THESE TERMS GOVERN YOUR USE OF THIS PRODUCT

Your use of this electronic information product ("EIP"), and the digital data files contained on it (the "Content"), is governed by the terms set out on this page ("Terms of Use"). By opening the EIP and viewing the Content , you (the "User") have accepted, and have agreed to be bound by, the Terms of Use.

EIP and Content: This EIP and Content is offered by the Province of Ontario's *Ministry of Northern Development, Mines and Forestry* (MNDMF) as a public service, on an "as-is" basis. Recommendations and statements of opinions expressed are those of the author or authors and are not to be construed as statement of government policy. You are solely responsible for your use of the EIP and its Content. You should not rely on the Content for legal advice nor as authoritative in your particular circumstances. Users should verify the accuracy and applicability of any Content before acting on it. MNDMF does not guarantee, or make any warranty express or implied, that the Content is current, accurate, complete or reliable or that the EIP is free from viruses or other harmful components. MNDMF is not responsible for any damage however caused, which results, directly or indirectly, from your use of the EIP or the Content. MNDMF assumes no legal liability or responsibility for the EIP or the Content whatsoever.

Links to Other Web Sites: This EIP or the Content may contain links, to Web sites that are not operated by MNDMF. Linked Web sites may not be available in French. MNDMF neither endorses nor assumes any responsibility for the safety, accuracy or availability of linked Web sites or the information contained on them. The linked Web sites, their operation and content are the responsibility of the person or entity for which they were created or maintained (the "Owner"). Both your use of a linked Web site, and your right to use or reproduce information or materials from a linked Web site, are subject to the terms of use governing that particular Web site. Any comments or inquiries regarding a linked Web site must be directed to its Owner.

Copyright: Canadian and international intellectual property laws protect the EIP and the Content. Unless otherwise indicated, copyright is held by the Queen's Printer for Ontario.

It is recommended that reference to the Content be made in the following form:

MacDonald R.D. 1941. Geology of Gorham Township and vicinity; Ontario Department of Mines, Annual Report 1939, v.48, pt.3, p.1-18.

Use and Reproduction of Content: The EIP and the Content may be used and reproduced only in accordance with applicable intellectual property laws. *Non-commercial* use of unsubstantial excerpts of the Content is permitted provided that appropriate credit is given and Crown copyright is acknowledged. Any substantial reproduction of the Content or any *commercial* use of all or part of the Content is prohibited without the prior written permission of MNDMF. Substantial reproduction includes the reproduction of any illustration or figure, such as, but not limited to graphs, charts and maps. Commercial use includes commercial distribution of the Content, the reproduction of multiple copies of the Content for any purpose whether or not commercial, use of the Content in commercial publications, and the creation of value-added products using the Content.

Contact:

FOR FURTHER INFORMATION ON	PLEASE CONTACT:	BY TELEPHONE:	BY E-MAIL:
The Reproduction of the EIP or Content	MNDMF Publication Services	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales.ndm@ontario.ca
The Purchase of MNDMF Publications	MNDMF Publication Sales	Local: (705) 670-5691 Toll Free: 1-888-415-9845, ext. 5691 (inside Canada, United States)	Pubsales.ndm@ontario.ca
Crown Copyright	Queen's Printer	Local: (416) 326-2678 Toll Free: 1-800-668-9938 (inside Canada, United States)	Copyright@gov.on.ca

FORTY-EIGHTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

1939

PART III

PROVINCE OF ONTARIO
DEPARTMENT OF MINES

HON. ROBERT LAURIER, *Minister of Mines* H. C. RICKABY, *Deputy Minister*

FORTY-EIGHTH ANNUAL REPORT

OF THE

ONTARIO DEPARTMENT OF MINES

BEING

VOL. XLVIII, PART III, 1939

Geology of Gorham Township and Vicinity

By

R. D. MACDONALD

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed and Published by T. E. Bowman, Printer to the King's Most Excellent Majesty
1941

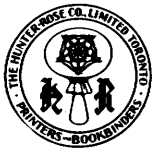

THE HUNTER-ROSE CO., LIMITED TORONTO
PRINTERS-BOOKBINDERS

TABLE OF CONTENTS

Vol. XLVIII, Part III

ILLUSTRATIONS

SKETCH MAPS

COLOURED GEOLOGICAL MAP

(In pocket at back of report)

Map No. 48c—Gorham Township and Vicinity, District of Thunder Bay, Ontario. Scale, 1 mile to the inch.

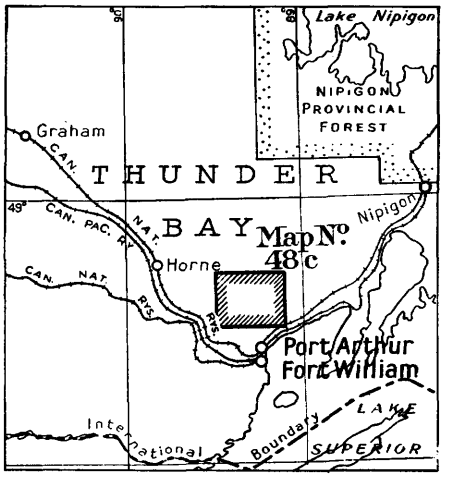
Geology of Gorham Township and Vicinity

By R. D. Macdonald

INTRODUCTION

The map area designated as "Gorham Township and Vicinity" lies a short distance north of Port Arthur in the district of Thunder Bay. It includes the townships of Gorham and Jacques, the eastern parts of Ware and Fowler, the western part of MacGregor, and an area surrounding Onion lake.

Prospecting in the area was originally carried out in the search for iron ore, but no commercial deposits were found. Present activities are concerned with the search for gold. Gold has been found in quartz veins and stringers in sheared volcanics. Pyrite is the chief metallic mineral associated with the gold.



Key map showing the location of the Gorham Township area. Scale, 50 miles to the inch.

