THE JULIAN DEPOSIT GUIDE
1970

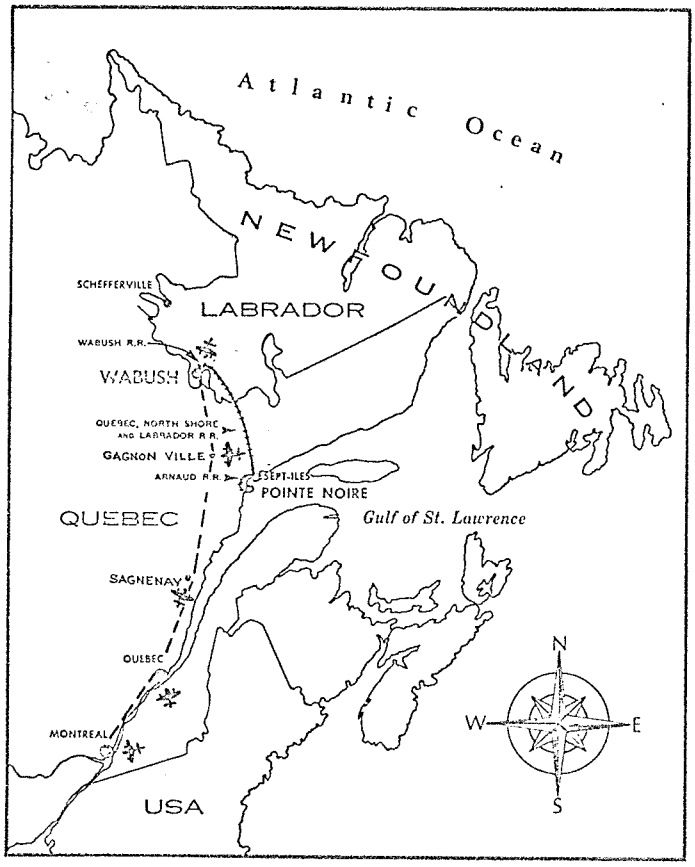
Julco Iron Corporation Limited

The Julian Deposit

1967 Guidebook

The Julian deposit is a large body of concentrating type iron ore situated in the Wabush Lake district, Labrador. This guide will acquaint the reader with the Wabush Lake district and present information about the Julian deposit, which when developed will be a significant supplier of iron ore products for European and North American markets.

The tour starts at the Montreal airport where the three and one half hour flight to Wabush via commercial airline leaves in the morning, with stops at Quebec, Saguenay, and Gagnonville.



Montreal - Wabush

Javelin's role in the development of the Wabush Lake district can be briefly outlined during the flight. The company played its part during a period of technological change in the iron ore industry, and it is necessary to present the history of exploration and developments in Labrador in order to appreciate the company's contribution.

Prior to the 20th century, Labrador-Ungava was a vast wilderness known only to the Indians and a few trappers and Jesuit missionaries. A. P. Low of the Geological Survey of Canada explored parts of the interior and noted the presence of iron bearing rocks in the early 1890's, however, the soft ores of the Knob Lake district remained unknown until the 1920's. Reuben D'Aigle prospected in the Wabush Lake area in 1914 and obtained samples of the iron bearing rocks. He and others promoted a gold rush in the Wabush Lake area in 1932; though no precious metals were discovered, the widespread, low grade, ferriginous rocks were found.

The Labrador Mining and Exploration Co. Ltd. was formed in 1936 on a 20,000 square mile prospecting rights concession which included the soft ore deposits at Knob Lake and all of the area in the Wabush Lake district. As they were obliged to periodically release areas, rights to lands lying east of the Wabush-Shabogamo Lake system reverted back to Newfoundland in 1939.

The Hollinger and Hanna interests acquired L. M. & E. during

World War II, and by 1949 had outlined reserves of high-grade, direct-shipping ore at Knob Lake sufficient to justify development. Accordingly, the Iron Ore Co. of Canada was formed and construction began, with the first ore train moving south to Seven Islands, Quebec over the newly completed 360 mile railway in 1954.

Cleveland Cliffs Iron Co. sponsored an exploration program in the Mt. Wright area, west of Wabush in Quebec, in the late 1940's, but as no direct-shipping ore was found the project was terminated shortly before the value of the Wabush type of iron formation as a concentrating type ore was generally realized. U. S. Steel subsequently moved into the Mt. Wright area and began work which lead to their present operations at Gagnonville, and probably will lead to the development of the Mt. Wright deposits in the future.

