

THE UNIVERSITY OF MANITOBA

PETROLOGY OF THE ELBOW LAKE STOCK  
ELBOW LAKE - GRASS RIVER AREA  
MANITOBA

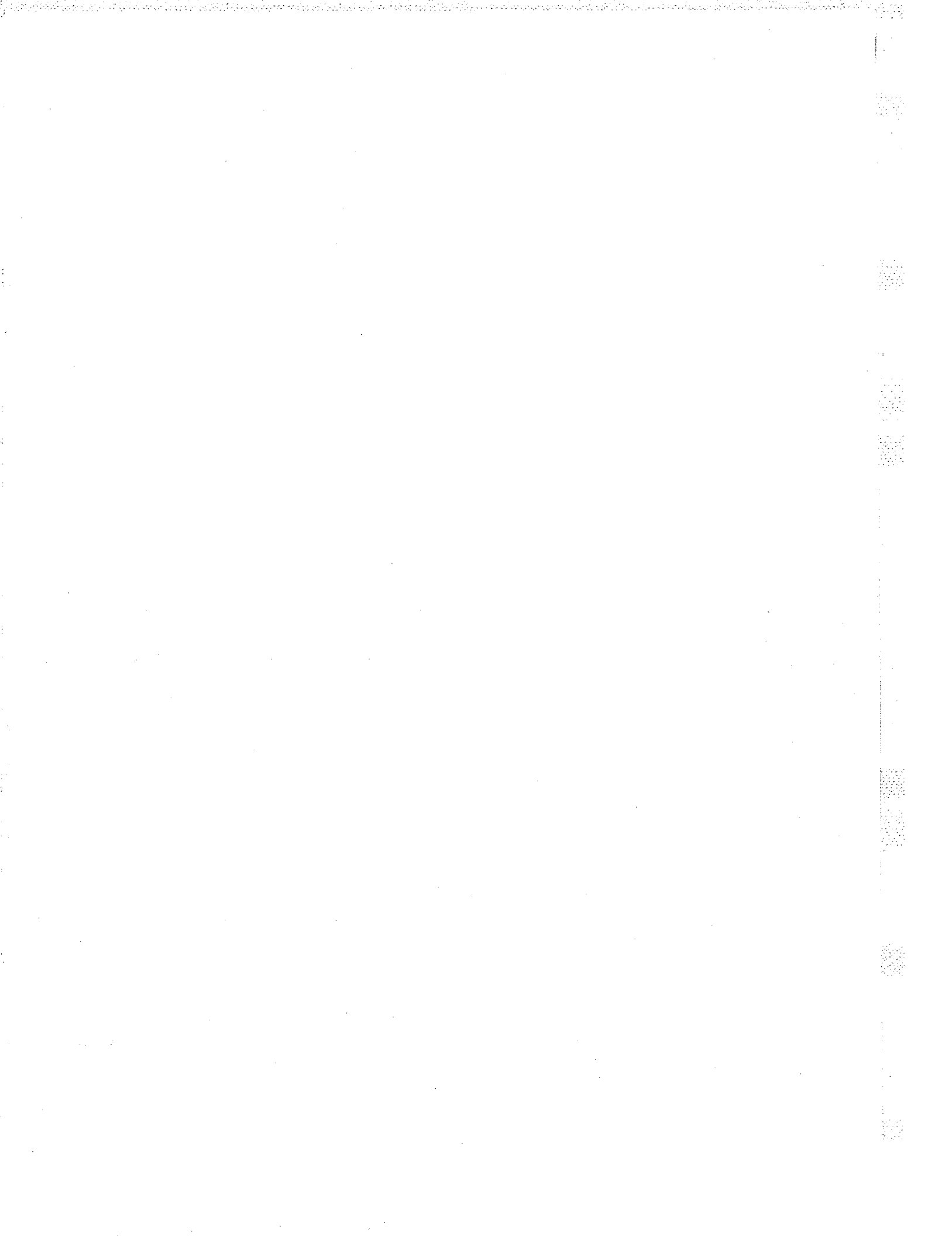
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A Thesis  
Presented to  
The Faculty of Graduate Studies and Research  
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of the Requirements for the Degree  
Master of Science

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by  
Abul Ata Quaraishi  
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## ABSTRACT

A stock of quartz diorite, intrusive into greenstone, outcrops just south of Elbow Lake, about 40 miles east of Flin Flon, Manitoba.