The field work in connection with this report was done during the summer of 1938. The geology was mapped by means of pace-and-compass traverses, the resulting information being recorded on a base map supplied by the Air Surveys Branch, Department of the Interior, Ottawa.

Acknowledgments

The field mapping was greatly facilitated by the co-operation of the residents of the area and the men interested in its mineral development. The writer wishes to express his appreciation and thanks to J. D. Wright, W. W. Beaton, and G. Papineau for the information they supplied in connection with the properties of Gorham Gold Mines, Limited, and Lake Head Gold Mines, Limited. Able assistance was rendered in the field mapping by J. E. S. Milne, A. M. Burslem, and A. Johnson.

Means of Access

Most of the area is accessible by gravel roads. The roads in the western part connect with the highway running from Port Arthur to Winnipeg; those in the eastern part lead directly to Port Arthur. The northern parts of Jacques and

Fowler townships can be reached by a canoe route that connects with the road to Dog lake just east of Paul lake. The route leads westward through Paul, Spike, and Hawkeye lakes and eastward through Missing and Mary lakes. Onion lake forms a means of access to the northeastern part of the area. Current river, the only sizable river in the area, is unsuitable for navigation by canoe over most of its length.

Previous Geological Work

A compilation of previous geological work done in the Gorham area appears on map No. 308A, "The Lake Nipigon Sheet," published in 1935 by the Geological Survey of Canada. The compilation is based on mapping done by Wm. McInnes[1] and L. P. Silver.[2] Modifications and additions to this work were supplied by T. L. Tanton[3] in the years 1919, 1921, and 1924.

View of the Current River valley looking north from a point one and a half miles south of Onion lake.

An excellent bibliography of publications on the area is included by Tanton in Memoir 167 of the Geological Survey of Canada.

Topography

The area lies in a range of rocky hills to the north of the Kaministikwia valley. In some places the elevations are from 600 to 700 feet above the level of Lake Superior. The direction of drainage is southward. The Current and

[1]Wm. McInnes, "Report on the Geology of the Area Covered by the Seine River and Lake Shebandowan Map-Sheets, Comprising Portions of Rainy River and Thunder Bay Districts, Ontario," Geol. Surv. Can., Vol. X, 1897, pt. H, pp. 13-51.

[2]L. P. Silver, "The Animikie Iron Range," Ont. Bur. Mines, Vol. XV, 1906, pt. 1, pp. 156-172.

[3]T. L. Tanton, Geol. Surv. Can., Sum. Rept. 1919, pt. E, pp. 1-7; Sum. Rept. 1921, pt. D, pp. 1-6; Sum. Rept. 1924, pt. C, pp. 1-27.

North Current rivers empty into Lake Superior within the city limits of Port Arthur. McIntyre creek, which drains the western part of Gorham township, empties into Lake Superior between Port Arthur and Fort William. The northern parts of Jacques and Fowler townships are drained by way of Hawkeye lake to Dog lake and thence southward to the Kaministikwia river. The large north-south drainage channels are probably pre-glacial and show little relation to the structure of the underlying rocks.

Rock outcrops are abundant in most parts of the area. Glacial deposits are usually thin but are known to have local thicknesses of at least 50 feet. The southern part of Ware township and the southwestern part of Gorham township

View looking north from the southeast corner of lot 7, concession III, Gorham township, showing the typical topography of the township.

are extensively covered by glacial deposits and drift. Since the topography of the area shows a moderate relief, drainage is quite effective and very few muskegs are found.

Natural Resources

The commodity of greatest economic importance in the area has been pulpwood timber. Logging has been carried on by large timbering concerns and by individual farmers in the area. Much of the better timber has been removed by cutting or destroyed by fire, and at the present time only a relatively small amount of timber is being taken out.

Mixed farming is carried on in the southern part of the area. Owing to the relatively rugged and rocky nature of the area, however, it is not good farming land and only small fields have been cleared.

Hydro-electric power is developed on the Current river at Port Arthur. A control dam, which forms part of the power development, is situated at the south end of Onion lake.

GENERAL GEOLOGY

The consolidated rocks of the area are pre-Cambrian in age. They are overlain by gravel, sand, clay, and drift of glacial and post-glacial origin. The pre-Cambrian rocks include intrusive, extrusive, and sedimentary types. The extrusive rocks, consisting of altered lavas and pyroclastics, are classed as Keewatin because of their lithological similarity to the type Keewatin rocks. These rocks have a general east-west trend across the southern parts of Ware, Gorham, and MacGregor townships.

Two lithologically distinct groups of sediments occur in the area. The more widespread group occurs mainly to the north of the Keewatin rocks in a belt of variable width. The sediments of this group are provisionally classed as Coutchiching in age. The other, less extensive, group of sediments lies within the belt of Keewatin rocks and is considered to be post-Keewatin in age. It corresponds to Tanton's Windigokan series.[1]

The large granitic bodies of the area intrude Keewatin and Coutchiching formations. Diabase occurs as the youngest of the pre-Cambrian rocks and intrudes all other formations.

The various formations are tabulated with respect to age as follows:—

Table of Formations

QUATERNARY	
PLEISTOCENE and RECENT:	Till, gravel, sand, clay, and muskeg accumulations.
PRE-CAMBRIAN	
KEWEENAWAN:	Diabase. Olivine gabbro.
POST-KEEWATIN:	BATHOLITHIC INTRUSIVES: Biotite and hornblende granite, porphyritic granite, grey biotite granite and granite gneiss, pegmatite and diorite. SEDIMENTS: Conglomerate, arkose, greywacke and fine siliceous sediment, iron formation.
KEEWATIN:	ACID VOLCANICS: Rhyolite and rhyolite porphyry, dacite, sericite schist. VOLCANIC FRAGMENTALS: Agglomerate, tuff, sediments, iron formation. BASIC VOLCANICS: Andesite, basalt, pillow lava, hornblende schist and gneiss, chlorite schist.
COUTCHICHING:	Banded mica schist and gneiss. Stratified sediments. Massive siliceous sediments.