The Province of Newfoundland formed the Newfoundland and Labrador Corporation (Nalco) in 1951 to develop the province's natural resources. They became the holders of the mineral rights of the area released by L. M. & E. in 1939. Nalco sponsored exploration parties in the area in 1953, and these parties discovered, probably rediscovered, the two showings of iron formation which known as the Wabush and Julian deposits. Mr. John C. Doyle became interested in the Nalco properties and a Javelin engineer examined the Wabush deposit in July 1953. He recognized that the prospect showed evidence of a very large tonnage potential

of low grade ore readily amenable to gravity concentration. A camp and three drills were flown into the property in September. Thirty-two holes were completed between October and February 1954. This work demonstrated the existence of a very large deposit situated a mere 40 miles from the railway then under construction.

Wabush Lake Camp - 1954

The task facing Javelin was formidable. It had to prove that the ore could be concentrated into a high-grade product; that the reserves were adequate to support a very large-scale operation involving huge capital expenditures and requiring long term sales contracts for development; and that such a project was technically and economically sound. These events took place during a period

when the iron ore and steel industry, while aware of the potential advantages of high-grade ores, were still oriented toward direct-shipping ores. Efforts along these lines were frustrating at times, but they were successful when an arrangement was worked out with Pickands Mather & Co. in 1957 whereby the Wabush deposit was leased to them for development in return for production royalties.

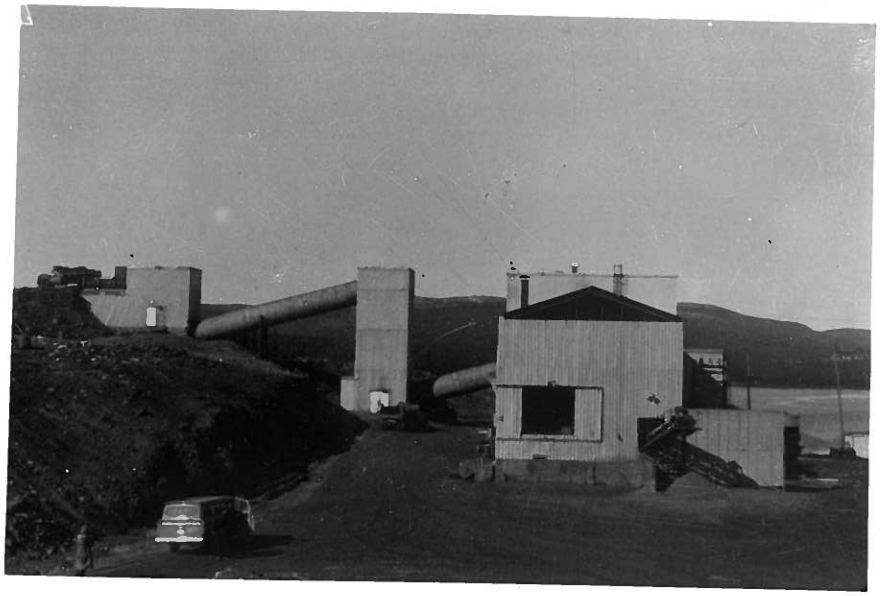
Drill Rig, Wabush - 1954

In the meantime, the Iron Ore Co. of Canada was busy with their Knob Lake project, and is was 1956 before they seriously began to investigate the L. M. & E. concession area in Wabush.

By 1959 however, they had decided to proceed with their Carol development. Pickands Mather had completed their evaluation of the Wabush deposit, and having secured participants in its development, they joined with I.O.C.C. in joint construction of the Wabush Lake Railway.

Javelin had originally begun this project in 1955 and had completed the subgrade to mile 15 by 1957. This accomplishment permitted truck hauling of heavy equipment and supplies for the Wabush and Carol projects from the existing railway to Shabogamo Lake, from where they were carried in barges to Wabush. This system was used until the Wabush Lake Railway was completed.

Test Pit - Wabush, September 1956



Wabush Pilot Plant - 1961

Before we land at Wabush, it should be remembered that in 1953 there was nothing in this area, look at it now. In 1954 there was nothing but a small camp and a few Javelin personnel, today there are two towns accomodating the needs of over 15,000 people and about 3/4 of a billion dollars worth of facilities engaged in turning out 15-16 million tons of iron ore products each year.

