67.5	70.15	-	-
	% Soluble	-	-	61.7	67.5
Silica	% SiO_2	4.39	1.82	4.52	4.96
Phosphorus	% P	0.015	0.012	-	-
Manganese	% Mn	0.19	0.054	0.80	-
Alumina	% Al_2O_3	0.053	0.032	< 0.05	-
Lime	% CaO	0.36	0.25	2.67	-
Magnesia	% MgO	0.23	0.068	1.48	-
Sodium	% Na_2O	0.007	0.006	0.010	0.016
Potassium	% K_2O	0.009	0.008	0.006	0.006
Sulphur	% S	0.0075	0.0135	-	-
Nickel	% Ni	0.004	0.004	-	-
Chromium	% Cr	0.003	0.003	-	-
Titanium	% TiO_2	0.04	0.014	-	-
Arsenic	% As	0.0027	0.0026	-	-
Loss On Ignition	% LOI	-	-	2.71	-

Note: Sample C - Cherty Metallic from the Main Zone has a higher carbonate content as shown by the CaO, MgO and LOI.

VOLUME II

1975 - 1976
PRELIMINARY INVESTIGATION
DECEMBER LAKE IRON PROPERTY
QUEBEC UNGAVA MINING COMPANY



H. E. NEAL & ASSOCIATES LTD.
TORONTO — CANADA

VOLUME II

TABLE OF CONTENTS

Note: Progress Reports 2 and 4 are on other properties.

QUEBEC UNGAVA MINING COMPANY

Development Licence	Claim No.	Township	Expiry Date
330 448	2,3,4,5	5048	Oct. 10, 1976
330 449	1,2,3,4,5	5048	Oct. 13, 1976
330 450	1,2,3,4,5	5048	Oct. 13, 1976
345 701	1,2,3,5	5048	Oct. 14, 1976
345 702	1,2,3,4,5	5048	Oct. 14, 1976
345 703	2,3,4,5	5048	Oct. 16, 1976
345 706	1,2,3,4,5	5048	Oct. 16, 1976
345 707	1,2,3,4	5048	Oct. 17, 1976
345 708	1,2,3,4,5	5048	Oct. 17, 1976
345 710	2,3,4,5	5048	Oct. 18, 1976
345 720	1,2,3,4,5	5048	Oct. 18, 1976
345 721	2,3,4,5	5048	Oct. 19, 1976
345 724	1,2,3,4,5	5048	Oct. 19, 1976
345 725	2,3,4,5	5048	Oct. 20, 1976
345 726	1,2,3,4,5	5048	Oct. 20, 1976
345 740	2,3,4,5	5048	Oct. 10, 1976
345 741	1,2,3,4,5	5048	Oct. 10, 1976
345 742	1,2,3,4,5	5048	Oct. 13, 1976
345 743	1,2,3,4,5	5048	Oct. 13, 1976
345 744	1,2,3,4,5	5048	Oct. 14, 1976
345 745	1,2,3,4,5	5048	Oct. 14, 1976
345 746	2,3,4,5	5048	Oct. 16, 1976
345 747	2,3,4,5	5048	Oct. 16, 1976
345 748	1,2	5048	Oct. 17, 1976
345 749	2,3,4,5	5048	Oct. 17, 1976
345 750	1,2,3,4,5	5048	Oct. 18, 1976
345 751	2,3,4,5	5048	Oct. 18, 1976
345 752	1,2,3,4,5	5048	Oct. 19, 1976
345 753	2,3,4,5	5048	Oct. 19, 1976
345 754	1,2,3,4,5	5048	Oct. 20, 1976
345 755	2,3,4,5	5048	Oct. 20, 1976
345 756	2,3,4,5	5048	Oct. 21, 1976
345 874	4,5	5047	Oct. 18, 1976
345 876	3,4,5	5047	Oct. 19, 1976
345 878	2,3,4,5	5047	Oct. 20, 1976
345 881	1,2,3,4	5047	Oct. 21, 1976
345 882	5	5047	Oct. 22, 1976
345 883	1,2,3,4	5047	Oct. 22, 1976
345 884	5	5047	Oct. 23, 1976
345 885	1,2,3,4,5	5047	Oct. 23, 1976
345 886	3,4,5	5047	Oct. 24, 1976
345 887	1,2,3,4,5	5047	Oct. 10, 1976
345 888	2	5047	Oct. 10, 1976
345 889	1,2,3,4,5	5047	Oct. 13, 1976
345 890	1,2,3,4	5047	Oct. 13, 1976
345 891	4,5	5047	Oct. 14, 1976
345 892	1,2,3,4,5	5047	Oct. 14, 1976
345 895 }	2,3	5047	Oct. 17, 1976
345 895 }	1,4,5	5048	Oct. 17, 1976
345 979	1,2,3,4,5	5047	Oct. 24, 1976
345 980	1,3	5047	Oct. 25, 1976
345 981	3,4,5	5047	Oct. 25, 1976
345 982	4,5,	5047	Oct. 26, 1976
345 983	1,2,3,4,5	5047	Oct. 26, 1976
345 984	3,4,5	5047	Oct. 27, 1976
345 985	1,2,3,4,5	5047	Oct. 27, 1976
345 986	4,5	5047	Oct. 28, 1976
345 987	4,5	5047	Oct. 28, 1976
345 988	1,2,3,4	5047	Oct. 29, 1976

H. E. Neal

QUEBEC UNGAVA MINING COMPANY

continued)

Development Licence	Claim No.	Township	Expiry Date
345 893	4,5	5048	Oct. 16, 1976
345 894	1,2,3,4,5	5048	Oct. 16, 1976
345 896	1,2,3,4,5	5048	Oct. 17, 1976
345 898	2,3,4,5	5048	Oct. 18, 1976
345 899	4,5	5048	Oct. 19, 1976
345 900	1,2,3,4,5	5048	Oct. 19, 1976
345 901	1,2,3,4,5	5048	Oct. 20, 1976
345 902	1,2,3,4,5	5048	Oct. 20, 1976
345 903	4,5	5048	Oct. 21, 1976
345 904	1,2,3,4,5	5048	Oct. 21, 1976
345 905	4,5	5048	Oct. 22, 1976
345 906	1,2,3,4,5	5048	Oct. 22, 1976
345 907	1,2,3,4	5048	Oct. 23, 1976
345 908	2,3,4,5	5048	Oct. 23, 1976
345 909	4,5	5048	Oct. 10, 1976
345 910	1,2,3,4,5	5048	Oct. 10, 1976
345 912	2,3,4,5	5048	Oct. 13, 1976
345 914	1,2,3,4,5	5048	Oct. 14, 1976
345 915	1,2,3,4,5	5048	Oct. 16, 1976
345 916	1,2,4,5	5048	Oct. 16, 1976
345 917	2,3,4,5	5048	Oct. 17, 1976
345 918	1,2,3,4,5	5048	Oct. 17, 1976
345 919	1,2,3,4,5	5048	Oct. 18, 1976
345 920	1,2,3,4,5	5048	Oct. 18, 1976
345 921	2,3,4,5	5048	Oct. 19, 1976
345 922	1,2,3,4,5	5048	Oct. 19, 1976
345 923	2,3,4,5	5048	Oct. 20, 1976
345 924	1,2,3,4,5	5048	Oct. 20, 1976
345 925	1,2,4,5	5048	Oct. 21, 1976
345 926	3,4	5048	Oct. 21, 1976
345 927	2,3,4,5	5048	Oct. 22, 1976
345 928	1,2,3,4,5	5048	Oct. 22, 1976
345 929	3,4,5	5048	Oct. 23, 1976
345 930	1,2,3,4,5	5048	Oct. 23, 1976

Report of

TESTWORK

on samples of Quebec Ungava ore

submitted by

H.E. NEAL AND ASSOCIATES LIMITED

Progress Report No. 1

Project No. L.R. 1867

NOTE:

This report refers to the samples as received.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
August 8, 1975

INTRODUCTION

On July 22, 1975, Mr. H.E. Neal requested Davis tube and Satmagan tests on eight drill core samples from Quebec Ungava.

LAKEFIELD RESEARCH OF CANADA LIMITED

A.G. Scobie, P. Eng.,
Manager

D.M. Wyslouzil, P. Eng.,
Chief Metallurgist

Investigation by: O.F.C. Cook

Results - Continued

Screen Analyses

Sample No. 1708

32 Minute Grind

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	-	-	100.0
100	-	-	100.0
150	0.1	0.1	99.9
200	0.1	0.2	99.8
270	0.3	0.5	99.5
400	2.3	2.8	97.2
- 400	97.2	100.0	-
Total	100.0	-	-

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
August 8, 1975

Results - Continued

Davis Tube Test

94.3 95.7

Sample No.	Head			Concentrate			% -400 mesh	Tailing Assay % Sol. Fe (Calc.)
	Sol. Fe	Assay % Mag. Fe (Calc.)	Mag. Fe (Sat.)	Weight %	Assay % Sol. Fe	% Rec'y Sol. Fe		
1708**	36.7	30.8	30.6	45.1	68.3	83.9	83.0	10.7
1708*	37.1	31.0	30.7	44.8	69.3	83.7	97.2	11.0
1707*	33.9	28.6	28.4	40.3	70.9	84.3	97.5	8.9
1732*	37.1	31.4	31.4	45.1	69.7	84.7	97.8	10.3
1737*	30.7	20.2	20.3	29.0	69.7	65.8	98.2	14.7
1758*	33.0	23.6	23.7	33.5	70.4	71.5	97.8	14.2
1763*	27.8	22.5	22.5	32.6	69.0	80.9	97.4	7.9
1787*	28.1	8.7	8.8	12.8	67.6	30.8	96.5	22.3
1800*	31.5	24.6	24.6	35.2	70.0	78.2	98.1	10.6

** 16 Minute Grind

* 32 Minute Grind

Screen Analyses

Sample No. 1708

16 Minute Grind

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.1	0.1	99.9
100	0.1	0.2	99.8
150	0.2	0.4	99.6
200	1.0	1.4	98.6
270	4.1	5 5	94.5
400	11.5	17.0	83.0
- 400	83.0	100.0	-
Total	100.0	-	-

SAMPLE PREPARATION

Each sample was reduced to nominal 1/4 inch mesh size by jaw-crusher and cone-crusher. One-eighth of each sample was then removed by riffling, and roll-crushed to minus 20 mesh and 100 gram charges were prepared.

One sample, No. 1708, was selected at random, and 100 gram charges were ground in an Abbe pebble mill, in order to establish the grind required to produce samples at 100 % minus 325 mesh for the Davis tube tests. The optimum grind was found to be 32 minutes.

DETAILS OF DAVIS TUBE TESTS

1. The Davis tube tests were performed under the following conditions:

Waterflow	400 ml. per minute
Tube Oscillations	100 strokes per minute
Current to Poles	2.0 amperes
Retention Time	5 minutes

The magnetic fractions were dried, weighed and assayed for soluble iron.

All head samples were assayed for soluble iron, and the magnetic iron content was determined by Satmagan.

An Investigation of

THE RECOVERY OF IRON

on samples of Quebec Ungava ore

submitted by

H.E. NEAL AND ASSOCIATES LIMITED

Progress Report No. 3

Project No. L.R. 1867

NOTE:

This report refers to the samples as received.

The practice of this Company in issuing reports of this nature is to require the recipient not to publish the report or any part thereof without the written consent of Lakefield Research of Canada Limited.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
April 14, 1976

I N T R O D U C T I O N

On September 17 and October 31, 1975, twelve boxes of Quebec Ungava ore samples were received from H.E. Neal and Associates Limited. Instructions were received from Mr. H.E. Neal to prepare each individual sample for soluble iron and Satmagan magnetic iron analysis. This was carried out and reported.

Later Mr. Neal instructed by telephone that Davis tube tests should be carried out on selected composites.

LAKEFIELD RESEARCH OF CANADA LIMITED

A.G. Scobie

A.G. Scobie, P. Eng.,
Manager

D.M. Wyslouzil

D.M. Wyslouzil, P. Eng.,
Chief Metallurgist

Investigation by: O.F.C. Cook

DAVIS TUBE TEST RESULTS

24 Minute Pebble Mill Grind

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Recovery Sol. Fe	% -400 mesh	Tailing Assays, % Sol. Fe
QUC 1	31.1	20.1	29.1	69.1	64.7	96.4	15.4
2	31.8	25.2	36.0	70.1	79.4	95.6	10.2
3	31.8	22.9	33.3	68.7	71.9	91.1	13.4
4	35.2	30.0	43.1	69.5	85.1	93.2	9.2
5	32.2	24.9	35.5	70.1	77.3	91.3	11.3
6	31.0	17.8	26.5	67.2	57.5	91.2	17.9
7	33.1	24.2	35.0	69.2	73.2	91.7	13.7
8	33.8	26.0	37.5	69.3	77.0	94.4	12.4
9	30.1	21.5	32.7	65.9	71.6	91.0	12.7
10	35.6	29.9	42.8	69.8	84.1	95.6	9.9
11	30.0	19.2	28.1	68.2	63.8	93.4	15.1
12	32.0	21.4	31.1	68.7	66.7	94.8	15.5
13	31.7	18.8	27.1	69.4	59.3	92.6	17.7
14	31.8	20.9	31.0	67.3	65.6	91.2	15.9
15	30.7	23.5	34.9	67.3	76.6	94.2	11.0
16	35.3	30.4	43.9	69.3	86.2	98.0	8.7
17	30.3	21.3	31.4	67.9	70.4	93.8	13.1
18	30.4	19.8	29.1	63.2	65.2	93.6	14.9
19	31.2	22.6	33.8	67.0	72.6	93.4	12.9
20	29.7	22.7	34.5	65.8	76.3	95.8	10.7
21	32.5	25.6	36.4	70.4	79.0	96.2	10.7
22	30.9	21.1	33.1	70.0	74.9	94.8	11.6
23	32.2	22.8	33.4	68.2	70.7	93.2	14.1
24	35.0	28.9	42.2	68.5	82.7	92.8	10.5
25	30.4	17.2	26.3	65.3	56.5	90.2	17.9
26	33.0	24.4	36.1	67.7	74.1	91.6	13.4
27	33.0	25.7	37.5	68.4	77.7	93.0	11.8
28	29.9	19.9	29.8	66.9	66.7	94.6	14.2
29	31.9	20.9	30.1	69.5	65.6	96.8	15.7
30	30.4	21.5	31.0	69.4	70.8	92.8	12.9
31	29.0	18.1	26.8	67.4	62.3	90.2	14.9
32	29.1	21.5	31.6	68.1	74.0	90.8	11.1
33	30.2	18.3	27.2	67.3	60.6	91.4	16.3
34	31.9	19.1	28.1	68.1	60.0	89.2	17.8
35	33.0	27.6	39.6	69.6	83.5	91.4	9.0
36	27.9	21.3	31.1	68.4	76.2	92.4	9.6
37	29.3	22.1	34.0	65.0	75.4	92.0	10.9
38	30.0	24.3	36.8	66.1	81.1	92.2	9.0
39	29.5	20.4	31.5	64.7	69.1	90.2	13.3
40	32.3	25.3	37.6	67.3	78.3	91.4	11.2

Test Results - Continued

24 Minute Pebble Mill Grind

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Recovery Sol. Fe	% -400 mesh	Tailing Assays, % Sol. Fe
QUC 41	32.9	26.8	40.0	67.1	81.6	92.0	10.1
42	33.5	24.5	36.4	67.3	73.1	91.6	14.2
43	32.4	19.8	29.9	66.3	61.2	87.6	17.9
44	30.8	20.3	29.2	69.6	66.0	91.3	14.8
45	28.8	10.8	16.3	66.3	37.5	91.0	21.5
46	32.4	18.0	27.0	66.7	55.6	89.8	19.7
47	30.0	23.7	34.6	68.6	79.1	92.2	9.6
48	32.4	25.6	37.2	68.9	79.1	97.2	10.8
49	27.6	20.0	30.6	65.2	72.3	88.4	11.0
50	31.3	21.4	31.5	67.8	68.2	92.8	14.5
51	31.9	15.1	22.5	67.2	47.4	93.4	21.7
52	27.5	25.4	37.1	68.4	92.3	91.8	3.4
53	34.0	26.4	40.0	66.1	77.8	89.6	12.6
54	30.4	14.6	22.3	65.5	48.0	88.2	20.3
55	32.9	25.9	37.4	69.[illegible]	78.8	91.8	11.2
56	30.4	16.5	23.8	69.4	54.3	91.8	18.2
57	29.4	21.4	33.7	63.4	72.7	89.2	12.1
58	29.8	19.3	27.8	69.6	64.9	93.0	14.5
59	34.2	29.0	41.5	69.9	84.8	94.4	8.9
60	30.7	25.1	36.3	69.1	81.7	92.2	8.8
61	31.4	26.7	38.4	69.6	85.1	92.6	7.6
62	31.4	25.5	36.8	69.2	81.1	91.2	9.4
63	31.0	22.7	33.1	68.7	73.4	91.4	12.3
64	30.0	22.0	32.0	68.9	73.5	91.0	11.7
65	27.4	12.6	19.9	63.1	45.8	88.2	18.5
66	25.9	22.1	32.5	67.9	85.2	82.8	5.7
67	25.3	20.6	29.8	69.0	81.3	82.8	6.7
68	22.0	12.5	18.5	67.5	56.8	82.0	11.7
69	30.8	22.1	30.9	71.6	71.8	94.2	12.6
70	30.8	24.6	35.0	70.3	79.9	94.4	9.5
71	36.3	32.5	45.0	72.3	89.6	95.5	6.9
72	30.9	25.5	36.2	70.4	82.5	93.6	8.5
73	35.3	28.8	40.2	71.7	81.7	94.8	10.8
74	30.7	25.7	37.2	69.1	83.7	94.4	8.0
75	28.7	22.0	31.8	69.1	76.6	95.4	9.9
76	31.3	23.8	33.1	72.0	76.1	94.4	11.2
77	31.8	27.3	38.5	71.0	86.0	93.8	7.3
78	30.3	25.6	35.5	72.0	84.4	94.8	7.4
79	32.1	23.0	32.9	69.9	71.6	91.6	13.6
80	33.3	28.5	41.6	68.6	85.7	91.4	8.2
81	30.9	17.0	24.9	63.3	55.0	89.4	18.5
82	26.9	12.5	19.7	63.7	46.7	90.8	17.9
83	31.4	21.8	32.9	66.4	69.6	86.8	14.2
84	31.6	21.1	30.1	70.1	66.8	92.6	15.0
85	30.1	13.7	19.5	70.3	45.5	91.0	20.4

Test Results - Continued

24 Minute Pebble Mill Grind

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Recovery Sol. Fe	% -400 mesh	Tailing Assays, % Sol. Fe
QUC 86	30.3	20.3	29.3	69.3	67.0	91.4	14.1
87	29.6	13.8	19.9	69.4	46.7	90.4	19.7
88	32.2	20.1	29.7	67.6	62.4	89.2	17.2
89	32.2	25.1	36.1	69.6	78.0	91.6	11.1
90	32.5	24.2	35.8	67.5	74.4	89.8	13.0
91	31.1	25.3	37.7	67.2	81.5	94.2	9.3
92	32.7	24.0	34.7	69.2	73.4	94.8	13.3
93	30.4	15.8	22.9	68.9	51.9	93.2	19.0
94	33.2	16.2	23.9	67.6	48.7	97.4	22.4
95	27.0	10.2	17.1	59.9	37.9	82.2	20.2
96	31.4	23.6	34.9	67.6	75.1	96.8	12.0
97	31.9	5.5	8.1	67.7	17.2	87.2	28.7
98	30.9	25.4	37.4	67.9	82.2	98.4	8.8
99	27.8	21.3	32.8	64.8	76.5	92.8	9.7
100	28.6	22.6	33.5	67.4	78.9	98.0	9.1
101	28.3	19.5	28.9	67.6	69.0	93.2	12.3
102	29.0	9.5	13.5	70.7	32.9	98.4	22.5
103	28.3	24.0	36.8	65.3	84.9	93.0	6.8
104	30.0	23.7	34.2	69.2	78.9	98.6	9.6
105	19.7	4.5	6.9	65.7	23.0	92.7	16.3
106	27.9	17.7	25.7	68.8	63.4	99.2	13.8
107	27.5	21.9	32.7	67.0	79.7	93.8	8.3
108	29.2	6.4	9.1	70.3	21.9	98.6	25.1
109	26.4	21.1	32.8	64.4	80.0	94.2	7.9
110	29.2	21.9	32.7	67.1	75.1	97.4	10.8
111	27.9	21.2	32.1	66.0	75.9	95.0	9.9
112	27.9	20.1	29.7	67.7	72.0	98.0	11.1
113	28.6	17.4	24.9	69.7	60.7	95.6	15.0
114	31.8	20.1	28.6	70.4	63.3	99.0	16.3
115	29.9	11.3	16.0	70.7	37.8	95.0	22.1
116	28.5	15.7	22.1	71.0	55.1	98.4	3.6
117	29.9	23.8	34.0	70.0	79.6	91.8	9.2
118	34.6	26.7	38.5	69.3	77.1	94.6	12.9
119	34.4	30.2	42.9	70.5	87.9	98.4	7.3
120	31.6	19.5	27.3	71.6	61.9	94.6	16.6
121	31.5	19.6	27.8	70.6	62.3	98.0	16.4
122	31.9	23.1	33.0	70.1	72.5	95.0	13.1
123	28.8	24.4	35.0	69.8	84.8	94.0	6.7
124	31.3	24.9	35.5	70.0	79.4	98.2	10.0
32 Minute Pebble Mill Grind							
9	30.1	21.7	32.0	67.7	72.0	96.1	12.6

SAMPLE PREPARATION

Stage 1

Each sample was reduced to nominal 1/4 inch mesh size by jaw-crusher and cone crusher. One eighth of each sample was then removed by riffling, and roll-crushed to minus 20 mesh. From this a sample was riffled, pulverized and assayed for soluble iron, and analyized by Satmagan for magnetic iron.

Stage 2

Composites were later made up from the minus 20 mesh rejects according to instructions received from Mr. Neal, and 100 gram charges were prepared and ground for 24 minutes in an Abbe pebble mill.

DETAILS OF DAVIS TUBE TESTS

The Davis tube tests were performed under the following conditions:

Waterflow	400 ml. per minute
Tube oscillations	100 strokes per minute
Current to poles	2.0 amperes
Retention time	5 minutes

The magnetic fractions were dried, weighed and assayed for soluble iron.

All head samples were assayed for soluble iron and the magnetic iron content was determined by calculation.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
April 14, 1976 / dmm

An Investigation of

THE RECOVERY OF IRON

from samples of Quebec Ungava Ore

submitted by

H.E. NEAL AND ASSOCIATES LIMITED

Progress Report No. 5

Project No. L.R. 1867

Note:

This report refers to the samples as received.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
December 22, 1976

INTRODUCTION

1. On November 11, 1976, instructions were received from Mr. H.E. Neal to prepare composites of previously-received Quebec Ungava samples from holes 76 - 25, 76 - 26, 76 - 27, 76 - 28 and 76 - 29 for standard Davis tube tests after a 24 minute pebble mill grind.

2. On November 18, 1976 a further five rock samples numbered QU 4801 to QU 4805 inclusive were delivered by Mr. Neal, with instructions to perform Davis tube tests on each individual sample under the same conditions.

LAKEFIELD RESEARCH OF CANADA LIMITED

A.G. Scobie P. Eng.,
Manager

D.M. Wyslouzil P. Eng.,
Chief Metallurgist

Investigation by: O.F.C. Cook

SAMPLE PREPARATION

Composites were made up from the minus 20 mesh rejects according to instructions received from Mr. Neal, and 100 gram charges were prepared and ground for 24 minutes in an Abbe pebble mill.

Samples QU 4801 to QU 4805 inclusive were crushed and 100 gram charges at minus 20 mesh prepared for Davis tube tests after grinding for 24 minutes.

DETAILS OF DAVIS TUBE TESTS

The Davis tube tests were performed under the following conditions.

Waterflow	400 ml per minute
Tube Oscillations	100 strokes per minute
Current to poles	20 amperes
Retention times	5 minutes

The magnetic fractions were dried, weighed and assayed for soluble iron.

All head samples were assayed for soluble iron and the magnetic iron content was determined by calculation.

Davis Tube Test Results

24 minute pebble mill grind

Comp. No.	Hole No.	Head Assay, % Sol. Fe	Head Assay, % Mag. Fe	Concentrate Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 Mesh	Tailing Assay, % Sol. Fe
QUC-133	76 - 25	29.1	21.7	30.5	71.0	74.4	95.8	10.7
134	76 - 25	30.4	24.4	34.7	70.2	80.1	93.6	9.2
135	76 - 25	32.2	28.6	40.6	70.5	88.9	97.4	6.0
136	76 - 25	32.9	27.0	38.0	71.1	82.1	92.4	9.5
137	76 - 25	32.5	22.3	31.9	69.8	68.5	95.8	15.0
138	76 - 25	33.8	25.2	36.1	69.7	74.4	96.2	13.5
139	76 - 25	34.4	27.2	38.6	70.5	79.1	97.2	11.7
140	76 - 26	31.3	25.4	35.5	71.5	81.1	97.4	9.2
141	76 - 26	29.4	23.3	32.8	70.9	79.1	97.6	9.1
142	76 - 26	33.1	22.0	30.9	71.1	66.4	98.2	16.1
143	76 - 26	33.1	14.7	20.7	70.8	44.3	98.4	23.3
144	76 - 27	26.2	18.8	26.6	70.5	71.6	95.8	10.1
145	76 - 27	31.9	25.3	36.1	70.0	79.2	97.2	10.4
146	76 - 27	30.2	22.9	32.7	70.1	75.9	97.2	10.8
147	76 - 27	31.6	25.5	36.0	70.9	80.8	93.8	9.5
148	76 - 27	31.4	24.9	35.0	71.2	79.4	97.2	10.0
149	76 - 27	33.5	16.3	23.4	69.7	48.7	96.9	22.4
150	76 - 27	29.7	11.0	15.5	70.8	36.9	94.7	22.2
151	76 - 28	32.4	24.9	35.2	70.7	76.8	96.2	11.6
152	76 - 28	31.3	22.7	32.2	70.4	72.4	96.2	12.7
153	76 - 28	32.8	23.1	32.7	70.6	70.4	96.7	14.4
154	76 - 28	33.7	24.9	35.3	70.6	74.0	96.4	13.6
155	76 - 28	34.6	13.4	19.1	70.2	38.8	94.2	26.2
156	76 - 28	28.9	20.8	29.4	70.6	71.8	97.9	11.5
157	76 - 29	33.4	28.2	40.2	70.1	84.4	97.9	8.7
158	76 - 29	31.8	22.2	31.7	69.9	69.7	95.6	14.1
159	76 - 29	32.3	21.4	31.3	68.3	66.2	91.1	15.9
160	76 - 29	33.1	23.6	33.9	69.7	71.4	95.9	14.3
161	76 - 29	32.9	23.0	33.3	69.1	70.0	95.8	14.8
162	76 - 29	32.4	22.4	32.2	69.7	69.3	95.8	14.7
163	76 - 29	32.8	23.3	34.5	67.6	71.1	92.0	14.5
164	76 - 29	34.5	24.7	36.3	68.0	71.5	96.3	15.4
165	76 - 29	31.2	19.7	28.7	68.6	63.1	92.8	16.1

Davis Test Tube Results - Continued

24 minute pebble mill grind - Continued

Sample No.	Head Assay, % Sol. Fe	Head Assay, % Mag. Fe	Concentrate Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 Mesh	Tailing Assay, % Sol. Fe
QU 4801	36.8	34.6 *34.2	48.5	71.4	94.1	96.4	4.2
QU 4802	30.5	23.4 *24.0	33.2	70.5	76.7	94.2	10.6
QU 4803	29.7	21.2 *21.7	30.4	69.9	71.5	94.4	12.1
QU 4804	32.5	20.7 *20.5	29.0	71.3	63.6	96.6	16.7
QU 4805	25.3	19.0 *19.7	26.5	71.6	75.0	94.4	8.6

* Mag. Fe Assay, % Satmagan. (% Mag. Fe. D.T. = 0.9451 x % Satmagan + 1.54)

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
December 22, 1976 / pj

An Investigation of

THE RECOVERY OF IRON

on samples of Quebec Ungava ore

submitted by

H.E. NEAL AND ASSOCIATES LIMITED

Progress Report No. 6

Project No. L.R. 1867

NOTE:

This report refers to the samples as received.

The practice of this Company in issuing reports of this nature is to require the recipient not to publish the report or any part thereof without the written consent of Lakefield Research of Canada Limited.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
March 24, 1977

I N D E X

INTRODUCTION

At a meeting in Lakefield on May 28, 1976, Mr. H.E. Neal of H.E. Neal and Associates authorized grindability and magnetic separation tests on composite samples of Quebec Ungava iron ore, designated Composites 125-132.

In addition, Mr. Neal requested testwork to evaluate the potential for hematite recovery from Composites 130-132, including selective flocculation and flotation.

LAKEFIELD RESEARCH OF CANADA LIMITED

A.G. Scobie, P. Eng.,
Manager

R.G. Williamson
Project Metallurgist

Investigation by: O.F.C. Cook
D.R. Shaw
A.E. Carr

S U M M A R Y

1. Head Analyses

Composite No.	% Sol. Fe	% Mag. Fe (Satmagan)	% Mag. Fe (D.T.)	Specific Gravity
125	28.8	23.4	23.0	3.35
126	31.0	23.2	22.7	3.45
127	30.9	22.3	22.0	3.45
128	31.5	26.4	25.[illegible]	3.44
129	31.9	24.8	24.2	3.45
130	28.4	12.8	12.8	3.38
131	31.5	16.2	16.8	3.41
132	31.7	10.6	10.6	3.60

2. Work Index and Davis Tube Tests

A series of grinding tests were conducted on 2000 gram samples of minus 10 mesh Composites 125-132. The product was screened and the results plotted to determine the size modulus (K_{80}). The work index was calculated using the formula proposed by F.C. Bond in the Third Theory of Comminution.

Davis tube tests were conducted on the ground product to determine the liberation size for a concentrate grade of 67-69 % soluble Fe. The results are presented in Table No. 1.

Table No. 1 - Work Index and Davis Tube Tests

Comp. No.	Grind min./ 2 kg	K_{80} µm	Power kWh/ lt	Surface Area cm²/g	Work Index	Davis Tube Concentrate Wgt. %	Davis Tube Concentrate Assay % Sol. Fe	Davis Tube Concentrate % Distr. Sol. Fe	Davis Tube Concentrate Surface Area cm²/g	D.T. Tail. Assays, % Sol. Fe
125	0	1128.0	0	-	-	-	-	-	-	-
	40	79.2	13.9	2172	14.9	40.3	58.2	81.4	-	9.0
	60	57.8	20.9	2770	18.2	36.9	62.0	79.5	-	9.4
	90	29.0	31.4	4303	17.9	33.5	67.3	78.3	-	9.4
	120	22.0	41.9	5170	20.3	32.8	68.8	78.4	2403	9.3
126	0	1089.0	0	-	-	-	-	-	-	-
	90	29.0	31.4	4387	17.9	33.3	67.8	72.8	-	12.6
	120	21.0	41.9	5351	20.3	32.9	69.0	73.2	-	12.4
127	0	1209.0	0	-	-	-	-	-	-	-
	90	29.0	31.4	4347	17.9	32.3	68.0	71.1	-	13.2
	120	22.0	41.9	5233	20.3	31.8	68.9	70.9	-	13.2
128	0	1017.0	0	-	-	-	-	-	-	-
	90	26.5	31.4	3746	17.3	36.3	70.2	80.9	-	9.4
	120	20.5	41.9	4412	19.9	36.1	70.6	80.9	-	9.4
129	0	1168.0	0	-	-	-	-	-	-	-
	90	28.0	31.4	3661	17.7	34.9	69.5	76.0	-	11.7
	120	22.0	41.9	4256	20.3	34.2	69.9	74.7	-	12.1
130	0	1209.0	0	-	-	-	-	-	-	-
	40	81.9	13.9	2026	15.4	25.6	55.2	49.8	-	19.2
	60	55.8	20.9	2618	17.8	22.0	61.6	47.7	-	19.0
	90	28.[illegible]	31.4	4038	17.6	19.1	67.0	45.1	-	19.3
	120	21.0	41.9	4784	19.8	18.3	68.5	44.1	2408	19.4
131	0	1168.0	0	-	-	-	-	-	-	-
	40	76.6	13.9	1513	14.7	32.7	59.0	61.2	-	18.1
	60	57.8	20.9	1953	18.3	29.7	62.3	58.7	-	18.5
	90	29.0	31.4	3010	18.2	25.2	67.8	54.2	-	19.3
	120	23.5	41.9	3521	21.0	24.2	68.4	52.5	-	19.7
132	0	1017.0	0	-	-	-	-	-	-	-
	90	32.0	31.4	5093	19.6	16.1	65.4	33.2	-	25.2
	120	25.0	41.9	6152	22.2	16.0	66.6	33.6	2486	25.1

Summary - Continued

3. Composites 125 - 129

A series of larger scale magnetic separation tests were conducted on Composites 125-129 to confirm the Davis tube results, and also to reduce the grinding power requirements by including a regrind in the flowsheet.

The circuit involved grinding a 2000 gram charge in a laboratory ball mill (13.9 kWh/Lt) and concentrating the product on a Jeffrey magnetic separator. The magnetic concentrate was reground in the same ball mill (13.9 kWh/Lt) and cleaned twice on the Jeffrey separator (Figure No. 1).

Slightly less power was required to produce results similar to the Davis tube tests (Table No. 2).

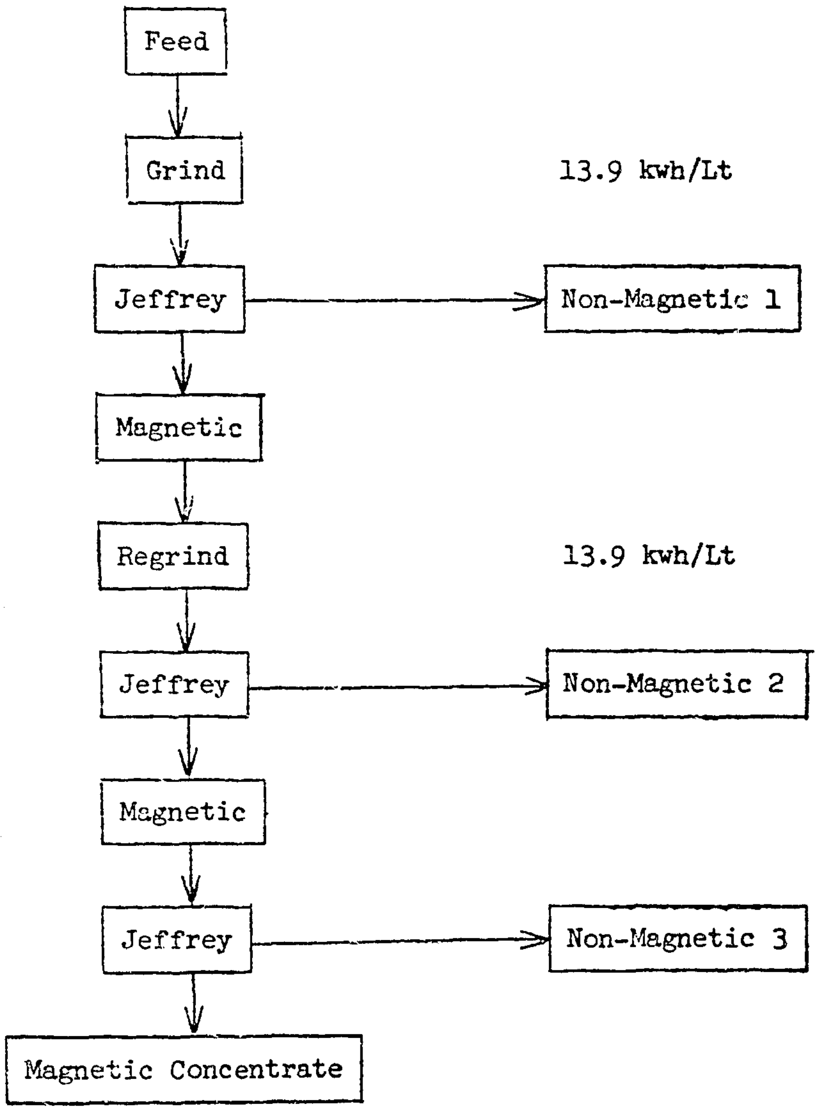
Table No. 2 - Magnetic Separation Tests

Test No.	Comp. No.	Power kWh/Lt			Magnetic Concentrate					
		Grind	Regrind	Total	Weight %	Assays, % Sol. Fe	Assays, % Mag. Fe	% Distr. Sol. Fe	% Distr. Mag. Fe	Surface Area cm^2/g
J1	125	13.9	13.9	27.8	33.5	67.3	67.1	75.9	95.4	2374
J2	126	13.9	13.9	27.8	33.5	67.8	67.8	72.5	95.1	2566
J3	127	13.9	13.9	27.8	31.4	67.5	67.3	67.1	93.8	2372
J4	128	13.9	13.9	27.8	36.1	71.0	70.9	79.0	96.2	2219
J5	129	13.9	13.9	27.8	34.1	71.8	70.9	74.6	96.4	2313

An attempt was made to upgrade the final magnetic concentrates by flotation using cationic collector Aerosurf MG83 to collect and remove a low grade tailing. The results which are tabulated in Table No. 3 suggested that a second regrind might be necessary to achieve a more significant upgrading of the magnetic concentrate.

Figure No. 1

Magnetic Separation Flowsheet - Composites 125-129



Summary - Continued

Table No. 3 - Flotation Concentration of Final Magnetic Concentrate

Test No.	Comp. No.	Collector type	Collector lb/t	Float Time min	Regrind kWh/Lt ore	Flotation Conc. Weight %	Flotation Conc. Assay % Sol. Fe	Flotation Conc. % Distr. Sol. Fe	Magnetic Conc. % Sol. Fe (Calc)	Magnetic Conc. % Distr. Sol. Fe
J1A	125	MG83	0.07	5	0	31.8	67.7	73.0	66.9	75.9
42	125	MG98	0.20	8	2.2	31.3	69.0	72.8	67.2	75.9
J2A	126	MG83	0.07	5	0	32.4	68.4	70.7	67.8	72.5
J3A	127	MG83	0.07	5	0	28.8	69.0	62.3	68.2	67.1
J4A	128	MG83	0.07	5	0	31.2	71.4	68.9	70.9	79.0
J5A	129	MG83	0.07	5	0	28.3	70.6	62.7	69.6	74.6

4. Composites 130 - 132

4.1. Selective Flocculation

A series of selective flocculation tests were conducted on Composites 130, 131 and 132 to evaluate the potential for hematite recovery. The following variables were investigated: grinding size, pH, sodium silicate concentration, sodium carbonate concentration, starch type and starch concentration.

The response of Composite 131 to selective flocculation was excellent, as shown by the test results in Figure No. 2 and Table No. 4. The response of Composite 130 was not as good, and Composite 132 was poor.