Coutchiching

The Coutchiching rocks consist of a sedimentary series occupying a belt to the south of the northern granite mass. The belt extends across the area with an average trend of N. 65° E. and ranges in width from 2 to 6 miles. In Ware township the width is narrow, since the belt is there intruded by a mass of porphyritic granite. Volcanic rocks lie within the sedimentary series in the central part of Ware township. A group of sediments surrounding the granite mass in the northern part of MacGregor township is lithologically like the sediments in the vicinity of Onion lake but is separated from them by a belt of basic volcanics. In general, the formation is characterized by a uniformity of bedded structures and steep dips.

[1]T. L. Tanton, Geol. Surv. Can., Sum. Rept. 1924, pt. C, pp. 11-17.

The sediments are separated into three main groups. The group that is the most widespread consists of stratified brownish-grey, medium- to fine-grained sediments, composed mainly of quartz and feldspar. Biotite forms an average of 5 to 10 per cent. of the rock. The bands, many of which show a gradation of grain size, range in width from a few inches up to 6 feet. The schistosity, as produced by the alignment of the biotite, appears to be parallel to the bedding. The degree of schistosity varies within the formation, but is usually more strongly developed towards the north. In the central part of Ware township some of the stratified sediments are slightly chloritic.

A second group, which is of local occurrence, consists of unstratified, fine-grained, highly siliceous rocks. Their biotite content is low, and schistosity is poorly developed. They may be of clastic or pyroclastic origin.

In the vicinity of the northern granite mass the sedimentary rocks are characteristically banded biotite schists and gneisses. Garnetiferous phases are locally present. These rocks are considered to be more highly metamorphosed phases of the previously described sediments. The contact between the Coutchiching sediments and the northern granite usually constitutes a zone of intrusion. Dike-like bodies of granite intrude the northern schists, and many schistose inclusions occur in the granite along its southern border.

The Coutchiching rocks are cut by numerous veins of white quartz. Many of the veins run parallel to the strike of the bedding or schistosity; others are irregular and show crosscutting relations. The rocks are also intruded by pegmatitic and dioritic bodies.

Keewatin

The Keewatin consists predominantly of acid and basic lavas and pyroclastics. The boundaries between the various groups are not sharply defined, and in the accompanying map the rocks have been grouped according to the predominant rock type.

Basic Volcanics

The basic lavas range in composition from dacite to basalt, andesite being the most common type. They are characteristically dark-green in colour, but the grain size varies from fine to coarse. The rocks are typically sheared and chloritized.

Poorly formed pillow structures occur in association with basic lavas in a few places. The best examples occur in the northern part of lot 2, concession II, Ware township, and lot 16, concession A, MacGregor township. The pillows are too poorly formed in most cases to afford a means of structural determination.

A coarse, dioritic-textured rock occurs in association with some of the basic lavas. No intrusive relations with the lava were seen; and since the rock shows an apparent gradation in many places to typical andesite, it is considered to represent a coarse-textured lava developed by recrystallization or by slow cooling of some of the thicker andesite flows. Examples of this type occur in lot 10, concession III, and lot 7, concession V, Gorham township. Examination of a thin section shows the rock to be distinctly altered with the development of chlorite and kaolin.

Metamorphism of the basic lavas has resulted in the production of hornblende and chlorite schists. The degree of schistosity varies throughout the volcanic belt. Chlorite schists are more commonly associated with the fine-grained andesites. Hornblende schists are common in the northern volcanic belt, which extends from Hazelwood lake to Beaverlodge lake. Where intruded by granite, the basic lavas have in many places been changed to a coarse-grained hornblendic rock.

Volcanic Fragmentals and Sediments

A considerable part of the Keewatin belt consists of sheared agglomerate and tuff. These occur in association with the lavas throughout the belt but are most extensive as a zone in the central part of the Keewatin.

The agglomerates are for the most part acidic in composition. The colour is generally greenish-grey on a fresh surface and light-grey on a weathered surface. The fragments, which lie in a tuffaceous groundmass, are largely rhyolite and rhyolite porphyry. A few are andesitic in composition. The shapes of the fragments are angular to elongate depending on the amount of shearing to which the rocks have been subjected. Good exposures occur on the property of Lake Head Gold Mines and on the Current river in mining claim No. 73E.

Basic agglomerates occur chiefly in the volcanic belt running from Hazelwood lake to Beaverlodge lake, where they are associated with coarse andesitic and hornblendic rocks. In some instances, where the fragments have the same composition as the groundmass, they may be flow breccias. These rocks typically show a greater proportion of fragments to groundmass than do the acidic agglomerates. All observed outcrops were distinctly sheared.

Massive and stratified tuffs are usually closely associated. They are largely acidic in composition and vary in texture from fine- to medium-grained. Some have a porphyritic appearance due to the presence of coarse quartz and feldspar grains in a fine-grained groundmass. The feldspars usually show a good crystal form. Examples of this type occur on the property of Lake Head Gold Mines. In a more basic type of tuff, andesitic material is present in fragmental grains. An example of this type occurs on the road between lots 12 and 13, concession II, Gorham township.

The tuffs occur in association with lavas and are highly metamorphosed. Some are now chlorite and sericite schists; others have been highly carbonatized. The feldspars are extensively altered to sericite and kaolin.

Minor amounts of sedimentary materials other than the stratified tuffs are present in the Keewatin rocks. These are usually associated with tuffaceous material, and on the map they are all grouped together. They include iron formation, chert, and banded carbonate rock. The iron formation in the Keewatin occurs in narrow widths, consisting of layers of magnetite and finely crystalline silica. Chert is usually associated with the iron formation as small irregular lenses. Banded carbonate rock occurs locally within the tuffaceous rocks. An example occurs on the bank of McIntyre creek, close to the Dog Lake road, lot 15, concession II, Gorham township.