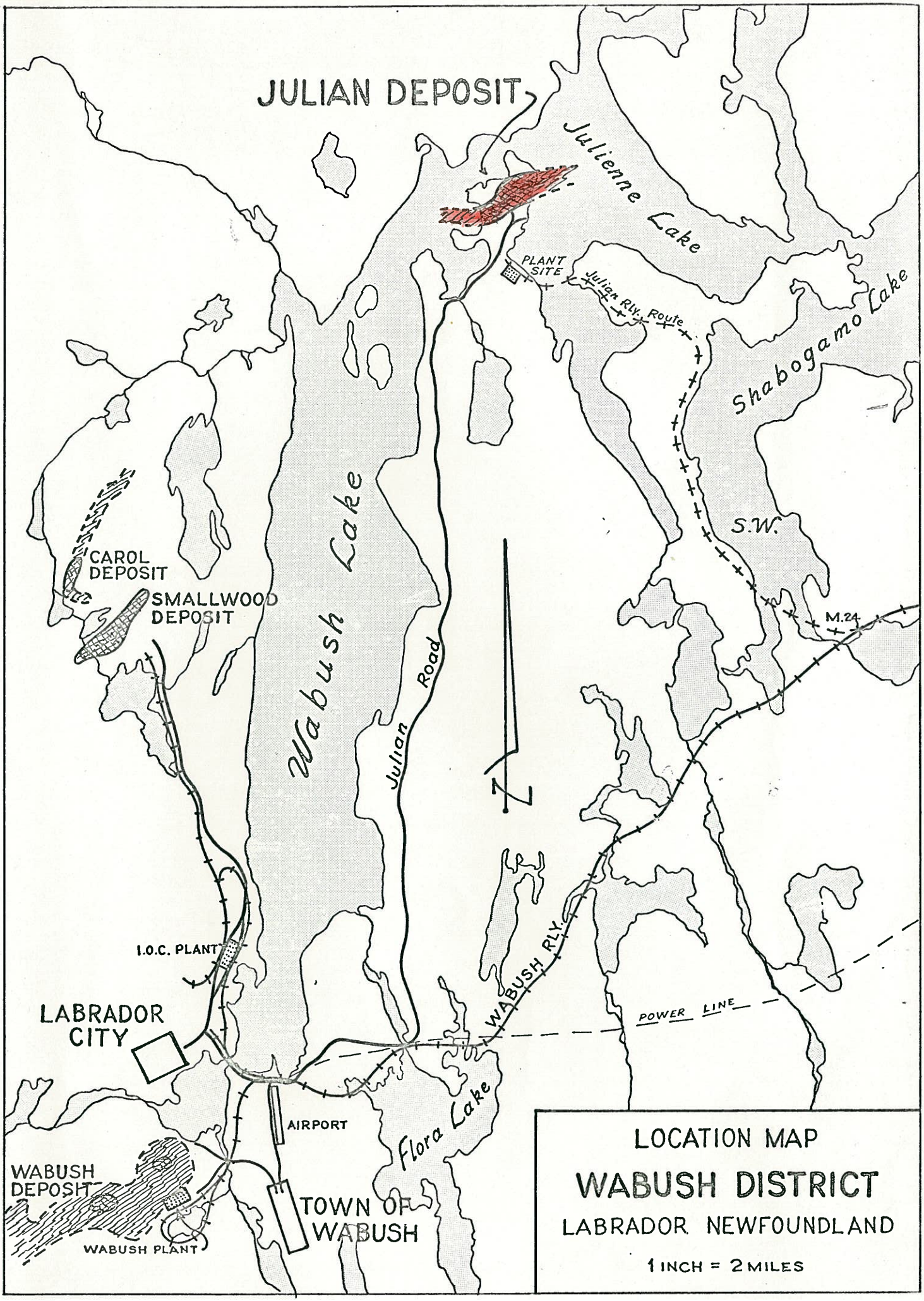
While Javelin doesn't produce any of this product itself, the company did forsee and demonstrate the potential, and expects to be able to develope the Julian deposit when market conditions permit. It is the only deposit in the district held independently

of established iron ore interests.