Summary - Continued

Composites 130-132

Selective Flocculation

Table No. 4 - Conditions

Test No.	Comp. No.	Grind min/kg	Size % -400 mesh	Reagent to Grind			Reagent to Cell				pH	No. of Stages
				Na_2CO_3	NaOH	Na_2SiO_3	Na_2CO_3	NaOH	Na_2SiO_3	Starch		
7	130	30	66	-	0.1	4.0	-	0.3	1.5	0.3	9.7	3
8	130	30	66	-	-	4.0	-	-	1.5	0.3	9.0	3
9	130	30	66	-	0.3	4.0	-	0.75	1.0	0.3	10.5	2
10	130	30	66	-	0.1	4.0	-	0.2	1.0	0.15	9.7	2
11	130	30	66	-	0.1	6.0	-	0.2	1.0	0.15	9.7	2
12	130	30	66	-	0.1	4.0	-	0.2	1.0	0.15	9.6	2
14	130	30	66	-	0.1	4.0	-	0.2	1.0	-	9.6	2
13	130	30	66	-	1.0	4.0	-	0.35	1.0	0.3	10.5	2
16	130	30	66	-	2.0	4.0	-	0.5	2.0	0.3	11.0	2
17	130	30	66	1.0	-	4.0	0.25	-	1.0	0.4	9.5	2
18	130	30	66	2.0	-	4.0	0.5	-	1.0	0.4	9.8	2
21	130	30	66	1.0	-	4.0	0.25	-	1.0	0.4	9.5	2
22	130	30	66	1.0	-	4.0	0.25	-	1.0	0.4	9.5	2
23	130	30	66	1.0	-	4.0	0.25	-	1.0	0.15	9.5	2
24	130	30	66	1.0	-	4.0	0.25	-	1.0	0.20	9.5	2
25	130	30	66	-	-	4.0*	-	-	1.0	0.20	9.5	2
26	130	30	66	1.0	-	8.0	0.25	-	1.0	0.35	9.6	2
27	130	30	66	-	-	4.0	0.25	-	1.0	0.35	9.5	2
28	130	30	66	1.0	-	** 4.0	0.25	-	1.0	0.35 ***	9.5	2
31	130	30	66	1.0	-	4.0	0.25	-	1.0	0.20	9.5	2
35	130	45	91	-	0.2	4.0	-	-	1.0	0.30	9.0	2
41	130	60	96	-	0.3	4.0	-	-	1.0	0.35	9.2	2
43	130	60	96	-	0.3	4.0	-	-	1.0	0.35	9.2	2
1	131	30	63	-	0.2	0.8	-	-	0.8	0.5	9.8	2
2	131	30	63	-	0.1	2.0	-	0.3	1.0	0.2	9.6	3
6	131	30	63	-	0.1	4.0	-	0.3	1.5	0.3	9.7	3
3	131	60	95	-	0.2	1.0	-	-	4.0	0.4	9.5	3
4	131	60	95	-	0.2	3.0	-	-	1.5	0.6	9.4	3
5	131	60	95	-	0.2	5.0	-	-	2.0	0.7	9.5	3
19	131	30	63	-	0.1	4.0	-	0.2	1.0	0.3	9.5	2
20	131	30	63	1.0	0.1	4.0	0.2	-	1.0	0.3	9.5	2
40	131	60	95	-	0.4	4.0	-	0.2	1.0	0.35	9.2	2
15	132	60	94	-	0.2	5.0	-	-	2.0	0.7	9.5	1
30	132	30	-	2.0	-	4.0	0.5	-	1.0	0.7	9.6	2
31	132	30	-	3.0	-	5.0	0.5	-	1.0	0.5	9.6	2

* 1.25 lb/ton TSPP

** 1.25 lb/ton Calgon

*** MRL 27.8 (tapioca)

starch conditioning time increased to 5 minutes in Tests 21-31

Summary - Continued

Composites 130-132

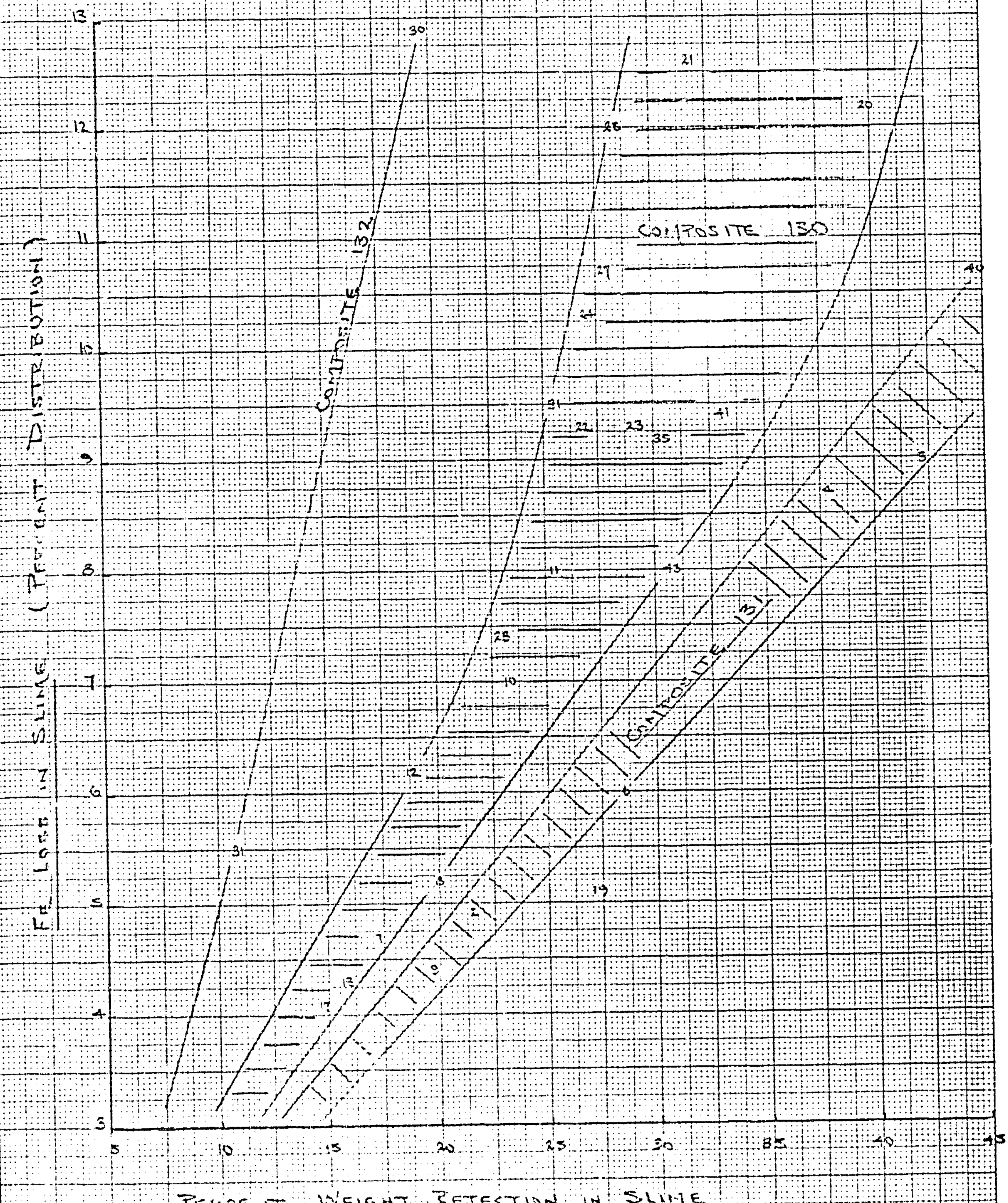
Selective Flocculation

Table No. 4 - Results

Test No.	Concentrate Weight %	Concentrate Assay % Fe	Concentrate % Distribution Fe	Slime Weight %	Slime Assay % Fe	Slime % Distribution Fe
7	82.7	33.0	95.3	17.3	7.86	4.7
8	80.0	33.7	94.8	20.0	7.45	5.2
9	80.2	33.8	95.6	19.8	6.29	4.4
10	76.8	34.2	93.0	23.2	8.57	7.0
11	74.8	34.2	92.0	25.2	9.00	8.0
12	81.1	33.3	93.8	18.9	9.46	6.2
14	68.3	35.7	85.8	31.7	12.67	14.2
13	84.2	32.5	95.7	15.8	7.93	4.3
16	92.7	30.7	98.6	7.3	5.79	1.5
17	85.2	31.0	95.9	14.8	7.58	4.1
18	84.3	33.1	95.7	15.7	8.01	4.3
21	68.2	35.7	87.4	31.8	11.1	12.6
22	73.2	34.3	90.7	26.8	9.63	9.3
23	70.9	34.8	90.7	29.1	8.68	9.3
24	72.9	34.2	89.7	27.1	10.6	10.3
25	71.8	35.0	88.0	28.2	12.2	12.0
26	72.6	35.1	89.7	27.4	10.8	10.3
27	72.2	35.4	89.3	27.8	11.1	10.7
28	77.2	35.4	92.6	22.8	9.54	7.4
31	74.5	34.4	90.5	25.5	10.5	9.5
35	69.8	37.5	90.8	30.2	8.8	9.2
41	66.9	39.4	90.6	33.2	8.1	9.4
43	69.2	37.8	92.0	30.8	7.4	8.0
1	95.2	33.8	99.7	4.8	1.41	0.3
2	78.3	38.1	95.1	21.7	7.06	4.9
6	71.4	41.1	94.0	28.6	6.61	6.0
3	93.6	33.8	99.6	6.4	2.22	0.4
4	62.2	47.1	91.3	37.8	7.35	8.7
5	57.7	49.9	91.0	42.3	6.69	9.0
19	72.8	40.6	94.9	27.2	5.87	5.1
20	60.3	46.8	87.8	39.7	9.87	12.2
40	55.3	51.6	89.3	44.7	7.67	10.7
15	72.9	35.2	82.0	27.1	21.0	18.0
30	80.5	34.2	87.1	19.5	20.9	12.9
31	89.0	35.2	94.5	11.0	16.3	5.5

FIGURE No 2

SELECTIVE FLOCCULATION COMPOSITES 130 - 132



Summary - Continued

4. Composites 130 - 132

4.1.1. Composite 131

The effect of grinding size and sodium silicate addition on the rejection of gangue slime from Composite 131 was studied in Tests 1-6. Increasing the primary grind from 66 % minus 400 mesh in Test 6 to 95 % minus 400 mesh in Test 40 increased slime weight rejection from 29 % with 6 % Fe loss to 45 % with only 11 % Fe loss.

Increasing the starch addition from 0.35 lb/ton in Test 40 to 0.7 lb/ton in Test 5 reduced slime weight rejection from 45 % with 11 % Fe loss to 42 % with 9 % Fe loss.

Increasing the sodium silicate addition from 1 to 5 lb/ton to the grind in Tests 3 to 5 increased slime weight rejection from 6 % with 0.4 % Fe loss to 42 % with 9 % Fe loss. Starch additions were also increased in the tests to flocculate the Fe minerals. The improved dispersive effect of sodium silicate added to the grind as opposed to being conditioned with the thickened pulp was apparent from the same tests.

The effect of softening the water by the addition of 1 lb/ton soda ash to the grind in Test 20 compared to Test 19 was to increase slime weight rejection from 27 % with 5 % Fe loss to 40 % with 12 % Fe loss. Both tests were conducted at a grind of 63 % minus 400 mesh. This result showed that the efficiency of sodium silicate as a gangue dispersant increased as the water hardness decreased.

The primary grind in Test 20 was 21 kWh/Lt compared to 42 kWh/Lt in Test 40. Modifications to the sodium silicate and starch additions could possibly reduce Fe loss in the slimes while maintaining weight rejection.

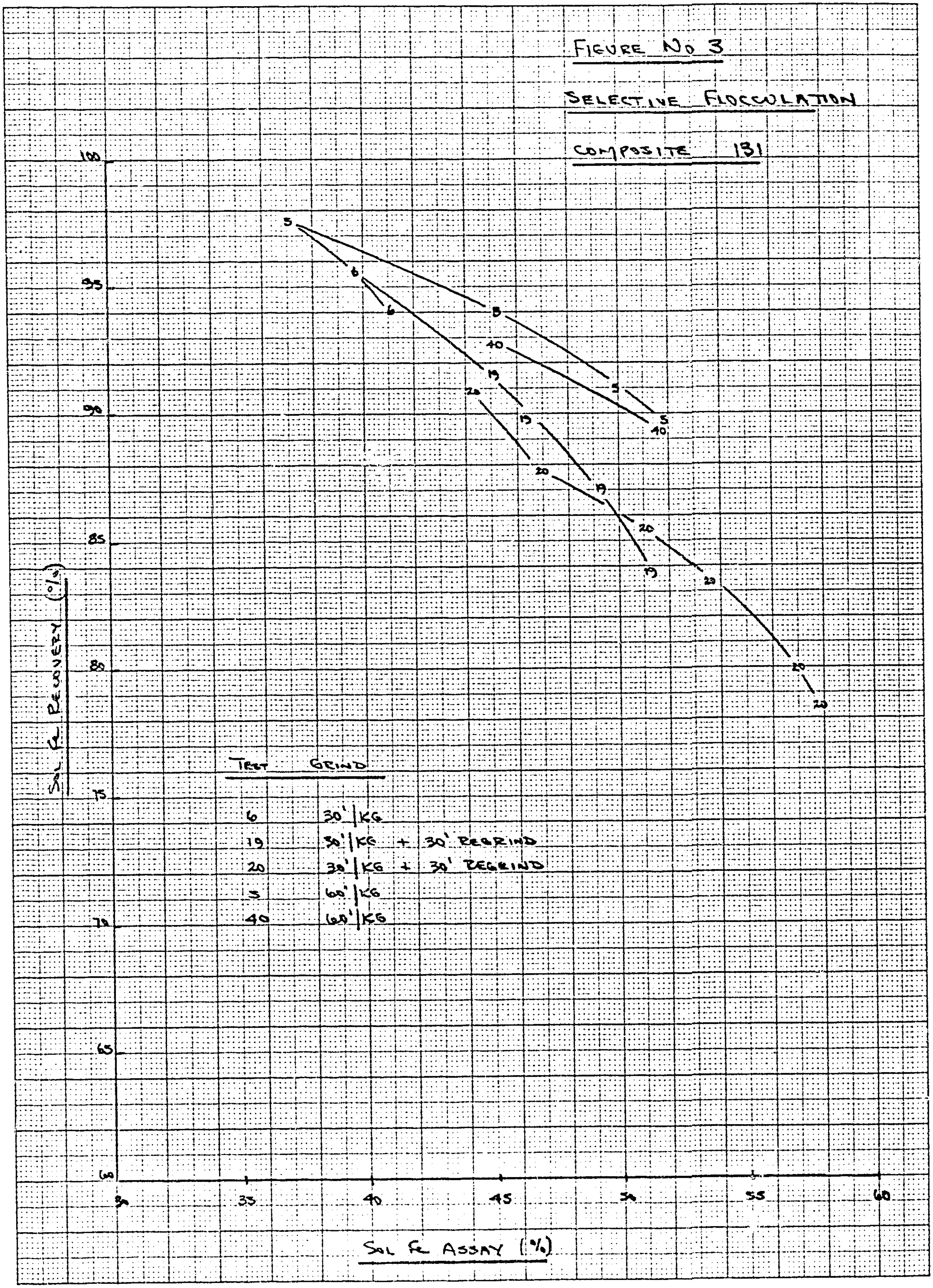


FIGURE No 3
SELECTIVE FLOCCULATION
COMPOSITE 131
Sol Fe Recovery (%)
Sol Fe Assay (%)
TEST GRIND
6 30' KG
19 30' KG + 30' REGRIND
20 30' KG + 30' REGRIND
5 60' KG
40 60' KG

Summary - Continued

4. Composites 130 - 132

4.1.1. Composite 131

In Tests 19 and 20 the sample was ground for 30 minutes (21 kWh/Lt), deslimed twice, and the concentrate reground for an additional 30 minutes (21 kWh/Lt). The results were inferior to a primary grind of 60 minutes (42 kWh/Lt). The results were inferior to a primary grind of 60 minutes (42 kWh/Lt) as shown in Figure No. 3.

4.1.2. Composite 132

Composite 132 responded extremely poorly to selective flocculation in the three tests that were conducted (Table No. 4).

4.1.3. Composite 130

Composite 130 was intermediate in response between Composites 131 and 132. The objective in the testwork was to determine optimum selective flocculation conditions at a primary grind of 66 % minus 400 mesh. The deslimed concentrate could then be reground and the process continued.

Compared to a finer primary grind this procedure had the advantage of reducing grinding power requirements and potentially reducing Fe slime losses through overgrinding. The test conditions and results are compiled in Table No. 4.

The influence of pH in slime weight rejection was examined in Tests 7, 8, 9, 13 and 16. Similar results were produced at pH 9 to 10.5, but at pH 11 slime weight rejection decreased considerably from 20 % down to 7 %.

Reducing the starch addition from 0.3 to 0.15 lb/ton in Tests 10 - 12 increased Fe loss in the slime without an equivalent increase in slime weight rejection. With no starch addition in Test 14, slime weight rejection was only 32 % at 12.7 % Fe assay. The problem appeared to be lack of dispersion, and in Tests 17 to 31 various reagents were added in an attempt to improve dispersion. These

Summary - Continued

4. Composites 130 - 132

4.1.3. Composite 130

reagents were soda ash, TSPP, calgon and increased sodium silicate concentration.

None of these reagents had any significant effect on the results.

Increasing the starch conditioning time from 1 minute to 5 minutes had a pronounced effect on the results. Slime weight rejection increased from 15 % in Test 17 with 1 minute conditioning to 32 % in Test 21 with 5 minutes conditioning. Fe losses increased considerably because of the smaller flocc size, and in fact Fe losses were almost as high as in Test 14 with no starch addition

In Test 13 the sample was ground for 30 minutes, deslimed twice, and the concentrate reground for an additional 30 minutes (42 kWh/Lt total power). The results were inferior to a primary grind of 45 or 60 minutes in Tests 35, 41 and 43 (Figure No. 4).

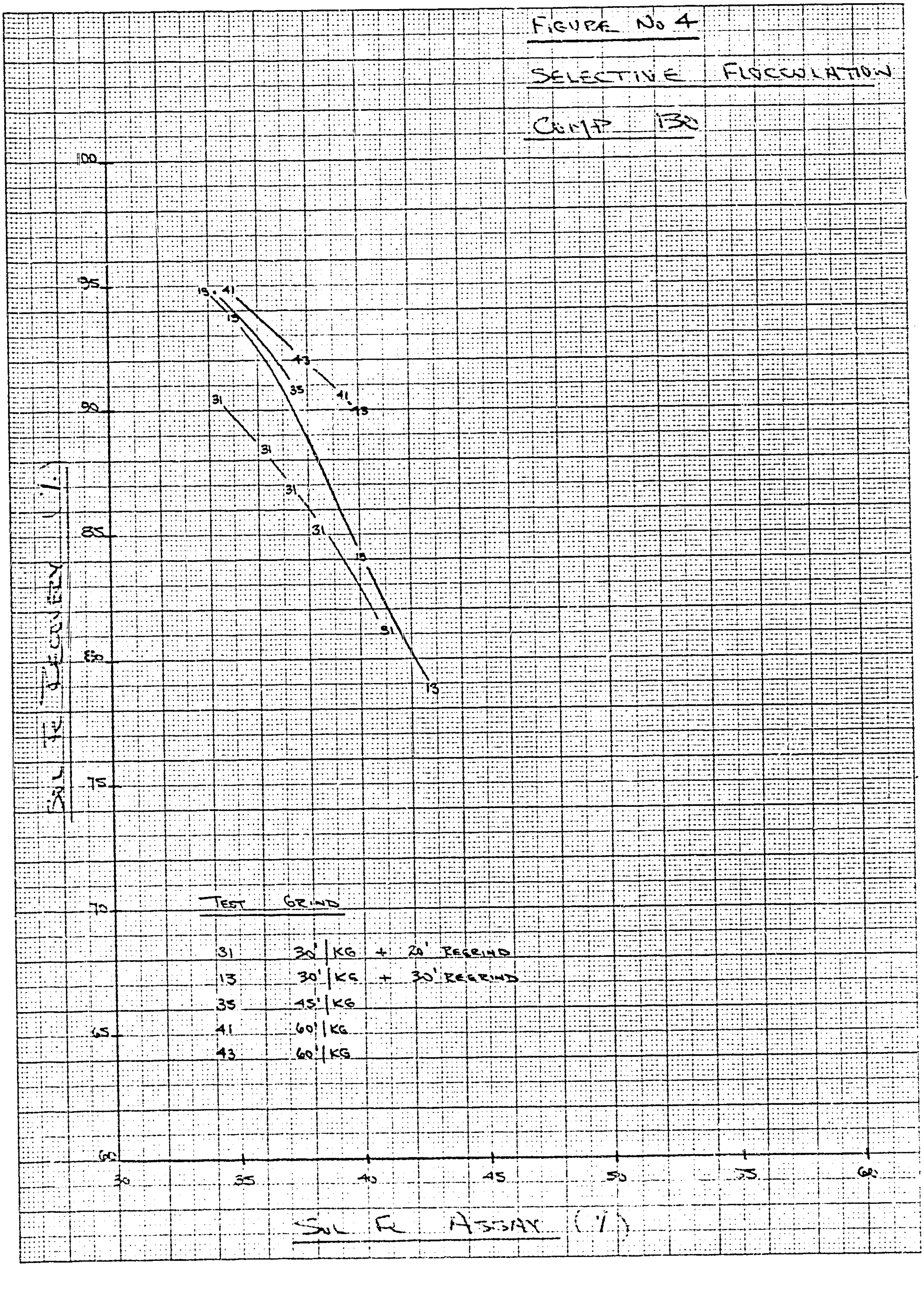


FIGURE No 4
SELECTIVE FLOCCULATION
COMP B2
SULFUR RECOVERY (%)
100
95
90
85
80
75
70
65
60
30
35
40
45
50
55
60
SULFUR ASSAY (%)
TEST GRIND
31 30' KG + 20' REGRIND
13 30' KG + 30' REGRIND
35 45' KG
41 60' KG
43 60' KG

Summary - Continued

4. Composites 130 - 132

4.2. Flotation

Rather than beneficiate the ore exclusively by selective flocculation, a procedure was studied in several tests which involved a combination of selective flocculation followed by flotation, as shown in the accompanying flowsheet (Figure No. 5). The ore was ground in a laboratory ball mill with NaOH and sodium silicate, after which the ground product was conditioned with starch and deslimed twice. The concentrate was reground in a lab ball mill, conditioned with starch to depress the iron minerals, and the gangue was floated with Aerosurf MG 98 using MIBC as a frother. The froth product was scavenged to recover additional iron. In a number of the tests the concentrate was not reground prior to flotation.

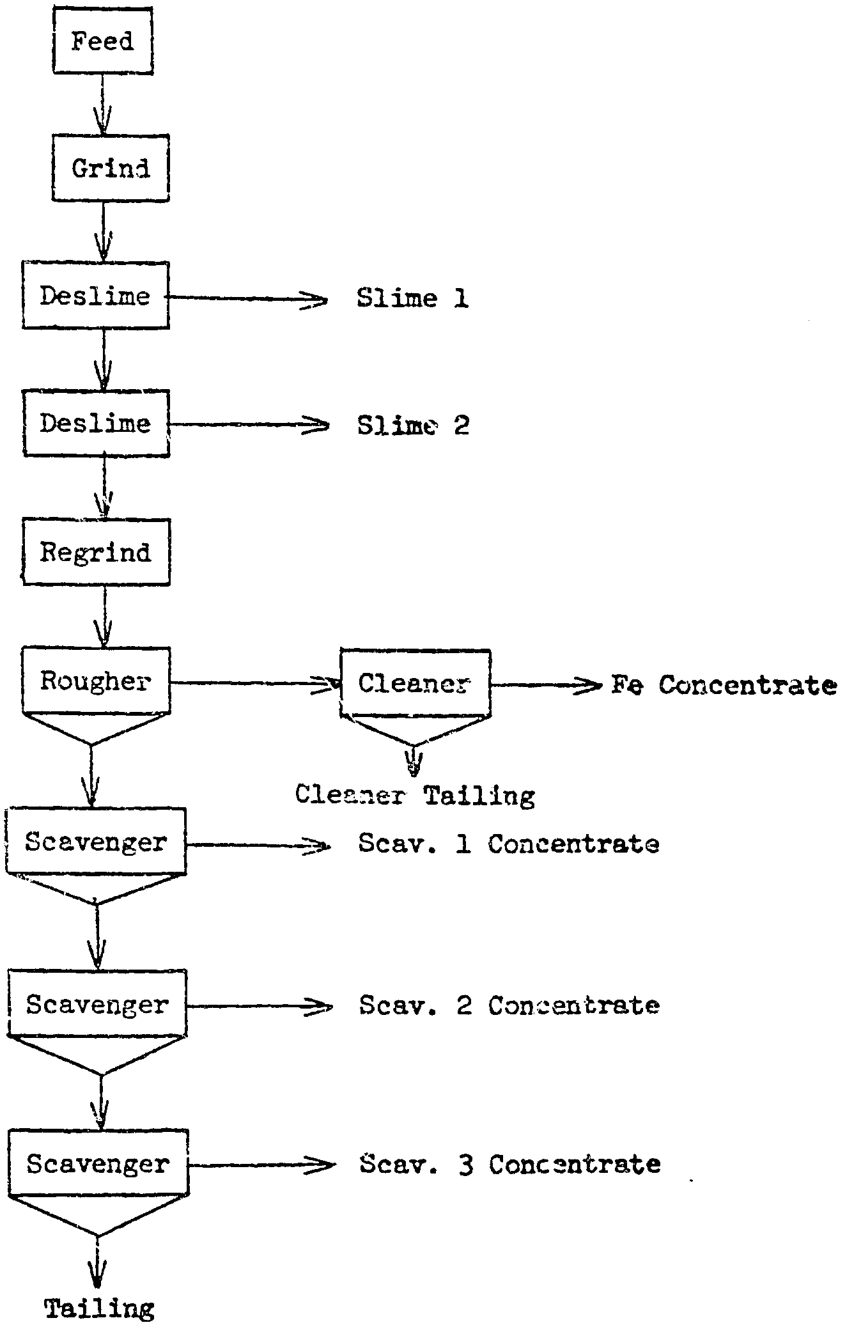
4.2.1. Composite 131

A series of seven selective flocculation/flotation tests were conducted on Composite 131. The test conditions and results are tabulated in Table No. 5. The procedure produced a far higher Fe recovery than by magnetic separation alone (Figure No. 6). Regrinding the flotation feed in Test 50 improved Fe grade.

Fe Grade	Fe Recovery	
	Selective Flocc and Flotation	Magnetic Separation
69	60	-
68	74	54
67	81	55
66	85	56
65	86	57

Figure No. 5

Composites 130-132 - Selective Flocculation / Flotation Flowsheet



Summary - Continued

Selective Flocculation and Flotation

Table No. 5 - Composite 131 - Conditions

Test No.	Comp. No.	Primary Grind min.	Weight g	Regrind minutes	Flotation Reagents lb/t				pH	Flotation Time°	
					NaOH	Starch	MG98	MIBC		Rougher	Cleaner
34	131	30	1000	0	1.2	2.0*	0.15 **	0.04	9.3	6	-
36	131	45	1000	0	0.2	1.5*	0.27	0.01	9.5	7	3
37	131	45	1000	0	0.2	1.5*	0.25	0.02	9.5	7	4
38	131	45	1000	0	0.2	0.9	0.27	0.01	9.5	10	4
39	131	45	1000	0	0.2	1.1	0.45	0.01	9.5	15	3
40	131	60	1000	0	0.2	1.1	0.45	0.01	9.5	15	3
50	131	60	1000	45	0.2	1.1	0.45	0.01	9.5	15	3

° minutes

* WW92 dextrin

** MG83

Summary - Continued

Selective Flocculation and Flotation

Table No. 5 - Composite 131 - Results

Test No.	Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
34	Fe Concentrate	26.2	67.6	56.1
	Fe Concentrate 1 to 3	32.9	66.7	69.5
	Fe 2nd Scav. Tailing	18.2	24.5	14.3
	Slime	48.9	10.4	16.2
36	Fe Concentrate	22.1	66.7	47.0
	Fe Concentrate 1 to 5	35.4	65.5	73.9
	Fe Tailing	24.4	22.0	17.1
	Slime 1 and 2	40.2	6.9	9.0
37	Fe Concentrate	23.2	66.5	49.3
	Fe Concentrate 1 to 5	33.7	65.3	70.4
	Fe Tailing	15.2	12.3	6.0
	Slime 1 and 2	40.2	8.4	10.7
38	Fe Concentrate	35.4	62.3	70.4
	Fe Tailing	11.2	4.8	1.7
	Slime 1 and 2	40.2	8.1	10.4
39	Fe Concentrate	34.0	66.5	69.9
	Fe Concentrate 1 and 2	35.3	65.7	71.7
	Fe Tailing	11.8	5.3	1.9
	Slime 1 and 2	40.6	8.6	10.8
40	Fe Concentrate	32.0	67.5	67.6
	Fe Concentrate 1 to 3	40.5	65.5	83.0
	Fe Tailing	9.7	5.4	1.6
	Slime 1 and 2	44.7	7.7	10.7
50	Fe Concentrate	20.3	69.7	44.7
	Fe Concentrate 1 to 4	39.7	66.5	83.4
	Fe Tailing	13.6	8.0	3.4
	Slime 1 and 2	44.6	7.27	10.2

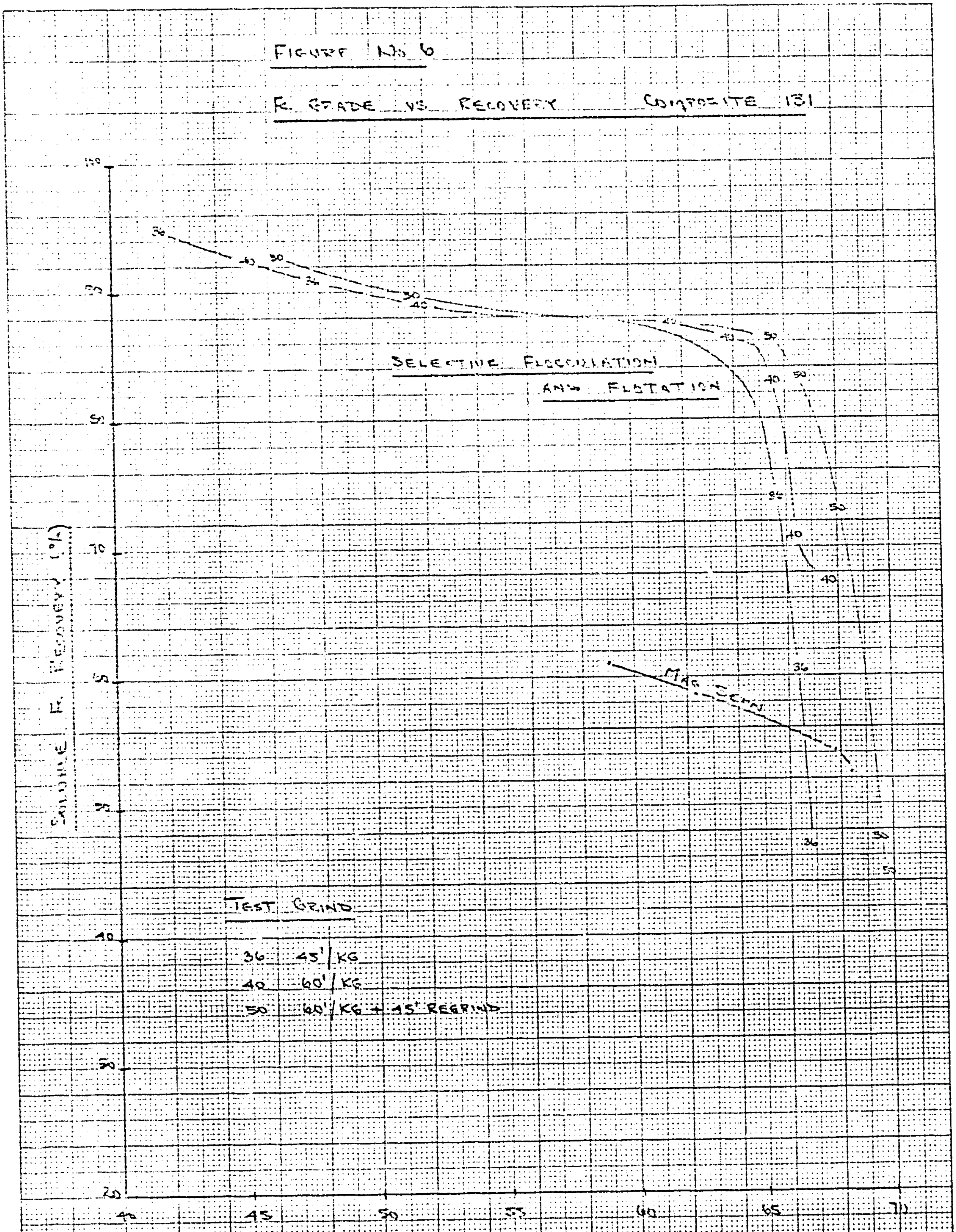


FIGURE No 6
Fe GRADE VS RECOVERY COMPOSITE 131
SELECTIVE FLOCCULATION AND FLOTATION
MAG. SEP.
SOLUBLE Fe RECOVERY (%)
SOLUBLE Fe ASSAY (%)
TEST GRIND
36 45'/KG
40 60'/KG
50 60'/KG + 45' REGRIND
100
90
80
70
60
50
40
30
20
40
45
50
55
60
65
70

Summary - Continued

4. Composites 130 - 132

4.2.2. Composite 130

A series of eight selective flocculation/flotation tests were conducted on Composite 130, of which the test conditions and results are tabulated in Table No. 6. The test results were not as good as those obtained on Composite 131. The best results were produced in Test 41 with no regrind before flotation. Magnetic separation alone produced a higher-grade product (Figure No. 7).

Fe Grade	Fe Recovery	
	Selective Flocc and Flotation	Magnetic Separation
68	-	44
66	-	45
64	-	46
62	-	47
60	46	48
58	51	49

Summary - Continued

Selective Flocculation and Flotation

Table No. 6 - Composite 130 - Conditions

Test No.	Primary Grind min	Weight g.	Regrind minutes	Flotation Reagents lb/t				pH	Flot. Time (min.)	
				NaOH	Starch	MG98	MIBC		Rougher	Cleaner
35	45	1000	0	0.2	3.0 *	0.30	0.01	9.5	6	7
41	60	1000	0	0.2	1.1	0.63	0.01	9.5	20	3
43	60	1000	0	0.2	1.25	0.49 0.27 ***	0.01	9.5	19	3
44	30	1000	60	0.2	1.1	0.60	0.01	9.5	16	7
45	60	1000	60	-	1.1	0.70	0.01	8.3	16	6
47	120 95% -400 mesh	1000	0	0.1	1.0	0.50	0.01	9.5	19	6
48	60	1000	120	0.1	1.0	0.60 **	0.04	9.5	14	4
49	30	1000	60	0.6	1.1	0.62	0.01	10.5	16	6

* WW92 Dextrin

** MG83

*** Duomeen L11

Summary - Continued

Selective Flocculation and Flotation

Table No. 6 - Composite 130 - Results

Test No.	Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
35	Fe Concentrate	30.9	52.1	55.8
	Fe 2nd Cl. Tailing	19.1	29.5	19.5
	Fe 1st Cl. Tailing	10.6	21.1	7.8
	Fe Rougher Tailing	9.2	23.9	7.7
	Slime 1 and 2	30.2	8.8	9.2
41	Fe Concentrate	20.9	60.9	43.9
	Fe Scav. 1 Conc.	15.6	42.3	22.7
	Fe Tailing	11.8	5.5	2.2
	Slime 1 and 2	33.2	8.1	9.4
43	Fe Concentrate	18.8	61.4	40.6
	Fe Scav. 1 Conc.	15.9	46.6	26.0
	Fe Tailing	10.4	6.6	2.4
	Slime 1 to 3	36.0	8.0	9.9
44	Fe Concentrate	17.9	63.0	38.7
	Fe Scav. 1 Conc.	24.4	36.8	30.8
	Fe Tailing	14.9	4.3	2.2
	Slime 1 and 2	21.6	8.9	6.5
45	Fe Concentrate	13.7	67.0	31.8
	Fe Conc. + Slime 4	16.4	61.5	35.0
	Fe Rougher Conc.	20.2	58.9	41.3
	Fe Scav. 1 Conc.	21.7	42.5	32.0
	Fe Tailing	2.8	5.1	0.5
	Slime 3	5.5	8.7	1.7
	Slime 1 and 2	31.0	7.6	8.1
47	Fe Concentrate	11.1	61.7	23.5
	Fe Rougher Conc.	19.3	59.2	39.1
	Fe Scav. 1 Conc.	19.6	46.6	31.3
	Fe Tailing	10.5	9.7	3.5
	Slime 1+2+3	36.4	7.0	8.8
48	Fe Concentrate	13.5	60.8	27.8
	Fe Rougher Conc.	17.9	58.0	35.2
	Fe Scav. 1 Conc.	32.7	37.8	41.9
	Fe Tailing	2.4	14.2	1.2
	Slime 1 and 2	29.4	7.6	7.5
49	Fe Concentrate	16.2	61.4	34.1
	Fe Scav. 1 Conc.	16.1	48.8	26.9
	Fe Tailing	24.9	7.1	6.1
	Slime 1 and 2	24.8	10.0	8.5

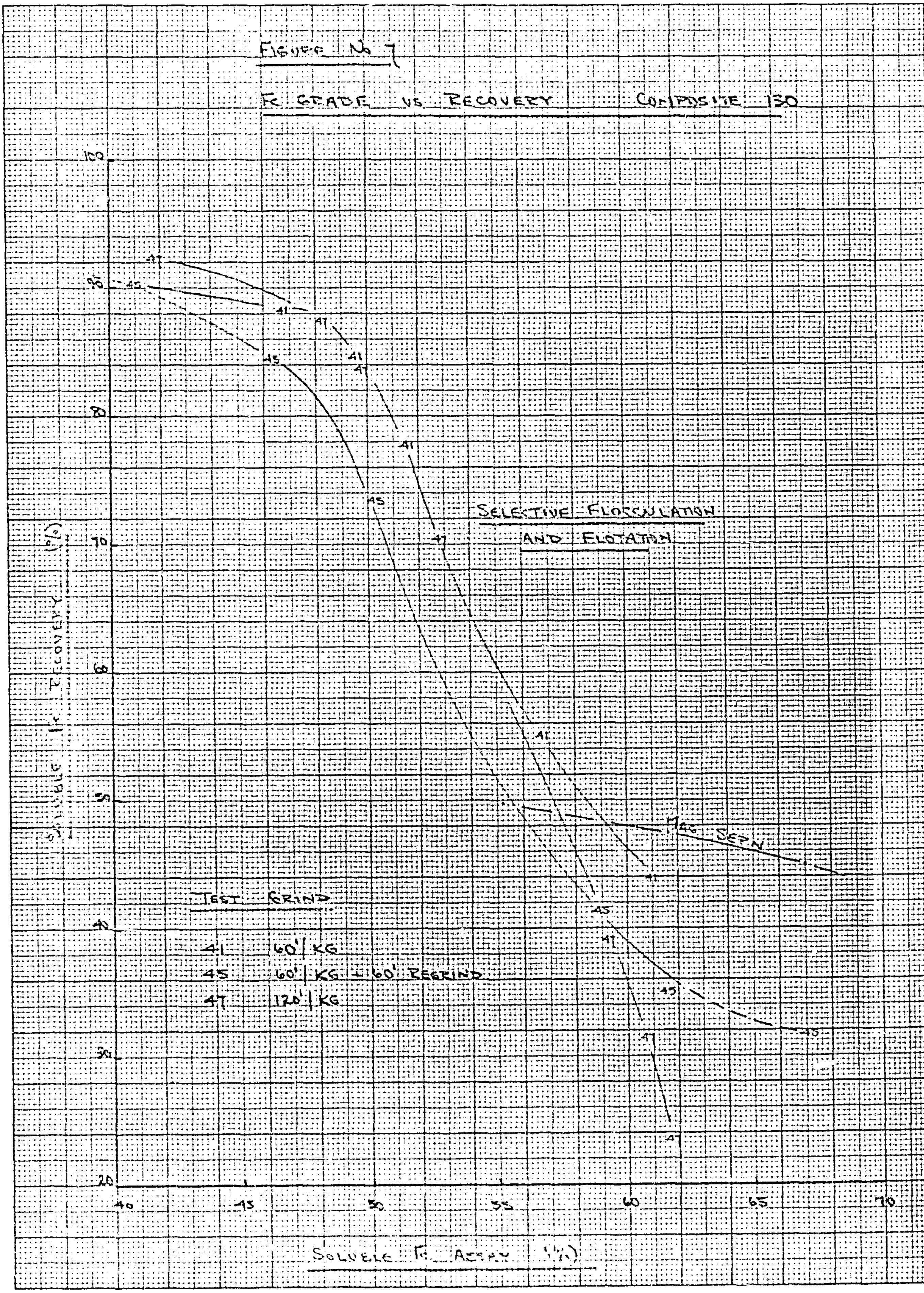


FIGURE No 7
Fe GRADE VS RECOVERY COMPOSITE 130
SELECTIVE FLOCCULATION
AND FLOTATION
MAG SEPN
TEST GRIND
41 60' KG
45 60' KG + 60' REGRIND
47 120' KG
SOLUBLE Fe ASSAY (%)
SOLUBLE Fe RECOVERY (%)
100
90
80
70
60
50
40
30
20
40
45
50
55
60
65
70

Summary - Continued

5. Concentrate Analysis

Analysis of the Fe concentrates from Composites 130 and 131 showed that although the concentrate from Test 43 (Composite 130) assayed 61.7 % soluble Fe, it contained only 4.5 SiO_2. The concentrate from Test 40 (Composite 131) assayed 67.5 % soluble Fe and contained 5.0 % SiO_2. Ankerite $Ca(Fe, Mg, Mn)(CO_3)_2$ was identified as a major gangue constituent in the concentrate from Composite 130.

Concentrate Analysis

Composite 130

Test 43	Fe Concentrate	Fe Scav. Concentrate 1
Fe (Sol)	61.7 %	46.6 %
Fe (Total)		48.4 %
SiO_2	4.52 %	20.0 %
K_2O	0.006 %	0.010 %
Na_2O	0.010 %	0.019 %
MnO_2	1.26 %	1.50 %
CaO	2.67 %	2.87 %
Al_2O_3	< 0.05 %	0.07 %
MgO	1.48 %	3.04 %
LOI	2.71 %	4.83 %
S	-	0.123 %

Composite 131

Fe Concentrate	Test 39	Test 40
Fe (Sol.)	66.5 %	67.5 %
SiO_2	7.70 %	4.96 %
K_2O	0.007 %	0.006 %
Na_2O	0.015 %	0.011 %

DISCUSSION AND RECOMMENDATIONS

The selective flocculation/flotation procedure which was used to recover additional hematite from the ore was successful for Composite 131 but was unsuccessful for Composite 130 because the flotation response of Composite 130 was not good. It may be warranted to evaluate the merits of additional collectors under varied process conditions, in order to determine the most effective reagent and process combination for Composite 130.

SAMPLE PREPARATION

The samples were jaw-crushed, cone-crushed and riffled to produce a predetermined weight per foot. The composite samples were combined, roll-crushed to minus 10 mesh, and riffled into 2 kilogram charges.

Composite 125 (Sample Numbers) - 751 g per sample

DDH	75 - 12	75 - 13	75 - 14
Footage	20 - 160	2 - 90	2 - 50
	1821A	1848A	1865A
	1822A	1849A	1866A
	1823A	1850A	1867A
	1824A	1851A	1868A
	1825A	1852A	1869A
	1826A	1853A	
	1827A	1854A	
	1828A	1855A	
	1829A	1856A	
	1830A		
	1831A		
	1832A		
	1833A		
	1834A		

Sample Preparation - Continued

Sample 126 (Sample Number) - 600 g per sample

DDH	75 - 01	75 - 02	75 - 03	75 - 18
Footage	51 - 230	2 - 108	4 - 105	5 - 40
	1701A	1720A	1731A	1900A
	1702A	1721A	1732A	1901A
	1703A	1722A	1733A	1902A
	1704A	1723A	1734A	1903A
	1705A	1724A	1735A	1904A
	1706A	1725A	1736A	1905A
	1707A	1726A	1737A	1906A
	1708A	1727A	1738A	
	1709A	1728A	1739A	
	1710A	1729A	1740A	
	1711A	1730A		
	1712A			
	1713A			
	1714A			
	1715A			
	1716A			
	1717A			
	1718A			

Sample Preparation - Continued

Composite 127 (Sample Number) - 500 g per sample

DDH	75 - 04	75 - 05	75 - 06	75 - 19
Footage	26 - 168	94 - 252	0 - 156	4 - 144
	1741A	1755A	1771A	1914A
	1742A	1756A	1772A	1915A
	1743A	1757A	1773A	1916A
	1744A	1758A	1774A	1917A
	1745A	1759A	1775A	1918A
	1746A	1760A	1776A	1919A
	1747A	1761A	1777A	1920A
	1748A	1762A	1778A	1921A
	1749A	1763A	1779A	1922A
	1750A	1764A	1780A	1923A
	1751A	1765A	1781A	1924A
	1752A	1766A	1782A	1925A
	1753A	1767A	1783A	1926A
	1754A	1768A	1784A	1927A
		1769A	1785A	1928A
		1770A	1786A	1929A
				1930A
				1931A
				1932A
				1933A
				1934A
				1935A
				1936A
				1937A
				1938A
				1939A
				1940A
				1941A

Sample Preparation - Continued

Composite 128 (Sample Numbers) - 600 g per sample

DDH	75 - 16	75 - 17
Footage	170 - 300	82 - 155
	189A 190A 191A 192A 193A 194A 195A 196A 197A 198A 199A 200A 219A 220A 221A 222A 223A 224A 225A 226A 227A 228A 229A 230A 231A 232A	1885A 1886A 1887A 1888A 1889A 1890A 1891A 1892A 1893A 1894A 1895A 1896A 1897A 1898A

Sample Preparation - Continued

Composite 129 (Sample Numbers) - 1500 g per sample

DDH	75 - 15
Footage	220 - 380
	233A 234A 235A 236A 237A 238A 239A 240A 241A 242A 243A 244A 245A 246A 247A 248A

Composite 130 (Sample Numbers

DDH	75 - 01	75 - 02	75 - 12	75 - 14
Footage	295 - 345	163 - 487	220 - 330	70 - 130
	22B 23A	40B 41B 42B 43B 44B 45B 46B 47B 48B 49B 50B 51B 52B 53B 54B 55B	1836A 1837A 1838A 1839A 1840A 1841A 1842A 1843A 1844A 1845A	1872A 1873A 1874A 1875A 1876A 1877A

Sample Preparation - Continued

Composite 131 (Sample Numbers)

DDH	75 - 12
	217A

Composite 132 (Sample Numbers)

DDH	75 - 02	75 - 08
Footage	109 - 163	
	37B 38B 39B	161E

Screen Analysis

Composite 125

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 10	0.5	0.5	99.5
14	14.4	14.9	85.1
20	25.0	39.9	60.1
28	18.3	58.2	41.8
35	11.0	69.2	30.8
48	9.2	78.4	21.6
65	4.9	83.3	16.7
100	4.4	87.7	12.3
150	2.5	90.2	9.8
200	2.6	92.8	7.2
270	1.5	94.3	5.7
400	1.8	96.1	3.9
- 400	3.9	100.0	-
Total	100.0	-	-

Composite 126

+ 10	0.3	0.3	99.7
14	13.8	14.1	85.9
20	26.8	40.9	59.1
28	20.0	60.9	39.1
35	11.1	72.0	28.0
48	8.8	80.8	19.2
65	4.6	85.4	14.6
100	3.8	89.2	10.8
150	2.2	91.4	8.6
200	2.3	93.7	6.3
270	1.3	95.0	5.0
400	1.6	96.6	3.4
- 400	3.4	100.0	-
Total	100.0	-	-

Screen Analysis

Composite 127

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 10	1.0	1.0	99.0
14	21.0	22.0	78.0
20	28.5	50.5	49.5
28	17.2	67.7	32.3
35	9.2	76.9	23.1
48	6.9	83.8	16.2
65	3.7	87.5	12.5
100	3.2	90.7	9.3
150	1.8	92.5	7.5
200	1.8	94.3	5.7
270	1.2	95.5	4.5
400	1.1	96.6	3.4
- 400	3.4	100.0	-
Total	100.0	-	-

Composite 128

+ 10	0.2	0.2	99.8
14	9.5	9.7	90.3
20	21.9	31.6	68.4
28	19.3	50.9	49.1
35	12.2	63.1	36.9
48	10.5	73.6	26.4
65	5.7	79.3	20.7
100	3.0	87.2	12.8
150	3.0	87.2	12.8
200	3.2	90.4	9.6
270	1.9	92.3	7.7
400	2.4	94.7	5.3
- 400	5.3	100.0	-
Total	100.0	-	-

Screen Analysis

Composite 129

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumuative
+ 10	0.2	0.2	99.8
14	13.4	13.6	86.4
20	25.3	38.9	61.1
28	19.0	57.9	42.1
35	10.9	68.8	31.2
48	9.1	77.9	22.1
65	4.9	82.8	17.2
100	4.1	86.9	13.1
150	2.4	89.3	10.7
200	2.5	91.8	8.2
270	1.4	93.2	6.8
400	1.9	95.1	4.9
- 400	4.9	100.0	-
Total	100.0	-	-

Composite 130

+ 10	1.1	1.1	98.9
14	24.7	25.8	74.2
20	27.1	52.9	47.1
28	15.0	67.9	32.1
35	8.2	76.1	23.9
48	6.9	83.0	17.0
65	4.1	87.1	12.9
100	3.3	90.4	9.6
150	1.9	92.3	7.7
200	1.9	94.2	5.8
270	1.2	95.4	4.6
400	1.5	96.9	3.1
- 400	3.1	100.0	-
Total	100.0	-	-

Screen Analysis

Composite 131

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 10	0.8	0.8	99.2
14	18.0	18.8	81.2
20	25.1	43.9	56.1
28	16.5	60.4	39.6
35	9.7	70.1	29.9
48	8.2	78.3	21.7
65	4.5	82.8	17.2
100	4.1	86.9	13.1
150	2.5	89.4	10.6
200	2.7	92.1	7.9
270	1.6	93.7	6.3
400	2.1	95.8	4.2
- 400	4.2	100.0	-
Total	100.0	-	-

Composite 132

+ 10	0.3	0.3	99.7
14	11.0	11.3	88.7
20	21.8	33.1	66.9
28	18.2	51.3	48.7
35	12.3	63.6	36.4
48	11.2	74.8	25.2
65	6.5	81.3	18.7
100	5.5	86.8	13.2
150	3.2	90.0	10.0
200	3.1	93.1	6.9
270	1.7	94.8	5.2
400	1.9	96.7	3.3
- 400	3.3	100.0	-
Total	100.0	-	-

Sample Preparation - Continued

Starch Preparation Procedure

Add 1.0 gram of pearl starch (corn starch) to 99 ml. of 0.5 % sodium hydroxide solution and heat with agitation to 84°C. Cool to room temperature before using.