Acid Volcanics

The acid volcanics consist of rhyolite and rhyolite porphyry. Although they are not as abundant as the basic volcanics they are the common type in the southern part of Ware township and the southwestern part of Gorham. The rhyolites are usually massive and have a dense siliceous appearance. A few associated sericite schists are considered to be schistose phases of the flows. The rhyolite porphyries have a groundmass similar to the rhyolites, but contain phenocrysts of quartz or quartz and feldspar. The colour of both types varies from pink to dark-grey, the commonest colour being a dull grey.

In the absence of visible intrusive relationships the porphyries are considered to be flow rocks, although some may be intrusive porphyries. That at least part of them are flows is indicated in certain outcrops by the presence of flow banding. Other outcrops contain both rhyolite porphyry and volcanic fragmental material.

Post-Keewatin Sediments

A group of clastic sediments, which lie stratigraphically above the Keewatin, occupy three elongate areas in Ware and Gorham townships. The rocks consist of conglomerate, arkose, greywacke, fine siliceous sediments, and iron formation. The coarser clastics, such as conglomerate and arkose, are poorly stratified. Many of the greywackes, fine siliceous sediments, and iron formations show

Boulder conglomerate, lot 10, concession I, Ware township.

bedding structures; but since gradation in grain size is not apparent, no information was obtained as to the direction of the tops of the beds.

The base of the sedimentary series consists of conglomerate, conglomeratic grit, or arkose. Examples of conglomerate are to be seen in the central part of lot 10, concession I, Gorham township; on the road between lots 10 and 11, concession I, Gorham township; and in the central part of lot 1, concession II, Ware township. An excellent example of boulder conglomerate occurs on the road between lots 10 and 11, concession I, Ware township. The pebbles range in length from 1 inch to 2 feet. The types of pebbles observed include granite,

chert, jasper, andesite, and vein quartz. Granite pebbles are the predominant type. The pebbles are round to elongate and lie in a massive to sheared, reddish-grey or grey arkosic groundmass.

Arkose occurs extensively within the sedimentary group, in some places associated with conglomerate, in others with coarse greywacke. The arkoses vary from coarse, massive, dull-red types to finer-grained, sheared, light greenish-grey types. They are composed of angular grains of quartz and feldspar together with such alteration products as sericite, kaolin, and chlorite.

A group of fine-grained, massive and stratified sediments occur in the belt occupying the southeastern part of Gorham township. Many of them are greywackes; others are very fine grained, light-grey to greenish-grey siliceous rocks. The fine-grained varieties may be waterlain tuffs.

Iron formation occurs in several horizons within the sedimentary series. One type consists of grey slaty material with beds of fine-grained silica and hematite or magnetite. Another type is less finely banded, and the iron is in the form of fine-grained magnetite.

Batholithic Intrusives

The granitic rocks of the area occur in seven masses. The main types are grey biotite granite, pink biotite and hornblende granite, and pink porphyritic hornblende granite. Despite the fact that the granites show marked differences in composition, texture, and colour, no evidence was obtained to show differences in age.

Grey biotite granite lies to the north of the Coutchiching sediments in the northern part of the area. The contact is in some places gradational, and many schistose inclusions are present in the granite. Some of the ghost-like inclusions impart a gneissic structure to the granite, but the major portion is massive. Coarse pegmatitic phases occur within the granite.

Pegmatitic dike-like bodies occur in the Coutchiching sediments. These are considered to be intrusive phases of the grey granite. Several outcrops of dioritic intrusive rock also occur within the Coutchiching. These are regarded as basic phases of the granitic intrusion or hybrid rocks resulting from assimilation of Coutchiching sediments.

Pink hornblende granite and biotite granite occur in five separate masses. The mass bordering the southwestern part of Gorham township and the southeastern part of Ware is a medium-grained, massive hornblende granite. A mass of similar type occurs in the central part of Gorham township to the south of Hazelwood lake. Parts of the mass are a biotite granite. The contacts are usually sharp. Where the granite intrudes basic Keewatin rocks, coarse massive hornblende phases may be present, as in the southeastern part of lot 8, concession V, Gorham township.

Three intrusive masses occur on the east side of the area. The southern mass consists of pink, massive granite. It differs from the other granites in having a higher content of quartz. Biotite is the usual accessory mineral; hornblende is present in some of the border phases. The granite mass in the northern part of MacGregor township and the eastern part of Gorham township is a medium-grained, pink to grey biotite or hornblende granite. It contains numerous inclusions of schistose country rock. The northern mass is a pink, medium-grained, massive biotite granite.

Pink porphyritic hornblende granite occurs in the southeastern part of Jacques township, in the southern part of Fowler township, and in the northern part of Ware. It is uniformly porphyritic, containing phenocrysts of feldspar

up to an inch in length. In the region of One Island lake this granite mass comes in close proximity to the grey granite of the northern part of the area. It was impossible, however, to obtain any information as to the relative ages of the two granites, as the contact is covered by overburden.

Basic dikes occur in the area, but they are too small to be indicated on the map. They are known to intrude both Coutchiching and Keewatin rocks but occur most abundantly in the Coutchiching rocks near their contact with the northern volcanic belt.

Keweenawan

A few outcrops of medium- to fine-grained diabase were encountered in the area. Since the rock is lithologically similar to the Keweenawan diabase of the Fort William area, it is here classed as Keweenawan. It occurs in isolated outcrops, which are thought to represent dike-like bodies. No information was obtained as to their trend or their true widths.

A mass of olivine gabbro occurs in lots 11 and 12, concessions I and II, Gorham township. The rock has a medium to coarse granitic texture and consists of andesine feldspar, pyroxene, and olivine. The feldspar shows a slight alteration to sericite. On the basis of its freshness and composition the rock is classed with the diabases as being Keweenawan in age.

Pleistocene and Recent

Pleistocene deposits of till and stratified sand, gravel, and clay are present in various parts of the area. Boulder clay occurs as a thin mantle in many places. Stratified gravel and sand occurs quite extensively as rolling plains or low ridges in the southern part of the area. A thin mantle of stratified, rusty-coloured clay occurs in lots 8 and 9, concessions IV and V, Ware township.