Wabush - Labrador City

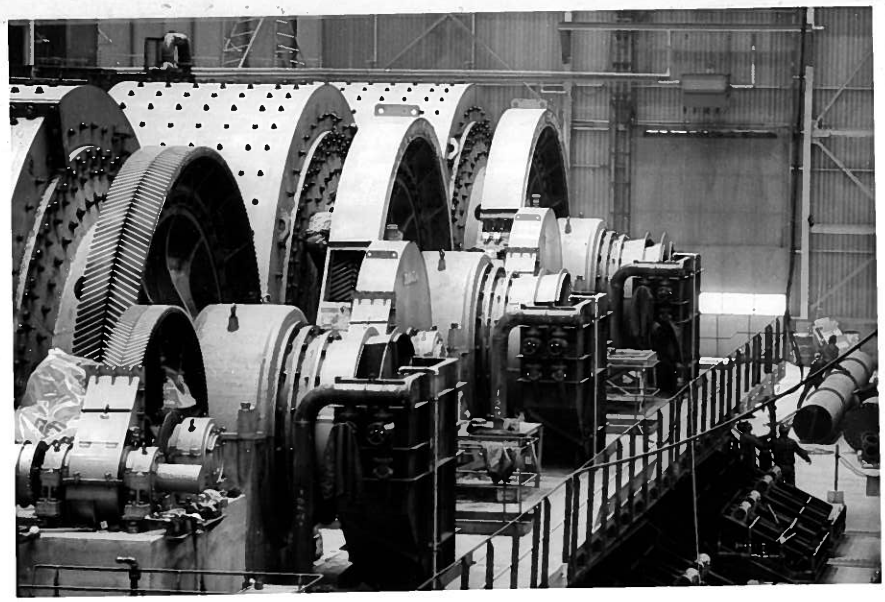
These two towns have been built during the past 8 years. They are company sponsored towns, though they have recently received municipal status. The companies own most of the houses and rent them to their employees; though some of the houses, apartment units and most business establishments are privately owned. The companies provide municipal and educational services and also sponsor or contribute towards recreational and service facilities; as the community centres, hospitals, swimming pool, ski slopes, radio and television.

The climate is not a serious deterent to year around operations though admittedly the summers are short and the winters long. Labor turnover is a problem, however. A high cost of living offsets the wage rates such that many families who come into the area become dissatisfied and leave. The confining effects of isolation also contribute to turnover, though some people are content to stay many years in the area. The towns are still growing as the companies require more people to operate their expanded facilities.


JULIAN DEPOSIT
Julienne Lake
PLANT SITE
Julian Rly. Route
Shabogamo Lake
S.W.
M.24
Wabush Lake
Julian Road
CAROL DEPOSIT
SMALLWOOD DEPOSIT
I.O.C. PLANT
LABRADOR CITY
WABUSH RLY.
POWER LINE
AIRPORT
Flora Lake
WABUSH DEPOSIT
WABUSH PLANT
TOWN OF WABUSH
LOCATION MAP
WABUSH DISTRICT
LABRADOR NEWFOUNDLAND
1 INCH = 2 MILES

Town of Wabush

Huge deposits of metamorphosed iron formation are the basis of the mining and milling operations. While the deposits are low-grade in comparison with direct-shipping ores, their coarse grained structure facilitates a simple gravity separation of the mineral components such that 64-66% iron products are readily made from the crude ore. Wabush produces concentrates that are pelletized at Pointe Noire near Seven Islands, I.O.C.C. pelletizes their concentrates in a pellet plant adjacent to their concentrator.



Grinding Mills - Wabush Plant

While the mining-milling process of the two operations are basically similar, the techniques and equipment used varies somewhat. I.O.C.C. mines a relatively hard quartz-specular hematite-magnetite ore from the Smallwood and Carol mines, the ore is trucked in 100 ton trailers to loading pockets above a railway tunnel, thence carried 8 miles in an automatic train to the mill. The crushed ore is ground dry in Aerofall mills, concentrated in Humphrey spirals and conveyed to the pellet plant.

The Wabush ore is comparatively soft quartz-specular hematite-martite ore. It is trucked to the crusher, ground wet in

Hardinge mills, concentrated in Humphrey spirals, dried and concentrated again in high-intensity electrostatic separators before shipment in closed railway cars.

The plants are highly automated and sophisticated. They operate very efficiently as long as the feed remains uniform over a period of time, but non-uniform material sometimes causes operational problems through the disruption of the plant's materials handling and treatment equipment.

Both plants operate around the clock throughout the year. Current production is about 16 million tons per year; Wabush 6 million, I.O.C.C. 10 million. Power is supplied through two transmission lines from Twin Falls, situated near the Churchill Falls power project currently under development.