Field examination established the internal homogeneity of the body, the concentration of inclusions near the contacts and the intrusive character of the contacts.

The distribution of joints, faults and foliation was mapped from the aerial photographs.

A study of thin sections revealed that the texture is hypautomorphic granular, with euhedral plagioclase crystals. This igneous texture is somewhat modified by deuteric alteration.

The main minerals are plagioclase and quartz, which occur in proportions which are roughly that of quartz - plagioclase - eutectic.

The variations of mineral compositions show no regular pattern. Deuteric alteration occurs with a concentric layered distribution pattern, with the most altered rocks in the center of the intrusive body.

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## CHAPTER I

### INTRODUCTION

A granitic intrusive rock outcrops in the Elbow Lake - Grass River area of Northern Manitoba between latitudes  $54^{\circ}42'N$   $54^{\circ}49' N$ , and longitudes  $100^{\circ}49'$  and  $100^{\circ}58' W$ , extending from the south side of Elbow Lake in the north to Barb Lake in the south, and from Claw Lake in the east to Grass River on the west. The intrusion is roughly pear shaped in plan (see Figures 1\* and 2), and is approximately 9 miles long north-south and 8 miles across east-west, covering an area of about 40 square miles.

The intrusion was mapped as "Quartz-eye granite" by Stockwell (1935). Although "quartz-eyes" are a prominent feature, this stock is not a granite by the petrographic definition, so the name "Elbow Lake Stock" is adopted here.

This report is concerned with the Elbow Lake Stock, considered under ~~three~~ major headings: 1) field relationships and megascopic characteristics; (2) textural and microscopic characteristics; and (3) deuteric alteration of the stock.

The first part of the study defined the contact relationships of the Elbow Lake Stock with the country rocks. The study of inclusions showed their abundance in the stock. The textural and microscopic study established a dominant paragenetic sequence of the major minerals and the variations

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\*Figure 1 is in back pocket

