A DETAILED ECONOMIC INVESTIGATION OF GEOCHEMICAL AND AEROMAGNETIC ANOMALIES NORTH CENTRAL MAINE

By W.F.Stickney, R.S.Young, L.A.Wing

Edited By R.G.Doyle

Special Economic Series No.4

Maine Geological Survey

Robert G. Doyle

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TABLE OF CONTENTS

TABLE OF CONTENTS CONT'D:

INDEX OF PLATES AND FIGURES

Geochemical Sheet, Part III, in Pocket

FOREWORD

The principle objective of the Maine Geological Survey after its organization as a full-time Agency in 1956 has been the promotion and development of the mineral resources of the State. Of the several projects which have been undertaken by the Survey to reach this objective, the present series of Economic Evaluations has met with the most success. It is not a common practice for a State Agency of this type to enter the field of mineral exploration, even in first phase work. At the outset, however, with the publication of Economic Study Series #1 (Penobscot County) it was recognized and noted that the specific problems for conducting exploration in Maine that were being encountered by mining companies had hindered successful exploration work.

The geologists initially involved in these four Economic Studies had gained experience in the State in previous work and it was felt that if the State Survey could underwrite the cost of experimental techniques in exploration several hurdles might be overcome. The editor and his colleagues feel that the recent history of successes in mineral exploration in Maine have justified the program in Maine.

This present report will be the last in a series of four areal economic evaluations. Like its predecessors, results presented herein run the whole gamut of target interest; but the information does provide an accurate representation of the type of targets and environment which are found within the subject area.

The editor wishes to acknowledge the unique contribution so unstintingly provided by field directors of the various programs. To Dr. Robert S. Young, Chief Geologist, University of Virginia; Mr. Lawrence A. Wing, Chief Geochemist, James W. Sewall Company; and to Mr. W. F. Stickney of the Survey staff and geologic coordinator, the editor offers his grateful thanks and appreciation. Appreciation and acknowledgment should be extended to all of the field assistants who supported the program since 1959; and to the geologic mapping parties from the USGS staff, as well as the many geologists who made contributions to our effort in their work for private industry and universities.

With the present high level of exploration activity in Maine and northern New England, it would be presumptuous for this Agency to continue conducting exploration reconnaissance in the nature of the present economic studies. The Maine Geological Survey will, however, continue the economically oriented topical studies in both areas of interest and mineral commodities where such needs arise. The bulk of the effort of the Survey for the next several years will be directed toward detailed geologic mapping especially in areas of economic interest.

Robert G. Doyle
Editor

PART I

GEOLOGY

By

Webster F. Stickney

INTRODUCTION

During the summer field seasons of 1962 through 1964 a reconnaissance geologic mapping program was conducted by the Maine Geological Survey to complement a regional stream sediment geochemical and ground geophysical study of a large portion of north central Maine. The resulting information was used principally to provide a geologic framework for geophysical evaluations in areas of geochemically anomalous drainage basins located by the stream sediment sampling phase of the overall program.

The area of study (see Plate 1) is generally bound on the north by Potowadjo Ridge, First Roach Pond, Moosehead Lake and Misery Ridge. The southern slopes of Moxie Mountain, Foster Ridge and Russel Mountain, and the Piscataquis River form the approximate southern border of the project area. The western boundary is the 70th meridian, the east line of limit is a north south line from Pemadumcook Lake, along the Piscataquis-Penobscot County line to Boyd Lake. The bounds include the Sebec, Sebec Lake, Greenville and The Forks U.S.G.S. 15-minute quadrangles in entirety, major portions of the Moosehead Lake, First Roach Pond, Jo-Mary Mountain and Brassua Lake quadrangles and minor parts of the Boyd Lake, Norcross, Bingham, Kingsbury, Guilford, Dover-Foxcroft, and Schoodic 15-minute quadrangles (see location index map, Figure 1). This includes nearly all the southern quarter of Piscataquis County and a small portion of eastern Somerset County. Total area is approximately 1400 square miles.

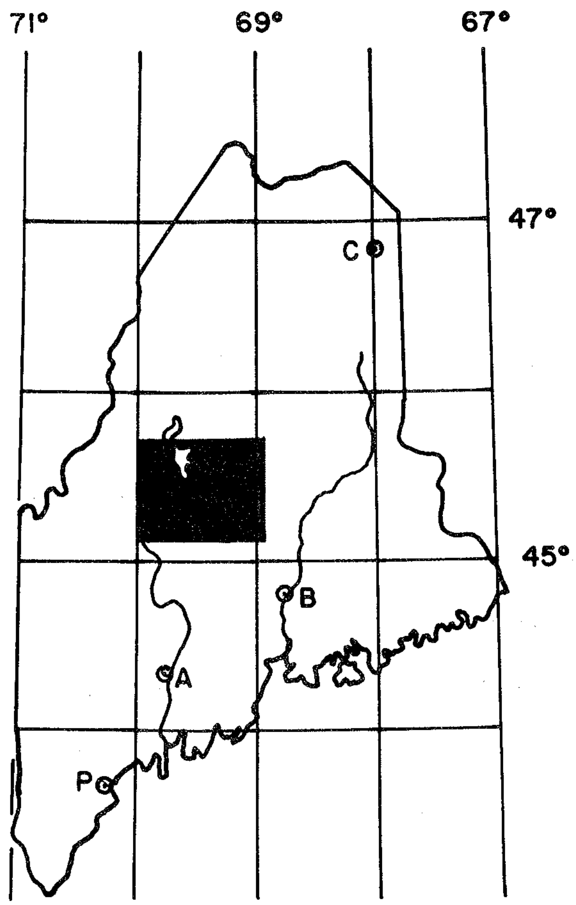

Figure 1. Index map showing the limits of the area of exploration within the State of Maine. P-Portland, A-Augusta, B-Bangor, C-Caribou.