The Julian Deposit

After the initial examination of the deposit by Nalco in 1953, Javelin made a preliminary geologic investigation in 1956. This was followed by diamond drilling in 1957 and 1958. More geologic work was conducted in 1959 and a bulk sample was obtained for metallurgical investigations in 1960. A road was built to the property in 1962, and an area extending across the deposit was stripped for examination. The lakeward extensions were geophysically outlined and a large bulk sample obtained in 1963. The deposit is considered to have been explored sufficiently to indicate its general nature and potential, though it is realized that further drilling and large scale metallurgical investigations need to be conducted for concentration plant design purposes.

Julian Road Construction - 1962

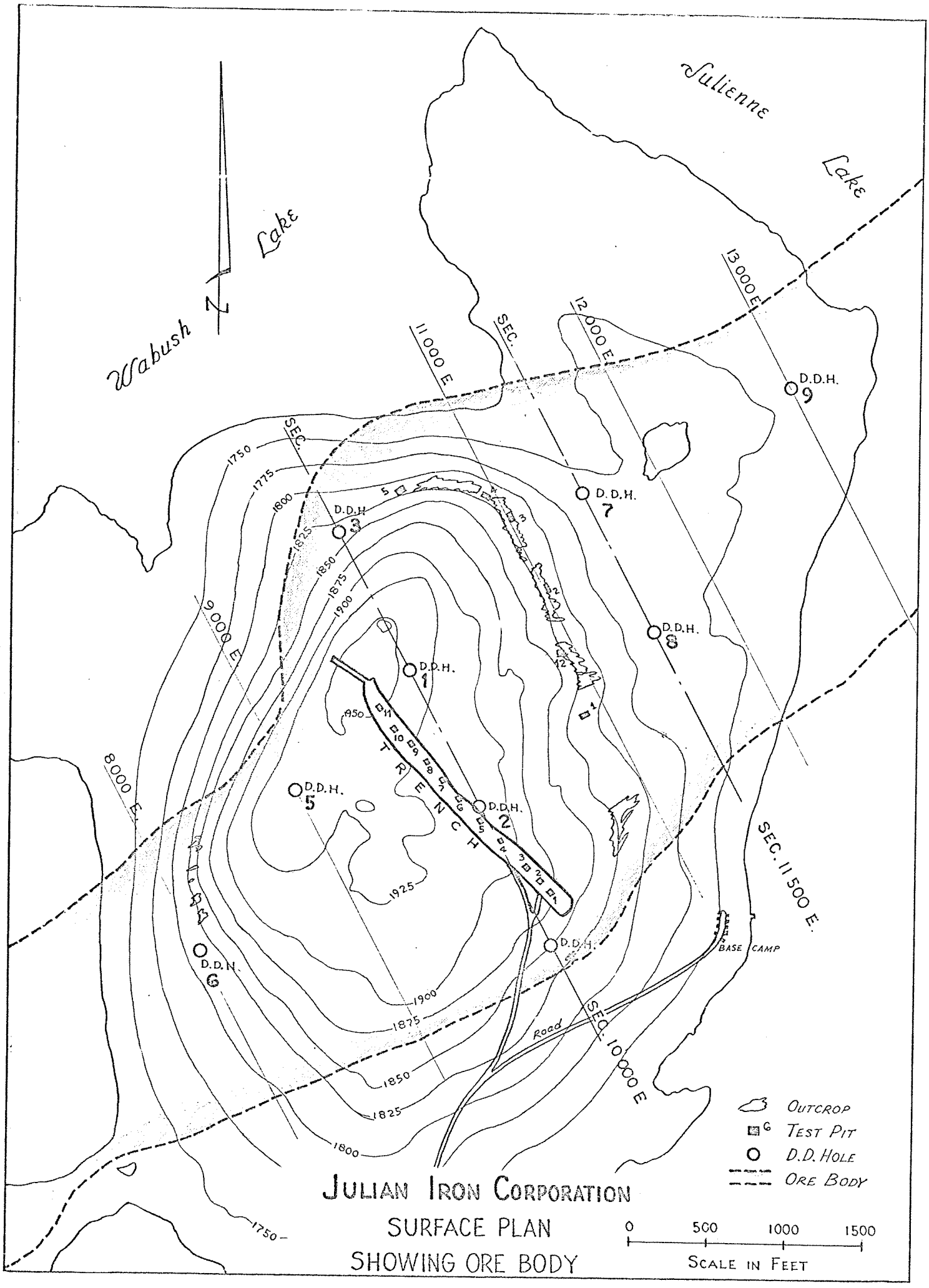
The deposit forms the core of the hill and rises to about 225 feet above lake level. It occupies approximately 320 acres, varies from 1800 to 3000 feet wide and about a mile in length, total length including lakeward extensions is about 3 miles.