DETAILS OF TESTS

Grinding and Davis Tube Tests

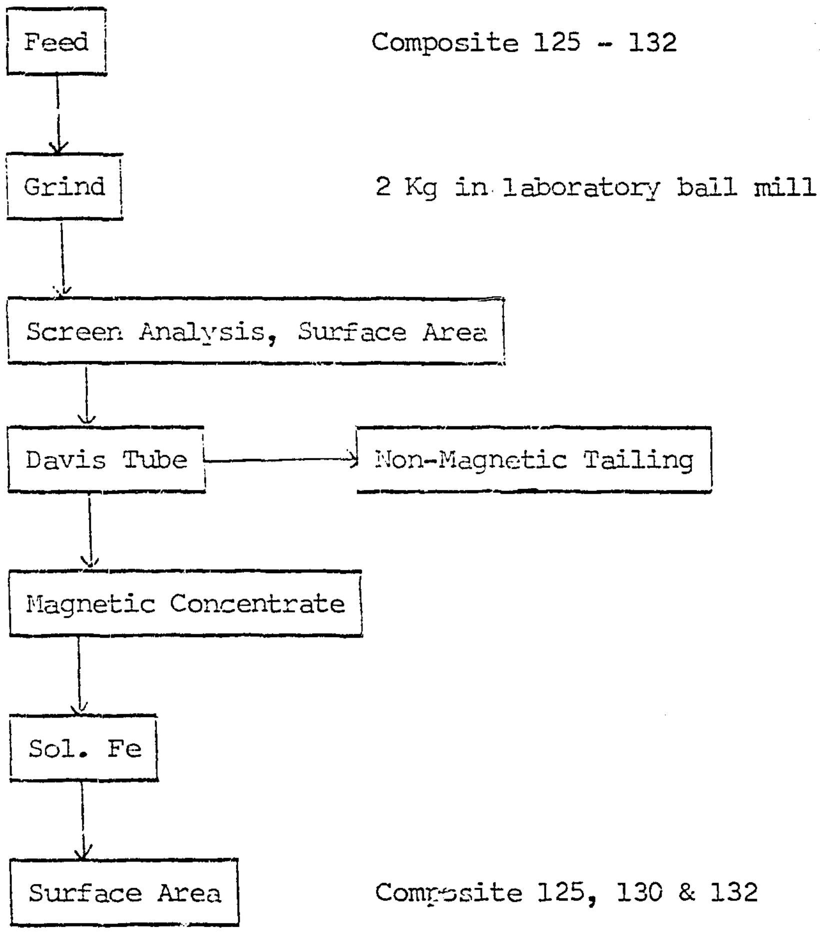
1. Purpose: To determine the relationship between grinding size and Davis tube concentrate grade for each of the Composites 125 - 132.

2. Procedure: A sample of 2000 grams of each of the Composites 125 - 132 was ground at 66 % solids in a laboratory ball mill containing 28 lb steel balls. The ground product was filtered, dried and riffled to obtain a sample for screen analysis and for surface area determination using a Permeran (Outokumpu Oy). A second sample was riffled out for Davis tube testing under the following conditions:

Feed Weight:	10 grams
Water Flow:	1 liter per minute
Oscillations:	100 strokes per minute
Current to coils:	2 amperes
Time:	5 minutes

Both the Davis tube concentrate and tailing were assayed for soluble Fe. Work indices were calculated for each of the grinding tests.

Flowsheet


Feed
Composite 125 - 132
Grind
2 Kg in laboratory ball mill
Screen Analysis, Surface Area
Davis Tube
Non-Magnetic Tailing
Magnetic Concentrate
Sol. Fe
Surface Area
Composite 125, 130 & 132

Grinding and Davis Tube Tests - Continued

Results

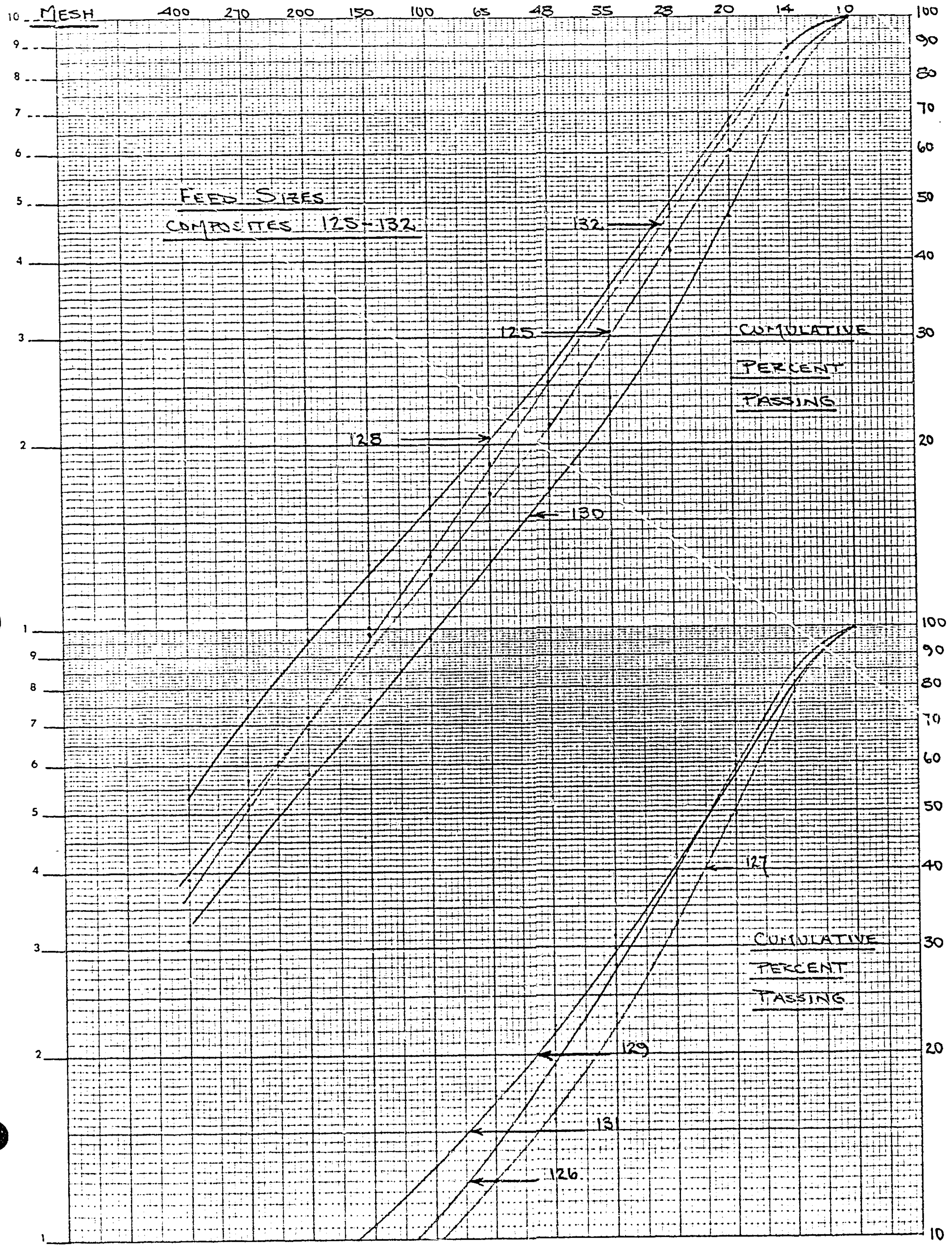
Composite No.	Grind min./ 2 Kg	Surface Area cm^2/gm	% -400 mesh	Head Assay, % Sol. Fe.	Head Assay, % Mag. Fe.	Concentrate Weight %	Concentrate Assay, % sol. Fe	Concentrate % Rec'y sol. Fe	Tailing Assay, % sol. Fe
QUC 125	40'	2172	52	28.8	23.5	40.3	58.2	81.4	9.0
	60'	2770	64	28.8	23.4	36.9	62.0	79.5	9.4
	90'	4303	90	28.8	22.5	33.5	67.3	78.3	9.4
	120'	5170	96	28.8	22.6	32.8	68.8	78.4	9.3
QUC 126	90'	4387	89	31.0	23.2	33.3	67.8	72.8	12.6
	120'	5351	96	31.0	22.7	32.9	69.0	73.2	12.4
QUC 127	90'	4347	89	30.9	22.3	32.3	68.0	71.1	13.2
	120'	5233	96	30.9	21.9	31.8	68.9	70.9	13.2
QUC 128	90'	3746	93	31.5	26.4	36.3	70.2	80.9	9.4
	120'	4412	97	31.5	25.5	36.1	70.6	80.9	9.4
QUC 129	90'	3661	92	31.9	24.8	34.9	69.5	76.0	11.7
	120'	4256	97	31.9	23.9	34.2	69.9	74.7	12.1
QUC 130	40'	2026	52	28.4	14.1	25.6	55.2	49.8	19.2
	60'	2618	66	28.4	12.8	22.0	61.6	47.7	19.0
	90'	4038	91	28.4	12.5	19.1	67.0	45.1	19.3
	120'	4784	96	28.4	12.8	18.3	68.5	44.1	19.4
QUC 131	20'*	1513	52	31.5	19.3	32.7	59.0	61.2	18.1
	30'*	1953	63	31.5	16.2	29.7	62.3	58.7	18.5
	90'	3010	90	31.5	16.6	25.2	67.8	54.2	19.3
	120'	3521	95	31.5	17.1	24.2	68.4	52.5	19.7
QUC 132	90'	5093	86	31.7	10.5	16.1	65.4	33.2	25.2
	120'	6152	94	31.7	10.6	16.0	66.6	33.6	25.1

* 1 Kg Charges

Grinding and Davis Tube Tests - Continued

Work Index Calculations

Composite	Grind Min./2 Kg	Product %-400 mesh	Product $K_{80}/\mu m$	Power Input kWh/st	Work Index
125	Feed	3.9	1128	-	-
	40	52	79.2	12.44	14.9
	60	64	57.8	18.66	18.2
	90	90	29	27.99	17.9
	120	96	22	37.32	20.3
126	Feed	3.4	1089	-	-
	90	89	29	27.99	17.9
	120	-	21	37.32	20.3
127	Feed	3.4	1209	-	-
	90	89	29	27.99	17.9
	120	-	22	37.32	20.3
128	Feed	5.3	1017	-	-
	90	93	26.5	27.99	17.3
	120	-	20.5	37.32	19.9
129	Feed	4.9	1168	-	-
	90	92	28	27.99	17.7
	120	-	22	37.32	20.3
130	Feed	3.1	1209	-	-
	40	52	81.9	12.44	15.4
	60	66	55.8	18.66	17.8
	90	91	28	27.99	17.6
	120	96	21	37.32	19.8
131	Feed	4.2	1168	-	-
	40	52	76.6	12.44	14.7
	60	63	57.8	18.66	18.3
	90	90	-	27.99	18.2
	120	95	23.5	37.32	21.0
132	Feed	3.3	1017	-	-
	90	86	32	27.99	19.6
	120	94	25	37.32	22.2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200
150
100
65
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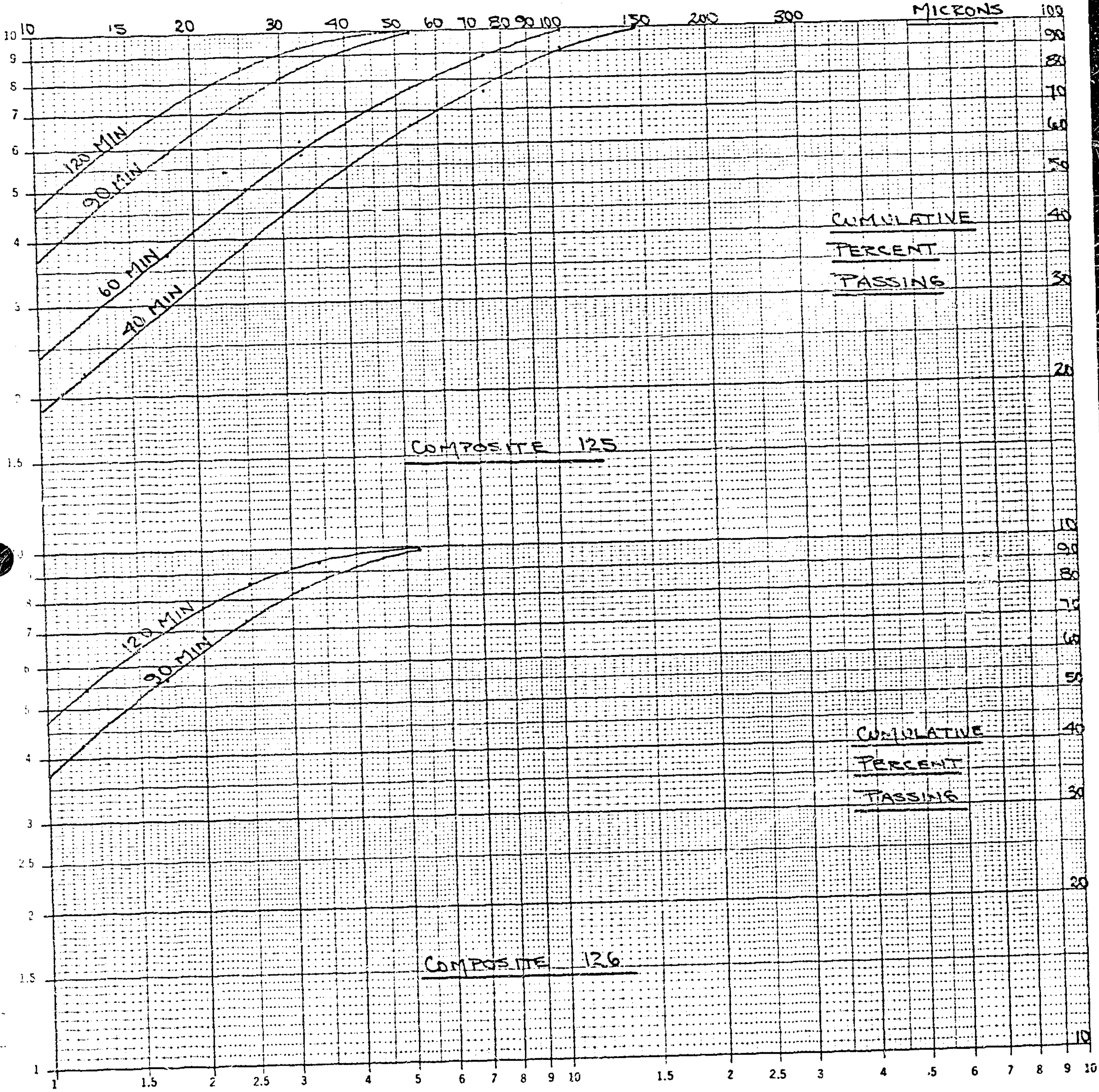
35
28
20
14
10
FEED SIZES
COMPOSITES 125-132
132
125
128
130
CUMULATIVE PERCENT PASSING
127
CUMULATIVE PERCENT PASSING
129
131
126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20
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100
150
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300
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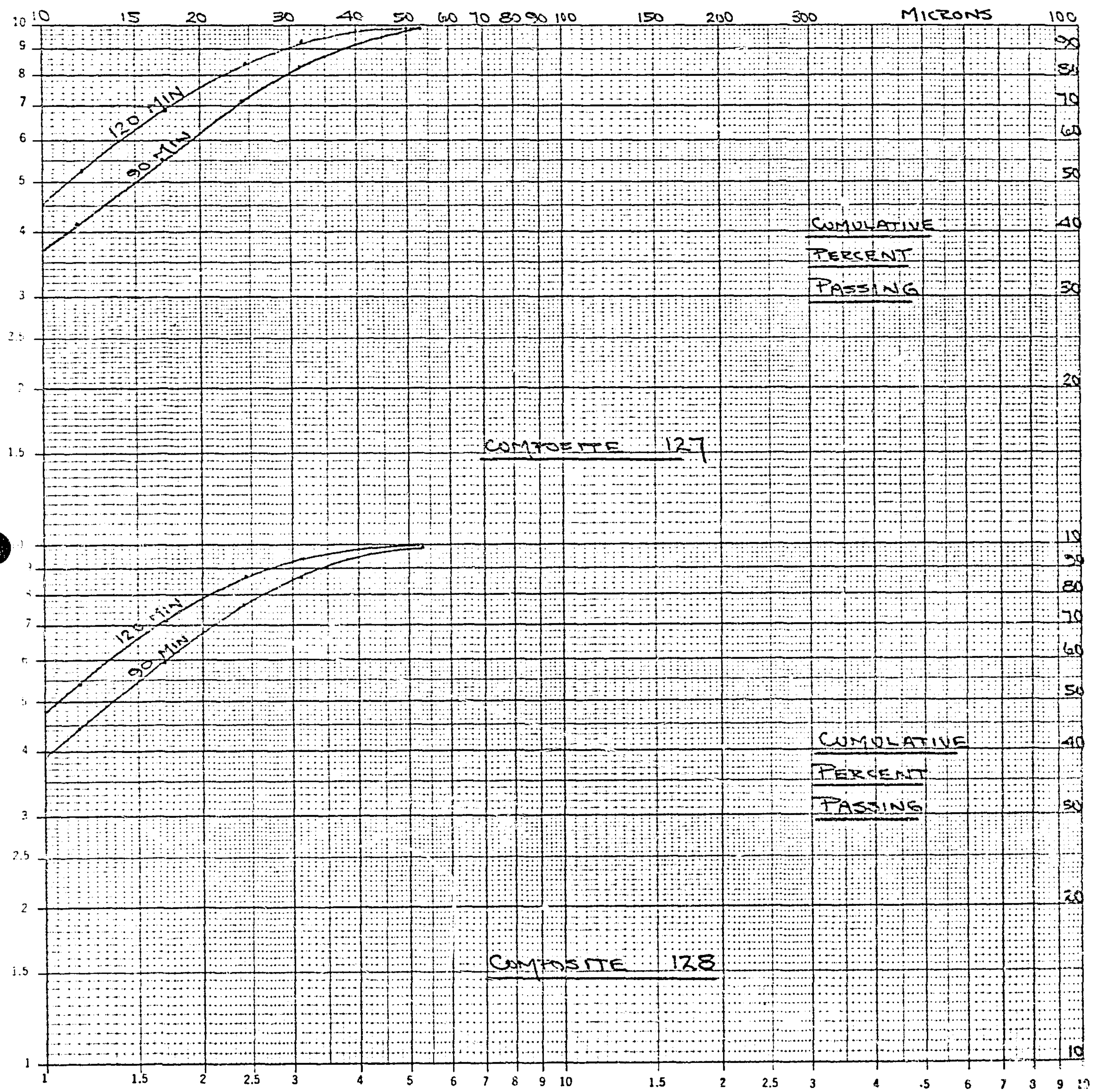
CUMULATIVE PERCENT PASSING
COMPOSITE 125
120 MIN
90 MIN
CUMULATIVE PERCENT PASSING
COMPOSITE 126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15
20
30
40
50
60
70
80
90
100
150
200
300
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90 MIN
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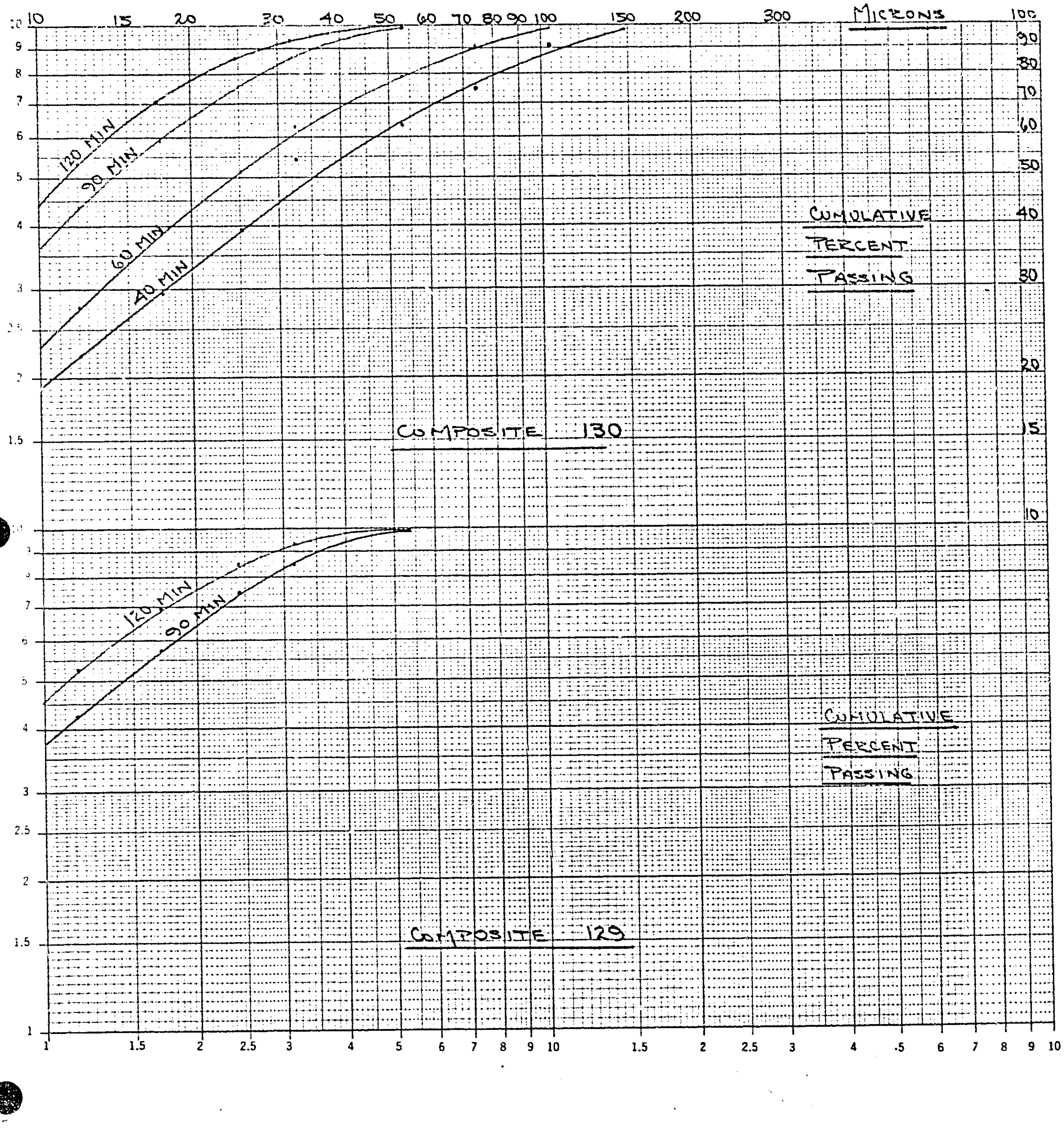
PERCENT
PASSING
COMPOSITE 127
120 MIN
90 MIN
CUMULATIVE
PERCENT
PASSING
COMPOSITE 128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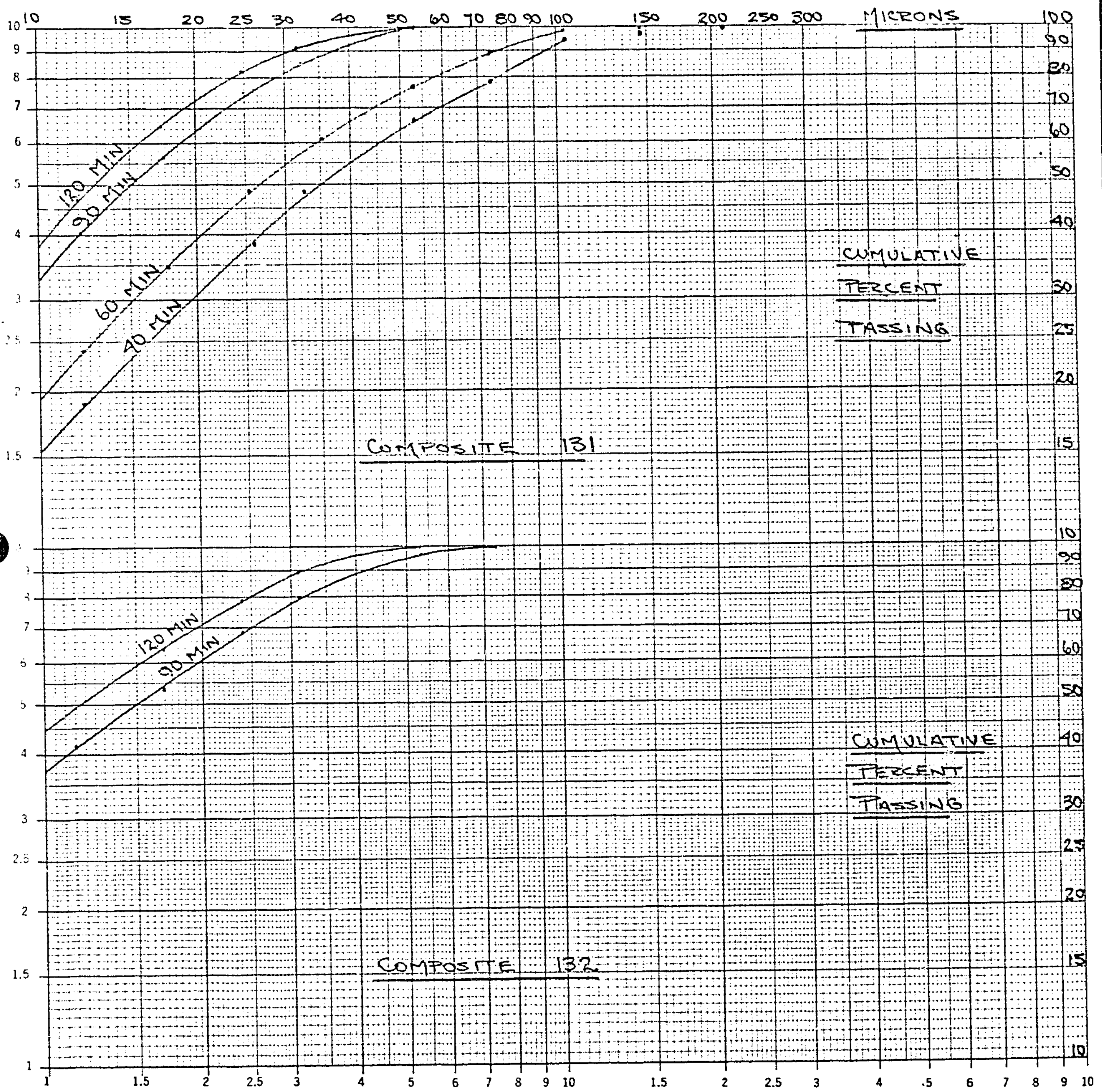
120 MIN
90 MIN
60 MIN
40 MIN
CUMULATIVE PERCENT PASSING
COMPOSITE 130
120 MIN
90 MIN
CUMULATIVE PERCENT PASSING
COMPOSITE 129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40 MIN
CUMULATIVE
PERCENT
PASSING
COMPOSITE 131
120 MIN
90 MIN
CUMULATIVE
PERCENT
PASSING
COMPOSITE 132

Grinding and Davis Tube Tests - Continued

Screen Analysis

Comp 125 40' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100 mesh	1.2	1.2	98.8
150	7.0	8.2	91.8
200	15.8	24.0	76.0
270	10.4	34.4	65.6
32.7 µm	7.4	41.8	58.2
25.4	19.1	60.9	39.1
17.7	9.5	70.4	29.6
12.2	7.2	77.6	22.4
9.4	3.5	81.1	18.9
- 9.4	18.9	100.0	-
Total	100.0	-	-

Specific Gravity 3.35

Comp 125 60' min./2 Kg

+ 150 mesh	1.2	1.2	98.8
200	9.2	10.4	89.6
270	11.8	22.2	77.8
32.7 µm	16.2	38.4	61.6
25.4	11.6	50.0	50.0
17.7	12.1	62.1	37.9
12.2	9.5	71.6	28.4
9.4	4.7	76.3	23.7
- 9.4	23.7	100.0	-
Total	100.0	-	-

Specific Gravity 3.35

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 125 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200 mesh	0.2	0.2	99.8
270	1.1	1.3	98.7
32.5 µm	13.3	14.6	85.4
25.2	10.5	25.1	74.9
17.6	16.4	41.5	58.5
12.1	14.6	56.1	43.9
9.3	7.3	63.4	36.6
- 9.3	36.6	100.0	-
Total	100.0	-	-

Specific Gravity 3.35

Composite QUC 125 120' min./2 Kg.

+ 270 mesh	0.2	0.2	99.8
32.5 µm	6.4	6.6	93.4
25.2	7.4	14.0	86.0
17.6	15.2	29.2	70.8
12.1	16.6	45.8	54.2
9.3	8.9	54.7	45.3
- 9.3	45.3	100.0	-
Total	100.0	-	-

Speceific Gravity 3.35

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 126 90' min/2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200	0.2	0.2	99.8
270	1.0	1.2	98.8
31.2 μm	14.9	16.1	83.9
24.2	10.9	27.0	73.0
16.9	16.4	43.4	56.6
11.6	14.2	57.6	42.4
9.0	7.0	64.6	35.4
- 9.0	35.4	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Composite 126 120' min./2 Kg

+ 270	0.1	0.1	99.9
32.0 μm	6.2	6.3	93.7
24.8	7.4	13.7	86.3
17.3	15.2	28.9	71.1
11.9	16.4	45.3	54.7
9.2	8.9	54.2	45.8
- 9.2	45.8	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 127 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200	0.2	0.2	99.8
270	1.4	1.6	98.4
31.2 µm	15.4	17.0	83.0
24.2	11.4	28.4	71.6
16.9	16.2	44.6	55.4
11.6	13.8	58.4	41.6
9.0	6.8	65.2	34.8
- 9.0	34.8	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Composite 127 120' min./ 2 Kg

+ 270 mesh	0.2	0.2	99.8
31.8 µm	7.2	7.4	92.6
24.6	8.2	15.6	84.4
17.2	15.8	31.4	68.6
11.8	16.2	47.6	52.4
9.1	8.6	56.2	43.8
- 9.1	43.8	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite 128 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 270	0.6	0.6	99.4
31.2 µm	13.3	13.9	86.1
24.2	10.0	23.9	76.1
16.9	16.5	40.4	59.6
11.6	15.4	55.8	44.2
9.0	8.0	63.8	36.2
- 9.0	36.2	100.0	-
Total	100.0	-	-

Specific Gravity 3.44

Composite QUC 128 120' min./2 Kg

+ 270 mesh	0.1	0.1	99.9
31.5 µm	6.2	6.3	93.7
24.4	7.3	13.6	86.4
17.0	15.2	28.8	71.2
11.7	17.1	45.9	54.1
9.1	9.6	55.5	44.5
- 9.1	44.5	100.0	-
Total	100.0	-	-

Specific Gravity 3.44

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 129 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 270 mesh	0.8	0.8	99.2
31.3 µm	13.9	14.7	85.3
24.3	10.9	25.6	74.4
17.0	16.8	42.4	57.6
11.7	15.0	57.4	42.6
9.0	7.7	65.1	34.9
- 9.0	34.9	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Composite QUC 129 120' min./ 2 Kg

+ 270 mesh	0.1	0.1	99.9
31.5 µm	6.9	7.0	93.0
24.4	8.0	15.0	85.0
17.0	15.8	30.8	69.2
11.7	16.8	47.6	52.4
9.1	9.2	56.8	43.2
- 9.1	43.2	100.0	-
Total	100.0	-	-

Specific Gravity 3.45

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite 130 40' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100 mesh	1.6	1.6	98.4
150	7.2	8.8	91.2
200	15.9	24.7	75.3
270	11.8	36.5	63.5
32.4 µm	9.2	45.7	54.3
25.1	15.2	60.9	39.1
17.5	9.6	70.5	29.5
12.0	7.3	77.8	22.2
9.3	3.6	81.4	18.6
- 9.3	18.6	100.0	-
Total	100.0	-	-

Specific Gravity 3.38

Composite 130 60' min./2 Kg

+ 150 mesh	1.0	1.0	99.0
200	8.4	9.4	90.6
270	11.6	21.0	79.0
32.4 µm	16.0	37.0	63.0
25.1	11.6	48.6	51.4
17.5	12.6	61.2	38.8
12.0	10.1	71.3	28.7
9.3	5.0	76.3	23.7
- 9.3	23.7	100.0	-
Total	100.0	-	-

Specific Gravity 3.38

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite 130 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200 mesh	0.2	0.2	99.8
270	1.1	1.3	98.7
32.1 µm	12.3	13.6	86.4
24.9	10.6	24.2	75.8
17.4	16.8	41.0	59.0
12.0	15.3	56.3	43.7
9.2	7.7	64.0	36.0
- 9.2	36.0	100.0	-
Total	100.0	-	-

Specific Gravity 3.38

Composite QUC 130 120' min./2 Kg

+ 270 mesh	0.2	0.2	99.8
31.9 µm	6.3	6.5	93.5
24.7	7.5	14.0	86.0
17.2	15.7	29.7	70.3
11.9	17.2	46.9	53.1
9.2	9.3	56.2	43.8
- 9.2	43.8	100.0	-
Total	100.0	-	-

Specific Gravity 3.38

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite 131 20' min./1 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65 mesh	0.2	0.2	99.8
100	0.7	0.9	99.1
150	5.0	5.9	94.1
200	15.5	21.4	78.6
270	12.3	33.7	66.3
32.6 µm	17.8	51.5	48.5
26.0	10.1	61.6	38.4
17.6	11.1	72.7	27.3
12.1	8.4	81.1	18.9
9.4	3.9	85.0	15.0
- 9.4	15.0	100.0	-
Total	100.0	-	-

Specific Gravity 3.41

Composite 131 30' min./1 Kg

+ 100 mesh	0.2	0.2	99.8
150	1.2	1.4	98.6
200	9.2	10.6	89.4
270	12.6	23.2	76.8
32.7 µm	16.2	39.4	60.6
25.3	12.3	51.7	48.3
17.7	13.6	65.3	34.7
12.2	10.7	76.0	24.0
9.4	5.0	81.0	19.0
- 9.4	19.0	100.0	-
Total	100.0	-	-

Specific Gravity 3.41

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 131 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200 mesh	0.1	0.1	99.9
270	0.8	0.9	99.1
32.1 µm	13.3	14.2	85.8
24.9	11.0	25.2	74.8
17.4	18.1	43.3	56.7
12.0	16.6	59.9	40.1
9.2	8.2	68.1	31.9
- 9.2	31.9	100.0	-
Total	100.0	-	-

Specific Gravity 3.41

Composite QUC 131 120' min./2 Kg

+ 270 mesh	0.2	0.2	99.8
31.9 µm	8.6	8.8	91.2
24.7	8.8	17.6	82.4
17.2	17.4	35.0	65.0
11.9	18.1	53.1	46.9
9.2	9.5	62.6	37.4
- 9.2	37.4	100.0	-
Total	100.0	-	-

Specific Gravity 3.41

Grinding and Davis Tube Tests - Continued

Screen Analysis

Composite QUC 132 90' min./2 Kg

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 200 mesh	0.6	0.6	99.4
270	3.1	3.7	96.3
31.0 µm	16.4	20.1	79.9
24.0	11.6	31.7	68.3
16.8	14.8	46.5	53.5
11.5	11.9	58.4	41.6
8.9	5.8	64.2	35.8
- 8.9	35.8	100.0	-
Total	100.0	-	-

Specific Gravity 3.60

Composite QUC 132 120' min./2 Kg

+ 270 mesh	0.6	0.6	99.4
31.0 µm	10.7	11.3	88.7
24.0	9.8	21.1	78.9
16.8	15.6	36.7	63.3
11.5	13.9	50.6	49.4
8.9	6.9	57.5	42.5
- 8.9	42.5	100.0	-
Total	100.0	-	-

Specific Gravity 3.60

Magnetic Separation

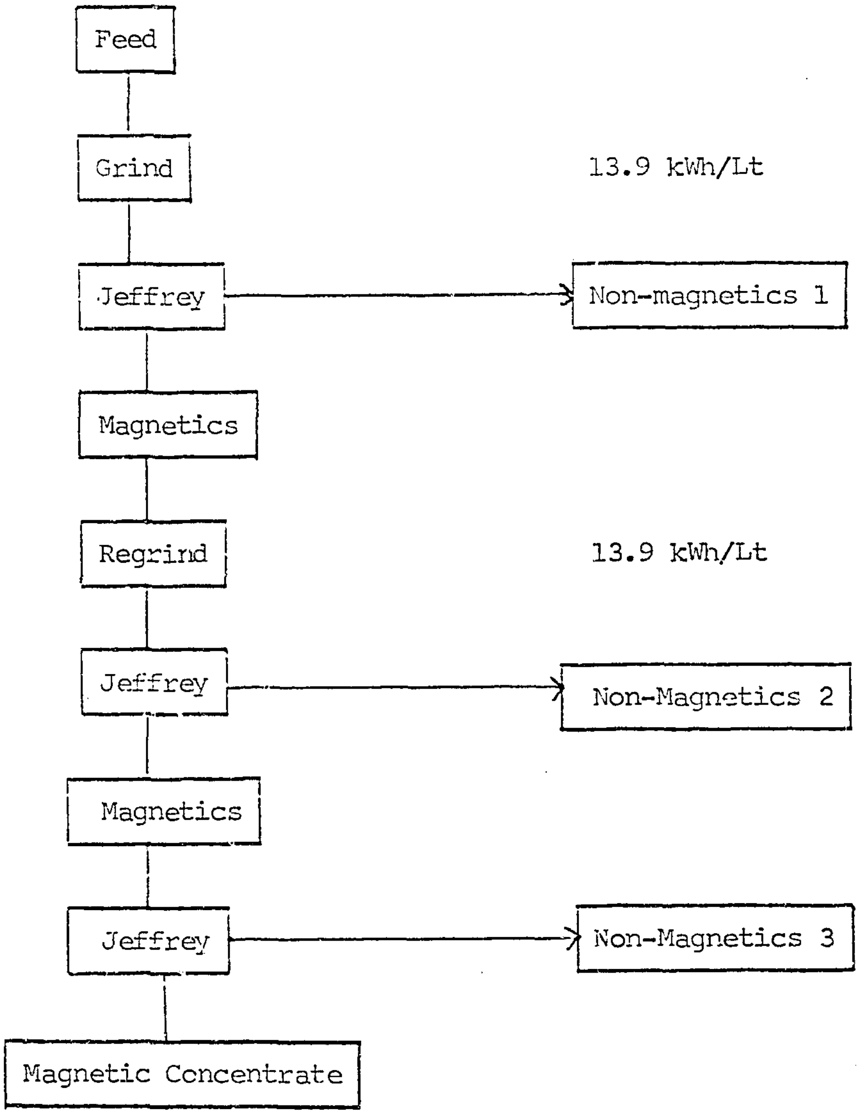
Tests No. J1 to J5

1. Purpose: To conduct a series of larger scale magnetic separation tests on Composites 123 - 129, to confirm the Davis tube results and also to reduce the grinding power requirements by including a regrind in the flowsheet.

2. Procedure: A 2000 grams charge of -10 mesh ore was ground at 66 % solids in a laboratory ball mill containing 28 lb steel balls (1.39 kWh/lt). The ground product was passed through a Jeffrey magnetic separator at 2 amperes. The magnetic concentrate was reground in the same ball mill (13.9 kWh/Lt) and cleaned twice on the Jeffrey separator at 2 amperes.