Evidence of glacial erosion can be seen in the rounded nature of the rock hills and in the presence of glacial striae on numerous outcrops. Two sets of striae are present, the more predominant one trending south-southwest, the other trending south-southeast. Several outcrops reveal both sets. For a more detailed description of the glacial phenomena of the area, the reader is referred to Tanton's report on the Fort William and Port Arthur area.[1]

Post-glacial accumulations of muskeg are present, but owing to the moderate relief of the area drainage is good and the muskegs are neither numerous nor extensive.

STRUCTURAL GEOLOGY

Primary structures suitable for the determination of the attitude of beds and lava flows are present in some parts of the area. Pillow structures are few and usually poor. The Coutchiching sediments show grain-size variations in many places. The attitudes in the post-Keewatin sediments could not be determined.

The formations show a general east to east-northeast trend. Schistosity runs parallel to the trend of the formations and has, in many places, destroyed primary structures. The schistosity dips steeply or is vertical. The attitude of the formations, as determined by the dip of sedimentary beds and lava flows, is also steep or vertical. Some of the beds have been overturned as much as 20 degrees.

The attitude of the sedimentary beds in the Coutchiching sediments affords the chief evidence for placing the formation stratigraphically below the Keewatin. The contact between the sediments and the Keewatin volcanics crosses

[1]T. L. Tanton, Geol. Surv. Can., Mem. 167, 1931, pp. 76-80.

the road to Lottit lake in lot 8, concession V, Gorham township. For a distance of one and a half miles north of this contact the sediments show tops of bedding to the south. North of this mile and a half zone the beds are too highly sheared to show distinct grain-size variations. The sediments, then, occupy a position stratigraphically below the volcanics, unless the contact represents a major fault contact. In concessions III and IV of Ware township, two volcanic lenses lie within Coutchiching-like sediments. To the north and south of these volcanics the sediments show tops south, so that the apparent relationship indicates an interbanding of sediments and volcanics. Thus the major part of the Coutchiching sediments is considered to be pre-Keewatin in age, since it would be necessary to postulate several major faults, for which there is no direct evidence, to satisfy a contention for post-Keewatin age. The Coutchiching-like rocks lying to the south of the northern volcanic band may be considered as occupying a transition zone from a period of dominant sedimentary action to one of dominant volcanic action. The post-Keewatin sediments occupy synclinal basins in the Keewatin.

Highly sheared zones are probably indications of faulting that took place during the folding of the rocks. In some places the formations have been slightly offset by cross-faults. Fracturing has occurred in some of the more massive types of rocks.

ECONOMIC GEOLOGY

Iron

The mineral possibilities of the area have been investigated intermittently over a period of more than forty years. The iron formations were first investigated as possible sources of iron ore. Many test pits were sunk on them, but the material was not found to be of commercial grade. The patented mining claims of the area were taken up during the period of investigation for iron. Tanton[1] states, in connection with the grade of the iron formations in the Eastern Part of the Matawin Iron Range, that, "The possible commercial value of the richest known parts of the Keewatin iron formation depends on the feasibility of employing a method of beneficiation."

Molybdenum

Molybdenite is known to occur in several places in the Port Arthur region. So far none of the occurrences has proved to be of economic value. A few tons of rock containing molybdenite were shipped during 1938 from a deposit near Loon lake in McTavish township, but the material was not of commercial grade. An occurrence of molybdenite on the south edge of lot 10, concession I, Jacques township, was staked in 1938 by Y. Nelson, of Fort William. Other occurrences in the vicinity of this deposit are reported, but none of them was visited.

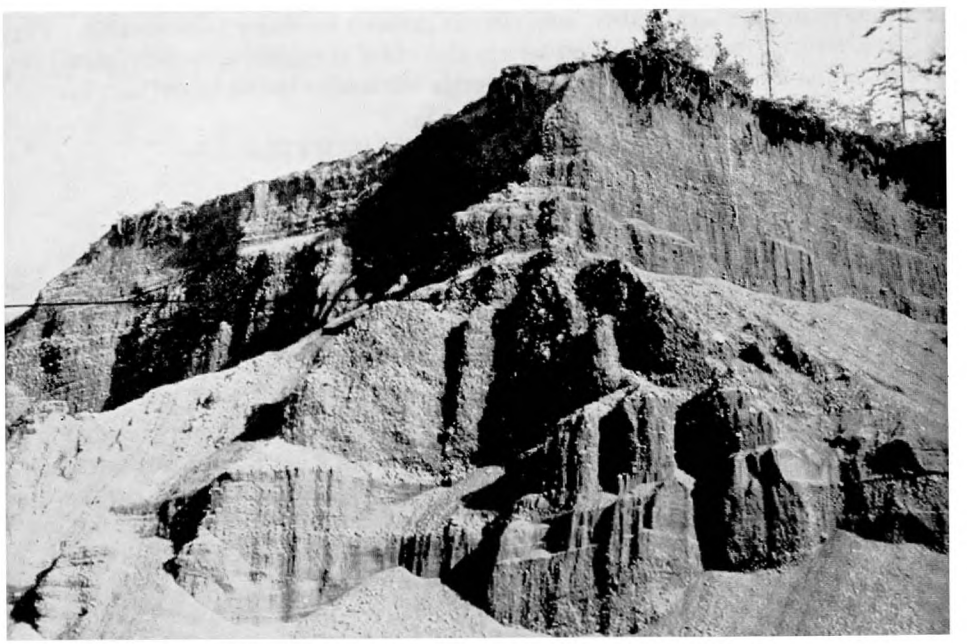
Gold

Present economic interest in the area was brought about by the discovery of gold early in the year 1935. Gold has since been found in several places within the area, but only two finds have so far shown promise of developing ore bodies of commercial grade. The gold occurs in quartz veins in greenstone, tuff, and agglomerate. The veins occupy shear zones or fractures and may be lenticular or regular in shape.