Geology

The deposit can be best appreciated by walking the length of the stripped area, then cutting over and following the eastern bench back towards camp. This presents two reasonably complete sections across the deposit, offering an opportunity to observe the mineralogy and general nature of the ore body.

Basically, the deposit consists of a number of layers of metamorphically recrystallized oxide faces, iron formation totalling over 700 feet in stratigraphic thickness overlying quartzite. The formations have been folded into a northeast trending, canoe-shaped, overturned syncline with the rocks in most outcrops dipping southeast. Depth to the bottom of the syncline is unknown, but hole 2 is 705 feet deep and still in ore, similarly in hole 1 at 596 feet.

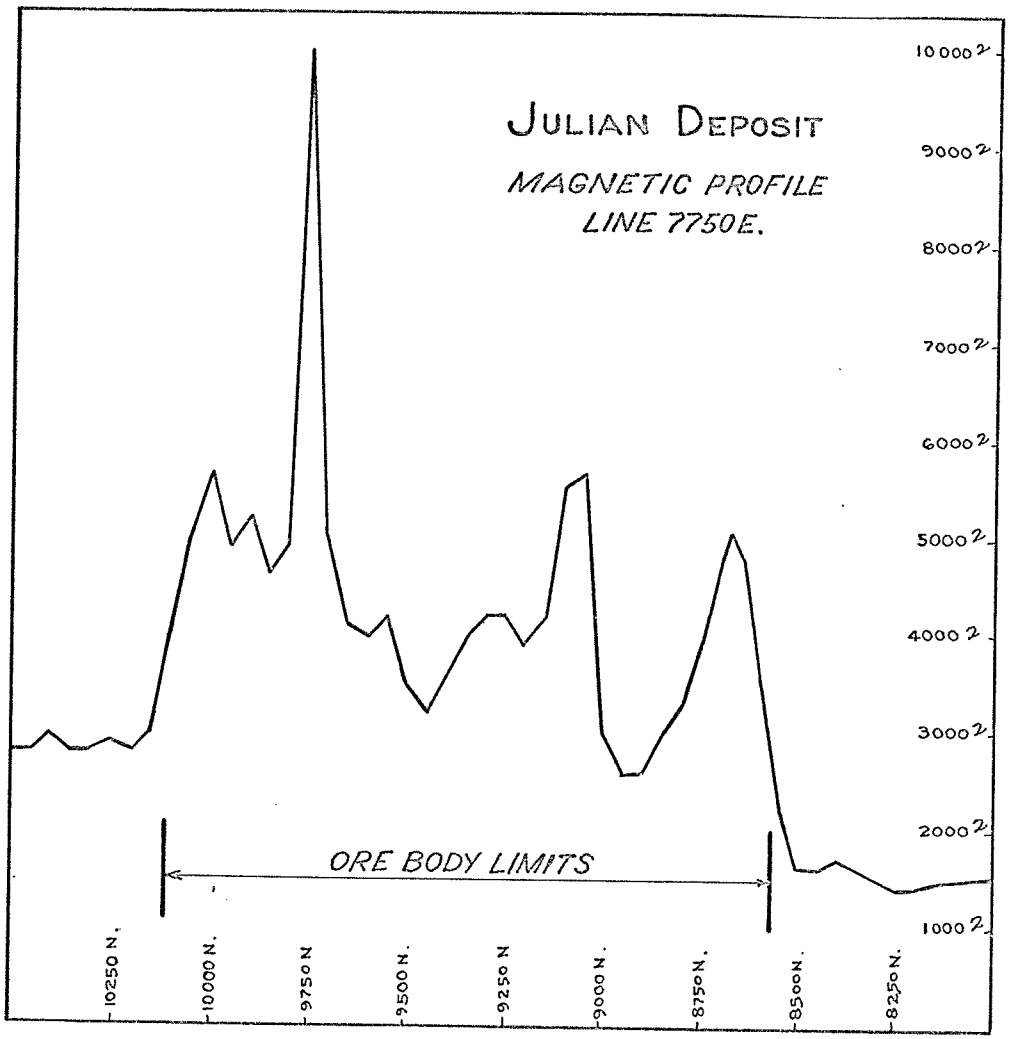
Quartz, specular hematite, and martite (oxidized magnetite) account for over 90% of the material in the deposit. Variations in the relative proportions of these minerals and the textures permits recognition of the various stratigraphic layers. The



JULIAN IRON CORPORATION

SURFACE PLAN SHOWING ORE BODY

remainder of the material is composed of variable amounts or fine grained specular hematite, red hematite, goethite, limonite, and locally secondary manganiferous materials.