Tests No. J1 to J5 - Continued

Flowsheet



Tests No. J1 to J5 - Continued

Test No.	Comp. No.	Product	Weight %	Assays, % Sol. Fe	Assays, % Mag. Fe	% Recovery Sol. Fe	% Recovery Mag. Fe	Surface Area cm_2/g	% -400 mesh
J1	125	Conc.	33.5	67.3	67.1	75.9	95.4	2374	89.6
		Non-Mags. 3	2.9	17.5	7.2	1.7	0.9	3223	
		Non-Mags. 2	12.4	14.1	3.8	5.9	2.0		
		Non-Mags. 1	51.2	9.6	0.8	16.5	1.7		
		Head	100.0	29.7	23.6	100.0	100.0		
J2	126	Conc.	33.5	67.8	67.8	72.5	95.1	2566	98.6
		Non-Mags. 3	2.2	25.3	14.7	1.8	1.4	2657	
		Non-Mags. 2	11.9	15.3	3.0	5.8	1.5		
		Non-Mags. 1	52.4	11.9	0.9	19.9	2.0		
		Head	100.0	31.3	23.9	100.0	100.0		
J3	127	Conc.	31.4	67.5	67.3	67.1	93.8	2372	85.2
		Non-Mags. 3	0.9	45.8	36.9	1.3	1.5	2657	
		Non-Mags. 2	9.4	19.2	5.2	5.7	2.2		
		Non-Mags. 1	58.3	14.0	1.0	25.9	2.5		
		Head	100.0	31.6	22.5	100.0	100.0		
J4	128	Conc.	36.1	71.0	70.9	79.0	96.2	2219	92.0
		Non-Mags. 3	1.6	22.7	12.0	1.1	0.7	2906	
		Non-Mags. 2	6.9	15.0	3.7	3.2	1.0		
		Non-Mags. 1	55.4	9.8	1.0	16.7	2.1		
		Head	100.0	32.5	26.6	100.0	100.0		
J5	129	Conc.	34.1	71.8	70.9	74.6	96.4	2313	89.0
		Non-Mag. 3	1.9	19.5	7.2	1.1	0.6	3327	
		Non-Mag. 2	9.6	15.1	2.9	4.4	1.1		
		Non-Mag. 1	54.4	12.0	0.9	19.9	1.9		
		Head	100.0	32.8	25.1	100.0	100.0		

Flotation

Test No. J1A

Purpose: To upgrade the final Jeffrey concentrate from composite 125 by cationic flotation.

Procedure: As below.

Feed: 250 grams, final Jeffrey Concentrate from test J1

Conditions:

Stage	Reagents Added, pounds per ton		Time, Minutes			pH
	MG-83	MIBC	Grind	Cond.	Froth	
Rougher (1)	0.05	0.07	-	1	3	7.7
Rougher (2)	0.02	-	-	1	2	-
Scavenger	0.01	0.01	-	1	2	-

Metallurgical Results

Product	Weight % Individual	Weight % Overall	Assays, % Sol. Fe	% Distribution Sol. Fe Ind.	% Distribution Sol. Fe O'all
1. Fe Concentrate	95.0	31.8	67.7	96.1	73.0
2. Scav. Conc.	3.8	1.3	56.2	3.2	2.4
3. Scav. Tailing	1.2	0.4	39.9	0.7	0.5
Head (Calc.)	100.0	33.5	66.9	100.0	75.9

Calculated Grades and Recoveries

Products 1 and 2	98.8	33.1	67.3	99.3	75.4

Test No. J2A

Purpose: To upgrade the final Jeffrey concentrate for composite 126.

Procedure: As below.

Feed: 250 grams final Jeffrey concentrate from test J2.

Conditions:

Stage	Reagents Added, pounds per ton		Time, minutes			pH
	MG-83	MIBC	Grind	Cond.	Froth	
						7.7
Rougher (1)	0.05	0.02	-	1	3	-
Rougher (2)	0.02	-	-	1	2	-
Scavenger	0.01	0.01	-	1	2	-

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Ind.	Sol. Fe O'all
1. Fe Concentrate	96.6	32.4	68.4	97.5	70.7
2. Scav. Concentrate	2.0	0.7	55.1	1.6	1.2
3. Scav. Tailing	1.4	0.4	41.7	0.9	0.6
Head (Calculated)	100.0	33.5	67.8	100.0	72.5

Calculated Grades and Recoveries

Products 1 and 2	98.6	33.1	68.1	99.1	71.9

Test No. J3A

Purpose: To upgrade the final Jeffrey concentrate from composite 127.

Feed: 250 grams final Jeffrey concentrate from test J3

Conditions:

Stage	Reagents Added, pounds per ton		Time, minutes			pH
	MG83	MIBC	Grind	Cond.	Froth	
						7.7
Rougher (1)	0.05	0.02	-	1	3	-
Rougher (2)	0.02	-	-	1	2	-
Scavenger	0.01	0.01	-	1	2	-

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Ind.	Sol. Fe O'all
1. Fe Concentrate	91.6	28.8	69.0	92.8	62.3
2. Scav. Concentrate	5.3	1.7	62.2	4.8	3.2
3. Scav. Tailing	3.1	0.9	53.6	2.4	1.6
Head (Calculated)	100.0	31.4	68.2	100.0	67.1

Calculated Grades and Recoveries

Products 1 and 2	96.9	30.5	68.6	97.6	65.5

Test No. J4A

Purpose: To upgrade the final Jeffrey concentrate from composite 128.

Procedure: As below.

Feed: 250 grams final Jeffrey concentrate from test J4.

Conditions:

Stage	Reagents Added, pounds per ton		Time, minutes			pH
	MG-83	MIBC	Grind	Cond.	Froth	
						7.7
Rougher (1)	0.05	0.02	-	1	3	-
Rougher (2)	0.02	-	-	1	2	-
Scavenger	0.01	0.01	-	1	2	-

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Ind.	Sol. Fe O'all
1. Fe Concentrate	86.5	31.2	71.4	87.2	68.9
2. Scav. Concentrate	8.7	3.2	69.3	8.5	6.7
3. Scav. Tailing	4.8	1.7	64.1	4.3	3.4
Head (Calculated)	100.0	36.1	70.9	100.0	79.0

Calculated Grades and Recoveries

Products 1 and 2	95.2	34.4	71.2	95.7	75.6

Test No. J5A

Purpose: To upgrade the final Jeffrey concentrate from composite 129.

Procedure: As below.

Feed: 250 grams final Jeffrey concentrate from test J5

Conditions:

Stage	Reagents Added, pounds per ton		Time, minutes			pH
	MG-83	MIBC	Grind	Cond.	Froth	
						7.7
Rougher (1)	0.05	0.02	-	1	3	-
Rougher (2)	0.02	-	-	1	2	-
Scavenger	0.01	0.01	-	1	2	-

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Ind.	Sol. Fe O'all
1. Fe Concentrate	82.9	28.3	70.6	84.0	62.7
2. Scav. Concentrate	9.4	3.2	70.2	9.5	7.1
3. Scav. Tailing	7.7	2.6	58.7	6.5	4.8
Head (Calcualted)	100.0	34.1	69.6	100.0	74.6

Calculated Grades and Recoveries

Products 1 and 2	92.3	31.5	70.6	93.5	69.8

Test No. 42

Purpose: To upgrade the final Jeffrey concentrate from composite 125 by cationic flotation after a regrind.

Procedure: As below

Feed: 375 grams Jeffrey cleaner concentrate J1.

Grind: 20 minutes at 50 percent solids in the Abbé Pebble Mill.

Conditions:

Stage	Reagents Added, pounds per ton		Time, minutes			pH
	MG-98A	MIBC	Grind	Cond.	Froth	
Rougher (1)	0.10	0.02	-	2	3	7.1
Rougher (2)	0.05	-	-	1	3	-
Cleaner	0.05	-	-	1	2	-
Scavenger - 1	-	-	-	1	2	-
Scavenger - 2	-	-	-	1	1	-

Stage	Flotation
Flotation Cell	250 g D-1
Speed:r.p.m.	900
% Solids	Ro-25

Test No. 42 - Continued

Metallurgical Results

Product	Weight % Individual	Weight % Overall	Assays, % Sol. Fe	% Distribution Sol. Fe Ind.	% Distribution Sol Fe O'all
1. Fe Concentrate	75.4	25.3	69.4	77.8	59.1
2. Cl. Tailing	3.9	1.3	66.9	3.9	3.0
3. Scav. - 1 Conc.	14.0	4.7	67.7	14.1	10.7
4. Scav. - 2 Conc.	3.8	1.3	49.9	2.8	2.1
5. Fe Tailing	2.9	0.9	31.4	1.4	1.0
Head (Calc.)	100.0	33.5	67.2	100.0	75.9

Calcualted Grades and Recoveries

Products 1 + 2	79.3	26.6	69.3	81.7	62.1
Products 1 - 3	93.3	31.3	69.0	95.8	72.8
Products 1 - 4	97.1	32.6	68.3	98.6	74.9
Products 1 ÷ 3	89.4	30.0	69.1	91.9	69.8

Screen Analysis

Composite of all Products

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	3.0	3.0	97.0
- 400	97.0	100.0	-
Total	100.0	-	-

Selective Flocculation

Test No. 1

Purpose: To conduct a selective flocculation test.

Feed: 1000 g minus 10 mesh composite 131.

Grind:

Stage	Mill	Time(Min.)	Weight(Grams)	% Solids
Primary	Ball	30	1000	66
Regrind	Ball	30	-	-

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	EDTA* Hardness mg/l $CaCO_3$
	NaOH	Sodium Silicate	Starch	Grind	Cond.	Settling			
Grind	0.2	0.8	-	30**	-	-	-	-	-
Deslime 1A	-	-	0.4	-	1	2	9.8	13	46
Deslime 1B	-	0.8	-	-	1+1	2	-	-	44
Regrind	-	1.6	-	30**	-	-	-	-	-
Deslime 2A	-	-	0.2	-	1	3	9.9	13	45
Deslime 2B to 2F	-	0.5	-	-	1+1	3	-	-	78
Deslime 2G & 2H	-	0.5	-	-	½+½	1	-	9	89

* Water Hardness of Tap Water 93

** Followed by magnetic flocculation

Stage	1A	1B	2A	2B to F	2G to H
Machine	D-1	D-1	D-1	D-1	D-1
Vessel	4000	4000	4000	4000	4000
Speed (rpm)	1200	1200	1200	1200	1200
Pulp Volume	3500	3500	3500	3500	3500
Final Volume	1500	1300	1500	1500	1000

•ml

Test No. 1 - Continued

Comments

The primary grind product appeared too coarse. There was only limited dispersion of silicate which resulted in low weight removal during desliming.

The sodium silicate addition was increased in the regrind to improve dispersing, however, the silicates still appeared poorly dispersed. Addition of the caustic starch formed large floccs which were slow in compacting. In later stages, as the concentration of starch was lowered by repeated dilution, the floccs were not as prevalent, and the mud line formed faster.

The concentrate contained a larger quantity of coarse silicate particles. These particles appeared free of iron but too large to be dispersed. Many of the silicate appeared as light brown semi-opaque grains. Screening a small sample on a 400 mesh screen concentrated the silicate in the oversize.

Test No..1 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	53.2	50.9	84.0
2. 2G + H Slime	11.9	21.5	7.9
3. 2B to F Slime	28.1	8.94	7.7
4. 2A Slime	2.0	1.20	0.1
5. 2B Slime	3.6	1.62	0.2
6. 1A Slime	1.2	0.79	0.1
Head (Calc.)	100.0	32.2	100.0

Calculated Grades and Recoveries

Products 1 and 2	65.1	45.5	91.9
Products 1 to 3	93.2	34.5	99.6
Products 1 to 4	95.2	33.8	99.7
Products 1 to 5	98.8	32.6	99.9
Products 5 + 6	4.8	1.41	0.3

Test No. 2

Purpose: To increase the sodium silicate addition to the primary grind.

Feed: 1000 g minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000 g	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	EDTA* Hardness mg/l $CaCO_3$
	NaOH	Sodium Silicate	Starch	Grind	Cond.	Settling			
Grind	0.1	2.0	-	30*	-	-	-	-	-
Deslime 1A	0.1	-	0.2	-	2	2	9.6	15	46
Deslime B	0.1	0.5	-	-	1	2	9.3	9	64
Deslime C	0.1	0.5	-	-	1	2	9.3	9	71

Comments: The starch addition flocculated a large weight.
The concentrate contained coarse silicates and fine iron minerals.

*Folowed by magnetic flocculation

Metallurgical Results

Product	Weight %	Assays, %	% Distribution
		Sol. Fe	Sol. Fe
1. Concentrate	78.3	38.1	95.1
2. Stage 1C Slime	5.1	10.1	1.6
3. Stage 1B Slime	13.8	7.02	3.1
4. Stage 1A Slime	2.8	1.73	0.2
Head (Calc.)	100.0	31.4	100.0

Calculated Grades and Recoveries

Products 1 and 2	83.4	36.4	96.7
Products 1 to 3	97.2	32.2	99.8
Products 2 to 4	21.7	7.06	4.9

Test No. 3

Purpose: To increase the fineness of the primary grind.

Feed: 1000 g minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Primary	0.2	1.0	-	60	-	-	-	-
Deslime A	-	1.0	-	-	2	5	9.2	19
Deslime B	-	1.0	-	-	2	5	-	-
Deslime C	-	2.0	0.4	-	2+1	5	9.5	-
Deslime D	-	2.0	-	-	2	2	9.0	-
Deslime E	-	2.0	0.1	-	2+1	2	8.9	-
Deslime F	-	1.0	-	-	2	2	8.9	-
Deslime G	-	1.0	-	-	2	2	8.8	

Metallurgical Results

Product	Weight %	Assays, %	% Distribution
		Sol. Fe	Sol. Fe
1. Concentrate	55.1	49.8	86.4
2. Slime E	4.8	20.3	3.1
3. Slime D	33.7	9.56	10.1
4. Slime A to C	6.4	2.22	0.4
Head (Calculated)	100.0	31.8	100.0

Calculated Grades and Recoveries

Products 1 + 2	59.9	47.4	89.5
Products 1 - 3	93.6	33.8	99.6

Test No. 4

Purpose: To increase the sodium silicate addition to the primary grind.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Primary Grind	0.2	3.0	-	60	-	-	-	-
	-	-	-	-	-	-	8.6	
Deslime A	-	-	0.40	-	1	2	9.4	22
Deslime B	-	0.5	0.1	-	2+1	2	-	-
Deslime C	-	1.0	0.1	-	2+1	1½	-	-
Deslime D	-	1.0	0.1	-	2+1	1½	8.9	-

Test No. 4 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	55.9	50.4	87.8
2. Slime D	6.3	18.0	3.5
3. Slime C	17.7	13.9	7.7
4. Slime B	8.8	2.10	0.6
5. Slime A	11.3	1.23	0.4
Head (Calc.)	100.0	32.1	100.0

Calculated Grades and Recoveries

Products 1 + 2	62.2	47.1	91.3
Products 1 - 3	79.9	39.7	99.0
Products 1 - 4	88.7	36.0	99.6
Products 3 - 5	37.8	7.35	8.7

Test No. 5

Purpose: To further increase the sodium silicate addition to the primary grind.

Feed: 1000 g minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.2	5.0	-	60	-	-	-	-
	-	-	-	-	-	-	8.8	22
Deslime 1	-	-	0.4	-	1	2	9.5	-
Deslime 2	-	1.0	0.1	-	2+1	4	-	-
Deslime 3	-	1.0	0.2	-	2+1	2½	-	-
Deslime 4	-	1.0	0.1	-	2+1	2½	9.4	-

Stage	1	2	3	4
Machine	D-1	D-1	D-1	D-1
Vessel	4000 ml	4000 ml	4000 ml	4000 ml
Speed (rpm)	1200	1200	1200	1200
Pulp Volume	3500	3500	3500	3500

Test No. 5 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	54.9	51.7	89.8
2. Slime 4	2.8	13.8	1.2
3. Slime 3	8.0	11.8	3.0
4. Slime 2	17.6	6.49	3.6
5. Slime 1	16.7	4.51	2.4
Head (Calc.)	100.0	31.6	100.0

Calculated Grades and Recoveries

Products 1 + 2	57.7	49.9	91.0
Products 1 - 3	65.7	45.2	94.0
Products 1 - 4	83.3	37.0	97.6
Products 3 - 5	42.3	6.69	9.0

Test No. 6

Purpose: Similar to test No. 2, except Na_2SiO_3 increased to 4 lb/ton to grind.

Feed: 1000 g minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	4.0	-	30	-	-	-	-
	-	-	-	-	-	-	8.6	-
Stage 1	0.1	-	0.3	-	2	3	9.5	23
Stage 2	0.1	1.0	-	-	1	3	9.6	21
Stage 3	0.1	0.5	-	-	1	3	9.7	20

Screen concentrate on 200 mesh. Assay plus and minus fractions.

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate -200 m	69.0	41.4	91.5
2. Concentrate +200 m	2.4	32.2	2.5
3. Slime 3	3.9	13.2	1.6
4. Slime 2	7.4	8.47	2.0
5. Slime 1	17.3	4.31	2.4
Head (Calculated)	100.0	31.2	100.0

Calculated Grades and Recoveries

Products 1 + 2	71.4	41.1	94.0
Products 1 - 3	75.3	39.6	95.6
Products 1 - 4	82.7	36.9	97.6
Products 3 - 5	28.6	6.61	6.0

Test No. 7

Purpose: To repeat test No. 6, but use composite 130.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	4.0	-	30	-	-	-	-
	-	-	-	-	-	-	9.2	27
Stage 1	0.1	-	0.3	-	2	3	9.7	-
Stage 2	0.1	1.0	-	-	2	3	9.7	23
Stage 3	0.1	0.5	-	-	1	3	9.6	22

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	82.7	33.0	95.3
2. Slime 3	3.5	10.7	1.3
3. Slime 2	6.5	9.06	2.0
4. Slime 1	7.3	5.49	1.4
Head (Calc.)	100.0	28.7	100.0

Calculated Grades and Recoveries

Products 1 + 2	86.2	32.1	96.6
Products 1 - 3	92.7	30.5	98.6
Products 2 - 4	17.3	7.86	4.7

Test No. 8

Purpose: Repeat test No. 7, but omit NaOH.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed		Time, minutes			pH	Temp. °C
	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	4.0	-	30	-	-	-	-
	-	-	-	-	-	9.1	26
Stage 1	-	0.3	-	2	3	-	-
Stage 2	1.0	-	-	2	3	9.0	25
Stage 3	0.5	-	-	1	3	-	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	80.0	33.7	94.8
2. Slime 3	5.1	9.93	1.8
3. Slime 2	7.1	7.69	1.9
4. Slime 1	7.8	5.53	1.5
Head (Calc.)	100.0	28.5	100.0

Calculated Grades and Recoveries

Products 1 + 2	85.1	32.3	96.6
Products 1 - 3	92.2	30.4	98.5
Products 2 - 4	20.0	7.45	5.2

Test No. 9

Purpose: Repeat test No. 7, but increase NaOH addition to obtain pH 10.5.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.3	4.0	-	30	-	-	9.8	-
	-	-	-	-	-	-	-	24
Stage - 1	0.4	-	0.3	-	2+1	3	10.5	24
Stage - 2	0.35	1.0	-	-	2+1	2½	10.5	-

Comments: Starch level appeared to be excessive.

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	80.2	33.8	95.6
2. Slime 2	8.2	7.82	2.3
3. Slime 1	11.6	5.21	2.1
Head (Calc.)	100.0	28.35	100.0

Calculated Grades and Recoveries

Products 1 + 2	19.8	6.29	4.4

Test No. 10

Purpose: Repeat test No. 7, but decrease starch addition to stage 1.

Feed: 1000 g minus 10 mesh compsite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	4.0	-	30	-	-	9.9	24
Stage 1	0.1	-	0.15	-	2+1	2½	9.7	-
Stage 2	0.1	1.0	-	-	2	2 3/4	9.6	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	76.8	34.2	93.0
2. Slime 2	8.1	10.5	3.0
3. Slime 1	15.1	7.47	4.0
Head (Calc.)	100.0	28.26	100.0

Calculated Grades and Recoveries

Products 1 + 2	23.2	8.57	7.0

Test No. 11

Purpose: Repeat test No. 10, but increase Na_2SiO_3 to 6.0 lb/ton in the grind.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	6.0	-	30	-	-	9.6	-
Stage 1	0.1	-	0.15	-	2+1	2 3/4	9.7	26
Stage 2	0.1	1.0	-	-	2	2½	9.7	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	74.8	34.8	92.0
2. Slime 2	8.3	10.6	3.1
3. Slime 1	16.9	8.21	4.9
Head (Calc.)	100.0	28.3	100.0

Calculated Grades and Recoveries

Products 1 + 2	25.2	9.00	8.0

Test No. 12

Purpose: Repeat test No. 10, but use boiled caustic starch.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	50

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	4.0	-	30	-	-	9.3	26
Stage 1	0.1	-	0.15	-	2+1	2½	9.6	-
Stage 2	0.1	1.0	-	-	2	2½	9.6	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	81.13	33.30	93.8
2. Slime 2	7.42	12.12	3.1
3. Slime 1	11.45	7.76	3.1
Head (Calc.)	100.0	28.8	100.0

Calculated Grades and Recoveries

Products 2 + 3	18.9	9.46	6.2

Conclusions: Boiled starch was not as effective or efficient as starch heated to 84°C.

Test No. 13

Purpose: Similar to test No. 9, but increase NaOH to 1 lb/ton in the primary grind.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	50

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	Final Volume ml
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling			
Grind	1.0	4.0	-	30	-	-	10.2	26	-
Stage 1	0.2	-	0.3	-	2+1	2	10.4	-	1300
Stage 2	0.15	1.0	-	-	2	2½	10.5	-	1100
Regrind	0.5	2.0	-	30	-	-	9.8	-	-
Stage 3	-	-	0.2	-	1	1	-	-	1500
Stage 4	-	0.5	-	-	2	2	-	-	1000
Stage 5	0.4	0.5	-	-	2	1½	11.0	-	1500
	-	1.5	-	-	2	1	-	-	400
Stage 6	-	1.0	0.1	-	-	-	9.8	-	400

Stage	1 - 6
Machine	D - 1
Vessel	41 Beaker
Speed (rpm)	1200
Pulp Volume	3500

Test No. 13 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	52.8	42.73	78.9
2. Slime 6	7.0	21.05	5.2
3. Slime 5	16.5	16.73	9.7
4. Slime 4	3.9	7.62	1.0
5. Slime 3	4.0	6.15	0.9
6. Slime 2	6.7	8.71	2.0
7. Slime 1	9.1	7.35	2.3
Head (Calc.)	100.0	28.6	100.0

Calculated Grades and Recoveries

Products 1 + 2	59.8	40.2	84.1
Products 1 - 3	76.3	35.1	93.8
Products 1 - 4	80.2	33.8	94.8
Products 1 - 5	84.2	32.5	95.7
Products 6 + 7	15.8	7.93	4.3
Products 5 - 7	19.8	7.57	5.2
Products 4 - 7	23.7	7.58	6.2
Products 3 - 7	40.2	11.3	15.9
Products 2 - 7	47.2	12.8	21.1

Test No. 14

Purpose: To repeat test No. 12, but without starch.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	Final Volume ml
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling			
Grind	0.1	4.0	-	30	-	-	9.3	25	-
Stage 1	0.1	-	-	-	2	2½	9.6	-	500
Stage 2	0.1	1.0	-	-	2	2½	9.6	-	500

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	68.25	35.69	85.8
2. Slime 2	4.91	15.70	2.7
3. Slime 1	26.84	12.12	11.5
Head (Calc.)	100.0	28.4	100.0

Calculated Grades and Recoveries

Products 2 + 3	31.75	12.67	14.2

Test No. 15

Purpose: To conduct a selective flocculation test on composite 132. Procedure as for test No. 5.

Feed: 1000 grams minus 10 mesh composite 132.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	66

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	Final Volume ml
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling			
Grind	0.2	5.0	-	60	-	-	9.2	-	-
Stage 1	-	-	0.4	-	1	3	-	-	2000
Stage 2	-	1.0	0.1	-	2+1	4	No Settling		

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	89.0	35.23	94.5
2. Slime 1	11.0	16.32	5.5
Head (Calc.)	100.0	33.2	100.0

Test No. 16

Purpose: Increase NaOH addition to 2 lb/ton to the primary grind. Study the effect of TSPP.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	50

Conditions:

Stage	Reagents, lb/ton feed				Time, minutes			pH	Temp. °C	Final Volume ml
	NaOH	Na_2SiO_3	Starch	TSPP*	Grind	Cond.	Settling			
Grind	2.0	4.0	-	-	30	-	-	11.0	-	-
Stage 1	-	-	0.3	-	-	1	1	-	25	2000
Stage 2	0.5	2.0	-	-	-	2	3½	11.0	-	1500
Stage 3	-	-	-	0.5	-	2	5	10.3	-	1000
Stage 4	-	-	0.1	-	-	1	2½	9.8	-	1250
Stage 5	-	2.0	-	-	-	2	4	9.7	-	750

*Tetra Sodium Pyro-phosphate

Test No. 16 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	83.7	33.1	96.0
2. Slime 5	3.1	11.3	1.2
3. Slime 4	2.9	4.95	0.5
4. Slime 3	3.0	8.22	0.9
5. Slime 2	4.5	6.74	1.0
6. Slime 1	2.8	4.30	0.5
Head (Calc.)	100.0	28.9	100.0

Calculated Grades and Recoveries

Products 1 + 2	86.8	32.3	97.2
Products 1 - 3	89.7	31.4	97.7
Products 1 - 4	92.7	30.7	98.6
Products 1 - 5	97.2	29.6	99.5
Products 5 + 6	7.3	5.79	1.5
Products 4 - 6	10.3	6.50	2.4
Products 3 - 6	13.2	6.17	2.9
Products 2 - 6	16.3	7.14	4.1

Test No. 17

Purpose: To repeat test No. 7, but with soda ash.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	50

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	EDTA hardness mg/1 $CaCO_3$	Final Volume ml
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling				
Grind	1.0	4.0	-	30	-	-	9.5	-	-	-
Stage 1	-	-	0.3	-	1	1½	9.5	26	37	1250
Stage 2	0.25	1.0	0.1	-	2+2+1	2	9.5	26	-	1250

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	85.2	31.0	95.9
2. Slime 2	5.2	9.22	1.7
3. Slime 1	9.6	6.70	2.4
Head (Calc.)	100.0	27.5	100.0

Calculated Grades and Recoveries

Products 2 + 3	14.8	7.58	4.1

Test No. 18

Purpose: To repeat test No. 7, but increase the soda ash addition.

Feed: 1000 g minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	50

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C	EDTA hardness mg/l $CaCO_3$	Final Volume ml
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling				
Grind	2.0	4.0	-	30	-	-	-	-	-	-
Stage 1	-	-	0.3	-	1	1	9.8	-	26	1250
Stage 2	0.5	1.0	0.1	-	2+1	2	9.8	-	-	1200

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	84.3	33.1	95.7
2. Slime 2	5.3	9.10	1.7
3. Slime 1	10.4	7.46	2.6
Head (Calc.)	100.0	29.2	100.0

Calculated Grades and Recoveries

Products 2 + 3	15.7	8.01	4.3

Test No. 19

Purpose: To repeat the primary desliming stages of test No. 6, but regrind, magnetize and clean the primary concentrate.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60
Regrind	Pebble	20	716.9	50

Conditions: Magnetize primary concentrate for 5 minutes on Lurgi at 10 amps.

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.1	4.0	-	30	-	-	8.5	-
Slime 1	0.1	-	0.3	-	2	3	9.5	24
Slime 2	0.1	1.0	-	-	1	3	9.5	-
Regrind	0.5	2.0	-	20	-	-	-	-
Slime 3	-	-	0.2	-	1	2	9.6	25
Slime 4	-	0.5	-	-	1	2	-	-
Slime 5	-	0.5	-	-	1	2	-	-
Slime 6	-	1.5	-	-	1	2	-	-
Slime 7	-	1.5	-	-	1	2	-	-

Stage	1, 2	3	4	5, 6, 7
Machine	D-1	D-1	D-1	D-1
Vessel	4000ml	3000ml	3000ml	3000ml
Speed (rpm)	1000	900	900	900
Pulp Volume, ml.	3500	2500	2000	1500

Test No. 19 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	51.1	51.1	83.8
2. Slime 7	4.1	25.1	3.3
3. Slime 6	5.4	15.7	2.7
4. Slime 5	0.9	23.3	0.7
5. Slime 4	1.9	17.8	1.1
6. Slime 3	9.4	11.1	3.3
7. Slime 2	13.7	9.18	4.0
8. Slime 1	13.5	2.51	1.1
Head (Calc.)	100.0	31.2	100.0

Calculated Grades and Recoveries

Products 1 and 2	55.2	49.2	87.1
Products 1 to 3	60.6	46.2	89.8
Products 1 to 4	61.5	45.9	90.5
Products 1 to 5	63.4	45.0	91.6
Products 1 to 6	72.8	40.6	94.9
Products 1 to 7	86.5	35.6	98.9
Products 7 and 8	27.2	5.87	5.1

Screen Analysis-Reground Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	21.0	21.0	79.0
- 400	79.0	100.0	-
Total	100.0	-	-

Test No. 20

Purpose: To repeat test No. 19, but use Na_2CO_3 throughout the test.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60
Regrind	Pebble	20	599.6	50

Conditions: Magnetize primary concentrate for 5 minutes on Lurgi at 10 amps.

Stage	Reagents, lb/ton feed				Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Na_2CO_3	Grind	Cond.	Settling		
Grind	0.1	4.0	-	1.0	30	-	-	9.4	-
Slime 1	0.1	-	0.3	-	-	2	2	9.4	24
Slime 2	0.1	1.0	-	-	-	1	3	9.5	-
Regrind	0.5	2.0	-	1.0	20	-	-	9.8	-
Slime 3	-	0.5	0.2	-	-	1	3	9.9	-
Slime 4	-	0.5	-	0.2	-	1	3	9.5	-
Slime 5	-	0.5	-	0.2	-	1	2	9.4	-
Slime 6	-	0.5	-	0.2	-	1	2	9.5	

Test No. 20 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	43.6	57.8	78.4
2. Slime 6	1.6	29.3	1.5
3. Slime 5	4.8	22.9	3.5
4. Slime 4	3.9	17.7	2.1
5. Slime 3	6.4	11.7	2.3
6. Slime 2	6.0	16.8	3.1
7. Slime 1	33.7	8.64	9.1
Head (Calculated)	100.0	32.1	100.0

Calculated Grades and Recoveries

Products 1 and 2	45.2	56.8	79.9
Products 1 to 3	50.0	53.5	83.4
Products 1 to 4	53.9	50.9	85.5
Products 1 to 5	60.3	46.8	87.8
Products 1 to 6	66.3	44.1	90.9
Products 6 and 7	39.7	9.87	12.2

Screen Analysis - Reground Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	30.0	30.0	70.0
- 400	70.0	100.0	-
Total	100.0	-	-

Test No. 21

Purpose: To repeat test No. 17, but to investigate the effect of increased starch conditioning time.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	1.0	4.0	-	30	-	-	9.5	-
Stage 1	-	-	0.3	-	5	1½	9.5	24
Stage 2	0.25	1.0	0.1	-	2+2+3	2	9.5	-

Stage	1 and 2
Machine	D-1
Vessel	4000 ml
Speed (rpm)	1000
Pulp Volume	3500 ml

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	68.2	35.7	87.4
2. Slime 2	5.7	13.4	2.7
3. Slime 1	26.1	10.6	9.9
Head (Calc.)	100.0	27.9	100.0

Calculated Grades and Recoveries

Products 2 and 3	31.8	11.1	12.6

Test No. 22

Purpose: To repeat test No. 21, but reduce slime weight in stage No. 1, by increasing settling time.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	1.0	4.0	-	30	-	-	9.5
Stage 1	-	-	0.3	-	5	2.25	9.5
Stage 2	0.25	1.0	0.1	-	2+2+3	2.5	9.5

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	73.2	34.3	90.7
2. Slime 2	5.9	12.5	2.7
3. Slime 1	20.9	8.82	6.6
Head (Calc.)	100.0	27.7	100.0

Calculated Grades and Recoveries

Products 2 and 3	26.8	9.63	9.3

Test No. 23

Purpose: To repeat test No. 22, but with reduced starch addition in stage 1, and omit starch to stage 2.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	1.0	4.0	-	30	-	-	9.5	-
Stage 1	-	-	0.15	-	5	2.25	9.5	25
Stage 2	0.25	1.0	-	-	2+2	2.5	9.5	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	70.9	34.8	90.7
2. Slime 2	9.1	13.6	4.6
3. Slime 1	20.0	6.44	4.7
Head (Calc.)	100.0	27.2	100.0

Calculated Grades and Recoveries

Products 2 and 3	29.1	8.68	9.3

Test No. 24

Purpose: To repeat test No. 23, but add 0.05 lb/ton starch to 2nd stage.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:	Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
	Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	1.0	4.0	-	30	-	-	9.5	-
Stage 1	-	-	0.15	-	5	2.25	9.4	25
Stage 2	0.25	1.0	0.05	-	2+2+3	2.5	9.5	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	72.9	34.2	89.7
2. Slime 2	6.8	13.9	3.4
3. Slime 1	20.3	9.47	6.9
Head (Calc.)	100.0	27.8	100.0

Calculated Grades and Recoveries

Products 2 and 3	27.1	10.6	10.3

Test No. 25

Purpose: To repeat test No. 24, but use TSPP in place of Na_2CO_3.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH
	TSPP	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	1.0	4.0	-	30	-	-	9.4
Stage 1	-	-	0.15	-	5	2.25	9.4
Stage 2	0.25	1.0	0.05	-	2+2+3	2.5	9.5

Note: No apparent difference between TSPP and Na_2CO_3.

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	71.8	35.0	88.0
2. Slime 2	7.7	14.2	3.8
3. Slime 1	20.5	11.4	8.2
Head (Calc.)	100.0	28.6	100.0

Calculated Grades and Recoveries

Products 2 and 3	28.2	12.2	12.0

Test No. 26

Purpose: To repeat test No. 21, but increase Na_2SiO_3 addition to primary grind.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	1.0	8.0	-	30	-	-	9.7	-
Slime 1	-	-	0.3	-	5	2.0	9.6	25
Slime 2	0.25	1.0	0.05	-	2+2+3	2.35	9.6	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	72.6	35.1	89.7
2. Slime 2	6.3	14.2	3.1
3. Slime 1	21.1	9.76	7.2
Head (Calc.)	100.0	28.4	100.0

Calculated Grades and Recoveries

Products 2 and 3	27.4	10.8	10.3

Test No. 27

Purpose: To investigate the effect of Calgon in place of Na_2CO_3.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed				Time, minutes			pH	Temp. °C
	Na_2CO_3	Calgon	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	-	1.0	4.0	-	-	-	-	9.3	-
Slime 1	-	-	-	0.3	-	5	2.25	9.3	25
Slime 2	0.25	0.25	1.0	0.05	-	2+2+3	2.25	9.5	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	72.2	35.4	89.3
2. Slime 2	7.4	14.6	3.8
3. Slime 1	20.4	9.81	6.9
Head (Calc.)	100.0	28.6	100.0

Calculated Grades and Recoveries

Products 2 and 3	27.8	11.1	10.7

Test No. 28

Purpose: To investigate the effect of Tapioca starch (Stein-Hall MRL-278) in place of pearl starch.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	MRL-278	Grind	Cond.	Settling		
Grind	1.0	4.0	-	30	-	-	9.5	-
Slime 1	-	-	0.30	-	5	2.5	9.5	25
Slime 2	0.25	1.0	0.05	-	2+2+3	2.25	9.5	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	77.2	35.4	92.6
2. Slime 2	6.5	11.9	2.6
3. Slime 1	16.3	8.60	4.8
Head (Calc.)	100.0	29.5	100.0

Calculated Grades and Recoveries

Products 2 and 3	22.8	9.54	7.4

Test No. 30

Purpose: To conduct a selective flocculation test on composite 132 with modifications as shown below.

Feed: 1000 grams minus 10 mesh composite 132.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	2.0	4.0	-	30	-	-	9.6	-
Slime 1	-	-	0.5	-	5	2.5	-	26
Slime 2	0.50	1.0	0.2	-	2+2+3	2.25	-	-

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Concentrate	80.5	34.2	87.1
2. Slime 2	5.5	21.5	3.7
3. Slime 1	14.0	20.7	9.2
Head (Calc.)	100.0	31.6	100.0

Calculated Grades and Recoveries

Products 2 and 3	19.5	20.9	12.9

Test No. 31

Purpose: To repeat test No. 24, but regrind, magnetize, and clean the primary concentrate.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60
Regrind	Pebble	20	730	50

Conditions:

Stage	Reagents, lb/ton feed				Time, minutes			pH
	$NaOH$	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	-	1.0	4.0	-	30	-	-	-
Slime 1	-	-	-	0.15	-	5	2.25	9.5
Slime 2	-	0.25	1.0	0.05	-	2+2+3	2.5	9.5
Regrind	0.5	0.25	2.0	-	20	-	-	-
Slime 3	-	-	-	0.05	-	3	2.5	10.0
Slime 4	-	-	0.5	-	-	2	2.5	9.6
Slime 5	-	0.20	0.5	-	-	2+2	2.0	9.8
Slime 6	-	0.20	0.5	-	-	2+2	1.5	9.3

Stage	Slime 1&2	Slime 3&4	Slime 5&6
Machine	D-1	D-1	D-1
Vessel	4000 ml	3000 ml	3000 ml
Speed (rpm)	1000	900	900
Pulp Volume, ml	3500	2500	2000

Test No. 31 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	56.0	41.0	81.2
2. Slime 6	7.0	16.3	4.0
3. Slime 5	2.8	16.2	1.6
4. Slime 4	3.2	15.2	1.7
5. Slime 3	5.5	10.4	2.0
6. Slime 2	7.3	13.0	3.4
7. Slime 1	18.2	9.49	6.1
Head (Calc.)	100.0	28.3	100.0

Calculated Grades and Recoveries

Products 1 and 2	63.0	38.3	85.2
Products 1 to 3	65.8	37.3	86.8
Products 1 to 4	69.0	36.3	88.5
Products 1 to 5	74.5	34.4	90.5
Products 6 and 7	25.5	10.5	9.5

Screen Analysis - Reground Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	29.5	29.5	70.5
- 400	70.5	100.0	-
Total	100.0	-	-

Test No. 32

Purpose: To repeat test No. 30, on composite 132, but to improve slime weight rejection and reduce Fe loss to slime.

Feed: 1000 grams minus 10 mesh composite 132.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60

Conditions:

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	Na_2CO_3	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	3.0	5.0	-	30	-	-	9.7	-
Slime 1	-	-	0.4	-	5	2.25	-	26
Slime 2	0.5	1.0	0.1	-	2+2+3	1.75	9.6	-

Metallurgical Results

Product	Weight %	Assays, %	% Distribution
		Sol. Fe	Sol. Fe
1. Fe Concentrate	72.9	35.2	82.0
2. Slime 2	6.7	21.8	4.7
3. Slime 1	20.4	20.7	13.3
Head (Calc.)	100.0	31.3	100.0

Calculated Grades and Recoveries

Products 2 and 3	27.1	21.0	18.0

Test No. 32 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	4.7	4.7	95.3
100	1.6	6.3	93.7
150	1.9	8.2	91.8
200	6.4	14.6	85.4
270	8.8	23.4	76.6
400	13.5	36.9	63.1
- 400	63.1	100.0	-
Total	100.0	-	-

Flotation

Test No. 33

Purpose: To investigate upgrading the Fe concentrate after selective flocculation by cationic flotation.

Procedure: See flowsheet.

Feed: 250 grams Fe concentrate from test No. 19. (30' primary grind to 79 % minus 400 mesh)

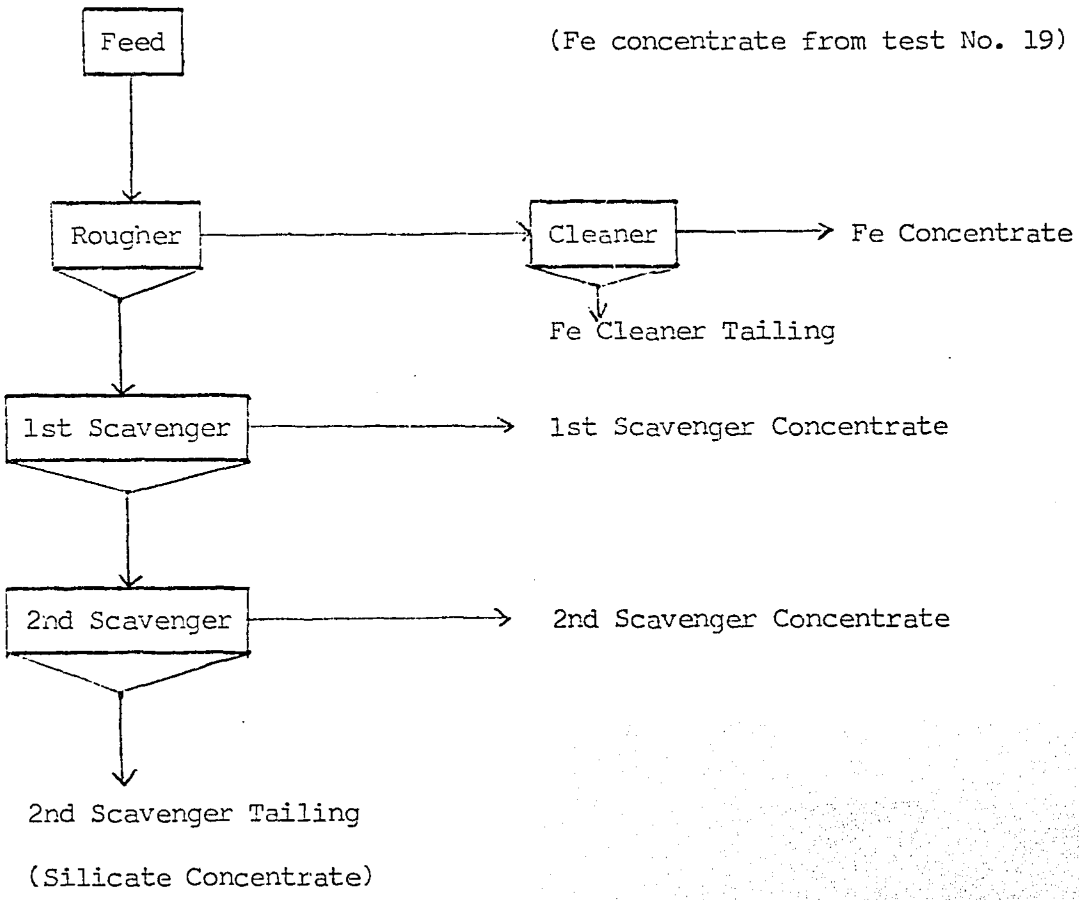
Conditions:

Stage	Reagents Added, pounds per ton feed			Time, minutes			pH
	Na_2CO_3	MG83	MIBC	Grind	Cond.	Froth	
	-	-	-	-	-	-	8.1
Condition	0.8	-	-	-	1	-	9.2
Rougher 1	-	0.10	0.02	-	1	3	-
Rougher 2	-	0.05	0.02	-	1	3	-
Cleaner	-	0.02	0.02	-	1	2	-
1st Scavenger	-	-	0.01	-	1	2	8.7
2nd Scavenger	-	-	0.01	-	1	2	-

Stage	Flotation
Flotation Cell	250 g D-1
Speed: r.p.m.	900

Test No. 33 - Continued

Flowsheet



Test No. 33 - Continued

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Individual	Overall
1. Fe Concentrate	38.3	11.9	66.0	49.1	41.2
2. Fe Cleaner Tailing	5.7	1.8	61.7	6.8	5.7
3. Fe 1st Scav. Conc.	8.8	2.7	64.0	11.0	9.2
4. Fe 2nd Scav. Conc.	4.8	1.5	59.3	5.5	4.6
5. Fe 2nd Scav. Tail.	42.4	13.2	33.5	27.6	23.1
Head (Calculated)	100.0	31.1	51.5	100.0	83.8

Test No. 34

Purpose: To repeat test No. 33, but improve Fe recovery by the use of WW-92 as Fe depressant during SiO_2 flotation.