[1]T. L. Tanton, Geol. Surv. Can., Sum. Rept. 1924, pt. C, p. 22.

The known gold occurrences lie in a belt of carbonatized Keewatin greenstones and pyroclastics in concession II, Gorham township. No genetic source is postulated for the gold-bearing veins, since no granites lie close to the belt and no intrusive porphyries were distinguished in the field.

The two main gold occurrences of the area are on the properties of Gorham Gold Mines, Limited, and Lake Head Gold Mines, Limited. Low values in gold are reported from a vein in lot 11, concession II, Gorham township; and in lot 10, concession II, a thin stringer of quartz is said to contain much visible gold. W. W Beaton reports that exploratory work during the fall of 1938 on the Universal claims, lot 5, concession II, Gorham township, has met with some encouragement.



Face of pit in deposit of stratified sand and gravel, lot 16, concession II, Gorham township.

Sand and Gravel

Glacial sands and gravels have been used extensively in the area for the surfacing of motor roads and for building purposes. A deposit of stratified sand and gravel, situated in lot 16, concession II, Gorham township, was used during 1938 as a source of material for the paving of the Dawson Road highway.

Prospecting Conditions

Although the area in the vicinity of Port Arthur was first prospected many years ago, it is only within the past five years that any systematic search has been made for gold. Within these years several gold occurrences have been located. In view of the short period of activity and the limited amount of prospecting that has been done, the area presents many possibilities for future work. Rock outcrops are quite abundant, and in many places only a relatively thin overburden covers bed rock. It is difficult, however, to obtain prospecting rights, since much of the land is now under patent.

Because of their massive and homogeneous nature the granites and Coutchiching sediments do not present likely areas in which to prospect for gold. There is a possibility that molybdenite may be present in economic quantities in association with the pegmatites that intrude the Coutchiching rocks. The most favourable gold areas are apparently those underlain by sheared and carbonatized. lavas and tuffs. Although no gold-bearing veins have been located in the post-Keewatin sediments, they should not be neglected as prospecting areas since many of the rocks are distinctly sheared.

Quartz veins of appreciable size are not common in the area. Although many appear to be barren on the weathered surface, some of them contain metallic minerals below the weathered zone. The veins occur as quartz injections in sheared zones or as definite veins having sharp walls against the country rock. A carbonate mineral, probably ankerite, is present in many of the veins. Pyrite and, to a lesser extent, chalcopyrite are the chief metallic accessory minerals in the auriferous veins. Galena and sphalerite were also noted in certain veins.

DESCRIPTION OF PROPERTIES

Gold

Lake Head Gold Mines, Limited

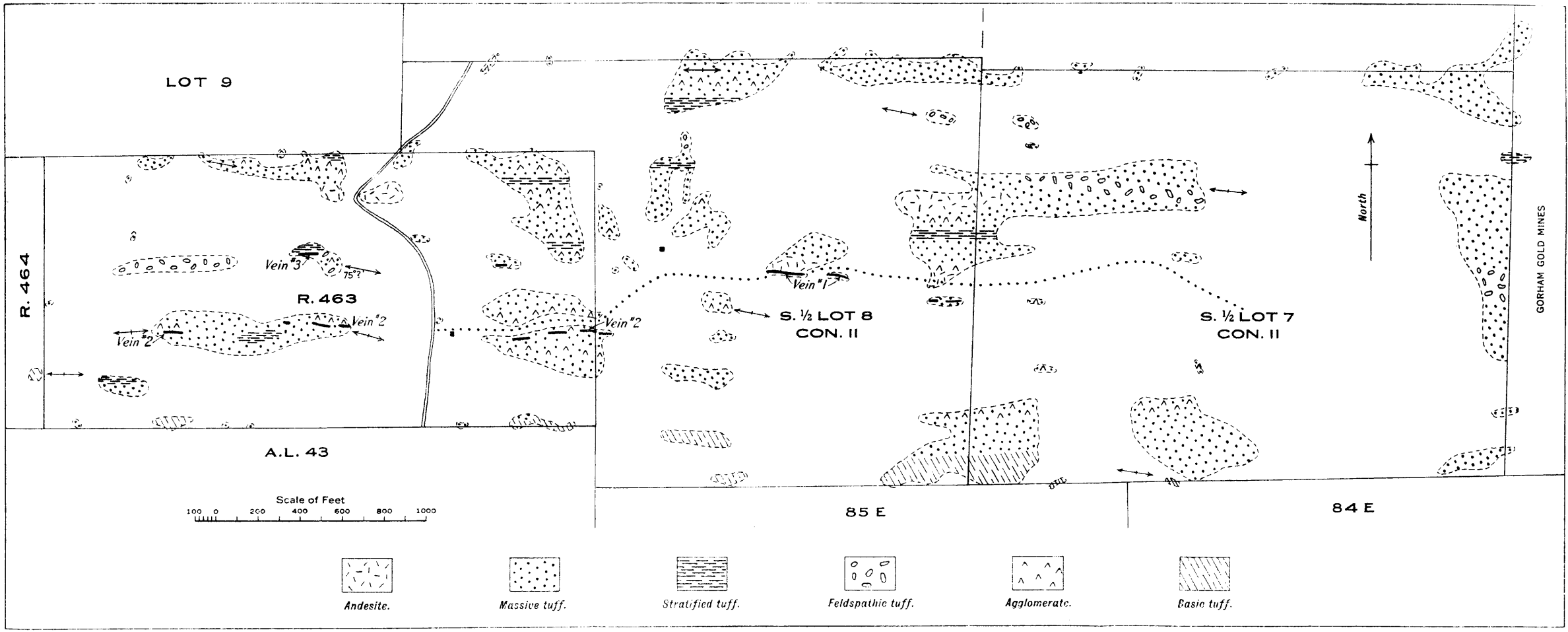
The property of Lake Head Gold Mines, Limited, is situated in Gorham township and comprises the south halves of lots 7 and 8, concession II, and mining claim R. 463.