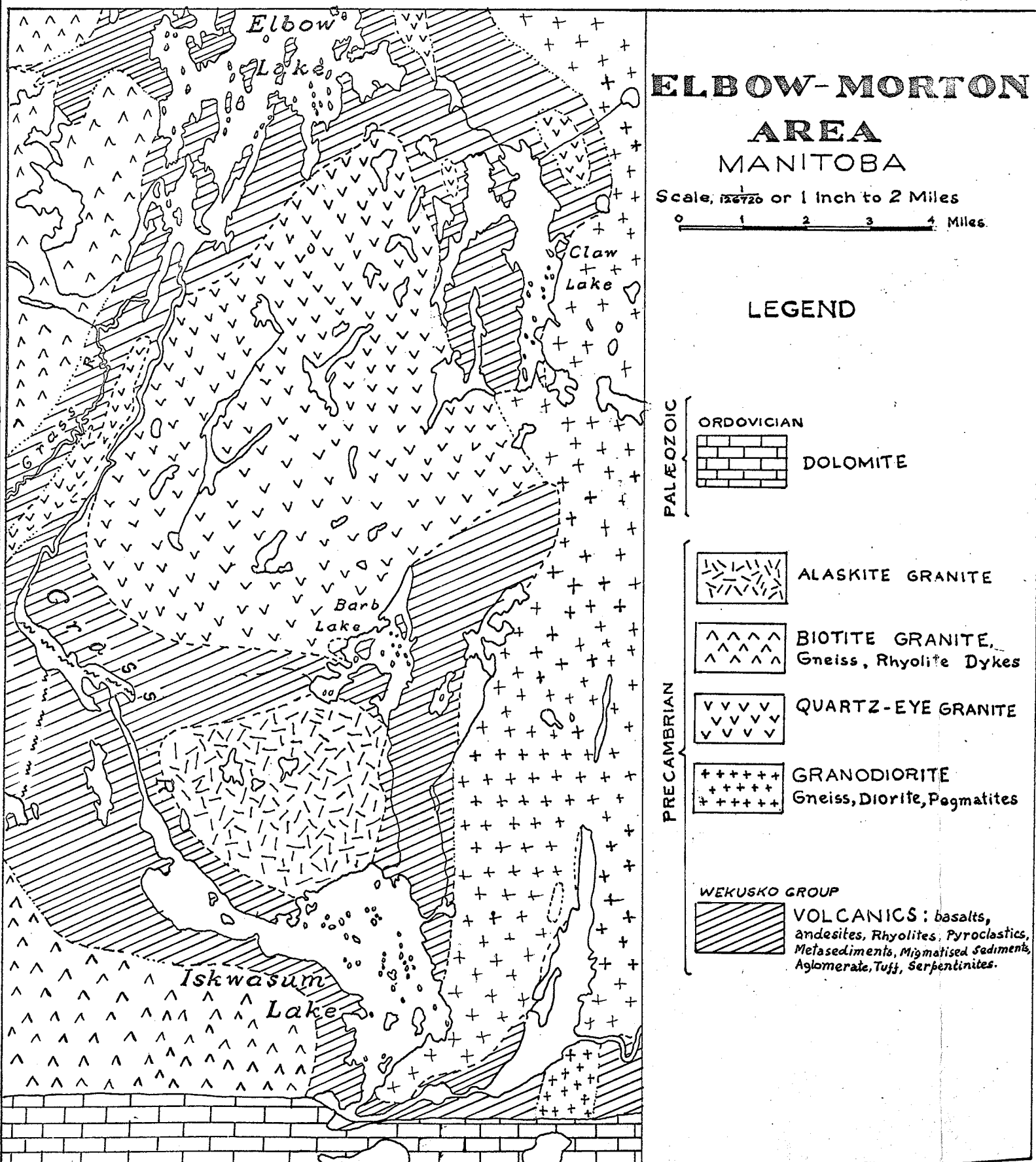


FIGURE-2. GEOLOGICAL MAP OF THE ELBOW LAKE - GRASS RIVER AREA AFTER STOCKWELL (1935) WITH MODIFICATION BY AUTHOR & HUNT (UNPUBLISHED).

in habit of each major mineral. It includes a treatment of plagioclase zoning and twinning and the development of perthite. The study of alteration of major minerals showed a pattern of definite type. The conclusion is that this stock was of magmatic origin and intruded into the greenstone - sedimentary series of the Precambrian Shield.

#### LOCATION AND ACCESSIBILITY

Elbow Lake - Grass River area is about 38 miles east of Flin Flon and about 90 miles northeast of The Pas (see Figure 1). The Canadian National Railway branch from Cranberry portage to Chisel Lake passes through the Elbow Lake stock. The nearest railway station is Roblaytin, which lies on the western bank of the Grass River. The stock can also be reached by canoe from both Cranberry Portage, down the Grass River, and from Iskwasum Lake, up the Grass River. Iskwasum Lake can be reached by an all weather road from The Pas, which is about 90 miles. There is a good camping ground at Iskwasum Lake. The Grass River flows southward from the Elbow Lake and falls into Iskwasum Lake, with three small portages close to the C.N.R. track.

From Iskwasum Lake, at its northernmost end, there is a foot track of about 4 miles to the Barb Lake.

The quickest mode of access to the area is by aircraft from The Pas.

## TOPOGRAPHY AND DRAINAGE

The area has the broad rolling topography of low relief characteristic of much of the Canadian Shield. Within the area, however, two minor divisions can be made in a very general way, viz., the southern half of the area has greater relief than the northern part. The northern part, underlain by the Elbow Lake stock, is generally rather flat with extensive areas of muskeg and swamps. The depressions are overgrown with small spruce, poplar and underbushes whereas the ridges are barren of trees except for small hardy pines. Outcrops are more abundant in the southern part of the area, which is underlain by volcanics and metasedimentary rocks. There the terrain is rugged and rocky with long narrow swampy depressions.

The area is drained by the Grass River. There are a number of small lakes within the area underlain by the Elbow Lake stock. A few small intermittent streams drain them, but lose their identity in a maze of swamps and muskegs. Hills and plateaux of rocks rise beside the main water routes and large lakes.