Procedure: As for test No. 33, but use NaOH for pH adjustment and WW-92 for Fe depression.

Feed: 250 grams Fe concentrate from test No. 19. (30' primary grind to 79 % minus 400 mesh)

Conditions:

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	WW-92	MG-83	MIBC	Grind	Cond.	Froth	
		-	-	-	-	-	-	7.9
Condition 1	1.2	-	-	-	-	1	-	9.3
Condition 2	-	1.0	-	-	-	2	-	-
Rougher 1	-	-	0.10	0.02	-	1	3	-
Rougher 2	-	1.0	0.05	0.02	-	2+1	3	-
1st Scavenger	-	0.25	-	0.01	-	1	2	-
2nd Scavenger	-	0.25	-	0.01	-	1	2	-

Metallurgical Results

Product	Weight %		Assays, %	% Distribution	
	Individual	Overall	Sol. Fe	Sol. Fe Individual	Sol. Fe Overall
1. Fe Concentrate	51.2	26.2	67.6	67.0	56.1
2. Fe 1st Scav. Conc.	9.3	4.8	64.6	11.6	9.7
3. Fe 2nd Scav. Conc.	3.8	1.9	60.4	4.4	3.7
4. Fe 2nd Scav. Tail.	35.7	18.2	24.5	17.0	14.3
Head (Calculated)	100.0	31.1	51.7	100.0	83.8

Calculated Grades and Recoveries

Products 1 and 2	60.5	31.0	67.1	78.6	65.8
Products 1 to 3	64.3	32.9	66.7	83.0	69.5

Test No. 35

Purpose: To produce an Fe concentrate by selective flocculation, followed by cationic flotation.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	45	1000	60

Conditions: Selective Flocculation

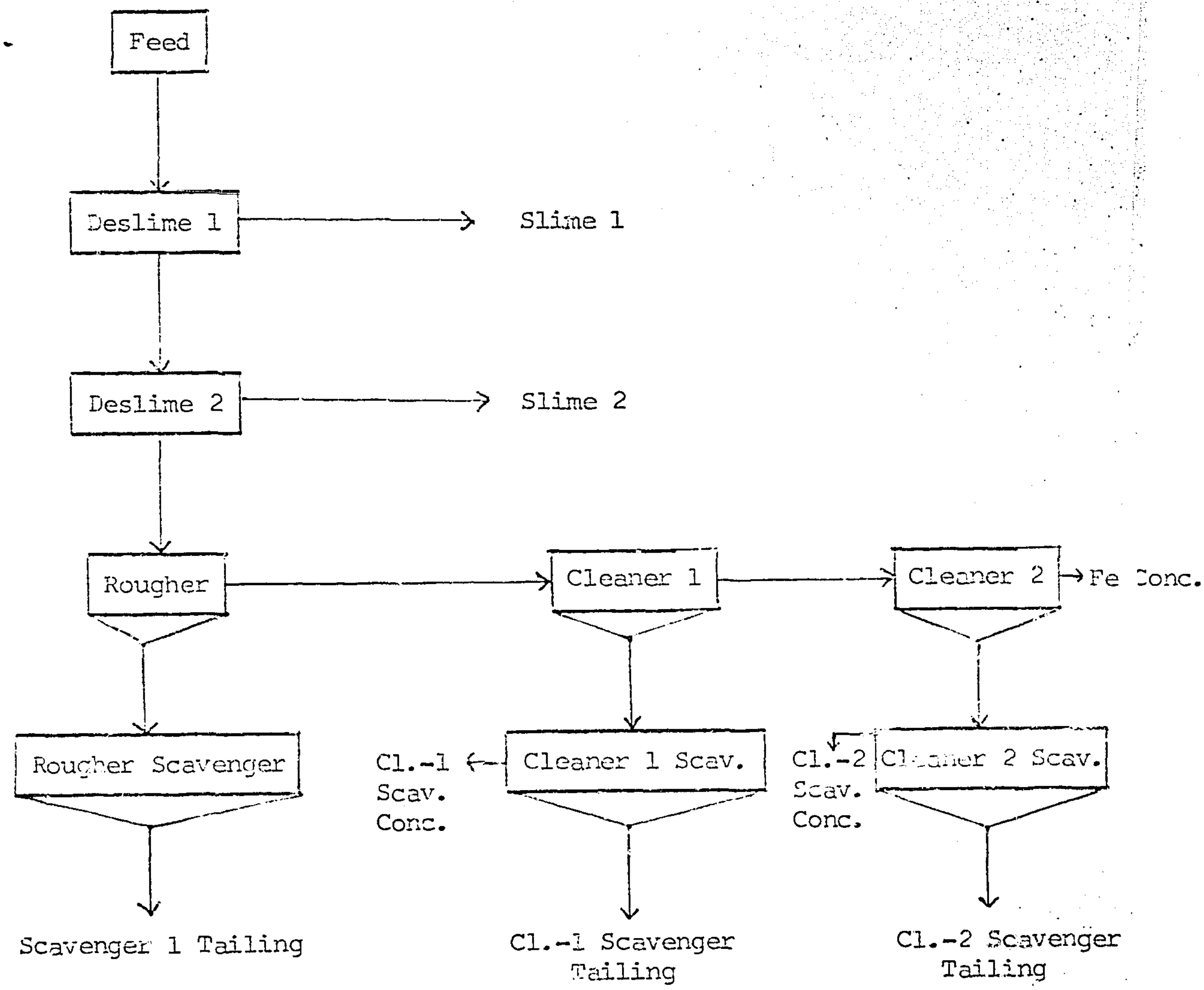
Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.2	4.0	-	45	-	-	-
Slime 1	-	-	0.3	-	3	3.5	9.0
Slime 2	-	1.0	-	-	2	2.75	9.1

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	MG98A	WW-92	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	-	1.0	-	-	2	-	-
Rougher 1	-	0.10	-	0.01	-	1	3	-
Rougher 2	-	0.05	-	-	-	1	3	-
1st Cleaner	-	-	1.0	-	-	2	-	9.4
	-	0.05	-	-	-	1	4	-
2nd Cleaner	-	-	1.0	-	-	2	-	9.3
	-	0.10	-	-	-	1	3	-
1st Cl. Scavenger	-	-	0.5	-	-	2	3	-
2nd Cl. Scavenger	-	-	0.5	-	-	2	3	-
Rougher Scavenger	-	-	0.5	-	-	2	2	-

Test No. 35 - Continued

Flowsheet



Test No. 35 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	30.9	52.1	55.8
2. 2nd Cl. Scav. Conc.	6.8	42.3	9.9
3. 2nd Cl. Scav. Tail.	12.3	22.4	9.6
4. 1st Cl. Scav. Conc.	6.3	26.3	5.8
5. 1st Cl. Scav. Tail.	4.3	13.6	2.0
6. Ro. Scav. Conc.	4.9	31.1	5.3
7. Ro. Scav. Tail.	4.3	15.7	2.4
8. Slime 2	10.3	11.1	4.0
9. Slime 1	19.9	7.6	5.2
Head (Calculated)	100.0	28.8	100.0

Calculated Grades and Recoveries

Products 1 - 2	37.7	50.3	65.7
Products 1 - 3	50.0	43.4	75.3
Products 1 - 4	56.3	41.6	81.1
Products 1 - 5	60.6	39.6	83.1
Products 1 - 6	65.5	38.9	88.4
Products 1 - 7	69.8	37.5	90.8
Products 1 - 8	80.1	34.1	94.8
Products 2 + 3	19.1	29.5	19.5
Products 4 + 5	10.6	21.1	7.8
Products 6 + 7	9.2	23.9	7.7
Products 8 + 9	30.2	8.8	9.2

Test No. 35 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100	0.3	0.3	99.7
150	0.5	0.8	99.2
200	1.4	2.2	97.8
270	2.2	4.4	95.6
400	8.0	12.4	87.6
- 400	87.6	100.0	-
Total	100.0	-	-

Test No. 36

Purpose: To investigate the effect of a finer primary grind on selective flocculation/flotation.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	45	1000	60

Conditions: Selective Flocculation

Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.2	4.0	-	45	-	-	8.5
Slime 1	0.2	-	0.3	-	3	2.0	9.0
Slime 2	-	1.0	-	-	2	1.75	9.0

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	WW-92	MG98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	2	-	-
Rougher 1	-	-	0.20	0.01	-	2	4	-
Rougher 2	-	-	0.05	-	-	2	3	-
Cleaner	-	0.5	-	-	-	2	-	-
	-	-	0.02	-	-	1	3	-
Scavenger 1	-	0.2	0.02	-	-	2	3	-
Scavenger 2	-	0.2	-	-	-	2	3	-
Scavenger 3	-	0.2	-	-	-	2	2	-

Test No. 36 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	22.1	66.7	47.0
2. Cleaner Tailing	0.9	60.0	1.7
3. Scav. 1 Conc.	5.6	66.4	11.9
4. Scav. 2 Conc.	3.1	65.0	6.4
5. Scav. 3 Conc.	3.7	58.0	6.9
6. Tailing	24.4	22.0	17.1
7. Slime 2	11.8	11.1	4.2
8. Slime 1	28.4	5.2	4.8
Head (Calculated)	100.0	31.3	100.0

Calculated Grades and Recoveries

Products 1 + 2	23.0	66.4	48.7
Products 1 - 3	28.6	66.4	60.6
Products 1 - 4	31.7	66.3	67.0
Products 1 - 5	35.4	65.5	73.9
Products 1 - 6	59.8	47.7	91.0
Products 1 - 7	71.6	41.7	95.2
Products 7 + 8	40.2	6.9	9.0

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.1	0.1	99.9
100	0.5	0.6	99.4
150	0.5	1.1	98.9
200	1.0	2.1	97.9
270	1.8	3.9	96.1
400	7.8	11.7	88.3
- 400	88.3	100.0	-
Total	100.0	-	-

Test No. 37

Purpose: To repeat test No. 36, but improve Fe recovery by modifying the desliming and flotation conditions.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	45	1000	60

Conditions: Selective Flocculation

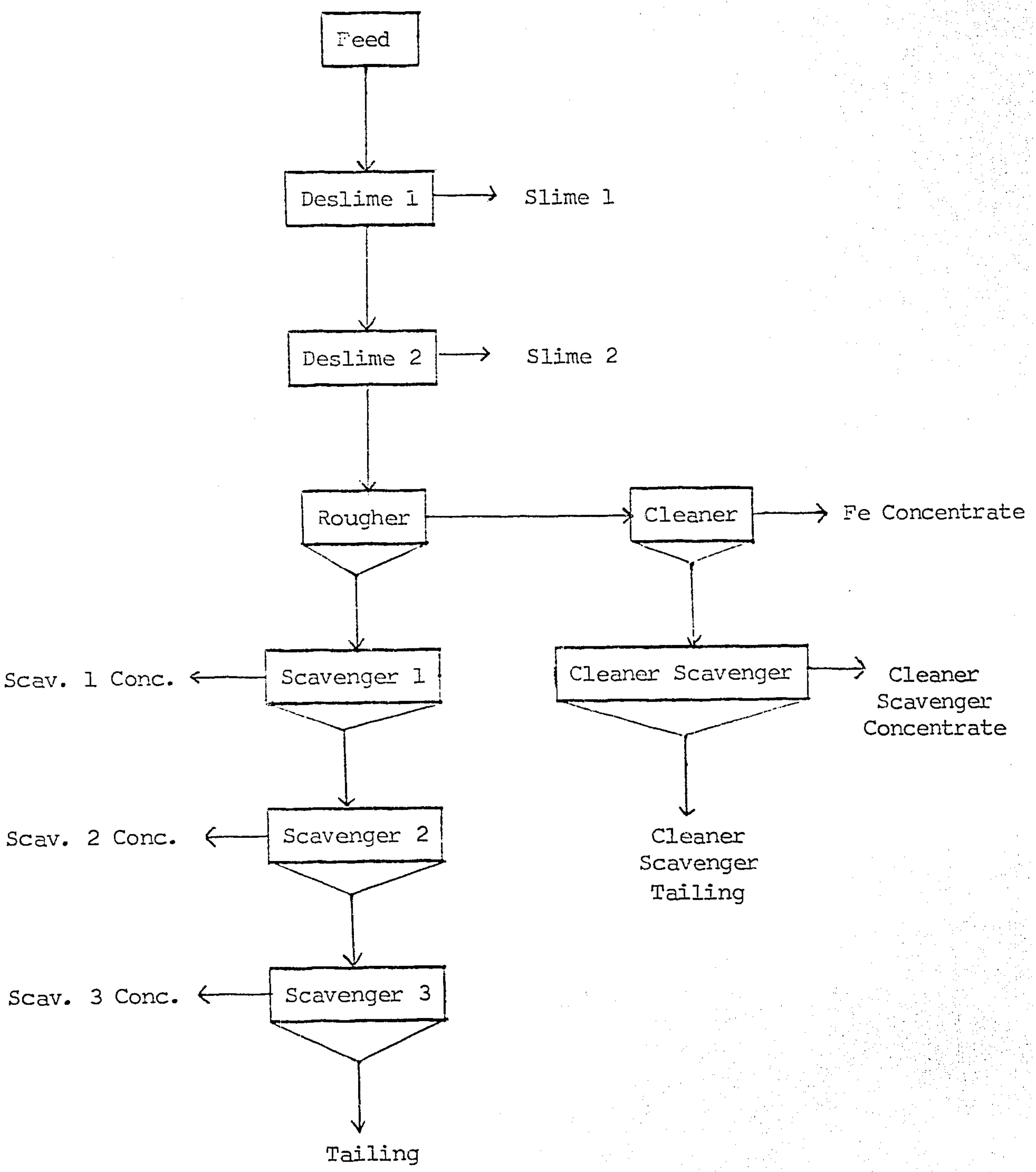
Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.3	4.0	-	45	-	-	8.9
Slime 1	0.1	-	0.30	-	3	2.0	9.2
Slime 2	0.1	1.0	0.05	-	1+2+3	2.25	9.2

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	WW-92	Mg98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.5	-	-	-	2	-	-
Rougher 1	-	-	0.15	0.01	-	2	4	-
Rougher 2	-	-	0.075	-	-	2	3	-
Cleaner	-	-	0.02	-	-	2	4	-
Cleaner Scav.	-	-	-	0.01	-	1	3	-
Scav. No. 1	-	1.0	0.01	-	-	2	3	-
Scav. No. 2	-	0.5	-	-	-	1	2½	-
Scav. No. 3	-	0.5	-	-	-	1	2	-
Scav. No. 4	-	0.5	-	-	-	1	2	-

Test No. 37 - Continued

Flowsheet



Test No. 37 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	23.2	66.5	49.3
2. Scav. Conc.	0.7	63.7	1.4
3. Cl. Scav. Tail.	0.5	22.6	0.4
4. Scav. 1 Conc.	5.3	66.6	11.3
5. Scav. 2 Conc.	4.0	62.5	8.0
6. Scav. 3 Conc.	3.4	53.5	5.8
7. Scav. 4 Conc.	7.4	30.1	7.1
8. Tailing	15.2	12.3	6.0
9. Slime 2	7.9	11.9	3.0
10. Slime 1	32.4	7.5	7.7
Head (Calculated)	100.0	31.3	100.0

Calculated Grades and Recoveries

Products 1 + 2	23.9	66.4	50.7
Products 1 - 3	24.4	65.5	51.1
Products 1 - 4	29.7	65.7	62.4
Products 1 - 5	33.7	65.3	70.4
Products 1 - 6	37.1	64.3	76.2
Products 1 - 7	44.5	58.6	83.3
Products 1 - 8	59.7	46.8	89.3
Products 1 - 9	67.6	42.7	92.3
Products 9 + 10	40.3	8.4	10.7

Test No. 38

Purpose: To repeat test No. 37, but use starch in place of dextrin in flotation.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	45	1000	60

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.3	4.0	-	45	-	-	8.9
Slime 1	0.1	-	0.30	-	3	2.0	9.2
Slime 2	0.1	1.0	0.05	-	1+2+3	2.25	9.2

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	0.5	-	-	-	2	-	-
Rougher 1	-	-	0.15	0.01	-	2	4	-
Rougher 2	-	0.25	0.075	-	-	2+2	3	-
Rougher 3	-	0.15	0.02	-	-	2+2	3	-
Cleaner	-	-	0.02	-	-	2	4	-
Cleaner Scav.	-	0.05	-	-	-	2	2	-
Scav. No. 1	-	0.10	0.02	-	-	2+2	2	-
Scav. No. 2	-	0.08	-	-	-	2	2	-
Scav. No. 3	-	0.05	-	-	-	2	1½	-

Test No. 38 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	35.4	62.3	70.4
2. Cl. Scav. Conc.	1.5	49.2	2.4
3. Cl. Scav. Tail.	2.7	17.3	1.5
4. Scav. 1 Conc.	4.9	64.1	10.0
5. Scav. 2 Conc.	2.4	33.6	2.6
6. Scav. 3 Conc.	1.7	18.2	1.0
7. Tailing	11.2	4.8	1.7
8. Slime 2	9.5	11.4	3.4
9. Slime 1	30.7	7.1	7.0
Head (Calculated)	100.0	31.3	100.0

Calculated Grades and Recoveries

Products 1 + 2	36.9	61.8	72.8
Products 1 - 3	39.6	58.7	74.3
Products 1 - 4	44.5	59.3	84.3
Products 1 - 5	46.9	58.0	86.9
Products 1 - 6	48.6	56.6	87.9
Products 1 - 7	59.8	46.9	89.6
Products 1 - 8	69.3	42.0	93.0
Products 8 + 9	40.2	8.1	10.4

Test No. 39

Purpose: To repeat test No. 38, but improve flotation conditions.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	45	1000	60

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.3	4.0	-	45	-	-	8.9
Slime 1	0.1	-	0.3	-	3	2.0	9.2
Slime 2	0.1	1.0	0.05	-	1+2+3	2.25	9.2

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	5	-
Rougher 2	-	0.10	0.10	-	-	2+2	4	-
Rougher 3	-	-	0.05	-	-	2	3	-
Rougher 4	-	-	0.05	-	-	2	3	-
Cleaner	-	-	0.05	-	-	2	3	-
Cleaner Scav.	-	0.04	0.01	-	-	2+1	2	-
Scav. No. 1	-	0.20	0.01	-	-	2+1	2½	-
Scav. No. 2	-	0.15	-	-	-	2	2	-
Scav. No. 3	-	0.10	-	-	-	2	1½	-

Test No. 39 - continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate*	34.0	66.5	69.9
2. Cl. Scav. Conc.	1.3	45.3	1.8
3. Cl. Scav. Tail.	2.2	19.7	1.3
4. Scav. 1 Conc.	5.0	63.4	9.8
5. Scav. 2 Conc.	2.2	41.3	2.8
6. Scav. 3 Conc.	2.9	18.8	1.7
7. Tailing	11.8	5.3	1.9
8. Slime 2	8.5	12.4	3.2
9. Slime 1	32.1	7.6	7.6
Head (Calculated)	100.0	32.4	100.0

Calcualted Grades and Recoveries

Products 1 + 2	35.3	65.7	71.7
Products 1 - 3	37.5	63.0	73.0
Products 1 - 4	42.5	63.1	82.8
Products 1 - 5	44.7	62.0	85.6
Products 1 - 6	47.6	59.4	87.3
Products 1 - 7	59.4	48.6	89.2
Products 1 - 8	67.9	44.1	92.4
Products 8 + 9	40.6	8.60	10.8
Products 8 - 10	52.4	7.86	12.7
Products 1 + 4	39.0	66.1	79.7

*Additional Assays: Fe Concentrate: Na_2O - 0.015 %
K_2O - 0.007 %
SiO_2 - 7.70 %

Test No. 40

Purpose: To repeat test No. 39, but with a finer primary grind.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.4	4.0	-	60	-	-	9.0	-
Slime 1	0.05	-	0.30	-	3	2.0	9.2	26
Slime 2	0.1	1.0	0.05	-	1+2+3	2.0	9.2	-

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MC98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	5	-
Rougher 2	-	0.05	0.10	-	-	1+2	4	-
Rougher 3	-	-	0.05	-	-	2	3	-
Rougher 4	-	-	0.05	-	-	2	3	-
Cleaner	-	-	0.05	-	-	2	3	-
Scav. No. 1	-	0.2	0.01	-	-	2+1	2½	-
Scav. No. 2	-	0.15	-	-	-	2	2	-
Scav. No. 3	-	0.10	-	-	-	2	1½	-

Test No. 40 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate*	32.0	67.5	67.6
2. Cl. Tailing	2.2	47.2	3.2
3. Scav. 1 Conc.	6.3	61.8	12.2
4. Scav. 2 Conc.	2.8	37.8	3.3
5. Scav. 3 Conc.	2.3	19.2	1.4
6. Tailing	9.7	5.4	1.6
7. Slime 2	10.4	10.6	3.4
8. Slime 1	34.3	6.8	7.3
Head (Calculated)	100.0	32.0	100.0

Calculated Grades and Recoveries

Products 1 + 2	34.2	66.2	70.8
Products 1 - 3	40.5	65.5	83.0
Products 1 - 4	43.3	63.7	86.3
Products 1 - 5	45.6	61.5	87.7
Products 1 - 6	55.3	51.6	89.3
Products 1 - 7	65.7	45.1	92.7
Products 7 + 8	44.7	7.67	10.7
Products 6 - 8	54.4	7.26	12.3
Products 1 + 3	38.3	66.6	79.8

*Additional Assays: Fe Concentrate: Na_2O - 0.011 %
K_2O - 0.006 %
SiO_2 - 4.96 %

Test No. 40 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.3	0.3	99.7
100	0.6	0.9	99.1
150	0.4	1.3	98.7
200	0.9	2.2	97.8
270	1.3	3.5	96.5
400	5.0	8.5	91.5
- 400	91.5	100.0	-
Total	100.0	-	-

Test No. 41

Purpose: To repeat test No. 35, but with a finer primary grind, and several modifications to the flotation conditions.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.3	4.0	-	60	-	-	9.2
Slime 1	-	-	0.30	-	3	4.5	9.2
Slime 2	-	1.0	0.05	-	2+2	3.0	9.1

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	4	-
Rougher 2	-	0.05	0.13	-	-	1+2	4	-
Rougher 3	-	-	0.075	-	-	2	4	-
Rougher 4	-	-	0.07	-	-	2	4	-
Rougher 5	-	0.05	0.08	-	-	1+2	4	
Cleaner	-	-	0.08	-	-	2	3	-
Scav. No. 1	-	0.25	0.01	-	-	2+1	3	-
Scav. No. 2	-	0.20	-	-	-	2	2½	-
Scav. No. 3	-	0.15	-	-	-	2	2	-
Scav. No. 4	-	0.10	-	-	-	2	1½	

Test No. 41 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	20.9	60.9	43.9
2. Cl. Tailing	7.3	44.6	11.2
3. Scav. 1 Conc.	15.6	42.3	22.7
4. Scav. 2 Conc.	5.8	34.1	6.8
5. Scav. 3 Conc.	2.9	24.1	2.4
6. Scav. 4 Conc.	2.5	16.7	1.4
7. Scav. Tailing	11.8	5.5	2.2
8. Slime 2	12.4	10.1	4.3
9. Slime 1	20.8	6.9	5.1
Head (Calculated)	100.0	29.0	100.0

Calculated Grades and Recoveries

Products 1 + 2	28.2	56.7	55.1
Products 1 - 3	43.8	51.6	77.8
Products 1 - 4	49.6	49.5	84.6
Products 1 - 5	52.5	48.1	87.0
Products 1 - 6	55.0	46.7	88.4
Products 1 - 7	66.9	39.4	90.6
Products 1 - 8	79.2	34.8	94.9
Products 8 + 9	33.2	8.09	9.4
Products 7 - 9	45.0	7.41	11.6

Test No. 41 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	1.6	1.6	98.4
100	0.9	2.5	97.5
150	0.6	3.1	96.9
200	0.9	4.0	96.0
270	1.2	5.2	94.8
400	4.6	9.8	90.2
- 400	90.2	100.0	-
Total	100.0	-	-

Test No. 43

Purpose: To repeat test No. 41, but improve selectivity and Fe recovery in flotation.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling	
Grind	0.3	4.0	-	60	-	-	9.2
Slime 1	-	-	0.30	-	3	4.5	9.2
Slime 2	-	1.0	0.05	-	2+2	3.0	-
Slime 3	-	1.0	-	-	1	3.0	-

Conditions: Flotation.

Stage	Reagents Added, pounds per ton					Time, minutes			pH
	NaOH	Starch	MG98A	Duomeen L-11	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	-	1	-	9.5
Condition 2	-	1.25	-	-	-	-	3	-	-
Rougher 1	-	-	0.15	0.075	0.01	-	2	3	-
Rougher 2	-	-	0.12	0.05	-	-	1+2	4	-
Rougher 3	-	-	0.07	0.05	-	-	1+2	4	-
Rougher 4	-	-	0.05	0.05	-	-	1+2	4	-
Rougher 5	-	-	0.05	0.05	-	-	1+2	4	-
Cleaner	-	-	0.05	-	-	-	2	3	-
Scav. No. 1	-	0.30	0.02	0.01	-	-	2	3	-
Scav. No. 2	-	0.25	0.005	0.005	-	-	2	2	-
Scav. No. 3	-	0.15	-	-	-	-	2	2	-
Scav. No. 4	-	0.10	-	-	-	-	2	1½	-

Test No. 43 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Conc. (-48 mesh)	18.6	61.7	40.4
2. Fe Conc. (+48 mesh)	0.2	35.1	0.2
3. Cleaner Slime	0.9	33.5	1.1
4. Cleaner Tailing	2.8	49.8	4.9
5. Scav. 1 Conc.	15.9	46.6	26.0
6. Scav. 2 Conc.	8.0	34.8	9.8
7. Scav. 3 Conc.	4.0	24.7	3.5
8. Scav. 4 Conc.	3.2	16.3	1.8
9. Tailing	10.4	6.6	2.4
10. Slime 3	5.2	10.5	1.9
11. Slime 2	13.7	8.6	4.1
12. Slime 1	17.1	6.5	3.9
Head (Calculated)	100.0	28.5	100.0

Calculated Grades and Recoveries

Products 1 + 2	18.8	61.4	40.6
Products 1 - 3	19.7	60.1	41.7
Products 1 - 4	22.5	58.9	46.6
Products 1 - 5	38.4	53.8	72.6
Products 1 - 6	46.4	50.5	82.4
Products 1 - 7	50.4	48.5	85.9
Products 1 - 8	53.6	46.5	87.7
Products 1 - 9	64.0	40.1	90.1
Products 1 - 10	69.2	37.8	92.0
Products 11 + 12	30.8	7.44	8.0
Products 10 - 12	36.0	7.99	9.9
Products 9 - 12	46.4	7.59	12.3

Test No. 43 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100	0.2	0.2	99.8
150	0.3	0.5	99.5
200	0.7	1.2	98.8
270	1.4	2.6	97.4
400	7.8	10.4	89.6
- 400	89.6	100.0	-
Total	100.0	-	-

Additional Assays

	Fe Concentrate	Fe Scavenger Concentrate
Fe (T) %		48.4
Fe (sol) %	61.7	46.6
SiO_2 %	4.52	20.0
K_2O %	0.006	0.010
Na_2O %	0.01	0.019
MnO_2 %	1.26	1.50
CaO %	2.67	2.87
Al_2O_3 %	<0.05	0.07
MgO %	1.48	3.04
LOI %	2.71	-
S %	-	0.123

Test No. 44

Purpose: To investigate the effect of a fine regrind prior to flotation.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60
Regrind	Ball	60	783	50

Conditions: Selective Flocculation

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.3	4.0	-	30	-	-	9.4	-
Slime 1	-	-	0.25	-	3	2.75	9.2	24
Slime 2	-	1.0	0.05	-	2+3	2.50	9.1	-

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Regrind	0.1	-	-	-	60	-	-	-
Condition 1	0.2	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	4	-
Rougher 2	-	0.05	0.13	-	-	2+2	4	-
Rougher 3	-	0.04	0.10	-	-	2+2	4	-
Rougher 4	-	-	0.10	-	-	2	4	-
Cleaner 1	-	-	0.05	-	-	2	4	-
Cleaner 2	-	-	0.02	-	-	2	3	-
Cleaner Scavenger	-	0.05	0.01	-	-	2+1	2	-
Scavenger 1	-	0.25	0.01	-	-	2+1	3	-
Scavenger 2	-	0.20	-	-	-	2	2½	-
Scavenger 3	-	0.15	-	-	-	2	2	-

Stage	Selective Flocculation	Rougher
Flotation Cell	4 l Beaker	500 g D-1
Speed: r.p.m.	1200	1200

Test No. 44 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	17.9	63.0	38.7
2. Scav. Cl. Conc.	5.0	49.6	8.5
3. Scav. Cl. Tail.	2.0	45.4	3.1
4. Scav. 1 Conc.	24.4	36.8	30.8
5. Scav. 2 Conc.	10.1	23.3	8.1
6. Scav. 3 Conc.	4.1	14.7	2.1
7. Tailing	14.9	4.3	2.2
8. Slime 2	6.1	11.6	2.4
9. Slime 1	15.5	7.9	4.1
Head (Calculated)	100.0	29.2	100.0

Calculated Grades and Recoveries

Products 1 + 2	22.9	60.1	47.2
Products 1 - 3	24.9	58.9	50.3
Products 1 - 4	49.3	48.0	81.1
Products 1 - 5	59.4	43.8	89.2
Products 1 - 6	63.5	41.9	91.3
Products 1 - 7	78.4	34.7	93.5
Products 8 + 9	21.6	8.94	6.5
Products 8 - 10	36.5	7.05	8.7

Test No. 44 - Continued

Screen Analysis

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.1	0.1	99.9
100	0.3	0.4	99.6
150	1.0	1.4	98.6
200	1.1	2.5	97.5
270	1.4	3.9	96.1
400	2.6	6.5	93.5
- 400	93.5	100.0	-
Total	100.0	-	-

Test No. 45

Purpose: To investigate the effect of a finer primary grind.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60
Regrind	Ball	60	633	50

Conditions: Selective Flocculation

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.3	4.0	-	60	-	-	-	-
Slime 1	-	-	0.30	-	3	4.5	9.2	21
Slime 2	-	1.0	0.05	-	2+3	3.0	-	-
Regrind	-	2.0	-	60	-	-	-	-
Slime 3	-	-	0.075	-	3	6.0	8.7	-

Conditions: Flotation

Stage	Reagents Added, pounds per ton			Time, minutes			pH
	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Condition	0.8	-	-	-	3	-	8.6
Rougher 1	0.20	0.25	0.01	-	2	4	-
Rougher 2	0.10	0.15	-	-	2	4	-
Rougher 3	-	0.10	-	-	2	4	8.3
Rougher 4	-	0.10	-	-	2	4	-
Cleaner 1	-	0.05	-	-	2	3	8.2
Cleaner 2	-	0.05	-	-	2	3	-
Scav. 1	0.25	-	-	-	2	3	8.1
Scav. 2	0.20	-	-	-	2	2½	7.9
Scav. 3	0.15	-	-	-	2	2	7.8
Scav. 4	0.10	-	-	-	2	1½	7.8
Deslime Fe Concentrate 4 times after 1 minute settling time.							

Test No. 45 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	13.7	67.0	31.8
2. Cl. Slime	2.7	33.7	3.2
3. Cl. Tailing	3.8	47.5	6.3
4. Scav. 1 Conc.	21.7	42.5	32.0
5. Scav. 2 Conc.	10.6	30.7	11.3
6. Scav. 3 Conc.	5.3	20.9	3.8
7. Scav. 4 Conc.	2.9	12.9	1.3
8. Tailing	2.8	5.1	0.5
9. Slime 3	5.5	8.7	1.7
10. Slime 2	13.0	8.5	3.8
11. Slime 1	18.0	6.9	4.3
Head (Calculated)	100.0	28.8	100.0

Calculated Grades and Recoveries

Products 1 + 2	16.4	61.5	35.0
Products 1 - 3	20.2	58.9	41.3
Products 1 - 4	41.9	50.4	73.3
Products 1 - 5	52.5	46.4	84.6
Products 1 - 6	57.8	44.1	88.4
Products 1 - 7	60.7	42.6	89.7
Products 1 - 8	63.5	40.9	90.2
Products 1 - 9	69.0	38.4	91.9
Products 10 - 11	31.0	7.57	8.1
Products 9 - 11	36.5	7.74	9.8
Products 8 - 11	39.3	7.55	10.3

Screen Analysis - Regrind Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	13.2	13.2	86.8
- 400	86.8	100.0	-
Total	100.0	-	-

Test No. 46

Purpose: To investigate a selective flocculation, magnetic separation and flotation flowsheet.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60

Conditions: Selective Flocculation

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.3	4.0	-	60	-	-	9.4	-
Slime 1	-	-	0.30	-	3	4.5	9.4	20
Slime 2	-	1.0	0.05	-	2+3	3.0	9.2	-

Test No. 46 - Continued

Conditions: Magnetic Separation

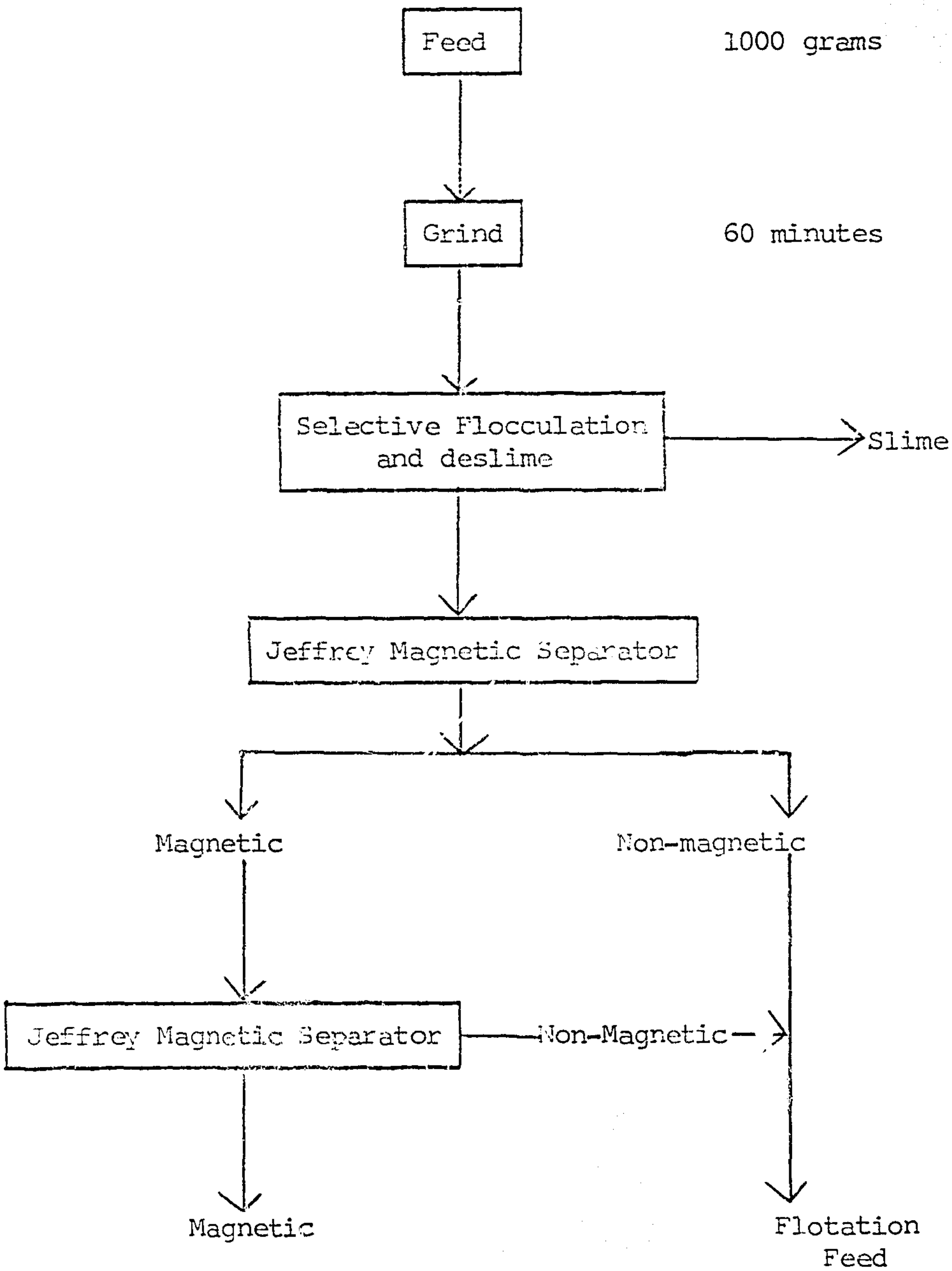
Pass the deslimed Fe concentrate through the Jeffrey magnetic separator set at 2.0 amperes. Repass the magnetics under the above condition. Combine the non-magnetics as flotation feed.

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MC98A	MIBC	Grind	Cond.	Froth	
Condition 1	0.2	-	-	-	-	1	-	9.2
Condition 2	-	0.25	-	-	-	3	-	-
Rougher 1	-	-	0.25	0.01	-	2	5	-
Rougher 2	-	0.10	0.15	-	-	2+2	5	-
Rougher 3	-	-	0.10	-	-	2	4	-
Cleaner	-	-	0.05	-	-	2	3	-
Scavenger 1	-	0.20	-	-	-	2	4	8.8
Scavenger 2	-	0.15	-	-	-	2	3	8.4
Scavenger 3	-	0.10	-	-	-	2	2	7.9

Test No. 46 - Continued

Flowsheet



Test No. 46 -- Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Magnetic Concentrate	20.3	64.5	47.4
2. Fe Flot. Concentrate	6.1	43.4	9.6
3. Cleaner Tailing	2.9	40.5	4.3
4. Scav. Conc. 1	7.6	40.6	11.2
5. Scav. Conc. 2	6.2	35.1	7.9
6. Scav. Conc. 3	5.1	23.6	4.4
7. Tailing	13.3	8.4	4.1
8. Slime 2	19.2	9.6	6.7
9. Slime 1	19.3	6.4	4.4
Head (Calculated.	100.0	27.6	100.0

Calculated Grades and Recoveries

Products 2 + 3	9.0	42.5	13.9
Products 2 - 4	16.6	41.6	25.1
Products 2 - 5	22.8	39.8	33.0
Products 2 - 6	27.9	36.9	37.4
Products 2 - 7	41.2	27.7	41.5
Products 8 + 9	38.5	8.00	11.1
Products 1 - 7	61.5	39.8	88.9

Test No. 47

Purpose: To investigate the effect of doubling the primary grind and examining MG83 and duomac in flotation.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	120	1000	60

Conditions: Selective flocculation

Stage	Reagents, lb/ton feed				Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Na_2CO_3	Grind	Cond.	Settling		
Grind	0.4	4.0	-	-	120	-	-	9.5	-
Slime 1	-	-	0.30	-	-	3	-	9.6	25
	-	-	-	4.0	-	2	-	10.0	23
	-	2.0	-	-	-	2	-	-	23
	-	-	0.20	-	-	-	5.0	-	-
Slime 2	-	2.0	-	-	-	2	-	9.8	-
	-	-	0.10	-	-	2	3.75	-	-
Slime 3	0.10	1.0	-	-	-	2	-	9.7	-
	-	-	0.05	-	-	2	3.0	-	-

Test No. 47 - Continued

Conditions: Flotation

Stage	Reagents Added, pounds per ton						Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	MG83	Duomac T	Grind	Cond.	Froth	
Condition 1	0.1	-	-	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	-	-	3	-	-
Rougher 1	-	-	0.20	-	-	-	-	2	4	-
Rougher 2	-	-	0.15	-	-	-	-	2	5	-
Rougher 3	-	-	0.10	-	-	-	-	2	5	9.2
Rougher 4	-	-	0.05	-	-	-	-	2	5	8.9
Cleaner No. 1	0.05	-	-	-	0.05	-	-	1+2	3	9.4
Cleaner No. 2	0.05	-	-	-	-	0.05	-	1+2	3	9.4
Scavenger No. 1	-	0.25	0.03	-	-	-	-	2	3	9.2
Scavenger No. 2	-	0.20	-	-	-	-	-	2	2½	9.0
Scavenger No. 3	-	0.15	-	-	-	-	-	2	2	8.7

Test No. 47 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	11.1	61.7	23.5
2. Cl. Tail. 2	4.1	58.1	8.2
3. Cl. Tail. 1	4.1	53.4	7.5
4. Scav. 1 Conc.	19.6	46.6	31.3
5. Scav. 2 Conc.	10.2	38.4	13.4
6. Scav. 3 Conc.	4.0	27.8	3.8
7. Tailing	10.5	9.7	3.5
8. Slime 3	6.0	9.4	2.0
9. Slime 2	10.9	7.6	2.8
10. Slime 1	19.5	6.0	4.0
Head (Calculated)	100.0	29.2	100.0

Calculated Grades and Recoveries

Products 1 + 2	15.2	60.7	31.7
Products 1 - 3	19.3	59.2	39.1
Products 1 - 4	38.9	52.8	70.4
Products 1 - 5	49.1	49.8	83.9
Products 1 - 6	53.1	48.2	87.7
Products 1 - 7	63.6	41.8	91.2
Products 9 + 10	30.4	6.6	6.8
Products 8 - 10	36.4	7.0	8.8

Test No. 47 - Continued

Screen Analysis - 120 Minute Grind

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 100	1.0	1.0	99.0
150	1.0	2.0	98.0
200	0.8	2.8	97.2
270	0.4	3.2	96.8
400	1.4	4.6	95.4
- 400	95.4	100.0	-
Total	100.0	-	-

Test No. 48

Purpose: To repeat test No. 41, but double the regrind time, and use MG83 in place of MG98.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60
Regrind	Ball	120	715	65

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.3	4.0	-	60	-	-	9.2	-
Slime 1	-	-	0.30	-	3	4.0	9.2	24
Slime 2	0.1	1.0	0.05	-	2+2	3.0	9.4	-

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG83A	MIBC	Grind	Cond.	Froth	
Regrind	0.1	-	-	-	120	-	-	-
Condition 1	0.05	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.25	0.04	-	2	5	-
Rougher 2	-	-	0.20	-	-	2	5	-
Rougher 3	-	-	0.15	-	-	2	4	8.6
Cleaner	0.10	-	0.10	-	-	2	4	9.3
Scav. No. 1	-	0.25	-	-	-	2	3	9.1
Scav. No. 2	-	0.20	-	-	-	2	2½	8.7
Scav. No. 3	-	0.10	-	-	-	2	2	8.6

Test No. 48 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	13.5	60.8	27.8
2. Cl. Tail.	4.4	49.3	7.4
3. Scav. 1 Conc.	32.7	37.8	41.9
4. Scav. 2 Conc.	12.9	25.6	11.2
5. Scav. 3 Conc.	4.7	18.9	3.0
6. Tailing	2.4	14.2	1.2
7. Slime 2	11.1	9.3	3.5
8. Slime 1	18.3	6.5	4.0
Head (Calc.)	100.0	29.5	100.0

Calculated Grades and Recoveries

Products 1 + 2	17.9	58.0	35.2
Products 1 - 3	50.6	44.9	77.1
Products 1 - 4	63.5	41.0	88.3
Products 1 - 5	68.2	39.5	91.3
Products 1 - 6	70.6	38.6	92.5
Products 1 - 7	81.7	34.6	96.0
Products 7 + 8	29.4	7.6	7.5

Screen Analysis - Regrind Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	1.6	1.6	98.4
- 400	98.4	100.0	-
Total	100.0	-	-

Test No. 49

Purpose: To repeat test No. 44, but with a higher pH during silica flotation.