Reserves

Reserves of this type of iron deposit are basically in direct proportion to the gross volume of the iron formation present subject only to such restrictions as operational mining or metallurgical limitations may impose. These considerations can not be definitively evaluated until the ore body has been completly outlined by further drilling, and large-scale pilot plant runs completed. From the nature of the deposit and comparison with Wabush, it is reasonably estimated that at least 90% of the bulk volume of the deposit can be economically mined and treated.

Present estimates of the reserve potential available for open pit mining, calculated to lie between sections 7000 and 13,500 east and down to elevation 1200 (530 feet below lake level) are in excess of 500 million tons of crude ore, with 27½ million yards of overburden and about 10 million tons of rock stripping required on the south side. These reserves lie in that 6500 foot portion of the deposit for which some evidence concerning the subsurface nature of the deposit is available. Over 8000 feet of magnetically indicated iron formation extends beyond these limits; though there is no direct knowledge of the thickness of overburden in these areas, depths of water do not exceed 25 feet beyond 5000E and 15000E.

Approximately 125 million tons of ore exist above lake level, sufficient for about 17 years at a 7.5 million tons/year.

extraction rate. The hydrology of the deposit is one of the items to be investigated in future development work programs.

Grade

The iron content of the ore varies from place to place over variable distances as a reflection of the environmental conditions during deposition, and as modified by later geologic events. Examination of all assays to date indicates that the assays tend to follow a log normal distribution curve. Arithmetic averages from all sources are given below.

Soluble Iron	36.330%	260 samples
Insolubles	46.850%	195 "
Manganese	0.340%	252 "
Phosphorus	0.014%	195 "
Sulphur	0.005%	98 "
Calcium Oxide	0.026%	17 "
Magnesium Oxide	0.028%	17 "
Titanium Oxide	0.046%	48 "
Aluminum Oxide	0.198%	12 "

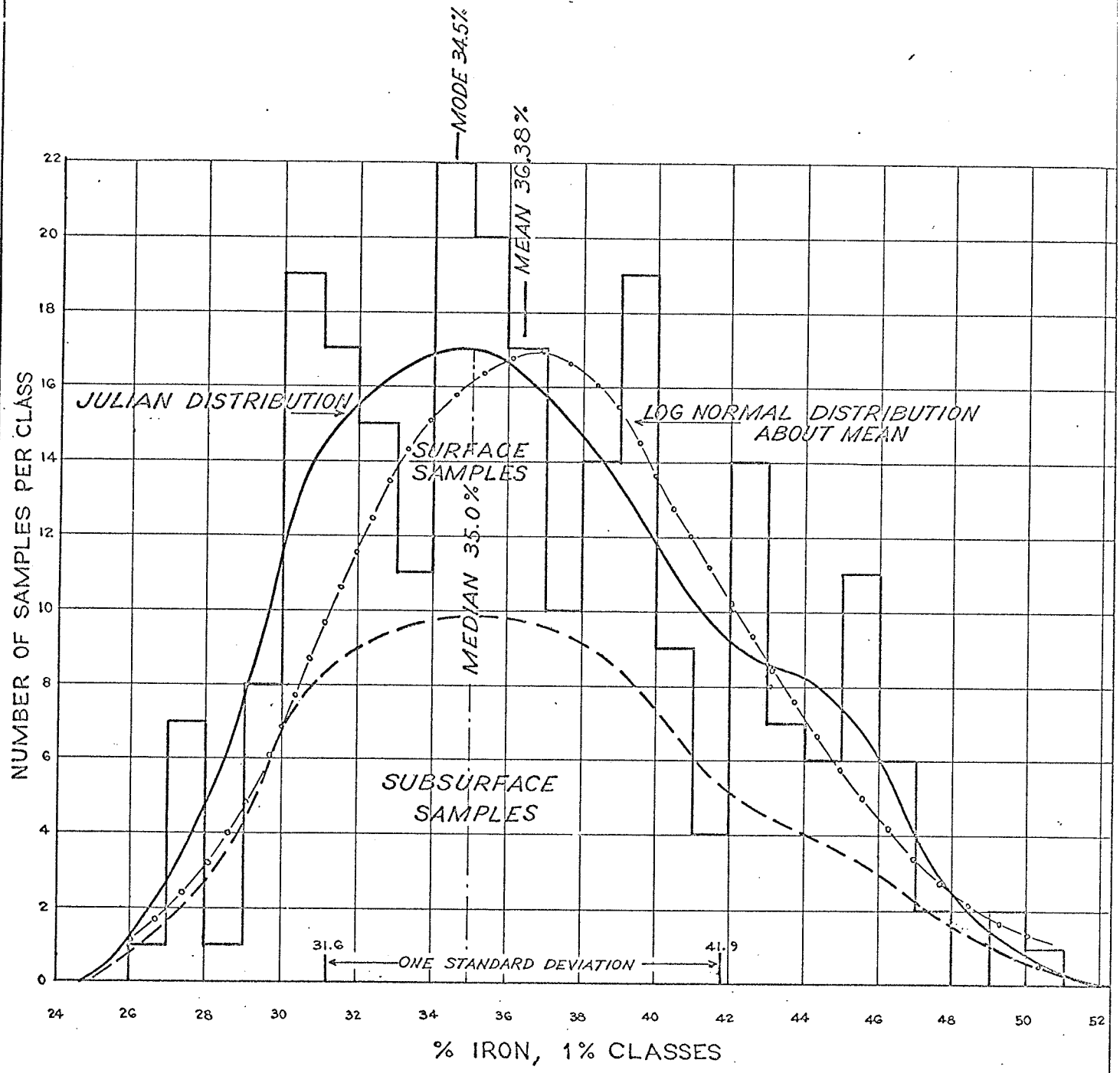
It is anticipated, as more samples become available, that the average iron grade will approach 35.5% on a volumetrically weighted basis. Manganese in the deposit is significantly lower that in the Wabush deposit according to the present evidence.