Glacial striae are preserved on many outcrops, especially on the greenstone, and indicate that the continental ice sheet of Pleistocene time moved south 25 degrees west.

### PREVIOUS WORKS

Stockwell (1935) was the first geologist to map the Elbow Lake area of the Northern Manitoba. Prior to Stockwell, exploratory works in the area by Bruce (1918) and Alcock (1920) were done, and gold was discovered at Elbow Lake by Gordon Murray in 1921. Several other gold deposits were found immediately after the original discovery was made, and the deposits were examined by Armstrong (1922) during the following summer. Wright (1930) examined a few of the deposits at Elbow and Morton Lakes.

Prospecting activity was continued in the 1930's and various companies and prospectors were granted lease properties. The Hudson Bay Mining Company was the biggest lessee in the area, and did detailed geological mapping and geophysical exploration works followed by diamond drilling in the area. No detailed geological informations of their works were available to the author. The northern half of Elbow Lake stock is included in the work of McGlynn (1959).

### PRESENT WORKS

It was in the summer months of 1965 that a geological survey party was deployed by the Manitoba Mines Branch with Dr. G.H. Hunt as the party-chief, to carry out a detailed geological mapping in the area from the C.N.R. track south to Iskwassum Lake between latitudes  $54^{\circ}35'$  and  $54^{\circ}45'$  N, and longitudes  $101^{\circ}0'$  and  $101^{\circ}45'$ . The report of the geological mapping has not yet been published.

During the summer months between June and August, 1965, the author studied and mapped the Precambrian rocks of the Grass River - Iskwasum Lake area, Northern Manitoba, while in the employ of the Manitoba Mines Branch. Dr. G. H. Hunt was chief of the field party consisting of seven persons. This is an example of a scheme whereby graduate students in geology in the University of Manitoba could conduct field mapping as a part of post-graduate studies at the Master's level.

During the field season of 1965, traverses were run, where feasible, at intervals of fifteen hundred and two thousand feet. The outcrops were located by pace and compass and on aerial photographs. Detailed mapping and sampling of the Elbow Lake stock was made from the Canadian National Railway track south towards Iskwasum Lake. A few samples were collected from the Elbow Lake stock north of the railway track in one day with a helicopter.

In 1966 the writer undertook the mapping and detailed sampling of this stock, north of the C.N.R. track.

The results of the mapping and the study of aerial photographs were combined with petrographic works, done in the winters, for this thesis.

Approximately 150 samples were collected to obtain representative specimens of the rock types and any variations in them. The locations of the samples are shown in Figure 1.



An excellent cross-section of the stock is exposed in rock cuts along the Canadian National Railway track (see Figures 3 and 4), from the railway milepost 12 to 21. Samples were collected at the interval of 2640 feet approximately, plus additional samples for any local variations. Samples were also collected from both north and south of the railways track by pace and compass traversing.

The hand specimens were studied under binocular microscope. Thin sections were cut for petrographic descriptions. Suites of specimens representative of the contact phases and gradational types were studied.