Feed: 1000 grams minus 10 mesh composite 130.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	30	1000	60
Regrind	Ball	60	748	65

Conditions: Selective Flocculation.

Stage	Reagents, lb/ton feed			Time, minutes		
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling
Grind	0.3	4.0	-	30	-	-
Slime 1	-	-	0.25	-	3	2.75
Slime 2	-	1.0	0.05	-	2+3	2.50

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Regrind	0.3	-	-	-	60	-	-	-
Condition 1	0.55	-	-	-	-	2	-	10.6
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	4	10.3
Rougher 2	-	0.05	0.15	-	-	2+2	4	-
Rougher 3	-	0.05	0.10	-	-	2+2	4	10.1
Rougher 4	-	-	0.10	-	-	2	4	10.0
Cleaner 1	-	-	0.05	-	-	2	3	-
Cleaner 2	-	-	0.02	-	-	2	3	-
Scav. No. 1 (1)	0.10	0.25	0.01	-	-	2+1	2	9.6-10.2
Scav. No. 1 (2)	-	-	0.01	-	-	1	2	-
Scav. No. 2	-	0.20	-	-	-	2	3	10.0
Scav. No. 3	-	0.15	-	-	-	2	3	9.8

Test No. 49 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	16.2	61.4	34.1
2. Cl. Tailing	5.3	48.2	8.8
3. Scav. 1 Conc.	16.1	48.8	26.9
4. Scav. 2 Conc.	8.9	38.0	11.6
5. Scav. 3 Conc.	3.8	31.4	4.1
6. Tailing	24.9	7.1	6.1
7. Slime 2	6.5	12.7	2.8
8. Slime 1	18.3	9.1	5.6
Head (Calc.)	100.0	29.2	100.0

Calculated Grades and Recoveries

Products 1 + 2	21.5	58.2	42.9
Products 1 - 3	37.6	54.1	69.8
Products 1 - 4	46.5	51.1	81.4
Products 1 - 5	50.3	49.6	85.5
Products 1 - 6	75.2	35.5	91.6
Products 7 + 8	24.8	10.0	8.5
Products 6 - 8	49.7	8.6	14.6

Screen Analysis - Regrind Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	9.3	9.3	90.7
- 400	90.7	100.0	-
Total	100.0	-	-

Test No. 50

Purpose: To repeat test No. 40, but to investigate the effect of a regrind prior to flotation.

Feed: 1000 grams minus 10 mesh composite 131.

Grind:

Stage	Mill	Time (Min.)	Weight (Grams)	% Solids
Primary	Ball	60	1000	60
Regrind	Ball	45	550	60

Conditions: Selective Flocculation

Stage	Reagents, lb/ton feed			Time, minutes			pH	Temp. °C
	NaOH	Na_2SiO_3	Starch	Grind	Cond.	Settling		
Grind	0.4	4.0	-	60	-	-	9.3	-
Slime 1	-	-	0.30	-	3	2.0	9.3	24
Slime 2	0.1	1.0	0.05	-	1+2+3	2.0	9.3	-

Conditions: Flotation

Stage	Reagents Added, pounds per ton				Time, minutes			pH
	NaOH	Starch	MG98A	MIBC	Grind	Cond.	Froth	
Regrind	-	-	-	-	45	-	-	-
Condition 1	0.20	-	-	-	-	1	-	9.5
Condition 2	-	1.0	-	-	-	3	-	-
Rougher 1	-	-	0.20	0.01	-	2	5	-
Rougher 2	-	0.05	0.10	-	-	1+2	4	9.3
Rougher 3	-	-	0.05	-	-	2	3	-
Rougher 4	-	-	0.05	-	-	2	3	9.1
Cleaner	-	-	0.05	-	-	2	3	9.0
Scav. No. 1	-	0.2	0.01	-	-	2+1	3	8.8
Scav. No. 2	-	0.15	-	-	-	2	2½	8.5
Scav. No. 3	-	0.10	-	-	-	2	2	8.4

Test No. 50 - Continued

Metallurgical Results

Product	Weight %	Assays, % Sol. Fe	% Distribution Sol. Fe
1. Fe Concentrate	20.3	69.7	44.7
2. Cl. Tailing	1.4	64.9	2.9
3. Scav. 1 Conc.	12.4	65.2	25.5
4. Scav. 2 Conc.	5.6	58.1	10.3
5. Scav. 3 Conc.	2.1	44.6	3.0
6. Tailing	13.6	8.0	3.4
7. Slime 1	8.3	11.1	2.9
8. Slime 2	36.3	6.4	7.3
Head (Calc.)	100.0	31.7	100.0

Calculated Grades and Recoveries

Products 1 + 2	21.7	69.4	47.6
Products 1 - 3	34.1	67.9	73.1
Products 1 - 4	39.7	66.5	83.4
Products 1 - 5	41.8	65.4	86.4
Products 1 - 6	55.4	51.3	89.8
Products 7 + 8	44.6	7.27	10.2
Products 6 - 8	58.2	7.44	13.6

Screen Analysis - Regrind Product

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 400	5.3	5.3	94.7
- 400	94.7	100.0	-
Total	100.0	-	-

APPENDIX 1

MINERALOGY OF FE CONCENTRATES (COMPOSITE 130)

INTRODUCTION

Two samples of test-products were received in the Mineralogy laboratory from H.E. Neal and Associates. The samples were submitted for identification of the gangue diluent and were identified as follows:

(1) Test No. 43 Fe Concentrate

(2) Test No. 43 Fe Scavenger Concentrate No. 1

SUMMARY

The scavenger concentrate No. 1 contained more gangue than did the Fe concentrate. The major gangue minerals were quartz and ankerite. Minor amounts of other carbonate mineral and an Fe mica were present.

Preparation and Procedure

A portion of each sample was mounted in a suitable refractive index oil on glass slides for microscopic examination in transmitted light. A second portion of each sample was treated in heavy liquid (sg 3.3) and the float fractions were submitted for x-ray powder diffraction for identification of the constituent minerals.

Results

The gangue minerals were similar for both the Fe concentrate and the Fe Scavenger concentrate No. 1. The major gangue minerals were ankerite and quartz, with the composition of some of the ankerite ($Ca[Mg, Fe][CO_3]_2$) approximating that of siderite ($FeCO_3$). The grain-size of the gangue particles ranged from smaller than 5 to 60 micrometres.

Approximately 75 percent of the gangue contained inclusions of opaque mineral. In general these inclusions were smaller than 2 micrometres.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
March 24, 1977 / Dmm, Slb

An Investigation of

THE RECOVERY OF IRON

on samples of Quebec Ungava ore

submitted by

H.E. NEAL AND ASSOCIATES LIMITED

Progress Report No. 7

Project No. L.R. 1867

NOTE:

This report refers to the samples as received.

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
May 11, 1977

INTRODUCTION

On November 30, 1976, instructions were received from Mr. H.E. Neal to prepare composites of the remainder of the 1976 Quebec Ungava samples.

Mr. Neal requested that standard Davis tube tests should be carried out after a 24 minute pebble mill grind.

LAKEFIELD RESEARCH OF CANADA LIMITED

A.G. Scobie

A.G. Scobie, P. Eng.,
Manager

D. M. Wyslouzil

D.M. Wyslouzil, P. Eng.,
Chief Metallurgist

Investigation by: O.F.C. Cook

SAMPLE PREPARATION

Composites were made up from the minus 20 mesh rejects according to instructions received from Mr. Neal, and 100 gram charges were prepared and ground for 24 minutes in an Abbe pebble mill.

DETAILS OF DAVIS TUBE TESTS

The Davis tube tests were performed under the following conditions:

Waterflow	400 ml. per minute
Tube Oscillations	100 strokes per minute
Current to Poles	2.0 amperes
Retention Time	5 minutes

The magnetic fractions were dried, weighed and assayed for soluble iron.

All head samples were assayed for soluble iron and the magnetic iron content was determined by calculation.

Results - Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Weight %	Concentrate Assay, % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay, % Sol. Fe
QUC 166	30.8	22.4	32.9	68.1	72.7	93.2	12.5
167	31.4	22.8	33.1	69.0	72.7	94.0	12.8
168	37.1	31.6	44.9	70.3	85.1	94.0	10.0
169	34.9	29.7	42.3	70.2	85.1	94.2	9.0
170	32.9	29.1	42.0	69.2	88.3	91.2	6.6
171	22.4	13.8	21.9	62.9	61.5	87.6	11.0
172	32.4	22.6	33.5	67.6	69.9	93.6	14.7
173	32.9	27.4	40.0	68.4	83.2	92.2	9.2
174	33.7	29.6	42.8	69.2	87.9	93.6	7.1
175	31.4	26.9	39.0	69.1	85.8	92.6	7.3
176	33.8	28.9	42.0	68.7	85.4	92.6	8.5
177	30.6	25.9	37.1	69.7	84.5	92.4	7.5
178	29.4	21.2	31.9	66.6	72.3	91.4	12.0
179	28.0	19.2	28.3	67.7	68.4	92.0	12.3
179A	33.2	27.3	39.8	68.5	82.1	93.2	9.9
180	31.6	26.4	39.6	66.7	83.6	91.6	8.6
181	32.6	27.6	41.8	66.0	84.6	90.0	8.6
182	31.1	21.0	32.1	65.5	67.6	91.1	14.8
183	32.4	25.8	39.1	66.1	79.8	94.0	10.8
184	31.4	24.9	37.8	69.9	79.3	93.6	10.4
185	30.1	23.0	35.7	64.4	76.4	92.4	11.1
186	28.7	19.0	29.3	63.7	66.1	90.0	13.8
187	30.3	19.9	28.7	69.2	65.5	91.2	14.6
188	31.0	24.1	34.4	70.0	77.7	91.6	10.5
189	30.8	22.5	32.8	68.5	72.9	89.8	12.4
190	32.7	27.5	39.9	68.8	83.9	89.8	8.7
191	31.0	20.9	30.7	68.2	67.5	87.8	14.5
192	32.4	21.9	32.4	67.6	67.6	90.0	15.5
193	31.9	27.0	39.2	68.9	84.7	90.0	8.0
194	30.5	19.9	29.6	67.2	65.2	90.2	15.1
195	30.7	21.3	30.9	69.0	69.4	91.8	13.6
196	30.6	18.8	27.7	68.0	61.6	87.4	16.3
197	32.2	24.1	35.5	67.9	74.9	88.0	12.6
198	29.7	17.3	25.7	67.5	58.4	88.0	16.6
199	32.9	18.4	27.0	68.2	56.0	86.0	19.8
200	32.7	24.8	35.9	69.0	75.8	89.4	12.4
201	31.1	19.4	27.7	70.1	62.4	92.6	16.2
202	31.7	24.8	35.9	69.1	78.3	92.4	10.8
203	32.4	25.4	37.2	68.2	78.3	94.4	11.2
204	34.0	29.0	41.6	69.8	85.4	98.5	8.5
205	32.2	21.9	31.2	70.3	68.1	92.2	14.9
206	32.0	21.4	31.6	67.8	67.0	91.3	15.5

Results - Continued

Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay,% Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay, % Sol. Fe
QUC 207	32.6	24.8	36.3	68.3	76.1	91.7	12.3
208	32.3	21.4	32.8	65.3	66.3	92.0	16.2
209	34.2	23.6	33.9	69.7	69.1	95.5	16.0
210	34.2	28.1	40.0	70.3	82.2	95.2	10.1
211	30.8	21.0	30.9	67.9	68.1	93.4	14.2
212	32.7	25.1	36.8	68.2	76.8	92.7	12.0
213	30.0	15.1	23.1	65.4	50.4	90.4	19.4
214	33.0	20.1	29.9	67.3	61.0	92.0	18.4
215	34.4	26.8	39.1	68.6	78.0	92.8	12.4
216	31.4	20.4	30.3	67.2	64.8	90.0	15.8
217	31.8	23.0	33.0	69.7	72.3	98.3	13.1
218	33.1	25.5	36.8	69.4	77.2	96.4	12.0
219	31.4	23.2	33.1	70.0	73.8	93.6	12.3
220	29.8	21.6	32.1	67.2	72.4	93.9	12.1
221	32.9	22.6	34.1	66.2	68.6	93.5	15.7
222	29.5	18.8	29.0	64.9	63.8	92.6	15.0
223	30.9	16.8	26.0	64.5	54.3	90.0	19.1
224	32.5	24.7	38.0	65.1	76.1	93.6	12.5
225	33.7	27.1	39.6	68.4	80.4	93.0	10.9
226	29.6	22.1	33.8	65.5	74.8	93.0	11.3
227	26.1	17.2	25.3	67.8	65.7	87.6	12.0
228	29.8	17.6	26.4	66.7	59.1	92.2	16.6
229	30.4	20.5	29.9	68.7	67.6	92.4	14.1
230	31.8	24.8	36.1	68.8	78.1	92.2	10.9
231	32.6	21.8	31.9	68.2	66.7	92.4	15.9
232	28.9	21.3	32.2	66.3	73.9	89.4	11.1
233	30.7	19.0	29.0	65.5	61.9	90.6	16.5
234	31.7	21.9	32.4	67.6	69.1	90.6	14.5
235	31.6	25.5	36.9	69.2	80.8	90.8	9.6
236	33.2	17.1	25.2	67.8	51.5	87.8	21.5
237	31.1	18.3	26.2	69.8	58.8	87.8	17.4
238	32.2	21.0	31.0	67.9	65.4	96.0	16.2
239	31.0	20.9	30.2	69.3	67.5	92.4	14.4
240	30.2	22.1	31.9	69.2	73.1	91.2	11.9
241	31.1	24.7	36.1	68.5	79.5	91.0	10.0
242	32.1	26.9	39.3	68.5	83.9	90.2	8.5
243	29.5	21.5	32.1	67.1	73.0	91.2	11.7
244	32.5	25.7	37.9	67.9	79.2	90.6	10.9
245	29.6	20.9	30.4	68.6	70.5	90.0	12.6

Results - Continued

Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay, % Sol. Fe
QUC 246	27.7	12.4	19.5	63.7	44.8	85.8	19.0
247	31.0	16.3	23.2	70.1	52.5	93.6	19.2
248	30.5	22.4	31.8	70.5	73.5	92.0	11.8
249	33.2	27.0	38.8	69.7	81.5	93.0	10.1
250	30.8	24.0	34.8	68.9	77.8	91.2	10.5
251	30.8	23.5	34.7	67.7	76.3	90.6	11.2
252	32.1	24.4	35.2	69.4	76.1	91.4	11.8
253	29.5	22.2	32.2	68.9	75.2	89.4	10.8
254	32.3	26.2	39.0	67.1	81.0	90.8	10.1
255	30.2	14.6	21.3	68.5	48.3	94.2	19.8
256	32.6	23.4	33.8	69.2	71.7	92.2	13.9
257	31.0	22.4	32.4	69.1	72.2	92.2	12.7
258	31.3	23.8	34.9	68.3	76.2	89.2	11.5
259	33.2	27.7	40.5	68.3	83.3	90.6	9.3
260	29.8	18.6	28.0	66.6	62.6	86.4	15.5
261	31.7	23.7	35.5	66.8	74.8	88.6	12.4
262	29.9	25.5	37.0	68.9	85.2	91.0	7.0
263	30.6	17.7	26.5	66.8	57.8	90.2	17.5
264	31.7	16.2	24.3	66.6	51.1	83.2	20.5
265	32.4	27.6	39.9	69.2	85.2	89.6	8.0
266	28.1	21.5	33.2	64.7	76.4	93.0	9.9
267	28.6	20.9	31.0	67.4	73.1	93.2	11.2
268	29.2	14.5	20.8	69.6	49.6	93.8	18.6
269	32.2	13.2	18.7	70.5	40.9	94.4	23.4
270	31.7	16.8	24.4	69.2	53.3	91.8	19.6
271	28.2	17.6	25.0	70.2	62.2	94.2	14.2
272	29.3	20.0	28.5	70.0	68.3	94.8	12.9
273	30.2	19.5	28.3	68.9	64.6	95.0	14.9
274	32.9	24.1	34.2	70.4	73.2	92.2	13.4
275	31.5	22.9	32.3	70.8	72.6	89.6	12.7
276	32.7	27.3	38.9	70.3	83.6	90.8	8.8
277	30.3	22.9	34.1	67.2	75.6	88.8	11.2
278	31.0	22.7	32.5	69.7	73.1	89.4	12.4
279	29.4	16.8	24.5	68.7	57.3	90.6	16.6
280	30.8	24.2	35.1	68.9	78.5	89.8	10.2
281	33.6	26.7	39.0	68.4	79.4	89.2	11.4
282	34.0	28.0	41.2	68.0	82.4	88.2	10.2
283	32.6	26.1	39.1	66.7	80.0	85.0	10.7
284	31.7	20.6	31.2	65.9	64.9	85.0	16.2
285	31.8	24.6	37.2	66.5	77.8	87.2	11.2
286	30.8	23.2	35.7	64.9	75.2	88.6	11.9

Results - Continued

Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay,% Sol. Fe
QUC 287	31.4	24.0	36.2	66.2	76.3	88.2	11.7
288	29.5	18.1	26.2	68.9	61.2	87.4	15.5
289	29.6	15.0	21.4	69.9	50.5	88.4	18.6
290	29.0	23.8	34.5	69.0	82.1	89.6	7.9
291	30.3	18.1	26.1	69.4	59.8	93.4	16.5
292	28.0	22.9	35.0	65.5	81.9	92.4	7.8
293	26.9	20.0	30.0	66.6	74.3	90.0	9.9
294	34.0	18.9	27.1	69.6	55.5	94.2	20.8
295	30.2	13.8	19.9	69.5	45.8	91.2	20.4
296	31.3	22.6	32.4	69.6	72.0	91.0	12.9
297	31.8	20.7	30.1	68.9	65.2	87.8	15.8
298	30.5	18.6	27.0	68.8	60.9	89.0	16.3
299	30.5	19.4	28.8	67.5	63.7	89.8	15.5
300	33.3	20.4	30.4	67.0	61.2	89.6	18.6
301	20.0	1.7	4.1	41.1	8.4	75.4	19.1
302	30.1	21.1	31.0	68.2	70.2	88.0	13.0
303	32.0	23.1	34.0	68.0	72.3	89.8	13.5
304	34.0	28.2	41.0	68.7	82.8	90.4	9.9
305	32.1	21.8	33.0	66.0	67.9	86.6	15.4
306	34.2	27.2	40.0	67.9	79.4	90.6	11.7
307	32.2	24.0	35.0	68.6	74.6	88.6	12.6
308	32.4	24.7	37.0	66.7	76.2	91.6	12.3
309	31.3	24.8	36.0	68.9	79.2	89.6	10.2
310	32.2	26.1	38.5	67.9	81.2	89.8	9.9
311	31.7	27.2	40.0	68.0	85.8	90.6	7.5
312	32.5	26.8	39.2	68.3	82.4	89.8	9.4
313	31.7	23.9	35.9	66.6	75.4	89.4	12.2
314	33.4	25.5	37.5	67.9	76.2	88.4	12.7
315	34.3	27.0	39.1	69.0	78.7	90.4	12.0
316	33.1	27.3	40.9	66.8	82.5	89.0	9.8
317	33.7	28.4	42.2	67.4	84.4	90.0	9.1
318	33.1	17.8	26.3	67.6	53.7	90.4	20.8
319	29.6	15.9	23.1	68.8	53.7	92.8	17.8
320	29.4	17.9	25.4	70.5	60.9	91.0	15.4
321	30.7	17.9	25.7	69.5	58.2	88.8	17.3
322	31.3	23.3	33.7	69.0	74.3	87.8	12.1
323	31.2	23.2	34.0	68.2	74.3	88.6	12.1
324	30.9	20.0	30.5	65.6	64.8	86.2	15.7
325	32.3	26.6	39.0	68.2	82.3	89.0	9.3

Results - Continued

Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay, % Sol. Fe
QUC 326	32.3	25.7	38.0	67.7	79.7	88.6	10.6
327	30.4	22.3	33.5	66.5	73.3	91.6	12.2
328	30.2	23.0	34.0	67.7	76.2	88.8	10.9
329	25.3	18.9	30.5	62.0	74.7	89.2	9.2
330	30.8	26.7	39.0	68.4	86.6	91.0	6.8
331	22.6	16.5	25.0	65.8	72.8	91.8	8.2
332	28.0	20.5	30.2	67.8	73.1	91.4	10.8
333	29.7	12.2	17.5	69.8	41.1	94.6	21.2
334	27.9	10.4	15.0	69.5	37.4	92.2	20.6
335	33.9	17.7	26.2	67.4	52.1	92.8	22.0
336	36.8	19.7	29.0	67.8	53.4	92.8	24.1
337	30.5	14.6	21.1	69.4	48.0	93.8	20.1
338	32.9	19.4	30.0	64.8	59.1	88.4	19.2
339	33.5	18.1	28.8	65.3	56.1	83.4	20.6
340	32.4	14.8	22.0	67.1	45.6	91.6	22.6
341	30.6	15.8	22.8	69.5	51.8	89.0	19.1
4935	31.0	14.8	21.5	68.8	47.7	93.6	20.6
4936	34.7	29.8	43.1	69.1	85.8	93.8	8.6
4937	17.9	7.9	13.0	60.8	44.2	84.0	11.5
4938	35.4	21.9	31.4	69.4	61.6	94.6	19.8
4939	33.1	18.6	26.5	70.2	56.2	95.6	19.7
4940	31.6	26.8	38.9	69.0	84.9	95.0	7.8
4941	26.7	22.9	34.2	66.9	85.7	89.2	5.8
4942	31.6	27.1	39.1	69.2	85.6	94.2	7.5
4943	33.8	30.7	45.0	68.3	90.9	94.2	5.6
4944	33.3	8.2	11.9	69.2	24.7	96.2	28.5
4945	38.4	7.0	10.3	67.5	18.1	94.2	35.1
4946	29.5	16.6	24.6	67.5	56.3	94.8	17.1
4947	26.2	11.6	17.0	68.1	44.2	96.0	17.6
4948	22.5	12.9	18.5	69.5	57.1	91.2	11.8
4949	27.8	21.0	30.8	68.1	75.4	94.4	9.9
4950	30.1	24.6	37.1	66.3	81.7	93.2	8.7
4951	24.4	16.0	22.4	71.4	65.5	94.8	10.8
4952	27.4	20.4	29.9	68.2	74.4	91.8	10.0
4953	25.7	16.1	23.2	69.2	62.5	92.8	12.6
4954	30.9	23.3	33.9	68.6	75.3	92.4	11.6
4955	30.9	25.1	37.2	67.5	81.3	89.8	9.2

Results - Continued

Davis Tube Tests

Composite No.	Head Assays, % Sol. Fe	Head Assays, % Mag. Fe	Concentrate Weight %	Concentrate Assay % Sol. Fe	Concentrate % Rec'y Sol. Fe	% -400 mesh	Tailing Assay, % Sol. Fe
QUC 4956	30.7	22.8	33.8	67.6	74.4	89.0	11.9
4957	23.9	15.1	21.8	69.4	63.3	91.6	11.2
4958	18.5	8.9	13.2	67.4	48.1	88.8	11.1
4959	30.9	8.3	12.0	69.5	27.0	94.2	25.6
4960	23.6	12.4	18.1	68.7	52.7	92.8	13.6
4961	25.6	9.5	13.6	69.5	36.9	92.0	18.7
4962	29.8	2.7	3.9	68.2	8.9	87.2	28.2
4963	33.0	5.6	8.0	70.4	17.1	95.8	29.7
4964	29.0	6.1	8.8	68.8	20.9	92.8	25.2
4980	22.6	9.2	13.3	69.0	40.6	91.8	15.5
4981	26.0	22.3	32.3	69.1	85.8	93.4	5.4
4982	30.7	26.2	38.1	68.7	85.3	93.4	7.3
4983	24.5	16.0	23.3	68.6	65.2	93.2	11.1
4984	29.5	24.8	36.6	67.8	84.1	95.0	7.4
4985	26.2	17.9	26.0	68.7	68.2	92.2	11.3
4986	26.1	18.4	27.9	66.0	70.6	91.2	10.7
4987	31.6	25.4	39.8	63.9	80.5	87.4	10.2
4988	26.7	12.0	19.0	63.4	45.1	91.8	18.1
4989	23.0	9.5	15.3	62.1	41.3	92.2	15.9
4990	13.4	6.1	12.0	50.7	45.4	91.0	8.3
4991	32.7	19.3	27.8	69.6	59.2	92.8	18.5
4992	29.5	23.0	33.8	67.9	77.8	92.4	9.9
4993	29.2	24.7	37.1	66.7	84.7	90.6	7.1
4994	37.1	34.0	49.6	68.5	91.6	93.8	6.2
4995	30.3	25.5	38.0	67.0	84.0	93.8	7.8

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
May 11, 1977 / dmm

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-01
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

#9.

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-01 LENGTH: 189.0'
LOCATION: L20+00E, 17+50N MAIN ZONE
ELEVATION: 980' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 15, 1976 FINISHED: May 17, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc Mag. Fe.
				FOOTAGE						CONCENTRATE			%-400	
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
0	12.0	OVERBURDEN, no core recovery												
12.0	18.2	CHERTY CARBONATE I.F.												
		- dirty white to reddish grey brown color due to iron staining, core very broken due to leaching out of carbonates.												
		- carbonate occurs in isolated ovoid patches or in lenses which are leached out in the core.												
		- unit texture is massive to layered with disseminated massive to layered minor hematite and magnetite in laminae with diffuse to sharp boundaries.												
		- weakly to strongly magnetic patches or intervals.												
		- pyrite rosette at 31'.												
		- bedding at 25° to core axis.												
18.2	178.5	CHERTY MAGNETITE I.F.	001	18.2	28.2	10	33.6	28.5	18.2-40	39.8	68.5	82.1	93.2	27.3
		Bedding at 25-30° to core axis.	002	28.2	40.0	11.8	32.5	25.1						
		- massive to laminated unit texture with diffuse	003	40	50	10	30.3	23.9	40-60	39.6	66.7	83.6	91.6	26.4
		to sharp layered to laminated magnetite in an	004	50	60	10	32.5	27.7						
		olive green grey chert matrix.	005	60	70	10	34.1	28.9	60-80	41.8	66.0	84.6	90.0	27.6
		- overall color of the core is a dirty grey to	006	70	80	10	31.0	24.8						
		black.	007	80	90	10	31.0	22.4	80-100	32.1	65.5	67.6	91.1	21.0
			008	90	100	10	27.8	18.2						
		66.5 - 71.0 angular to subrounded ovoids of	009	100	110	10	30.0	23.0	100-120	39.1	66.1	79.8	94.0	25.8
		pink chert in a grey chert matrix.	010	110	120	10	33.5	28.1						
		64.5 - 65.0 serpentine carbonate rock - fine	011	120	130	10	30.9	24.7	120-140	37.8	65.9	79.3	93.6	24.9
		grained, soft, dark green,	012	130	140	10	32.8	25.2						
		moderately magnetic patches.	013	140	150	10	31.0	24.3	140-160	35.7	64.4	76.4	92.4	23.0
			014	150	160	10	28.7	20.1						
			015	160	170	10	29.4	19.0	160-178.5	29.8	63.7	66.1	90.0	19.0
			016	170	178.5	8.5	29.6	17.2						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-01
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-01 LENGTH: 189.0'
LOCATION: L20+00E, 17+50N MAIN ZONE
ELEVATION: 980' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 15, 1976 FINISHED: May 17, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %- 400 MESH	Calc. Mag. Fe.
		114.0 - 178.0 angular to rounded fragments of predominantly white chert in a grey chert matrix; occasional ovoids ($\measuredangle$1 cm diameter) of magnetite surrounded by a matrix of grey chert. - weakly to strongly magnetic.												
178.5	189	JASPER HEMATITE I.F. - very fragmented texture; composed of angular to sub-rounded fragments ($\measuredangle$1 cm diameter) of red jasper in a hematite rich matrix; also hematite layers in a jasper and hematite rich matrix.	017	178.5	189.0	10.5	29.3	0.5						
189		END OF HOLE												
		LOST CORE 0 - 12' no core recovery 12 - 26' one foot lost core 113 - 121 1½ ft. lost core. 171 - 182 one foot lost core												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-02
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-02 LENGTH: 358.0'
LOCATION: L00+48W, 21+12N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 19, 1976 FINISHED: May 22, 1976
LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc Mag. Fe.
0	31.5	OVERBURDEN, boulders and lost core												
31.5	97.0	CHERTY CARBONATE I.F.												
		- light to dark grey on fresh surface with numerous rusty colored vugs due to carbonate leaching.												
		- unit texture is massive to layered, with disseminated to lensitic minor hematite in a white chert matrix.												
97.0	344.5	CHERTY MAGNETITE I.F.	018	97	110	13	19.5	4.3						
		- alternating grey to black, layered to laminated	019	110	120	10	22.7	8.8						
		iron formation; diffuse to regular sharp	020	120	130	10	22.6	11.4						
		laminae of magnetite in a grey-green chert	021	130	140	10	23.6	10.4						
		matrix.	022	140	150	10	22.3	6.2						
		- bedding at 10° to core axis.	023	150	160	10	16.3	0.7						
		- interval is weakly to strongly magnetic.	024	160	170	10	24.7	6.4						
			025	170	180	10	30.2	18.2	170-190	28.7	69.2	65.5	91.2	19.9
		229.5 - 3" interval of carbonate rich	026	180	190	10	30.2	24.4						
		olivine-melilitite intrusive	027	190	200	10	31.4	24.3	190-210	34.4	70.0	77.7	91.2	24.1
		326.0 - 346.0 serpentinized, olivine, melilitite	028	200	210	10	30.5	21.5						
		occurs as minor narrow stringers	029	210	220	10	28.3	19.1	210-230	32.8	68.5	72.9	89.8	22.5
		(6" wide) cross cutting the	030	220	230	10	31.5	25.3						
		cherty magnetite I.F.	031	230	240	10	29.3	23.0	230-250	39.9	68.8	83.9	89.8	27.5
			032	240	250	10	35.8	31.3						
			033	250	260	10	31.6	26.3	250-270	30.7	68.2	67.5	87.8	20.9
			034	260	270	10	30.2	16.0						
			035	270	280	10	30.8	17.7	270-290	32.4	67.6	67.6	90.0	21.9
			036	280	290	10	32.4	25.2						
			037	290	300	10	34.4	30.3	290-310	39.2	68.9	84.7	90.0	27.0
			038	300	310	10	29.5	24.4						
			039	310	320	10	32.9	23.0	310-330	29.6	67.2	65.2	90.2	19.9
			040	320	330	10	26.1	13.7						
			041	330	344.5	14.5	28.2	19.0	330-344.5	30.0	64.8	59.1	88.4	19.4

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-02
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-02 LENGTH: 358.0'
LOCATION: L00+48W, 21+12N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 19, 1976 FINISHED: May 22, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % 400 MESH	Calc. Mag. Fe.
344.5	358	JASPER HEMATITE - dull, reddish grey rock with patches of white chert in a white and red chert matrix, with mainly hematite and some minor magnetite mineralization. - primarily layered with texture, unit a oolitic interval from 344.5 - 346.0 - weakly to moderately magnetic	042	344.5	354.0	9.5	33.3	16.9	344.5-354	28.8	65.3	56.5	83.4	18.1
358		END OF HOLE												

LOST CORE

0 - 5'	Overburden, no core recovery.
6 - 31'	14 feet lost core
31 - 41'	6 feet lost core
41 - 50'	4.5' lost core
50 - 61'	6 feet lost core
82 -112'	5 feet lost core
144 -155'	one foot lost core
155- 165'	one foot lost core

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-03 LENGTH: 231'
LOCATION: L20+10W, 15+00N MAIN ZONE
ELEVATION: 900' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 24, 1976 FINISHED: May 26, 1976

HOLE NO.: 76-03
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL. FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %400 MESH	Calc. Mag. Fe.
0	24.5	OVERBURDEN - boulders and lost core												
24.5	62.0	CHERTY CARBONATE I.F.	059	51	62	11	26.2	12.2						
		- core highly weathered due to ground water, much ground core where carbonate patches have leached out.												
		- generally a dirty white cherty matrix with appreciable carbonate and rusty staining due to iron carbonates.												
		- overall unit texture is diffuse regular layered, with minor hematite and magnetite in a cherty matrix.												
		- no distinct bedding to measure.												
		- non-magnetic to weakly magnetic.												
62.0	210.0	CHERTY MAGNETITE I.F.	060	62	70	8	30.8	18.2	62-80	27.7	70.1	62.4	92.6	19.4
		- massive to laminated iron formation with diffuse to sharp irregular to regular liminae of magnetite in a grey green chert matrix.	061	70	80	10	30.4	20.3						
			062	80	90	10	32.9	26.5	80-100	35.9	69.1	78.3	92.4	24.8
			063	90	100	10	31.0	24.8						
			064	100	110	10	31.7	24.5	100-120	37.2	68.2	78.3	94.4	25.4
		62.0 - 82.0 Minor carbonate pitting.	065	110	120	10	33.5	26.2						
		129.8 - 130.0 6" serpentine-carbonate intrusive (fine grained type)	066	120	130	10	32.5	26.4	120-140	41.6	69.8	85.4	98.5	29.0
			067	130	140	10	35.9	32.4						
			068	140	150	10	33.5	27.2	140-160	31.2	70.3	68.1	92.2	21.9
		bedding at 10-15° to core axis.	069	150	160	10	28.7	15.6						
			070	160	170	10	33.6	25.4	160-180	31.6	67.8	67.0	91.3	21.4
			071	170	180	10	30.1	20.9						
			072	180	190	10	28.9	21.1	180-210	36.3	68.3	76.1	91.7	24.8
			073	190	200	10	34.5	30.3						
			074	200	210	10	33.5	22.3						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-03
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-03 LENGTH: 231'
LOCATION: L20+10W, 15+00N MAIN ZONE
ELEVATION: 900' A.S.L. AZIMUTH: - DIP: -90°
STARTED: May 24, 1976 FINISHED: May 26, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
210.0	231.0	<u>JASPER HEMATITE I.F.</u>												
		Bedding at 10-15° to core axis.												
		210.0 - 231.0 Jasper hematite member has been intruded by serpentine carbonate intrusive (fine grained) which is most evident along fracture planes near the top of the interval and disseminated throughout the rock near the bottom of the interval. Layered to laminated unit texture with magnetite enrichment (due to intrusive?)	075	210	220	10	33.0	19.3	210-231	32.8	65.3	66.3	92.0	21.4
			076	220	231	11	31.5	21.2						
		210.0 - 229.0 typical jasper hematite texture.												
		229.0 - 230.4 oolitic jasper hematite I.F. with angular to rounded fragments of magnetite and hematite (<1 cm diam.) surrounded by jasper in a jasper oolite matrix.												
231.0		<u>END OF HOLE</u>												
		<u>LOST CORE</u>												
		0.0 - 40' 17' lost core												
		40.0 - 62' 11' lost core												
		62.0 - 72' 1' lost core												
		130.0 - 138' 2' lost core												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY	QUEBEC UNGAVA MINING
HOLE NO.	76-04
LENGTH	256'
LOCATION	L40+16W, 17+00N MAIN ZONE
ELEVATION	850' A.S.L.
AZIMUTH	-
DIP	-90°
STARTED	May 27,1976
FINISHED	May 31, 1976

HOLE NO. 76-04
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED
LOGGED BY Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
0	80.0	OVERBURDEN - boulders and sand												
80.0	89.0	CHERTY CARBONATE I.F.	077	80	89	9	31.3	8.7						
		- mainly a layered unit texture, with irregular diffuse laminae of minor hematite in a dirty white chert and carbonate matrix.												
		- core is stained rusty brown in places due to the leaching out of the iron												
		- non magnetic interval												
		- no discernable bedding												
89.0	239.8	CHERTY MAGNETITE I.F.	078	89	100	11	34.7	22.3	89-110	33.9	69.7	69.1	95.5	23.6
		- massive to laminated, with irregular to regular,	079	100	110	10	31.5	21.4						
		mainly sharp laminae or magnetite in a grey	080	110	120	10	32.1	27.1	110-130	40.0	70.3	82.2	95.2	28.1
		chert matrix.	081	120	130	10	32.9	26.5						
			082	130	140	10	31.1	19.4	130-150	30.9	67.9	68.1	93.4	21.0
		- dark grey to black in color.	083	140	150	10	30.9	22.7						
		89.0 - 108.0 Pitted, brown staining due to	084	150	160	10	34.7	27.0	150-170	36.8	68.2	76.8	92.7	25.1
		leaching of hematite.	085	160	170	10	32.0	24.8						
			086	170	180	10	28.9	16.4	170-190	23.1	65.4	50.4	90.4	15.1
		143.2 - 143.8) Fine grained serpentine rich	087	180	190	10	31.1	13.4						
		155.3 - 156.0) intrusive and highly laminated	088	190	200	10	33.8	22.4	190-210	29.9	67.3	61.0	90.2	20.1
		190.5 - 192.3)	089	200	210	10	30.8	18.3						
			090	210	220	10	34.5	27.5	210-230	39.1	68.6	78.0	92.8	26.8
239.8	243.3	Serpentine carbonate intrusive; green blebs and	091	220	230	10	33.0	26.4						
		patches with lenses of serpentine and calcite in	092	230	240	10	34.5	24.1	230-256	30.3	67.2	64.8	90.0	20.4
		a predominantly fragmental to layered unit texture.	093	240	250	10	29.3	15.1						
		Disseminated to laminated magnetite occurs in a	094	250	256	6	32.2	22.4						
		jasper matrix, with some angular to rounded white and pink chert fragments.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-04
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-04 LENGTH: 2.5'
LOCATION: L40+16W, 17+00N MAIN ZONE
ELEVATION: 850' A.S.L. AZIMUTH: – DIP: -90°
STARTED: May 27, 1976 FINISHED: May 31, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
243.3	256	CHERTY MAGNETITE I.F. -- Lithology as in interval 89 - 240. Bedding 10-15° core normal												
256		END OF HOLE												
		LOST CORE 0 - 40' 40' lost core 40 - 75' 10' lost core 75 - 77' 78.5-81.5' 82 - 84' 87 - 89'												

DIAMOND DRILL RECORD

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-05 LENGTH 329'
LOCATION L40-46W, 26+34N MAIN ZONE
ELEVATION 800' A.S.L. AZIMUTH - DIP -90°
STARTED June 1, 1976 FINISHED June 4, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-05
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	35.0	OVERBURDEN - boulders and till												
35.0	106.0	CHERTY CARBONATE I.F.	095	96	106	10	25.4	2.4						
		- massive to layered unit texture, with rusty brown spots and vugs due to carbonates being leached out.												
		- rusty brown to reddish grey color.												
		- non-magnetic to weakly magnetic.												
		50 - 106 minor hematite layers												
106.0	319.0	CHERTY MAGNETITE I.F.	096	106	110	4	30.1	21.7	106-120	33.0	69.7	72.3	98.3	23.0
			097	110	120	10	33.3	24.0						
		- bedding at 5-10°	098	120	130	10	30.8	20.2	120-140	36.8	69.4	77.2	96.4	25.5
		- mainly layered to laminated unit texture with diffuse irregular to sharp regular laminae of magnetite in a green grey chert matrix.	099	130	140	10	34.5	30.1						
			100	140	150	10	30.9	25.0	140-160	33.1	70.0	73.8	93.6	23.2
			101	150	160	10	30.9	20.0						
			102	160	170	10	31.1	20.8	160-180	32.1	67.2	72.4	93.9	21.6
		106.0 - 119.0 minor hematite in discrete blebs or ovoids in the chert matrix; rusty brown oxidation color.	103	170	180	10	27.2	20.9						
			104	180	190	10	35.4	28.5	180-200	34.1	66.2	68.6	93.5	22.6
			105	190	200	10	30.0	16.7						
		119.0 - 276.0 typical cherty magnetite texture as above.	106	200	219	10	26.5	14.8	200-220	29.0	64.9	63.8	92.6	18.8
			107	210	220	10	31.5	23.8						
		148.0 - 148.5) 199.0 - 199.5)) laminated texture, dark olive green color, possible fine grained serpentine-carbonate intrusive.	108	220	230	10	27.9	10.1	220-240	26.0	64.5	54.3	90.0	16.8
			109	230	240	10	33.6	23.5						
			110	240	250	10	32.4	21.3	240-260	38.0	65.1	76.1	93.6	24.7
			111	250	260	10	31.3	26.1						
		198.0 several angular fragments of pyrite less than 1" in diameter.	112	260	270	10	31.8	26.5	260-280	39.6	68.4	80.4	93.0	27.1
			113	270	280	10	35.9	26.6						
		208.0 - 209.0 laminated fine grained intrustive as above.	114	280	290	10	32.1	21.2	280-300	33.8	65.5	74.8	93.0	22.1
			115	290	300	10	28.1	21.3						
			116	300	310	10	25.2	15.6	300-319	25.3	67.8	65.7	87.6	17.2
			117	310	319	19	26.2	18.8						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVE MINING
HOLE NO.: 76-05 LENGTH: 329'
LOCATION: L40+46W, 26+34N MAIN ZONE
ELEVATION: 800' A.S.L. AZIMUTH: - DIP: 90°
STARTED: June 1, 1976 FINISHED: June 4, 1976