Metallurgy

Metallurgical testing of the 38½ ton sample collected in 1960 showed that the ore was ameneable to concentration using the same procedures as are presently in use in the district. Expected minimum mill performance is that recovery of at least

JULIAN DEPOSIT

IRON ASSAY FREQUENCY DISTRIBUTION



243 SAMPLES, INCLUDES ALL SAMPLES OF CRUDE ORE TO DATE
WORKING AVERAGE: 35.5±1%, S.D. + 5.5, -4.8.

NOTE: Based upon analysis of log normal distribution, here illustraded on a linear plot

June 1967

80% of the available iron units will produce one ton of 64% iron concentrate from about 2.5 tons of 35% crude ore. Quartz and ferriginous slimes are discarded. Electrostatic or other sophisticated processes could be used to raise the concentrate grade to about 66%. These preliminary figures will be further refined when large scale pilot plant testing is accomplished.

Physical Facilities

Feasibility examinations have been conducted of areas suitable for the necessary plants and related facilities. While detailed engineering surveys have yet to be conducted for design purposes, the general layout will probably follow the scheme herein suggested.

The crusher will be situated south of the ore body away from the pit area. A conveyor will carry the crushed ore to the concentrator situated on the hillside southeast of the deposit. A large area exists here where the concentration plant, pellet plant, transfer facilities, shops, warehouses, offices, etc., can be erected west of and above the railway and loading facilities.

The railway will approach the plant from the east across a 2300 foot long causeway across Julienne Lake between the points of land; depths of water do not exceed 10 feet. The railway route has been investigated from this point to the Wabush Lake Railway. It will be about 10 miles long, following

for the most part the western side of the southwestern arm of Shabogamo Lake. Total hauling distance to Pointe Noire will be about 270 miles.

The causeway will also serve as a control dam to impound the southeast arm of Julienne Lake as a plant - town water supply. The large drainage area assures an adequate supply of water. Tailings will be dumped into Julienne Lake north of the causeway.

Two areas have been investigated for townsite purposes. One involves the area along the Julian road between mile 15 and 16. It has the advantage of being close to the plant site and towards Wabush, but the area is underlain by rock and locally is poorly drained. The other area under consideration is the sand plain situated between Julienne Lake and the southwest arm of Shabogamo Lake. While it is further from the plant, there is no rock, it is well drained, well protected from fire, and adjacent to the railway route.

Conclusion

This concludes the tour of the Wabush Lake district, the Julian Deposit, and the present concept of the facilities needed to develope it. Data concerning the feasibility of the project are available, but for the purposes of this presentation we rely upon the existence of the two, multimillion ton operations

which are based upon similar deposits. These are currently being expanded and are the best evidence that year-round production of high-grade iron ore concentrates and pellets can be produced in this district for years to come.