Gold was discovered on the property early in the year 1935. In 1936 Lake Head Gold Mines, Limited, was formed to develop the property, and during the summer and fall of that year an extensive programme of surface exploration was carried out. Work was then discontinued till the spring of 1938, when some surface work and diamond-drilling were done in an attempt to locate the extension of the main vein on the property of Gorham Gold Mines, Limited. No development work was done during the late summer and fall of 1938.

The country rock on the property is largely acid volcanic tuffs and agglomerates. Some andesitic lava flows are interbanded with them. The tuffs include even-grained massive and banded types, and porphyritic-looking types, in which grains of feldspar and quartz lie in a finer-grained groundmass. A more basic type of tuff, which contains fragmental grains of basic material, occurs along the south side of the property. Many of the tuffs are highly carbonatized. No intrusive porphyries were observed on the property. A few zones show marked shearing, but in general the rocks are moderately sheared.

Veins.—Development work has disclosed three main veins and several minor ones. They trend in a general east-west direction parallel to the schistosity of the formations.

No. 1 vein lies in a sheared zone between andesite and banded tuff and has been opened for a distance of approximately 350 feet. It strikes N. 85° E. to S. 85° E. and dips about 80° S. Quartz has been injected in the shear zone, forming one main vein with subsidiary stringers alongside. The injected zone averages less than 4 feet in width. Ankerite is common in the quartz. Metallic mineralization consists of irregularly disseminated pyrite, minor amounts of chalcopyrite, and visible gold. A pyritized zone, ranging in width from 6 inches to 3 feet, lies along the north side of the vein. The pyrite, which is coarse and cubic, is evenly distributed. Sampling results, supplied by W. W. Beaton, show



GEOLOGICAL SKETCH MAP OF THE PROPERTY OF LAKE HEAD GOLD MINES, LIMITED

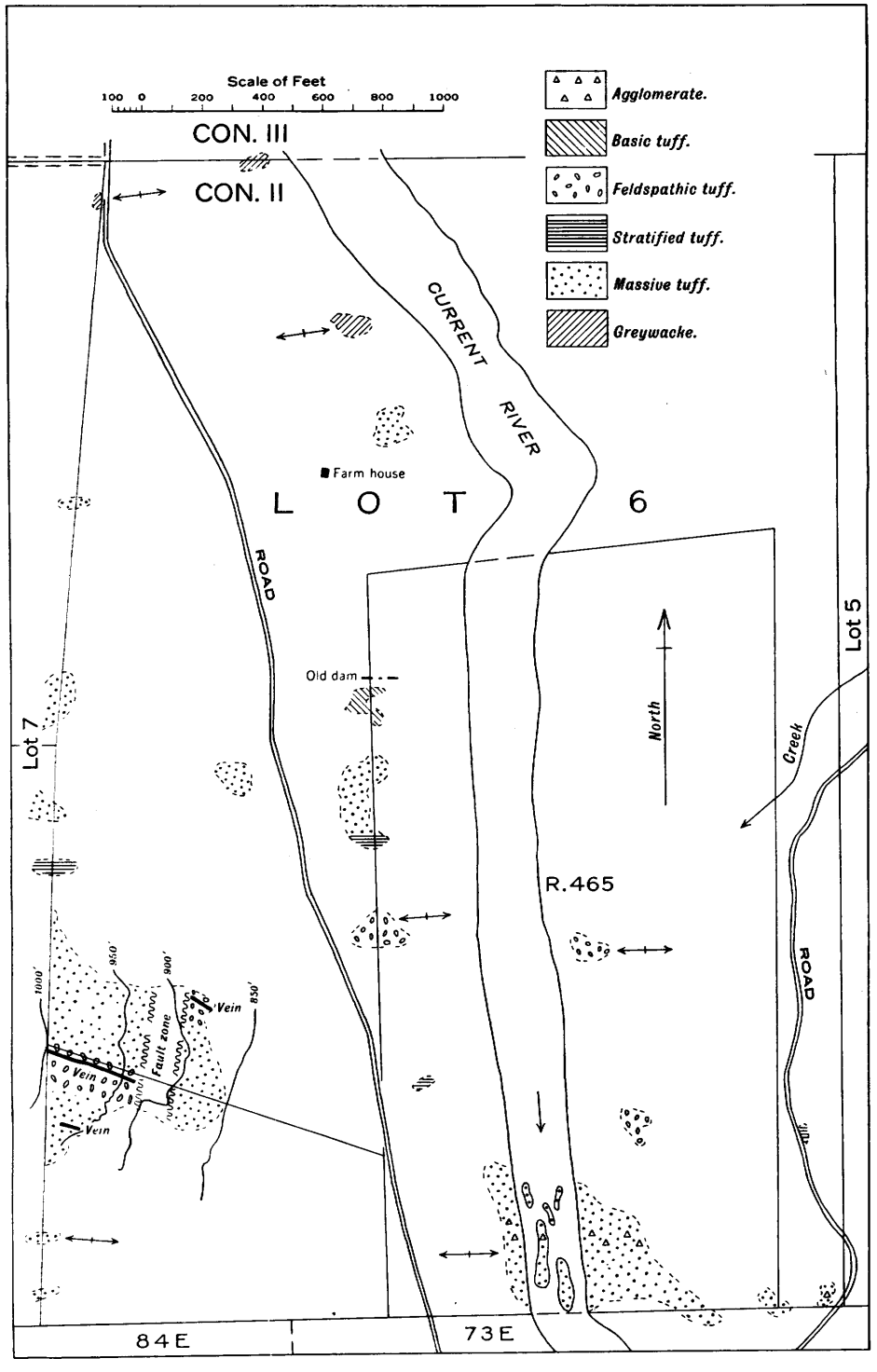
an average of 0.6 ounces in gold over 27 inches for a length of 124 feet. The gold, however, is unevenly distributed along this zone.