HOLE NO.: 76-05
SHEET NO.: 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		231.0 - 250.0 small angular fragments of magnetite (<½") surrounded by white chert in turn surrounded by massive magnetite.												
		276.0 - 310.0 minor jasper gives core a red grey color. weakly to strongly magnetic.												
		310.0 - 319.0 interval intruded by serpentine carbonate which is fine grained, laminated, dark olive green moderately magnetic												
319.0	329.0	JASPER HEMATITE I.F. - fine grained, red grey layered texture with hematite laminae and disseminated hematite in a jasper and hematite matrix.	118	319	329	10	5.7							
329.0		END OF HOLE												
		LOST CORE												
		0.0 - 44.0 mostly lost core - overburden												
		52.0 - 56.0												
		66.5 - 67.5												
		74.0 - 75.5												
		77.7 - 79.0												
		80.0 - 82.5												
		83.5 - 85.8												
		86.6 - 88.6												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-05
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-05 LENGTH: 329'
LOCATION: L40+46W. 26+3N MAIN ZONE
ELEVATION: 800' A.S.L. AZIMUTH: - DIP: 90°
STARTED: June 1, 1976 FINISHED: June 4, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
				FOOTAGE						CONCENTRATE			% -400	
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
		LOST CORE (continued)												
		89.2 - 91.8												
		92.5 - 94.0												
		97.1 - 98.6												
		100.0 - 101.8												
		104.3 - 105.9												
		202.6 - 206.0												
		315.0 - 316.1												
		318.3 - 319.2												
		323.0 - 328.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-06
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-06 LENGTH: 320'
LOCATION: L60+92W, 30+00N MAIN ZONE
ELEVATION: 710' A.S.L. AZIMUTH: - DIP: -90°
STARTED: June 6, 1976 FINISHED: June 9, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	36.0	OVERBURDEN - boulders												
36.0	105.2	CHERTY CARBONATE I.F.	119	95	105.2	10.2	18.8	12.6						
		- rusty brown to red grey in color.												
		- predominatly layered unit texture with discrete blebs of rusty colored or dark grey hematite.												
		36.0 - 65.0 large (½") vugs due to leaching out of hematite.												
		65.0 - 96.5 minor hematite spotting.												
		no distinct bedding planes are evident.												
		non to weakly magnetic.												
105.2	293.0	CHERTY MAGNETITE I.F.	120	105.2	110	5.2	28.2	12.5	105.2-120	26.4	66.7	59.1	92.2	17.6
			121	110	120	10	29.7	18.8						
		105.0 - 262.0 mainly a layered unit texture, with	122	120	130	10	31.1	20.5	120-140	29.9	68.7	67.6	92.4	20.5
		diffuse irregular to sharp regular	123	130	140	10	29.9	20.5						
		laminae of magnetite in a green-	124	140	150	10	32.0	25.8	140-160	36.1	68.5	78.1	92.2	24.8
		grey chert matrix.	125	150	160	10	30.6	24.1						
		bedding at 5° to core normal.	126	160	170	10	34.0	24.8	160-180	31.9	68.2	66.7	92.4	21.8
			127	170	180	10	31.1	16.7						
		110.5' dark grey to black color.	128	180	190	10	26.7	[illegible].8	180-200	32.2	66.3	73.9	89.4	21.3
		110.5 - poss. 6" of intrusive; fine grained,	129	190	200	10	31.3	23.2						
		dark green fragments in calcite	130	200	210	10	31.2	20.1	200-220	29.0	65.5	61.9	90.6	19.0
			131	210	220	10	31.2	18.3						
		195.0 - 255.0 angular to rounded intra clasts	132	220	230	10	31.3	20.6	220-240	32.4	67.6	69.1	90.6	21.9
		(square to oblong shaped) of	133	230	240	10	33.9	23.2						
		magnetite surrounded by white chert itself surrounded by a disseminated magnetite matrix	134	240	250	10	30.6	23.9	240-260	36.9	69.2	80.8	90.8	25.5

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-06
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-06 LENGTH: 320'
LOCATION: L60+92W, 30+00N MAIN ZONE
ELEVATION: 710' A.S.L. AZIMUTH: – DIP: -90°
STARTED: June 6, 1976 FINISHED: June 9, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	% -400 MESH	
		170.0 - 178.0 highly weathered interval with little vugs of hematite leaching.	135	250	260	10	33.0	27.2						
			136	260	270	10	32.6	11.1	260-280	25.2	67.8	51.5	82.8	17.1
		105.0 - 293.0 weakly to strongly magnetic.	137	270	280	10	34.7	22.7						
			138	280	290	10	32.0	17.2	280-293	26.2	69.8	58.8	87.8	18.3
			139	290	293	3	28.6	18.5						
293.0	320.0	<u>JASPER HEMATITE I.F.</u>												
		- mainly layered to massive unit texture, with laminae of hematite or disseminated hematite in a red chert or jasper matrix.	140	293	300	7	23.9	2.5						
			141	300	310	10	37.6	17.7						
			550	310	320	10	26.3	2.0						
		- no bedding planes are typical.												
		293.0 - 307.5 minor magnetite in this interval.												
		307.5 - 320.0 non magnetic mainly hematite in this interval.												
		314.8 - 315.3 fragmental texture' angular to rounded fragments of jasper and hematite in a hematite and jasper matrix.												
		317.0 - 317.5 normal sedimentary (oolitic) texture.												
320.0		<u>END OF HOLE</u>												
		<u>LOST CORE</u>												
		53.0 - 55.0												
		56.0 - 60.0												
		60.0 - 62.0												
		67.5 - 72.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-07 LENGTH: 332'
LOCATION: L101+58W, 27+73N MAIN ZONE
ELEVATION: 740' A.S.L. AZIMUTH: - DIP: -90°
STARTED: June 10, 1976 FINISHED: June 13, 1976

HOLE NO.: 76-07
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	20.0	OVERBURDEN - boulders												
20.0	156.0	CHERTY CARBONATE												
		- mainly massive to layered unit texture with intraclasts and laminae of hematite												
		- discrete blebs of iron carbonates and vugs due to leaching.												
		20.0 - 41.0 grey brown color												
		41.0 - 65.0 red brown staining												
		65.0 - 75.0 dirty white color with minor rusty red brown hematite staining												
		- non magnetic interval												
		- no typical bedding evident.												
156.0	313.0	CHERTY MAGNETITE I.F.	043	156	170	14	28.6	14.3						
		- bedding at 5-25°	044	170	180	10	30.2	18.2						
			045	180	190	10	29.6	14.5						
		- dark grey to black laminated to layered	046	190	200	10	31.4	22.4	190-210	30.9	69.0	69.4	91.8	21.3
		magnetite in an olive green grey chert matrix.	047	200	210	10	30.5	20.1						
		179.5 - layer of pyrite 1/8" thick.	048	210	220	10	29.1	20.7	210-230	27.7	68.0	61.6	87.4	18.8
			049	220	230	10	28.5	15.8						
		253.0 - 257.0 blebs of yellow grey Fe silicates?	050	230	240	10	29.5	23.0	230-250	35.5	67.9	74.9	88.0	24.1
			051	240	250	10	34.3	25.6						
		248.0 - pyrite rosette approx. ½" in dia.	052	250	260	10	32.2	19.0	250-270	25.7	67.5	58.4	88.0	17.3
		297.5 - fragmented iron formation; angular	053	260	270	10	30.2	16.4						
		fragments of chert containing	054	270	280	10	31.1	15.2	270-290	27.0	68.2	56.0	86.0	18.4
		angular fragments of magnetite.	055	280	290	10	33.8	22.3						
			056	290	300	10	31.7	23.2	290-313	35.9	69.0	75.8	89.4	24.8
			057	300	313	13	34.6	29.1						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-07
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-07 LENGTH: 332'
LOCATION: L101+58W, 27+73N MAIN ZONE
ELEVATION: 740' A.S.L. AZIMUTH: - DIP: -90°
STARTED: June 10, 1976 FINISHED: June 13, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %- 400 MESH	Calc. Mag. Fe.
313.0	332.0	JASPER HEMATITE I.F.	058	313	321	8	31.0	4.9						
		- largely fragmental to laminated unit texture, with angular to rounded intraclasts of jasper and pink chert in a hematite and jasper matrix.												
332.0		END OF HOLE												
		LOST CORE 23.0 - 26.0 29.0 - 34.0 42.5 - 47.5 49.0 - 51.5 52.5 - 54.5 56.0 - 61.5 62.0 - 64.0 71.0 - 72.0 74.0 - 75.0 82.5 - 83.0 87.5 - 89.5 96.0 - 97.5 117.0 -118.0 125.0 -131.0 136.0 -141.0 148.0 -150.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-08
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-08 LENGTH 266.0'
LOCATION L01+53W, 49+00N MAIN ZONE
ELEVATION 820' A.S.L. AZIMUTH - DIP -90°
STARTED June 14, 1976 FINISHED June 16, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
0	164.0	CHERTY CARBONATE - INTRUDED												
		- massive to fragmental unit texture.												
		- oolitic texture 0 - 17' and 28.0 - 28.2.												
		- rock is a grey color with small (< 1 cm diameter) spots of iron silicate (?) which pervade the whole rock, both the cherty fragments and the dark grey matrix material.												
		- the matrix material is a dark grey, fine grained, relatively hard rock which is probably a felsic volcanic composition												
		- interval is non-magnetic.												
		- no bedding planes discernible.												
		- 40' pyrite - ovulite replaced by pyrite.												
164.0	266.0	CHERTY CARBONATE I.F.												
		- predominatly a massive textured, red brown, rusty stained rock with numerous vugs due to leaching out of small (< 1 cm) spots of blebs of hematite.												
		- no bedding planes discernible.												
		- interval is non-magnetic												
266.0		END OF HOLE												

DIAMOND DRILL RECORD

NAME OF PROPERTY ~~QUEBEC UNGAVA MINING~~

HOLE NO. 76-08 LENGTH 266.0'

LOCATION L01+53W, 49+00N MAIN ZONE

ELEVATION 820' A.S.L. AZIMUTH - -90°

STARTED June 14, 1976 FINISHED June 16, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-08

SHEET NO. 2

MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
				FOOTAGE						CONCENTRATE				
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	% -400 MESH	
		<u>LOST CORE</u>												
		164.2 - 165.0												
		166.0 - 167.0												
		168.0 - 170.8												
		172.0 - 173.5												
		177.5 - 180.0												
		182.0 - 187.5												
		191.5 - 194.5												
		205.3 - 212.5												
		215.0 - 222.0												
		228.0 - 234.0												
		234.4 - 237.5												
		238.0 - 250.0												
		250.8 - 256.0												
		257.5 - 260.0												
		262.5 - 265.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-09
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-09 LENGTH: 348.6'
LOCATION: L40+00E, 21+61N MAIN ZONE
ELEVATION: 980' A.S.L. AZIMUTH: – DIP: 90°
STARTED: June 17, 1976 FINISHED: June 19, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
0	25.0	OVERBURDEN												
25.0	157.0	CHERTY CARBONATE I.F.	142	150	157	7	24.7	6.9						
		- mainly layered unit textire, with much rusty staining due to hematite content.												
		- discrete ovoids of hematite pervade the core or are leached out, leaving vugs and rusty staining.												
		0.0 - 116.0 reddish grey color, with discrete ovoids of iron carbonate?												
		86.0 - 87.0 hematite rich												
		91.0 - 92.0 hematite rich												
		116,0 - 157.0 rusty brown staining, no discrete ovoids or vugs of iron carbonate.												
		- non magnetic interval												
		- no good bedding evident.												
157.0	348.0	CHERTY MAGNETITE I.F.	143	157	160	3	30.2	18.8	157-180	31.0	67.9	65.4	96.0	21.0
		157.0 - 176.0 iron carbonate rich cherty magnetite	144	160	170	10	33.6	20.1						
		I.F.; grey to rusty brown weathering.	145	170	180	10	30.7	18.3	170-190	30.2	69.3	67.5	92.4	20.9
			146	180	190	10	32.4	23.5						
		176.0 - 328.0 cherty matrix, no carbonate leaching.	147	190	200	10	30.1	21.6	190-210	31.9	69.2	73.1	91.2	22.1
		- unit texture is mainly layered to laminated with	148	200	210	10	31.7	22.0						
		regular sharp laminae of dark grey to black	149	210	220	10	32.7	25.1	210-230	36.1	68.5	79.5	91.0	24.7
		magnetite in a grey green chert matrix.	150	220	230	10	31.7	24.1						
			151	230	240	10	34.7	29.2	230-250	39.3	68.5	83.9	90.2	26.9
		- more than usual number of pyrite blebs and laminae	152	240	250	10	29.7	23.6						
		scattered throughout the cherty magnetite.	153	250	260	10	28.9	21.2	250-270	32.1	67.1	73.0	91.2	21.5
		Pyrite rosettes (∠ ½") at 219, 262.5, 267, 268,	154	260	270	10	30.9	21.3						
		282, 310, 312												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-09
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-09 LENGTH: 348.6'
LOCATION: L40+00E, 21+61N MAIN ZONE
ELEVATION: 980' A.S.L. AZIMUTH: - DIP: 90^{o}
STARTED: June 17, 1976 FINISHED: June 19, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
		328.0 - 348.0 intermittent reddish-grey color	155	270	280	10	32.4	24.2	270-290	37.9	67.9	79.2	90.6	25.7
		due to red chert in the matrix.	156	280	290	10	32.7	25.6						
		- Interval weak to strongly magnetic	157	290	300	10	31.6	19.1	290-310	30.4	68.6	70.5	90.0	20.9
			158	300	310	10	31.6	23.0						
			159	310	320	10	27.5	9.4	310-348	19.5	63.7	44.8	85.8	12.4
348.6		END OF HOLE	160	320	330	10	27.3	12.4						
			161	330	340	10	29.5	14.4						
		LOST CORE	162	340	348	8	31.7	15.2						
		26.0 - 28.0												
		30.0 - 31.5												
		32.5 - 37.0												
		40.0 - 42.0												
		43.0 - 45.0												
		46.0 - 48.5												
		55.5 - 57.5												
		68.0 - 69.0												
		70.0 - 75.0												
		78.0 - 79.0												
		104.0 - 106.0												
		111.5 - 116.0												
		120.0 - 125.0												
		129.0 - 136.0												
		137.0 - 140.0												
		157.0 - 161.0												
		167.5 - 171.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-10
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-10 LENGTH: 278.0'
LOCATION: L59+86E, 36+77N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: June 22, 1976 FINISHED: June 24, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	6.4	OVERBURDEN - boulders and sand - no core.												
6.4	117.0	SLATE - fine grained, dark grey to black, greasy or soapy feel on fracture planes, alternating light and dark grey banding due to bands (< ½" wide) of light grey material. - core breaks along bedding planes, usually where weakened by fracture fillings of calcite (< 1/32" wide). - wavy or sinusoidal type bedding across width of core in upper part of interval suggests ripple marks or cross bedding. Bedding at 16' - 52° " 73' - 45° " 106' - 35° - minor pyrite along some fracture planes. - small micro-faulting usually at or nearly at angles to bedding; with displacement less than ¼".												
117.0	278.0	CHERTY CARBONATE - mainly layered unit texture with laminae and ovoids of iron carbonate and hematite in a white cherty matrix. - rusty red brown to grey color.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-10
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-10 LENGTH: 278.0'
LOCATION: L59+86E, 36+77N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: June 22, 1976 FINISHED: June 24, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		117.0 - 210.5 discrete ovoids of iron carbonate which have weathered out leaving vugs.												
		210-5 - 278.0 disseminated to layered iron carbonate in a white chert matrix, few ovoid vugs.												
278.0		<u>END OF HOLE</u>												
		<u>LOST CORE</u> 111.0 - 113.5 117.0 - 122.0 123.0 - 125.0 126.0 - 132.0 132.8 - 133.8 145.0 - 146.5 151.0 - 155.0 166.0 - 170.0 171.4 - 175.0 178.3 - 185.0 189.2 - 200.0 201.0 - 205.0 208.0 - 210.0 210.8 - 220.0 225.0 - 230.0 231.0 - 245.0 247.0 - 250.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-11
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-11 LENGTH: 471'
LOCATION: L00+28W, 31+40N MAIN ZONE
ELEVATION: 900' A.S.L. AZIMUTH: - DIP: -90^{o}
STARTED: June 26, 1976 FINISHED: June 30, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	6.0	OVERBURDEN - boulders and lost core												
6.0	255.0	CHERTY CARBONATE I.F.	184	245	255	10	22.7	2.3						
		6.0 - 125.0 dark grey colored with discrete rusty brown iron carbonate blebs. mainly a massive to layered texture.												
		125.0 - 137.5 dark brown colored interval due to numerous iron carbonate blebs.												
		137.5 - 169.0 much core lost, very poor record.												
		169.0 - 183.0 dark grey colored, massive unit texture, large discrete ovoids of rusty brown weathering iron carbonates.												
		183.0 - 191.0 very dark grey color, massive texture, very little iron carbonate.												
		191.0 - 208.0 predominantly red grey to brown color, massive textured, presence of small iron carbonate blebs.												
		208.0 - 237.0 light grey, massive to layered texture with red-brown layers in a grey chert matrix.												
		- apparent bedding at 236' - 25^{o} to core normal.												
		237.0 - 255.0 typical cherty magnetite texture but marked by absence of magnetite; layered to laminated due to hematite content.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-11
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-11 LENGTH: 471'
LOCATION: L00+28W, 31+40N MAIN ZONE
ELEVATION: 900' A.S.L. AZIMUTH: - DIP: 90°
STARTED: June 26, 1976 FINISHED: June 30, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
255.0	460.0	CHERTY MAGNETITE I.F.

- whole interval cut by olivine rich carbonate intrusive as follows:

239.0 - 240.0
240.5 - 241.0
296.2 - 296.4
261.2 - 262.0
375.0 - 375.5

generally layered to laminated unit texture to 393' with sharp regular magnetite laminaes

393.0 - 415.0 diffuse irregular magnetite laminae.

415.0 - 455.0 layered to laminated unit texture but interval marked by red grey color due to presence of pink chert.

428.5 - 429.0 fragmented interval with rounded fragments of pink and white chert in the grey chert matrix.

438.5 - 2" interval of rounded to angular fragments of magnetite in a cream colored chert matrix.

443.5 - 444.5 rounded to angular, generally oblong fragments of jasper in a magnetite and hematite matrix.

- magnetic interval moderately to strongly magnetic.

SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
185	255	265	10	30.1	11.9	255-275	21.3	68.5	48.3	94.2	14.6
186	265	275	10	30.7	16.1						
187	275	285	10	33.1	23.7	275-295	33.8	69.2	71.7	92.2	23.4
188	285	295	10	32.4	22.8						
189	295	305	10	31.9	25.8	295-315	32.4	69.1	72.2	92.2	22.4
190	305	315	10	28.9	18.2						
191	315	325	10	28.3	20.6	315-335	34.9	68.3	76.2	89.2	23.8
192	325	335	10	34.7	26.4						
193	335	345	10	34.4	23.0	335-355	40.5	68.3	83.3	90.6	27.7
194	345	355	10	29.8	24.1						
195	355	365	10	33.8	26.1	355-375	28.0	66.6	62.6	86.4	18.6
196	365	375	10	28.8	11.5						
197	375	385	10	33.5	23.6	375-395	35.5	66.8	74.8	88.6	23.7
198	385	395	10	30.5	23.2						
199	395	405	10	30.1	24.0	395-415	37.0	68.9	85.2	91.0	25.5
200	405	415	10	30.3	26.1						
201	415	425	10	33.8	14.5	415-445	26.5	66.8	57.8	90.2	17.7
202	425	435	10	30.2	18.5						
203	435	445	10	28.8	17.1						
204	445	455	10	32.2	14.3	445-460	24.3	66.6	51.1	83.2	24.3
205	455	460	5	32.8	16.7						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-11
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-11 LENGTH: 471'
LOCATION: L00+28W, 31+40N MAIN ZONE
ELEVATION: 900' A.S.L. AZIMUTH: - DIP: 90°
STARTED: June 26, 1976 FINISHED: June 30, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
460.0	471.0	JASPER HEMATITE I.F.	206	460	470	10	24.1	5.1						
		- generally layered to massive unit texture with a hematite dust and jasper fragment matrix cut by laminae of hematite and orange red jasper.												
		- massive magnetic patches (<3" thick) at 463' and 466'.												
		- interval is non magnetic.												
471.0		END OF HOLE												
		LOST CORE												
		0.0 - 40.0 Overburden												
		46.5 - 55.0												
		57.5 - 60.0												
		62.0 - 65.0												
		66.5 - 70.0												
		83.0 - 85.0												
		85.0 - 90.0												
		90.0 - 95.0												
		100.0 -105.0												
		105.8 -113.5												
		120.0 -130.0												
		133.0 -135.0												
		140.0 -153.0												
		155.0 -162.5												
		165.5 -166.5												
		175.0 -177.5												
		191.0 -194.0												
		208.0 -210.5												
		236.0 -237.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-12
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-12 LENGTH: 268'
LOCATION: L79+56E, 26+00N MAIN ZONE
ELEVATION: 960' AZIMUTH: - DIP: 90°
STARTED: July 1, 1976 FINISHED: July 4, 1976

LOGGED BY: Michael Smith and P. Atherton

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	2.5	OVERBURDEN - lost core												
2.5	38.3	CHERTY CARBONATE I.F. - diffuse irregular layered texture, with light grey aphanitic chert matrix. - patches of iron silicate occur throughout the interval. - minor hematite present in the interval as oolitic iron.	163	28.3	38.3	10	21.6	1.3						
38.3	227.0	CHERTY MAGNETITE I.F.	164	38.3	50.0	11.7	28.6	13.5	38.3-60	23.2	70.1	52.5	93.6	16.3
		- layered to laminated unit texture, with sharp regular laminae of magnetite in a green grey chert matrix.	165	50	60	10	31.7	19.9						
			166	60	70	10	31.9	23.0	60-80	31.8	70.5	73.5	92.0	22.4
			167	70	80	10	29.9	23.0						
			168	80	90	10	32.1	26.1	80-100	38.8	69.7	81.5	93.0	27.0
		- patches of diffuse irregular cream colored chert occur in the more massive chert matrix.	169	90	100	10	33.6	27.5						
			170	100	110	10	31.0	25.1	100-120	34.8	68.9	77.8	91.2	24.0
		38.3 - 96.5 laminated to layered texture.	171	110	120	10	31.6	23.6						
			172	120	130	10	29.2	20.8	120-140	34.7	67.7	76.3	90.6	23.5
		weakly to strongly magnetic.	173	130	140	10	31.4	24.3						
		iron silicates common in this interval usually occuring as yellowish splotches cutting both laminae and matrix.	174	140	150	10	31.5	24.1	140-160	35.2	69.4	76.1	91.4	24.4
			175	150	160	10	32.4	24.8						
			176	160	170	10	29.3	20.1	160-180	32.2	68.9	75.2	89.4	22.2
			177	170	180	10	31.9	23.5						
			178	180	190	10	30.6	23.2	180-200	39.0	67.1	81.0	90.8	26.2
		magnetite occurs occasionally as layers or laminae but more generally massive or disseminated in the chert matrix.	179	190	200	10	35.0	27.5						
			180	200	210	10	27.3	9.1						
			181	210	220	10	26.9	8.8						
			182	220	227	7	29.6	13.0						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-12
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-12 LENGTH: 268'
LOCATION: L79+56E, 26+00N, MAIN ZONE
ELEVATION: 960' AZIMUTH: - DIP: 90°
STARTED: July 1, 1976 FINISHED: July 4, 1976

LOGGED BY: Michael Smith and P.Atherton

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		96.5 - 200.5 weakly to strongly magnetic interval. chert matrix more 'patchy" than above, due to splotches of silicates; with magnetite and light grey chert layers in a dark grey chert matrix. bedding generally at 15° but is 70° to core normal, from 150-155'. 200.5 - 226.0 mainly a lean cherty member with olive green grey chert laminae and layers. some moderately magnetic intervals but not consistent throughout the interval. - Intrusives of serpentinized carbonate occur as thin, generally 3-6" thick fine grained dark green patches cut by ivory colored calcite, throughout the interval. 114.5 - 116.0 124.0 - 125.3 128.0 - 130.0 134.0 - 136.8 142.0 144.5 166.5 197.5 - pyrite as solitary blebs or rosettes at 84.5, 143.5, 182.0, 201.0, 233.0.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-12
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-12 LENGTH: 268'
LOCATION: L79+56E, 26+00N, MAIN ZONE
ELEVATION: 960' AZIMUTH: - DIP: 90°
STARTED: July 1, 1976 FINISHED: July 4, 1976

LOGGED BY: Michael Smith and ~~P.Atherton~~

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
227.0	248.0	SERPENTINE CARBONATE INTRUSIVE - fine grained to brecciated or fragmental unit texture; in cluded are laminae of lean chert and brecciated magnetic material - strongly magnetic in places	183	227	237	10	27.4	12.4						
248.0	268.0	JASPER HEMATITE I.F. - fragmental to laminated texture, with fragments or laminae of jasper and hematite in a jasper and hematite dust matrix. - some minor magnetite in the interval. - possible fault zone from 249.0 - 254.5; jasper fragments in a white chert matrix.	549	250	272.5	22.5	21.9	0.5						
	272.5	END OF HOLE												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-12
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-12 LENGTH 268'
LOCATION L79+56E, 26+00N, MAIN ZONE
ELEVATION 960' AZIMUTH - DIP 90°
STARTED July 1, 1976 FINISHED July 4, 1976

LOGGED BY Michael Smith and ~~P.Atherton~~

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	% -400 MESH	
227.0	248.0	SERPENTINE CARBONATE INTRUSIVE - fine grained to brecciated or fragmental unit texture; in cluded are laminae of lean chert and brecciated magnetic material - strongly magnetic in places	183	227	237	10	27.4	12.4						
248.0	268.0	JASPER HEMATITE I.F. - fragmental to laminated texture, with fragments or laminae of jasper and hematite in a jasper and hematite dust matrix. - some minor magnetite in the interval. - possible fault zone from 249.0 - 254.5; jasper fragments in a white chert matrix.	549	250	272.5	22.5	21.9	0.5						
	272.5	END OF HOLE												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-13
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-13 LENGTH: 163'
LOCATION: 100+79E, 11+35N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 5, 1976 FINISHED: July 7, 1976
LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
0	30.0	OVERBURDEN - boulders; mostly lost core in this interval.												
30.0	32.3	SERPENTINE - CARBONATE INTRUSIVE - fragmental to very laminated texture, dark olive green in color, fine grained to aphantic non-magnetic.	207	30	32	2	13.9	2.5						
32.3	88.0	CHERTY MAGNETITE I.F. - layered to laminated unit texture. - generally regular sharp laminae of magnetite in a dull olive green grey chert matrix. 70.0 - 81.0 minor irregular shaped blebs of disseminated carbonates throughout the core. interval is moderately to strongly magnetic. bedding at 10-20° core normal	208	32	40	8	38.4	27.5	32-50	39.9	59.2	85.2	89.6	27.6
			209	40	50	10	32.3	26.4						
			210	50	60	10	26.5	19.9	50- 70	33.2	64.7	76.4	93.0	21.5
			211	60	70	10	30.6	22.4						
			212	70	80	10	28.2	20.8	70- 88	31.0	67.4	73.1	93.2	20.9
			213	80	88	10	29.9	19.8						
88.0	163.0	CHERTY METALLIC I.F. - alternating lenses of cream colored and pink colored chert with lenses of hematite and magnetite. - metallic lustre. - unit texture is laminated with irregular to regular sharp laminae of hematite and magnetite in a pink chert matrix. - interval is weakly to moderately magnetic	214	88	100	12	28.7	14.4	88-120	20.8	69.6	49.6	93.8	14.5
			215	100	120	20	30.0	14.0						
			216	120	140	20	30.9	15.0	120-163	18.7	70.5	40.9	94.4	13.2
			217	140	163	23	32.2	11.0						

DIAMOND DRILL RECORD

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-13 LENGTH: 163'
LOCATION: 100+79E, 11+35N MAIN ZONE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP:
STARTED: July 5, 1976 FINISHED: July 7, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO.: 76-13
SHEET NO.: 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
163.0		END OF HOLE												
		CORE LOST - Negligible												

DIAMOND DRILL RECORD

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-14 | LENGTH: 323'
LOCATION: L101+54E, 32+55N | MAIN ZONE
ELEVATION: 880' A.S.L. | AZIMUTH: - | DIP: -90°
STARTED: July 8, 1976 | FINISHED: July 12, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO.: 76-14
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	10.0	OVERBURDEN - Boulders of Bedrock and Lost Core												
10.0	137.0	CHERTY CARBONATE I.F. (Intruded) 10.0 - 137.0 Fragmented Cherty Carbonate angular fragments of dirty cream coloured chert in a softer, rusty brown to purple-grey. Carbonate matrix. possible intrusive matrix composition. proportion of fragments to matrix is approximately 15%.												
137.0	182.0	CHERTY CARBONATE - non-fragmented cherty carbonate with discrete blebs of iron carbonates in a light grey chert matrix. 182.0 - 184.3 altered cherty carbonate, predominately grey chert with red brown iron stain. appears to be altered by the intrusive immediately below.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-14
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-14 LENGTH: 323'
LOCATION: L101+54E, 32+55N MAIN ZONE
ELEVATION: 880' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 8, 1976 FINISHED: July 12, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
184.3	220.0	SERPENTINE CARBONATE INTRUSIVE												
		184.3 - 186.5 fine grained, mainly serpentine with little carbonate.												
		fractured with conchoidal fractures.												
		surfaces have slippery feel, suggests talc.												
		186.5 - 207.0 more coarse grained, more carbonate.												
		207.0 - 220.0 fine grained as in 184.3-186.5, with some calcite lenses cutting the core at 90°, at 218-219.5.												
220.0	323.0	CHERTY METALLIC I.F.	218	220	230	10	15.9	5.5						
		220.0 - 234.0 altered cherty metallic, dark grey	219	230	240	10	26.0	14.7	230-250	24.4	69.2	53.3	91.8	16.8
		to red-grey, layered to laminated	220	240	250	10	36.6	18.1						
		texture, with minor calcite veining.	221	250	260	10	27.1	18.5	250-270	25.0	70.2	62.2	94.2	17.6
			222	260	270	10	30.0	16.9						
		small lensoidal interval from	223	270	280	10	29.0	18.2	270-290	28.5	70.0	68.3	94.8	20.0
		226-228 with rounded, oblong frag-	224	280	290	10	29.5	19.8						
		ments of jasper and grey chert.	225	290	300	10	27.9	20.6	290-323	28.3	68.9	64.6	95.0	19.5
		234.0 - 323.0 typical cherty metallic I.F. with	226	300	310	10	26.8	17.6						
		layered unit texture.	227	310	323	13	30.7	18.8						
		mainly sharp irregular laminae of hematite and magnetite in a pink and creamy yellow cherty matrix.												
		interval is weakly to moderately magnetic.												
		bedding is generally less than 10° to core normal.												
		silicate horizor from 234-245 and												

DIAMOND DRILL RECORD

QUEBEC UNGAVA MINING

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY

HOLE NO. 76-14 LENGTH 323'

LOCATION L101+54E, 32+55N MAIN ZONE

ELEVATION 880' A.S.L. AZIMUTH - DIP -90°

STARTED July 8, 1976 FINISHED July 12, 1976

HOLE NO. 76-14

SHEET NO. 3

MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
				FOOTAGE						CONCENTRATE			%-400	
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
323.0		END OF HOLE												
		LOST CORE												
		25.0 - 50.0 5 feet recovery												
		50.0 - 75.0 2 feet recovery												
		75.0 -100.0 10 feet recovery												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-15 LENGTH: 160'
LOCATION: L59+60E, 26+23N MAIN ZONE
ELEVATION: 950' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 13, 1976 FINISHED: July 14, 1976

HOLE NO.: 76-15
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%400 MESH	
0	26.0	OVERBURDEN OR CASING												
26.0	157.5	CHERTY MAGNETITE I.F.	228	28.5	40.0	11.5	32.5	22.8	28.5-50	34.2	70.4	73.2	92.2	24.1
			229	40	50	10	34.5	26.0						
		26.0 - 45.0 Minor rusty weathering, bedding at 15° - 25°.	230	50	60	10	32.6	25.1	50- 70	32.3	70.8	72.6	89.6	22.9
			231	60	70	10	32.1	21.1						
		45.0 - 121.7 typical cherty magnetite, layered and laminated, bedding at 20°.	232	70	80	10	31.4	25.1	70- 90	38.9	70.3	83.6	90.8	27.3
			233	80	90	10	36.1	29.0						
			234	90	100	10	29.5	21.7	90-110	34.1	67.2	75.6	88.8	22.9
		121.7 - 157.5 intruded by serpentine carbonate.	235	100	110	10	32.0	23.5						
		appears altered (rusty) iron	236	110	120	10	29.9	22.4	110-130	32.5	69.7	73.1	89.4	22.7
		silicates present from 137.2-140.	237	120	130	10	33.3	23.4						
			238	130	140	10	22.1	8.7						
		interval moderately magnetic.	239	140	150	10	18.8	0.9						
			240	150	157.5	7.5	23.3	0.4						
157.5	160.0	SERPENTINE CARBONATE INTRUSIVE												
		157.5 - 159.0 very fine grained, little carbonate.	241	157.5	160	2.5	21.7	3.3						
		159.0 - 160.0 med, grained, minor carbonate.												
160.0		END OF HOLE												
		LOST CORE												
		112.0 - 113.0												
		155.3 - 156.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-16
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-16 LENGTH: 283.5'
LOCATION: L20+82E, 27+85N MAIN ZONE
ELEVATION: 920' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 16, 1976 FINISHED: July 18, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	5.0	OVERBURDEN AND LOST CORE												
5.0	84.0	CHERTY CARBONATE	242	74	84	10	19.4	1.7						
		5.0 - 25.0 Discrete ovoids of iron carbonates in grey chert matrix.												
		25.0 - 66.0 rusty brown staining. iron carbonate layers in a grey chert matrix.												
		66.0 - 84.0 layered lean chert, no carbonates and no magnetite. interval non magnetic. bedding planes appear ∠10° core normal												
84.0	271.0	CHERTY MAGNETITE I.F.	243	84	90	6	28.2	11.4	84-110	24.5	68.7	57.3	90.6	16.8
			244	90	100	10	30.5	19.6						
		84.0 - 253.0 layered to laminated with irregular to regular sharp laminae of magnetite in a grey-green chert matrix.	245	100	110	10	28.9	17.2						
			246	110	120	10	29.8	22.8	110-130	35.1	68.9	78.5	89.8	24.2
			247	120	130	10	32.3	26.1						
			248	130	140	10	34.3	26.6	130-150	39.0	68.4	79.4	89.2	26.7
		bedding at 15°-20° core normal.	249	140	150	10	33.3	26.1						
			250	150	160	10	33.7	26.1	150-170	41.2	68.0	82.4	88.2	28.0
271.0	283.5	JASPER HEMATITE	251	160	170	10	34.5	28.5						
			252	170	180	10	33.2	27.4	170-190	39.1	66.7	80.0	85.0	26.1
		- granular, small (generally less than 1 mm), angular to rounded fragments of jasper in a hematite matrix.	253	180	190	10	31.6	22.7						
			254	190	200	10	29.0	16.3	190-210	31.2	65.9	64.9	85.0	20.6
			255	200	210	10	31.9	24.0						
		- interval is non-magnetic.	256	210	220	10	32.9	25.4	210-230	37.2	66.5	77.8	87.2	24.6
			257	220	230	10	30.5	23.5						
283.5		END OF HOLE	258	230	240	10	31.9	24.8	230-250	35.7	64.9	75.2	88.6	[illegible]
			259	240	250	10	30.5	[illegible]						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-16
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-16 LENGTH: 283.5'
LOCATION: L20+82E, 27+85N MAIN ZONE
ELEVATION: 920' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 16, 1976 FINISHED: July 18, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
			260	250	260	10	31.6	22.3	250-271	36.2	66.2	76.3	88.2	24.0
			261	260	271	11	32.2	24.9						
		LOST CORE												
			262	271	283	12	29.6	1.4						
		25.0 - 27.5												
		30.8 - 36.0												
		39.0 - 40.0												
		53.0 - 55.0												
		80.6 - 81.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-17
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO. 76-17 LENGTH 216'
LOCATION L59+22E, 17+00N MAIN ZONE
ELEVATION 1020' A.S.L. AZIMUTH - DIP -90°
STARTED July 20, 1976 FINISHED July 21, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	6.3	<u>OVERBURDEN - LOST CORE</u>												
		6.0 - 6.3 sandstone boulder												
6.3	115.0	<u>CHERTY MAGNETITE I.F.</u>	263	6.3	21.2	14.9	24.5	17.4	6.3-50.5	15.0	69.5	37.4	92.2	10.4
		6.3 - 21.2 layered unit texture, generally	264	26	39	13	34.4	19.6						
		a green grey to black colour, with	265	39	50.5	11.5	29.1	5.7						
		some iron carbonate pitting at 21.2.	266	50.5	60	9.5	31.7	17.4	50.5-70	26.2	68.9	61.2	87.4	18.1
			267	60	70	10	27.6	17.0						
		21.6 - 26.0 driller reported rods fell 5' -	268	70	80	10	31.8	21.2	70-99	21.4	69.9	50.5	88.4	15.0
		possible fault zone.	269	80	89	9	33.3	20.6						
		moderately magnetic interval	270	89	99	10	23.9	20.3						
		no typical bedding planes evident												
		26.0 - 50.5 hematite enriched cherty magnetite with carbonate.												
		dark reddish grey in colour.												
		interval has a layered unit texture with diffuse irregular to regular laminae of hematite in a white chert matrix from 46.5 to 50.0.												
		33.0 - 45.0 discrete ovoids of iron carbonate in this interval.												
		50.5 - 99.0 cherty magnetite I.F generally a layered to laminated texture, with diffuse irregular to sharp regular laminae of magnetite in a green grey chert matrix.												
		bedding at 15°-20° to core normal												
		interval is moderately to strongly magnetic												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-17
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-17 LENGTH 216'
LOCATION L59+22E, 17+00N MAIN ZONE
ELEVATION 1020' A.S.L. AZIMUTH - DIP 90°
STARTED July 20, 1976 FINISHED July 21, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE %FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		99.0 - 115.0 non magnetic cherty magnetite intruded by serpentine carbonate from 113.5 - 115.0												
115.0	216.0	SERPENTINE CARBONATE INTRUSIVE - generally a medium grained, dark green colour, with white calcite patches giving a salt and pepper texture. - Interval is non magnetic.												
216.0		END OF HOLE												
		LOST CORE 8.0 - 11.2 14.4 - 18.0 18.0 - 20.0 21.2 - 26.0 102.0 - 110.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-18 LENGTH: 197'
LOCATION: 0+60N, 60+00E MAIN ZONE
ELEVATION: 930' A.S.L. AZIMUTH: - DIP: -90^{o}
STARTED: July 23, 1976 FINISHED: July 24, 1976

HOLE NO.: 76-18
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
				FOOTAGE										
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
0	14.0	OVERBURDEN - boulders and lost core.												
14.0	60.0	CHERTY MAGNETITE I.F.	271	14	20	6	29.0	12.2						
		14.0 - 15.4 massive to layered unit texture, with diffuse irregular to sharp irregular laminae of magnetite	272	20	30	10	28.4	9.1						
			273	30	40	10	29.1	10.6						
			274	40	50	10	26.8	11.4						
		15.4 - 19.0 serpentine carbonate intrusive partly replaces cherty magnetite I.F.	275	50	60	10	33.1	16.3						
		fracture fillings of fine grained, cream coloured calcite in a matrix of aphanitic serpentine.												
		possible emerald green iron silicates on fracture surfaces.												
		19.0 - 37.7 very lean, weakly magnetic interval.												
		layered to laminated.												
		37.7 - 43.0 serpentine carbonate intrusive												
		similar to above, mainly laminated, fine grained and non magnetic.												
		43.0 - 60.0 fragmental to laminated unit texture as above with round to oblong fragments of serpentine and pinkish chert in a jasper rich magnetite matrix.												
		60.0 - 60.5 serpentine carbonate intrusive - very laminated.												
		jasper in matrix from 46.0 - 60.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-18
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-18 LENGTH: 197'
LOCATION: 0+60N, 60+00E MAIN ZONE
ELEVATION: 930' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 23, 1976 FINISHED: July 24, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
60.0	68.8	<u>JASPER HEMATITE I.F.</u> - main fragmental to irregular layered iron formation, with oblong fragments of jasper in a hematite matrix.	276	60	68.8	8.8	18.7	1.4						
68.8	102.5	<u>SERPENTINE CARBONATE INTRUSIVE</u> 68.8 - 90.0 jasper fragments in a coarse grained intrusive. upper contact with the jasper hematite member is fragmental, not fine grained. 90.0 - 102.5 typical serpentine carbonate with no jasper fragments; lower contact is fine grained.	277	92	102.5	10.5	8.7							
102.5	137.0	<u>4b INTRUDED JASPER HEMATITE</u> 102.5 - 137.5 mainly massive unit texture with irregular diffuse blebs of magnetite in a green grey chert matrix. (moderately magnetic) 105.5 - 137.0 disseminated rosettes of cream coloured iron silicates. 114.0 - 135.0 minor jasper fragments; small (4 mm) angular to large (2 cm. wide) surrounded in matrix.	278	102.5	110	7.5	25.9	19.8	102.5-120	34.5	69.0	82.1	89.6	23.8
			279	110	120	10	33.6	28.7						
			280	120	130	10	33.6	17.6	120-140	26.1	69.4	59.8	93.4	18.1
			281	130	140	10	27.4	18.5						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-18
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-18 LENGTH: 197'.
LOCATION: 0+60N, 60+00E MAIN ZONE
ELEVATION: 930' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 23, 1976 FINISHED: July 24, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
				FOOTAGE						CONCENTRATE			%-400	
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
137.0	197.0	CHERTY METALLIC	282	140	150	10	29.0	23.7	140-160	35.0	65.5	81.9	92.4	22.9
		137.0 - 176.5 layered to laminated unit texture, with sharp, irregular to regular laminae of magnetite	283	150	160	10	28.2	22.2						
			284	160	170	10	26.9	19.3	160-176.5	30.0	66.6	74.3	90.0	20.0
			285	170	176.5	6.5	27.9	19.9						
		bedding at 0-5°'	286	176.5	187	11.5	33.3	9.3						
			287	187	197	10	28.3	6.2						
		176.5 - 197.0 typical striped, pink and grey cherty metallic appearance with irregular, round to oblong fragments of pink chert surrounding white chert, separating lenses of hematite and minor magnetite.												
197.0		END OF HOLE												
		LOST CORE - none												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-19 LENGTH: 163'
LOCATION: L20+65E, 10+10S MAIN ZONE
ELEVATION: 1110' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 25, 1976 FINISHED: July 27, 1976

HOLE NO. 76-19
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	12.0	<u>OVERBURDEN</u> - no core recovered												
12.0	148.0	<u>CHERTY MAGNETITE I.F.</u>	288	12	20	8	33.7	20.1	12- 30	27.1	69.6	55.5	94.2	18.9
			289	20	30	10	35.3	15.2						
		12.0 - 26.5 discrete weathered out yellow-brown colour ovoids (1-5 mm) of iron carbonates.	290	30	40	10	34.3	20.8	30- 50	19.9	69.5	45.8	91.2	13.8
			291	40	50	10	25.0	8.4						
			292	50	60	10	31.2	22.2	50- 70	32.4	69.6	72.0	91.0	22.6
		12.0 - 36.0 small fragments (1 mm diameter) of jasper in the matric.	293	60	70	10	31.8	23.0						
			294	70	80	10	30.8	20.3	70- 90	30.1	68.9	65.2	87.8	20.7
			295	80	90	10	32.2	21.7						
		42.0 - 47.5 lean chert interval with minor soft iron silicates weathered out.	296	90	100	10	30.4	19.3	90-110	27.0	68.8	60.9	89.0	18.6
			297	100	110	10	31.0	17.7						
		weakly magnetic.	298	110	120	10	28.8	15.3	110-130	28.8	67.5	63.7	89.8	19.4
			299	120	130	10	32.7	21.8						
		47.5 - 118.5 typical cherty magnetite with layered to laminated unit texture.	300	130	140	10	32.8	14.6	130-148	30.4	67.0	61.2	89.6	20.4
			301	140	148	8	35.1	25.1						
		magnetite in diffuse, irregular to sharp regular laminae in a grey chert matrix.												
		118.5 - 133.5 layered to massive unit texture.												
		133.5 - 151.7 fragmented unit texture, with angular to round fragments of jasper and magnetite in a green-grey chert matrix.												
		bedding at 10°-20°.												
		interval mainly moderately magnetic.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-19
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-19   LENGTH: 163'
LOCATION: L20+65E, 10+10S   MAIN ZONE
ELEVATION: 1110' A.S.L.   AZIMUTH: –   DIP: -90°
STARTED: July 25, 1976   FINISHED: July 27, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
148.0	163.0	JASPER HEMATITE - layered to laminated unit texture, with diffuse, irregular hematite in a white chert and jasper matrix. bedding at 20°. interval is non magnetic.	302	148	163	15	20.1	19.7	148-163	4.1	41.1	8.4	75.4	1.7
163.0		END OF HOLE												
		LOST CORE 27.5 - 29.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-20
SHEET NO. 1

MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-20 LENGTH: 167'
LOCATION: L20+42W, 8+30S MAIN ZONE
ELEVATION: 1040' A.S.L. AZIMUTH: - DIP: -90°
STARTED: July 28, 1976 FINISHED: July 29, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0	5.0	OVERBURDEN - casing, no core recovery
5.0	145.0	CHERTY MAGNETITE I.F.
		- primarily a layered unit with small laminated intervals, irregular to regular sharp laminae of magnetite in a green-grey chert matrix.
		5.0 - 124.0 typical cherty magnetite as above, with bedding at 0°-20°.
		interval is moderately magnetic.
		124.0 - 145.0 mineralogy and texture as above but with minor pink chert and jasper in matrix.
145.0	167.0	JASPER HEMATITE I.F.
		145.0 - 150.0 zone of angular to rounded jasper fragments, usually oblong, in a matrix of hematite and pink and white chert.
		hematite dust rims some jasper fragments.
		unit texture is fragmental to layered.
		interval is non-magnetic.
		150.0 - 164.0 granular texture with rounded fragments containing granules of jasper and pink chert in a hematite matrix.

SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
303	5.0	10	5	30.7	25.6	5.0-20	31.0	68.2	70.2	88.0	21.1
304	10	20	10	31.3	21.3						
305	20	30	10	32.6	21.6	20- 40	34.0	68.0	72.3	89.8	23.1
306	30	40	10	32.4	25.4						
307	40	50	10	35.7	30.0	40- 60	41.0	68.7	82.8	90.4	28.2
308	50	60	10	32.3	25.7						
309	60	70	10	32.8	22.4	60- 80	33.0	66.0	67.9	86.6	21.8
310	70	80	10	31.9	20.2						
311	80	90	10	33.5	26.0	80-100	40.0	67.9	79.4	90.6	27.2
312	90	100	10	35.3	27.7						
313	100	110	10	31.6	22.5	100-120	35.0	68.6	74.6	88.6	24.0
314	110	120	10	32.8	25.5						
315	120	130	10	32.7	23.7	120-145	37.0	66.7	76.2	91.6	24.7
316	130	140	10	32.3	24.1						
317	140	145	5	33.5	27.0						
318	145	167	22	32.3	1.4						

DIAMOND DRILL RECORD

HOLE NO. 76-20

SHEET NO. 2

H. E. NEAL & ASSOCIATES LTD.

Mineral Consultants

MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING

HOLE NO.: 76-20 LENGTH: 167'

LOCATION: L20+42W, 8+30S MAIN ZONE

ELEVATION: 1040' A.S.L. AZIMUTH: - DIP: -90°

STARTED: July 28, 1976 FINISHED: July 29, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND %-400	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
		164.0 - 167.0 layered texture; a very hard glassy looking interval with layers of dull red coloured jasper and minor hematite.												
167.0		END OF HOLE												
5.0	155.0	INTERVAL TO SPLIT.												
		NO CORE LOSS.												

DIAMOND DRILL RECORD

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-21 LENGTH: 163'
LOCATION: L60+27W, 14+55S MAIN ZONE
ELEVATION: 1080' A.S.L. AZIMUTH: - DIP: -90^{o}
STARTED: July 29, 1976 FINISHED: July 31, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO.: 76-21
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST CONCENTRATE				GRIND %-400	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	%FE REC'Y	MESH	
0	5.0	OVERBURDEN - no core recovery												
5.0	151.0	CHERTY MAGNETIC I.F.	319	5	10	5	30.9	21.6	5-20	36.0	68.9	79.2	89.6	24.8
			320	10	20	10	32.1	26.8						
		5.0 - 141.8 massive to laminated texture with magnetite disseminated in a green-grey chert matrix in several intervals less one foot wide. Occurs mainly as laminae of magnetite, from diffuse irregular to regular sharp.	321	20	30	10	32.4	24.4	20- 40	38.5	57.9	81.2	89.8	26.1
			322	30	40	10	34.9	29.4						
			323	40	50	10	32.4	28.1	40- 60	40.0	68.0	85.8	90.6	27.2
			324	50	60	10	31.7	25.0						
			325	60	70	10	34.6	27.7	60- 80	39.2	68.3	82.4	89.8	26.8
			326	70	80	10	31.1	25.4						
			327	80	90	10	32.9	26.1	80-100	35.9	66.6	75.4	89.4	23.9
		141.8 - 151.0 minor hematite in this interval gives the fresh surface a red grey colour. Same textures as above.	328	90	100	10	30.7	20.6						
			329	100	110	10	33.0	25.0	100-120	37.5	67.9	76.2	88.4	25.5
			330	110	120	10	34.3	24.4						
			331	120	130	10	31.1	25.7	120-151	39.1	69.0	78.7	90.4	27.0
		bedding is at 0-10° core normal.	332	130	140	10	32.8	28.6						
		both intervals above are uniformly magnetic with no lean intervals.	333	140	151	11	38.6	25.1						
151.0	163.0	JASPER HEMATITE I.F.	334	151	163	12	34.6	1.6						
		- mainly a fragmental to layered texture, with rounded fragments of jasper and pink chert granules in an aphanitic hematite and jasper matrix.												
		- no bedding planes evident in this interval.												
		- interval is non-magnetic.												
163.0		END OF HOLE												
		LOST CORE												
		0 - 5'												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-22
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-22 LENGTH: 103'
LOCATION: L101+10W, 12+10S MAIN ZONE
ELEVATION: 1070' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 1, 1976 FINISHED: August 2, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	4.0	OVERBURDEN - casing, no core recovery												
4.0	64.0	CHERTY MAGNETITE I.F.	335	4	10	6	33.9	27.4	4- 20	40.9	66.8	82.5	89.0	27.3
		4.0 - 41.5 massive to layered texture, with several intervals (less than 1 ft.) of massive magnetite in a green grey chert matrix and more typically layers of irregular sharp magnetite in a green grey chert matrix.	336	10	20	10	32.9	27.2						
			337	20	30	10	34.9	29.7	20- 40	42.2	67.4	84.4	90.0	28.4
			338	30	40	10	39.0	27.8						
			339	40	50	10	31.8	15.4	40- 60	26.3	67.6	53.7	90.4	17.8
			340	50	64	14	34.0	17.2						
		- bedding from 5-25° in this interval.												
		- interval moderately magnetic.												
		41.5 - 64.0 minor hematite gives this interval a purple grey colour.												
		texture as above.												
		ground water leaching out the hematite leaves rusty stained pitting and some lost core intervals.												
64.0	103.0	JASPER HEMATITE	341	64	74	10	32.9	7.5						
		64.0 - 99.0 mainly a massive to layered texture, with rounded lenses of jasper and pink chert granules in a fine grained hematite and jasper matrix.												
		interval non-magnetic except for minor isolated patches.												
		99.0 - 103.0 high jasper and low hematite content make this interval extremely hard.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-22
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-22 LENGTH: 103'
LOCATION: L101+10W, 12+10S MAIN ZONE
ELEVATION: 1070' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 1, 1976 FINISHED: August 2, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
103.0		END OF HOLE												
		LOST CORE												
		0 - 4.0 55.5 - 56.0 59.0 - 61.0 66.5 - 67.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-23
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO. 76-23 LENGTH 337.5'
LOCATION L19+42W, 29+11N MAIN ZONE
ELEVATION 860' A.S.L. AZIMUTH - DIP -90°
STARTED August 3, 1976 FINISHED August 5, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	10.0	OVERBURDEN - no core recovery												
10.0	80.5	CHERTY CARBONATE I.F. - mainly a massive to layered unit, with discrete ovoids to lenses of hematite and iron carbonates, light grey chert matrix. Weathering of the hematite produces rusty red brown weathering vugs or intervals. 12.0 - 28.0 numerous rounded vugs of hematite or iron carbonate. 28.0 - 52.0 less weathered interval of minor rusty brown iron carbonates and hematite in a light grey chert matrix. 52.0 - 58.0 dark grey interval due to unweathered rounded patches and lenses of hematite. 58.0 - 68.0 rusty brown weathered interval, probably due to ground water. 68.0 - 71.0 same as interval 52-58. 75.0 - 80.5 rusty brown weathering, chert rich interval, layered texture.												
80.5	132.0	CHERTY MAGNETITE TEXTURE (UPPER LEAN CHERT) - straticraphically a part of the cherty magnetic horizon. - a layered unit with layers of chert and silicate granules in a grey chert matrix separated by discrete bands of aphanitic grey chert with minor magnetite.	342	122	132	10	25.4	10.1						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-23
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-23 LENGTH: 337.5'
LOCATION: L19+42W, 29+11N MAIN ZONE
ELEVATION: 860' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 3, 1976 FINISHED: August 5, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
132.0	326.0	CHERTY MAGNETITE I.F.	343	132	140	8	28.2	18.5	132-150	23.1	68.8	53.7	92.8	15.9
		- bedding at 0-10° core normal.	344	140	150	10	31.4	18.4						
		- a layered to laminated unit, with diffuse irregular to sharp regular laminae of magnetite in an olive green grey chert matrix.	345	150	160	10	29.5	17.9	150-170	25.4	70.5	60.9	91.0	17.9
			346	160	170	10	30.3	18.3						
			347	170	180	10	30.3	16.8	170-190	25.7	69.5	58.2	88.8	17.9
			348	180	190	10	31.7	19.4						
		132.0 - 142.0 layered, granular texture	349	190	200	10	32.4	20.2	190-210	33.7	69.0	74.3	87.8	23.3
			350	200	210	10	31.2	24.3						
		142.0 - 175.0 minor jasper fragments and laminae give this interval a pinkish tinge to the grey rock colour.	351	210	220	10	31.6	25.2	210-230	34.0	68.2	74.3	88.6	23.2
			352	220	230	10	31.8	20.9						
			353	230	240	10	30.2	15.9	230-250	30.5	65.6	64.8	86.2	20.0
		175.0 - 195.0 more disseminated magnetite in a layered interval with olive green grey chert matrix.	354	240	250	10	33.3	23.9						
			355	250	260	10	32.4	25.8	250-270	39.0	68.2	82.3	89.0	26.6
			356	260	270	10	33.0	27.3						
			357	270	280	10	34.0	29.5	270-290	38.0	67.7	79.7	88.6	25.7
		195.0 - 275.0 typical cherty magnetite I.F.	358	280	290	10	31.6	28.8						
		275.0 - 326.0 varying amounts of jasper granules, fragments and lenses.give a red orange colour in parts to the overall olive green, grey to black colour.	359	290	300	10	29.9	21.2	290-310	33.5	66.5	73.3	91.6	22.3
			360	300	310	10	31.7	22.1						
			361	310	320	10	37.6	23.4	310-326	34.0	67.7	76.2	88.8	23.0
			362	320	326	6	27.3	22.0						
		intervals all moderately magnetic.												
		bedding 10 to 60° at 306-326'.												
326.0	337.5	JASPER HEMATITE	363	326	337.5	11.5	26.6	2.9						
		- massive to laminated												
		333.5 - 337.5 high pink chert fragments.												
337.5		END OF HOLE												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-23
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-23 LENGTH: 337.5'
LOCATION: L19+42W, 29+11N MAIN ZONE
ELEVATION: 860' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 3, 1976 FINISHED: August 5, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		SERPENTINE-CARBONATE												
		INTRUSIVES 139.0 - ∠1"												
		191.5 - 192.0												
		203.0 - 203.5												
		218.7 - 219.0												
		222.0 - 222.5												
		232.0 - 232.4												
		LOST CORE												
		0 - 10.0												
		12.5 - 15.0												
		56.5 - 57.5												
		61.0 - 63.0												
		71.0 - 75.0												
		83.0 - 83.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-24
SHEET NO. 1

MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-24 LENGTH: 162'
LOCATION: L70+30E, 3+60S MAIN ZONE
ELEVATION: 1020' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 9, 1976 FINISHED: August 11, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
0	15.0	OVERBURDEN												
15.0	113.0	CHERTY MAGNETITE I.F.	364	15	20	5	21.2	14.2						
			365	20	30	10	19.1	12.5						
		- mainly layered to laminated texture with laminae	366	30	40	10	22.7	14.7	30- 50	30.5	62.0	74.7	89.2	18.9
		ranging from diffuse irregular to sharp regular	367	40	50	10	28.0	22.4						
		boundaries in an olive green-grey matrix.	368	50	60	10	35.0	30.6	50- 70	39.0	68.4	86.6	91.0	26.7
		- bedding at less than 15° generally.	369	60	70	10	28.0	23.1						
			370	70	80	10	17.1	10.8	70- 90	25.0	65.8	72.8	91.8	16.5
		- oolitic intervals consisting of magnetite	371	80	90	10	29.1	22.1						
		oolites in a chart matrix at 23.0 - 39.8	372	90	100	10	29.0	21.5	90-113	30.2	67.8	73.1	91.4	20.5
		65.8 - 75.0	373	100	113	13	28.1	20.1						
		- interval is moderately magnetic.												
113.0	162.0	CHERTY METALLIC I.F	374	113	120	7	31.6	21.6	113-162	17.5	69.8	41.1	94.6	12.2
		- predominantly a laminated texture, with generally	375	120	140	20	28.7	8.0						
		sharp regular laminae of pink chert, cream	376	140	162	22	30.8	12.7						
		coloured chert, magnetite and hematite combined.												
		- interval is weakly to moderately magnetite.												
162.0		END OF HOLE												
		LOST CORE												
		0 - 5.0												
		6.0 - 10.0												
		11.0 - 12.0												
		13.0 - 15.0												
		60.6 - 62.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-25
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-25 LENGTH: 357.5'
LOCATION: L30+00S, 6+87W BLACKIE LAKE
ELEVATION: 1020' A.S.L. AZIMUTH: Grid West DIP: -65°
STARTED: August 12, 1976 FINISHED: August 15, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	35.0	OVERBURDEN - boulders, no core recovery												
35.0	60.0	CHERTY CARBONATE I.F.	378	40	50	10	29.3	19.4						
		- rusty brown weathering.	379	50	60	10	25.3	11.4						
		- disseminated iron carbonates in a grey chert matrix; unit texture appears layered.												
		- weakly to moderately magnetic in places.												
60.0	244.3	CHERTY MAGNETITE I.F.	380	60	70	10	23.5	13.4						
			381	70	80	10	18.5	11.3						
		- massive to laminated texture with disseminated,	382	80	90	10	19.1	10.6						
		irregular, angular blebs to diffuse regular	383	90	100	10	27.1	17.2	90-110	30.5	71.0	74.4	95.8	21.7
		laminae of magnetite in a grey-green chert	384	100	110	10	31.4	26.7						
		matrix.	385	110	120	10	30.6	26.1	110-130	34.7	70.2	80.1	93.6	24.4
		73.0 - 112.5 irregular rosettes of grey green	386	120	130	10	30.3	23.2						
		to pinkish iron carbonates.	387	130	140	10	35.6	29.0	130-150	40.6	70.5	88.9	97.4	28.6
			388	140	150	10	32.8	30.2						
		125.0 - 155.0)	389	150	160	10	32.7	26.6	150-170	38.0	71.1	82.1	92.4	27.0
		172.0 - 179.0) jasper fragments in the chert	390	160	170	10	32.7	27.9						
		189.0 - 200.0) matrix	391	170	180	10	32.2	18.2	170-190	31.9	69.8	68.5	95.8	22.3
		207.0 - 223.0)	392	180	190	10	32.4	26.2						
		228.0 - 250.0)	393	190	200	10	36.0	27.0	190-210	36.1	69.7	74.4	96.2	25.2
		- bedding at 0-20°	394	200	210	10	31.2	23.0						
			395	210	220	10	34.8	29.0	210-230	38.6	70.5	79.1	97.2	27.2
		- generally a moderately magnetic interval	396	220	230	10	33.5	25.8						
			397	230	244.3	14.3	31.5	13.5						
244.3	276.0	SERPENTINE CARBONATE INTRUSIVE												
		244-3 - 276.0 intrusive cut by fragments and lenses of jasper	398	244.3	255	10.7	12.0	2.8						
		typical fine to coarse grained intrusive with angular serpentine in												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
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HOLE NO. 76-25
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-25 LENGTH: 357.5'
LOCATION: L30+00S, 6+87W BLACKIE LAKE
ELEVATION: 1020' A.S.L. AZIMUTH: Grid West DIP: -65°
STARTED: August 12, 1976 FINISHED: August 15, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
357.5		END OF HOLE												
		LOST CORE												
		0 - 35.0 with exception of several boulders												
		44.5 - 45.0												
		46.0 - 47.0												
		52.2 - 55.0												
		58.0 - 60.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-26
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-26 LENGTH: 315'
LOCATION: L30+00S, 31+00W BLACKIE LAKE
ELEVATION: 1070' A.S.L. AZIMUTH: Grid West DIP: -65°
STARTED: August 16, 1976 FINISHED: August 20, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
0	13.0	OVERBURDEN - Boulders, little core recovery												
13.0	119.0	CHERTY CARBONATE I.F.	399	109	119	10	18.1	0.5						
		- primarily a massive unit with minor layering; interval is predominantly iron silicates or carbonates in rosettes or in matrix.												
		20-0 - 70.0 rusty weathering vugs caused by the leaching out of iron carbonates in a grey chert matrix.												
		70.0 - 119.0 dark grey rosettes of unweathered silicate or carbonate in a grey chert matrix.												
			400	119	130	11	25.2	10.9						
119.0	258.0	CHERTY MAGNETITE I.F.	401	130	140	10	19.2	7.3						
		- mainly a layered to laminated unit with sharp regular laminae of magnetite in a green-grey chert matrix.	402	140	150	10	23.3	14.8						
			403	150	160	10	19.7	7.6						
			404	160	170	10	23.6	13.3						
		119.0 - 170.0 typical cherty magnetite with unusually green chert matrix.	405	170	180	10	29.0	24.0	170-190	35.5	71.5	81.1	97.4	25.4
			406	180	190	10	33.0	27.1						
			407	190	200	10	29.9	25.4	190-210	32.3	70.9	79.1	97.6	23.3
		170.0 - 258.0 matrix composed of increasing proportions of jasper towards the bottom of the interval to a maximum of 20% jasper and 80% chert as matrix.	408	200	210	10	28.1	21.1						
			409	210	220	10	32.9	22.5	210-230	30.9	71.1	66.4	98.2	22.0
			410	220	230	10	32.5	20.6						
			411	230	240	10	33.1	12.7	230-258	20.7	70.8	44.3	98.4	14.7
			412	240	250	10	32.3	11.7						
			413	250	258	8	32.4	18.5						
258.0	315.0	JASPER HEMATITE												
		- interval is layered to laminated hematite and magnetite I.F. The interval has sub-intervals	414	258	280	22	33.7	3.8						
			415	280	300	20	31.5	9.2						
			416	300	314	14	32.6	4.7						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-26
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBECE UNGAVA MINING
HOLE NO.: 76-26 LENGTH: 315'
LOCATION: 30+00S, 31+00W BLACKIE LAKE
ELEVATION: 1070' A.S.L. AZIMUTH: Grid West DIP: -65°
STARTED: August 16, 1976 FINISHED: August 20, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
258.0	315.0	JASPER HEMATITE (continued)												
		of predominantly magnetite mineralization in a orange pink and white chert matrix.												
		258.0 - 275.0 primarily hematite with minor magnetite in a jasper and pink chert matrix - weakly to non-magnetic.												
		275.0 - 285.0 primarily magnetite with minor hematite, moderately magnetic.												
		285.0 - 294.0 primarily hematite with minor magnetite. Weakly to non-magnetic.												
		294.0 - 298.0 primarily magnetite with minor hematite - weakly to strongly magnetic.												
		298.0 - 315.0 predominantly hematite with occasional magnetic intervals.												
315.0		END OF HOLE												
		LOST CORE												
		0 - 6.0												
		7.5 - 11.5												
		13.0 - 15.0												
		17.5 - 20.0												
		27.0 - 30.0												
		37.0 - 42.0												
		44.0 - 47.0												
		47.5 - 55.0												
		57.0 - 60.0												
		61.0 - 62.0												

DIAMOND DRILL RECORD

NAME OF PROPERTY QUEBEC UNGAVA MINING

HOLE NO. 76-27 LENGTH 247'

LOCATION L50+40S, 29+76W BLACKIE LAKE

ELEVATION 1120' A.S.L. AZIMUTH - DIP -90^{o}

STARTED August 21, 1976 FINISHED August 22, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-27
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	5.0	OVERBURDEN - no core recovery												
5.0	53.7	CHERTY CARBONATE I.F.	419	15	20	5	26.6	14.5						
		- predominantly a massive to diffuse irregular	420	20	30	10	23.2	8.8						
		layered texture, with minor magnetite layers,	421	30	40	10	23.7	13.2						
		weakly to strongly magnetic.	422	40	53.7	13.7	23.4	12.7						
		- iron carbonate ovoids weathered out leaving rusty brown vugs or light brown spots where weathering is not so intense.												
		- the chert matrix is a medium to dark grey colour.												
53.7	217.4	CHERTY MAGNETITE I.F.	423	53.7	60	6.3	20.2	13.5						
		- mainly a laminated unit texture, with diffuse	424	60	70	10	20.1	7.5						
		irregular to sharp regular laminae of magnetite	425	70	80	10	20.5	6.9						
		and minor hematite in an olive green-grey	426	80	90	10	22.4	14.8	80-100	26.6	70.5	71.6	95.8	18.8
		chert matrix.	427	90	100	10	29.6	23.0						
			428	100	110	10	32.8	26.9	100-120	36.1	70.0	79.2	97.2	25.3
		88.0 - 91.0 minor rounded jasper fragments in	429	110	120	10	30.2	23.6						
		the chert matrix.	430	120	130	10	31.8	22.9	120-140	32.7	70.1	75.9	97.2	22.9
			431	130	140	10	30.4	23.0						
		95.0 - 199.0 minor Fe carbonates or silicates	432	140	150	10	31.9	25.1	140-160	36.0	70.9	80.8	93.8	25.5
		occur as discrete ovoids or angular	433	150	160	10	31.3	24.5						
		fragments or patches in the chert	434	160	170	10	30.0	24.3	160-180	35.0	71.2	79.4	97.2	24.9
		matric.	435	170	180	10	33.6	23.5						
182.0	217.4	JASPER HEMATITE	436	180	190	10	35.0	16.4	180-200	23.4	69.7	48.7	96.9	16.3
		- increasing amounts of jasper and hematite but	437	190	200	10	33.0	14.4						
		still quite magnetic.	438	200	210	10	31.6	9.8	200-217.4	15.5	70.8	36.9	94.7	11.0
		interval mainly moderately magnetic.	439	210	217.4	7.4	28.0	11.7						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-27
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-27 LENGTH 247'
LOCATION L50+40S, 29+76W, BLACKIE LAKE
ELEVATION 1120' A.S.L. AZIMUTH - DIP -90°
STARTED August 21, 1976 FINISHED August 22, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
217.4	247.0	SERPENTINE CARBONATE INTRUSIVE	440	217.4	227	19.6	10.7	5.1						
		Typical textures												
		217.0 - 226.0 fine grained												
		226.0 - 247.0 medium grained												
247.0		END OF HOLE												
		LOST CORE												
		41.4 - 43.3												
		46.5 - 48.3												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-28 LENGTH: 405'
LOCATION: 19+83S, 26+20W BLACKIE LAKE
ELEVATION: 1020' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 23, 1976 FINISHED: August 26, 1976

HOLE NO.: 76-28
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
9	7.5	OVERBURDEN												
7.5	103.8	CHERTY CARBONATE	441	94	104	10	16.8	0.6						
		7.5 - 97.0 discrete ovoids of iron carbonates in a dark grey chert matrix. In areas where ground water has leached the carbonates along minor fractures, the carbonates are eroded out leaving vugs of rusty brown oxides.												
		38.0 - 40.0 carbonate appears intruded by a dark grey fine grained matrix surrounding angular chert fragments												
		whole carbonate interval is marked by numerous syneresis cracks, sometimes separated by more than one foot but also occur in pairs or sets less than one inch apart; cracks are parallel to bedding.												
103.8	215.0	LEAN CHERT - with minor magnetite.	442	104	110	6	26.8	13.0						
		- generally a massive to layered unit, the massive	443	110	120	10	20.1	7.0						
		intervals interspersed with layered intervals.	444	120	130	10	20.3	9.9						
		The massive intervals are generally granulitic	445	130	140	10	21.6	12.7						
		with minor oolite content. The granules appear	446	140	150	10	17.1	2.8						
		to be dark grey green chert matrix. The	447	150	160	10	12.6	1.7						
		layered intervals are characterized by diffuse	448	160	170	10	22.2	0.5						
		irregular layers of dark grey chert cut by	449	170	180	10	19.9	0.5						
		rosettes of iron carbonates.	450	180	190	10	20.2	0.5						
			451	190	200	10	17.3	0.5						
			452	200	210	10	18.7	0.5						
			453	210	215	5	19.7	1.2						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-28
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-28 LENGTH: 405'
LOCATION: 19+83S, 26+20W, BLACKIE LAKE
ELEVATION: 1020' A.S.L. AZIMUTH: - -90°
STARTED: August 23, 1976 FINISHED: August 26, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST CONCENTRATE FOOTAGE	% WT.	% SOL FE	% FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
		103.8 - 113.5 generally weakly to moderately magnetic due to minor magnetite.												
		113.5 - 215.0 non to weakly magnetic.												
215.0	400.0	CHERTY MAGNETITE I.F.	454	215	220	5	21.3	8.5						
		- generally a layered to laminated texture, with	455	220	230	10	30.3	22.2	220-240	35.2	70.7	76.8	96.2	24.9
		diffuse irregular to sharp regular laminae of	456	230	240	10	34.0	26.6						
		magnetite in an olive green-grey chert matrix.	457	240	250	10	33.3	26.4	240-260	32.2	70.4	72.4	96.2	22.7
			458	250	260	10	30.0	18.8						
		- bedding is from 0-15°.	459	260	270	10	29.6	20.3	260-280	32.7	70.6	70.4	96.7	23.1
			460	270	280	10	36.2	24.2						
		264.0 - 335.0 minor jasper and pink chert in the	461	280	290	10	32.8	26.4	280-300	35.3	70.6	74.0	96.4	24.9
		matrix and oblong pink chert	462	290	300	10	33.5	20.9						
		fragments surrounded by magnetite	463	300	310	10	34.0	12.1	300-320	19.1	70.2	38.8	94.2	13.4
		and hematite.	464	310	320	10	36.0	13.5						
		335.0 - 400.0 increasing amounts of jasper and	465	320	330	10	26.0	22.8	320-340	29.4	70.6	71.8	97.9	20.8
		hematite in the matrix, but the	466	330	340	10	31.5	18.2						
		interval is moderately to strongly	467	340	350	10	34.8	8.3						
		magnetic.	468	350	360	10	27.3	10.6						
			469	360	370	10	37.2	9.1						
		The whole cherty magnetite interval is moderately	470	370	380	10	29.0	12.3						
		to strongly magnetic.	471	380	390	10	31.0	13.4						
			472	390	400	10	29.8	13.2						
400.0	405.0	JASPER HEMATITE												
		- mainly a massive to layered unit texture with hematite in a pink chert and jasper matrix.	473	400	405	5	27.6	7.2						
405.0		END OF HOLE												
		LOST CORE												
		0 - 7.5												
		58.0 - 60.0												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-29 LENGTH: 345'
LOCATION: L00+50N, 9+50W BLACKIE LAKE
ELEVATION: 1045' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 27, 1976 FINISHED: August 29, 1976

HOLE NO.: 76-29
SHEET NO.: 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY: Michael Smith, P.Atherton, R.S. Ferguson

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND %-400	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	MESH	
0	7.2	OVERBURDEN - no core recovery												
7.2	25.5	CHERTY CARBONATE	474	15.5	25.5	10	17.4	0.7						
		7.2 - 12.0 massive texture												
		12.0 - 25.5 some layers, sharp to diffuse alternating white chert, containing fragments and oolites, with dark chert containing some chert fragments.												
		the iron carbonates are interstitial to fragments and occur as spots or rosettes.												
		syneresis cracks present.												
25.5	81.0	LEAN CHERT	475	25.5	30.0	4.5	34.4	15.1						
		- massive to layered to laminated texture.	476	30	40	10	21.9	3.0						
		- patches of magnetic material, weakly to strongly magnetic occurring throughout the interval.	477	40	50	10	21.0	0.5						
			478	50	60	10	21.9	0.6						
		- clusters of carbonate up to ¼".	479	60	70	10	22.8	5.7						
		- chert is white to dark grey.	480	70	81	11	17.9	2.8						
		- white chert occurs mostly as matrix, with oolites (patchy), granulites and patches of dark grey chert.												
		- syneresis cracks present.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-29
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-29 LENGTH: 345'
LOCATION: L00-50N, 9+50W, BLACKIE LAKE
ELEVATION: 1045' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 27, 1976 FINISHED: August 29, 1976
LOGGED BY: Michael Smith, P.Atherton, R.S. Ferguson

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
			481	81	90	9	26.2	14.3						
81.0	311.0	CHERTY MAGNETITE I.F.	482	90	100	10	19.9	6.2						
		81.0 - 128.5 massive to patchy to layered -	483	100	110	10	22.3	12.5						
		patchy magnetite (weakly to strongly	484	110	120	10	19.3	6.5						
		magnetic).	485	120	130	10	26.2	12.7						
			486	130	140	10	34.6	28.8	130-150	40.2	70.1	84.4	97.9	28.2
		oolitic throughout.	487	140	150	10	31.3	26.9						
		128.5 - 311.0 mainly strongly magnetic with some	488	150	160	10	31.3	24.6	150-170	31.7	69.9	69.7	95.6	22.2
		spots weakly to strongly magnetic.	489	160	170	10	31.0	19.0						
			490	170	180	10	31.5	20.8	170-190	31.3	68.3	66.2	91.1	21.4
		primarily patchy to layered - diffuse	491	180	190	10	31.5	21.9						
		to sharply layered patches of white	492	190	200	10	33.3	22.5	190-210	33.9	69.7	71.4	95.9	23.6
		and green chert with layers and	493	200	210	10	31.7	24.2						
		patches of magnetite.	494	210	220	10	33.2	25.6	210-230	33.3	69.1	70.0	95.8	23.0
		300.0 - 311.0 some jasper present.	495	220	230	10	30.9	20.1						
			496	230	240	10	29.4	18.0	230-250	32.2	69.7	69.3	95.8	22.4
		rock has a "churned-up" appearance	497	240	250	10	33.8	26.0						
		as the contact to the jasper	498	250	260	10	34.0	24.2	250-270	34.5	67.6	71.1	92.0	23.3
		hematite is approached.	499	260	270	10	29.8	21.6						
		pyrite occurs at:	500	270	280	10	36.5	28.7	270-290	36.3	68.0	71.5	96.3	24.7
		151.5, 174, 175, 199.5, 214, 216,	501	280	290	10	31.1	19.3						
		267.2, 293, 294.5, 297, 304.	502	290	300	10	30.3	16.9	290-311	28.7	68.6	63.1	92.8	19.7
			503	300	311	11	30.8	21.5						
		intrusives into ore at 97, 180, 220.5 (no larger than 6" wide)												
		bedding - 25° to 40°.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-29
SHEET NO. 3
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-29 LENGTH: 345'
LOCATION: L00-50N, 9+50W, BLACKIE LAKE
ELEVATION: 1045' A.S.L. AZIMUTH: - DIP: -90°
STARTED: August 27, 1976 FINISHED: August 29, 1976

LOGGED BY: Michael Smith, P. Atherton, R.S. Ferguson

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST	CONCENTRATE			GRIND	Calc. Mag. Fe.
FROM	TO		NUMBER	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	% -400 MESH	
311.0	340.0	JASPER HEMATITE - texture massive to layered to patchy. - white to grey chert layers - not much hematite. - jasper is massive to finely laminated with dark grey chert. - fractures filled with calcite throughout. 334.5 - 338.3 fragmental texture with white chert in a matrix consisting of white chert to jasper fragments (fragments up to one inch diameter) serpentine carbonate intrusive occurs at 322-322.6.	504 505	311 331	331 340	20 9	19.8 19.9	1.3 0.5						
340.0	345.0	SERPENTINE CARBONATE INTRUSIVE - contorted laminae of sparry calcite and jasper. - dark chert and some iron oxide patches.												
345.0		END OF HOLE												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-30
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-30 LENGTH: 311'
LOCATION: L29+50S, 12.00E HEMATITE LAKE
ELEVATION: 955'A.S.L. AZIMUTH: Grid East DIP: -45°
STARTED: September 2, 1976 FINISHED: September 5, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
9	21.5	OVERBURDEN - boulders and lost core												
21.5	100.0	CHERTY CARBONATE	507	90	100	10	22.6	2.66						
		- interval is predominantly layered, with disseminated ovoids of leached out iron carbonates or lenses of yellow weathering iron carbonate (2" wide,generally)												
		- unit is quite weathered throughout the whole interval.												
		- bedding appears to be at 20° to core normal.												
		- interval is non magnetic.												
100.0	228.0	CHERTY MAGNETITE I.F.	508	100	110	10	28.1	14.8						
		- interval is typically layered to laminated with	509	110	120	10	31.0	19.8	110-130	32.9	68.1	72.7	93.2	22.4
		diffuse irregular laminae of magnetite in an	510	120	130	10	31.6	24.4						
		olive green-grey cherty matrix.	511	130	140	10	31.5	21.5	130-150	33.1	69.0	72.7	94.0	22.8
			512	140	150	10	31.7	24.3						
		- intervals of iron carbonate from 100-205'	513	150	160	10	37.4	31.4	150-170	44.9	70.3	85.1	94.0	31.6
		generally unweathered, although sometimes	514	160	170	10	38.3	33.4						
		leached out by ground water, usually discrete	515	170	180	10	33.2	28.4	170-190	42.3	70.2	85.1	94.2	29.7
		ovoids of carbonate.	516	180	190	10	36.1	30.6						
		211.0 - 217.0 intruded by fine grained, serpentine	517	190	200	10	30.7	26.4	190-210	42.0	69.2	88.3	91.2	29.1
		carbonate intrusive.	518	200	210	10	35.4	32.0						
			519	210	220	10	25.5	16.0	210-228	21.9	62.0	61.5	87.6	13.8
		- interval is moderately to strongly magnetic.	520	220	228	8	18.9	10.5						
		- bedding planes approximately 20-25° to core normal.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-30
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY QUEBEC UNVANA MINING
HOLE NO. 76-30 LENGTH 311'
LOCATION L29+50S, 12+00E HEMATITE LAKE
ELEVATION 955' A.S.L. AZIMUTH Grid East DIP -45°
STARTED September 2, 1976 FINISHED September 5, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
228.0	311.0	SERPENTINE CARBONATE INTRUSIVE - fine to medium grained with distinct lineations due to calcite concentration in layers. - non-magnetic.	521	228	238	10	15.2	3.3						
311.0		END OF HOLE												
		LOST CORE 0 - 10.0 (a few pebbles recovered) 10.0 - 12.5 14.0 - 15.0 15.0 - 18.0 18.5 - 20.0 20.0 - 21.0 23.0 - 28.5 46.5 - 56.0 59.5 - 65.5 70.6 - 72.0 82.0 - 83.0												

DIAMOND DRILL RECORD

NAME OF PROPERTY	QUEBEC UNGAVA MINING
HOLE NO.	76-31
LENGTH	482'
LOCATION	L30+06S, 32+45W, HEMATITE LAKE
ELEVATION	940' A.S.L.
AZIMUTH	-
DIP	-90°
STARTED	September 6, 1976
FINISHED	September 10, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-31
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED
LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	19.0	OVERBURDEN, sand, no core recovery												
19.0	136.0	CHERTY CARBONATE	522	126	136	10	22.8	0.93						
		- a rusty brown to reddish grey weathered unit, with a mainly layered unit texture.												
		19.0 - 129.3 rusty weathering, with minor hematite from 116-118.												
		129.3 - 136.0 lean chert - no carbonate. bedding is at 25-30° to core axis in some intervals.												
		interval is non-magnetic.												
		iron carbonates occur as isolated rosettes or in lenses.												
136.0	309.0	CHERTY MAGNETITE I.F.	523	136	150	14	30.6	1.46						
		- unit is mainly layered, with diffuse irregular	524	150	160	10	33.1	22.5	150-170	33.5	67.6	69.9	93.6	22.6
		laminae of magnetite in a green grey chert	525	160	170	10	32.7	23.5						
		matrix.	526	170	180	10	32.4	26.9	170-190	40.0	68.4	83.2	92.2	27.4
			527	180	190	10	34.3	28.8						
		116.0 - 225.0 minor rosettes of iron carbonates.	528	190	200	10	35.3	31.7	190-210	42.8	69.2	87.9	93.6	29.6
			529	200	210	10	32.3	27.4						
		277.0 - 309.0 laminated unit texture.	530	210	220	10	30.0	24.8	210-230	39.0	69.1	85.8	92.6	26.9
		243.0 - 309.0 minor jasper in the matrix.	531	220	230	10	33.6	29.5						
			532	230	240	10	32.6	29.0	230-250	42.0	68.7	85.4	92.6	28.9
		277.0 minor serpentine intrusive, 6" wide,	533	240	250	10	35.0	28.3						
		fine grained, dark green.	534	250	260	10	29.5	25.8	250-270	37.1	69.7	84.5	92.4	25.9
		- no pyrite noted in cherty magnetite interval.	535	260	270	10	31.7	26.5						
		- bedding at 10-20° to core axis.	536	270	280	10	29.6	25.1	270-290	31.9	66.6	72.3	91.4	21.2
			537	280	290	10	29.1	17.1						
		- interval is moderately to strongly magnetic.	538	290	300	10	32.9	18.5	290-309	28.3	67.7	68.4	92.0	19.2
			539	300	309	9	[illegible]	[illegible]						

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-31
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-31 LENGTH: 482'
LOCATION: L30+06S, 32+45W, HEMATITE LAKE
ELEVATION: 940' A.S.L. AZIMUTH: - DIP: -90°
STARTED: September 6, 1976 FINISHED: September 10, 1976

LOGGED BY: Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
309.0	482.0	SERPENTINE CARBONATE INTRUSIVE	540	309	319	10	17.0	4.7						
		- unit is generally dark green with white spots or layers of calcite.												
		309.0 - 380.0 interval appears layered due to lenses of calcite which cross-cut the unit.												
		380.0 - 482.0 generally massive texture, with minor calcite stringers cross-cutting the unit.												
		- interval is non-magnetic.												
		- bedding of calcite layers 35-45' core normal												
482.0		END OF HOLE												
		LOST CORE												
		0 - 17.0												
		20.0 - 24.0												
		52.0 - 55.0												
		62.0 - 64.0												
		100.3 - 102.0												
		103.0 - 108.0												
		114.0 - 116.0												
		126.5 - 128.5												
		131.0 - 136.0												
		141.5 - 142.0												
		143.0 - 146.5												

DIAMOND DRILL RECORD

NAME OF PROPERTY QUEBEC UNGAVA MINING
HOLE NO. 76-32 LENGTH 136'
LOCATION L30+00S, 10+00W HEMATITE LAKE
ELEVATION 960' A.S.L. AZIMUTH - DIP -90°
STARTED September 12, 1976 FINISHED September 15, 1976

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-32
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND %-400 MESH	Calc. Mag. Fe.
0	11.0	OVERBURDEN												
11.0	136.0	CHERTY CARBONATE I.F.												
		- mainly a massive unit texture.												
		- interval is rusty red brown to reddish grey due to the leaching of iron carbonates.												
		- the carbonates occur as discrete ovoids and as lenses which weather out.												
		- no bedding planes typical of the interval												
		- interval is non-magnetic.												
136.0		END OF HOLE												
		LOST CORE												
		0 - 11.0; 12.0 - 14.0; 15.0 - 22.5; 26.0 - 37.0; 33.6 - 40.0; 40.5 - 44.0; 46.0 - 48.7; 50.0 - 55.0; 55.5 - 67.5; 71.2 - 76.4; 78.0 - 82.5; 86.0 - 89.4; 90.5 - 92.0; 96.0 - 98.6; 100.0 - 102.0; 110.0 - 111.5; 115.0 - 122.5												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-33
SHEET NO. 1
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-33 LENGTH: 472'
LOCATION: L30+00S, 11+00W, HEMATITE LAKE
ELEVATION: 960' A.S.L. AZIMUTH: - DIP: -90°
STARTED: September 16, 1976 FINISHED: September 19, 1976

LOGGED BY Michael Smith

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NUMBER	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	CRUDE ASSAY % SOL FE	CRUDE ASSAY % MAG FE	DAVIS TUBE TEST FOOTAGE	CONCENTRATE % WT.	CONCENTRATE % SOL FE	CONCENTRATE % FE REC'Y	GRIND % -400 MESH	Calc. Mag. Fe.
0	11.0	OVERBURDEN - lost core												
11.0	100.0	CHERTY CARBONATE I.F.	541	90	100	10	28.9	4.0						
		- mainly a layered to massive unit, with layers of red brown oxidized iron carbonates in a light cream coloured chert matrix.												
		- orientation of iron carbonates at 40-45° to core normal.												
		- minor discrete ovoids of iron carbonates.												
		- interval is non-magnetic.												
100.0	156.0	CHERTY MAGNETITE I.F.	542	100	110	10	35.6	15.3						
		- interval is largely layered, with angular to rounded fragments of magnetite and jasper in a white chert matrix.	543	110	120	10	33.7	12.0						
			544	120	130	10	39.0	16.8						
			545	130	140	10	35.8	14.9						
		- magnetite occurs as fracture fillings, or as rounded fragments or as a thin (less than 1 mm) skin surrounding pink chert or jasper fragments.	546	140	150	10	33.6	13.1						
			547	150	156	6	27.1	6.0						
		- interval is bedded at 55-65° to core normal.												
		- weakly to moderately magnetic.												

DIAMOND DRILL RECORD

H. E. NEAL & ASSOCIATES LTD.
Mineral Consultants

HOLE NO. 76-33
SHEET NO. 2
MAGNETIC IRON BY SATMAGAN UNLESS SPECIFIED

NAME OF PROPERTY: QUEBEC UNGAVA MINING
HOLE NO.: 76-33 LENGTH: 472'
LOCATION: L30+00S, 11+00W, HEMATITE LAKE
ELEVATION: 960' A.S.L. AZIMUTH: - DIP: -90°
STARTED: September 16m 1976 FINISHED: September 19, 1976

LOGGED BY: Michael Smith

FOOTAGE		DESCRIPTION	SAMPLE				CRUDE ASSAY %		DAVIS TUBE TEST				GRIND	Calc. Mag. Fe.
				FOOTAGE						CONCENTRATE				
FROM	TO		NUMBER	FROM	TO	TOTAL	SOL FE	MAG FE	FOOTAGE	% WT.	% SOL FE	% FE REC'Y	%-400 MESH	
156.0	472.0	SERPENTINE CARBONATE INTRUSIVE	548	156	166	10	14.0	.59						
		- unit appears to be a dyke.												
		- unit is finely to coarse grained with lenses of calcite cross-cutting the intrusive.												
		- bedding of calcite lenses at 65° to core normal.												
		- interval is non magnetic.												
472.0		END OF HOLE												
		INTERVAL TO SPLIT - 90 - 166.												