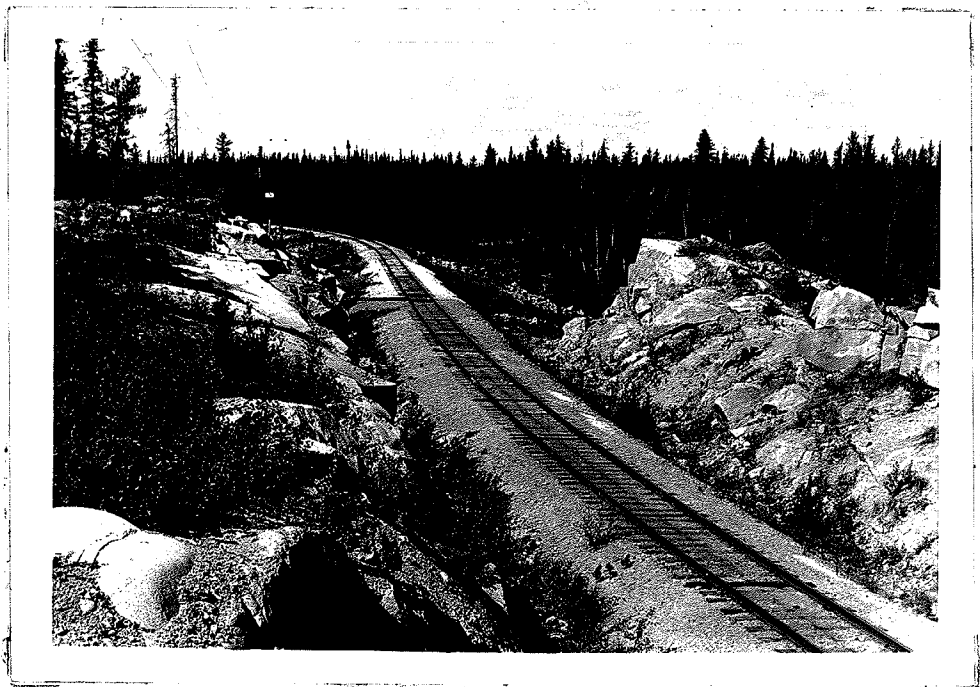
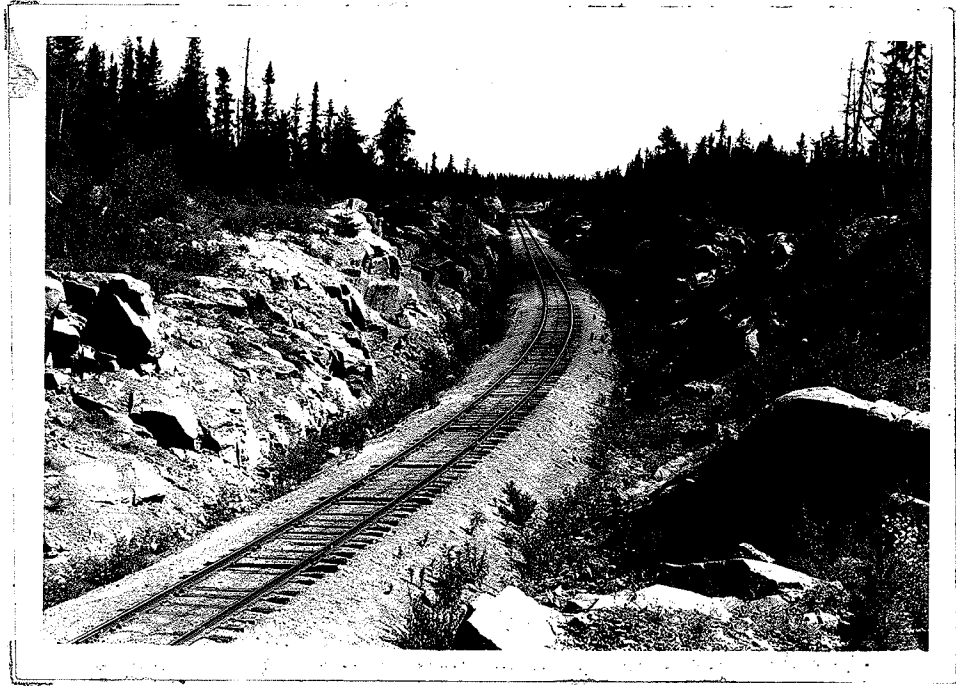
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The author conducted his field studies of the Elbow Lake stock while mapping the Grass River-Iskwasum Lake area for the Manitoba Mines Branch.

The author is indebted to Dr. H.D.B. Wilson, Chairman of the Department of Geology, University of Manitoba, who made the original suggestions of this thesis problem. The writer gratefully acknowledges the help given by Dr. J.F. Davies, Chief Geologist of the Manitoba Mines Branch, who provided the opportunity to do the mapping and sampling of the Elbow Lake stock in 1965. The writer is also indebted to Dr. G. H. Hunt, Party Chief, who conducted the Geological Survey Party of the Manitoba Mines Branch in the area, for most of

FIGURE 3. Outcrop at R.R. Milepost 15 looking east.

FIGURE 4. Outcrop at R.R. milepost 15, looking west,  
showing well-developed joints.



the field data and valuable guidance in the field.

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