No. 2 vein occupies a sheared zone in chloritic and agglomeratic tuff. The shear zone has a maximum width of 9 feet; the vein averages less than one foot in width. The vein strikes east-west, dips 80° S., and has been traced for a length of 500 feet. At its west end it narrows and pinches out; the east end is drift-covered. Cross-faulting has displaced the vein in two places, a distance of

Pit in No. 1 vein, Lake Head Gold Mines, Limited.

2 feet towards its west end and a distance of 18 feet about 80 feet from its east end. The vein quartz contains ankerite and is irregularly mineralized with pyrite. Visible gold is reported from the vein.

The supposed westward extension of No. 2 vein occurs in the central part of mining claim R. 463. It has been traced for a length of 900 feet and opened for approximately 325 feet. The strike varies from east-west to S. 75° E. The vein consists of an irregular quartz injection averaging less than one foot in width in a sheared acid tuff. Mineralization consists of quartz, ankerite, and disseminated pyrite. Pyrite also occurs in the wall rock close to the vein. Assay values are not known.



GEOLOGICAL SKETCH MAP OF THE PROPERTY OF GORHAM GOLD MINES, LIMITED.

No. 3 vein is an irregular quartz vein ranging in width from 6 inches to 3 feet. It occupies a shear zone in feldspathic tuff. Ankerite occurs with the quartz, and the quartz is slightly mineralized with pyrite. Visible gold is reported as occurring in the vein over a length of 30 feet.

Gorham Gold Mines, Limited

The property of Gorham Gold Mines, Limited, lies to the east of the property of Lake Head Gold Mines, Limited, and occupies lot 6, concession II, Gorham township, exclusive of mining claim R. 465.

Gold was discovered on the property in September, 1937. In January, 1938, the Gorham Gold Mining Syndicate was formed. The syndicate carried on surface work and completed 500 feet of diamond-drilling. In May, 1938, Gorham Gold Mines, Limited, was formed to carry on further development. During the summer, over 5,000 feet of diamond-drilling was completed, after which operations were suspended. Late in September an adit was started on the main vein structure.

The country rock on the property consists of sediments, tuffs, and agglomerates. The sediments, lying in the northern part of the property, have the appearance of greywackes but are considered to be tuffaceous in origin. The southern half of the property adjoins the east side of the Lake Head property and contains similar rock types. The strike of the rocks varies from N. 85° E. to S. 75° E.

Veins.—The main vein is situated near the west boundary of the property and occupies a shear zone in carbonated feldspathic tuff. The vein strikes N. 80° W. and dips vertically. It extends eastward from the west side of the property for 325 feet. In the west 45 feet the vein is very narrow, but for the remaining 280 feet it averages 3½ feet in width. This width was shown by diamond-drilling to hold at depths of 300 feet. At its east end the vein is cut off by a cross-fault. Ankerite occurs in the vein quartz. Metallic mineralization consists of irregularly disseminated pyrite, minor amounts of chalcopyrite, and gold. According to J. D. Wright, an average of surface sampling showed a gold content of 0.32 ounces for a width of 3½ feet and a length of 280 feet. Since erratic values were obtained from diamond-drilling, it was decided to drive an adit along the vein from its east end, where it outcrops on the face of a hill. Wright reports that by mid-January, 1939, the adit had been driven for 86 feet and that the vein in the adit showed an average width of 4.8 feet with assay values averaging 0.26 ounces.

A vein that is considered to be the eastward extension of the main vein has been located on the east side of the fault zone, 350 feet north of the main vein. This vein has been traced for 75 feet to a point where it is covered by heavy overburden. The vein has an average width of 5 feet and contains pyrite and visible gold.

A second zone in highly carbonatized tuff occurs 200 feet south of the main vein. It is mineralized with pyrite and is reported to contain visible gold. Values ranging from 0.09 to 0.52 ounces in gold were reported by Wright, but no continuity of values was established.

Mining Claim No. 211T

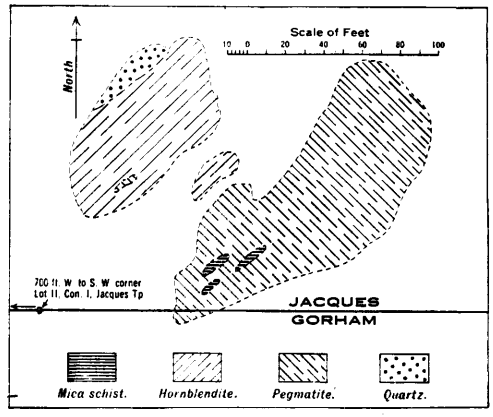
A mineralized quartz vein on mining claim No. 211T, Ware township, has been prospected by J. Matsen. The vein averages less than 2 feet in width and has been opened in only one trench for a length of 15 feet. It strikes N. 10° E. and dips 80° W. The vein lies in andesite and contains galena, sphalerite, and chalcopyrite. Some pyrite occurs in the wall rock. Assays are reported to show

values up to 0.12 ounces in gold and 5.5 ounces in silver per ton. Other mineralized veins occur on the property, but no encouraging values have been obtained from them.

Molybdenum

Claim T.B. 26,536

An occurrence of molybdenite was noted on claim T.B. 26,536, lot 10, concession I of Jacques township. The molybdenite occurs in an irregular quartz vein, trending N. 50° E., which is exposed for a length of 50 feet and a maximum



Geological sketch map of molybdenite deposit, claim T.B. 26,536, Jacques township.

width of 12 feet. The vein is in contact with a granitic-textured hornblendite on the south and is drift-covered on the north. A mass of granite pegmatite occurs 150 feet south of the vein. Small pegmatite stringers cut the hornblendite, and mica schist inclusions occur in the pegmatite. The molybdenite occurs as platy segregations in the vein quartz. A few crystals were also noted in the hornblendite. The vein quartz and molybdenite are evidently younger than the hornblendite and are thought to have been derived from the pegmatite.

INDEX, PART III