This area was selected on the basis of several known geochemical anomalies and previous airborne magnetic data (Wing, 1959) (Boucot et. al., 1960) (Balsley and Kaiser, 1954). The large massive sulfide deposit at Katahdin Iron Works was also a contributing factor in selecting the study area. The western half of the area (Area I) was added to the original during the latter weeks of the 1964 field season to include several other known sulfide prospects, geochemical anomalies and economically interesting environments in that region.

Because of the above mentioned plan changes and because of previous mapping work done, the area has been divided for ease of discussion into two parts, West - Area I and East - Area II. A line extending from Sugar Island in Moosehead Lake southeastward to Greenville and Abbot Village divides the project area into these two sections, as shown on Plate 2.

A detailed mapping reconnaissance was made in Area II as little or no geologic work had been done there except for Philbrick's study of Onawa pluton and its contact aureole. The writer made only cursory examination of a few of the lithologic units in Area I as time did not permit a complete reconnaissance of this half of the study area. The majority of the geologic information for the western half (Area I) has been compiled from published and unpublished work contributed to the Maine Geological Survey by various workers in the area.

LEGEND FOR GEOLOGIC MAP

DEVONIAN

- **Ds** — Seboomook fm.
- **Dp** — Slates-pelites and minor quartzites
- **Dcw** — Capens fm., Whiskey quartzite and equivalent rocks

SILURO-DEVONIAN

- **DSs-Dp** — Quartzites and minor slates
- **DSs** — Limy sandstone
- **DSls** — Limy argillites

SILURIAN

- **Sl / Sg** — Limestone, sandy limestone, limy quartzite and greenstone (Sg)

ORDOVICIAN

- **Ou** — Ultramafic rock
- **Ofp** — Felsite porphyry
- **Opq / Og** — "Pinstriped" quartzites and phyllite and massive greenstone (Og)
- **Op** — Green phyllite and quartzite
- **Os** — Dark gray slate and phyllite
- **Ogp** — Greenstone flows and pillow lavas
- **Oga** — Greenstone agglomerate
- **Oq / Of** — "Quartzwacke" - felsite and quartz porphyry (Of)

DEVONIAN

- **Dg** — Granite, quartz monzonite and granodiorite
- **Dd** — Diorite and pyroxene-hornblende granodiorite
- **Dga** — Gabbro, norite and troctolite
- **Dto / Dtok** — Tomhegan fm. and Kineo rhyolite member (Dtok)
- **Dt / Dtm** — Tarratine fm. and Misery quartzite member (Dtm)
- **Dv** — Volcanics
- **Dss** — Quartzites

- (stippled box) — Contact metamorphosed rocks (hornfels)

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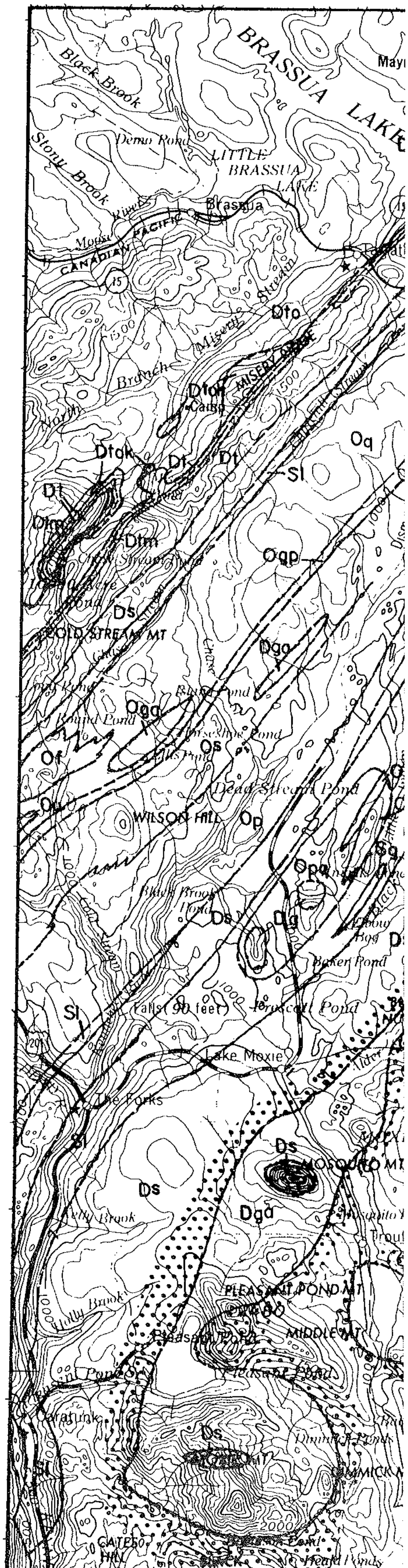

BRASSUA LAKE
Black Brook
Stony Brook
Demo Pond
LITTLE BRASSUA LAKE
Brassua
CANADIAN PACIFIC
Moose River
15
Misery Stream
Dfo
Branch
Dtq
Camp
Dtgk
Dt
Sl
Oq
Dtm
Ogp
Ds
COLD STREAM MT
Dgq
Ogg
Round Pond
Black Pond
Horseshoe Pond
Of
Os
Dead Stream Pond
WILSON HILL
Op
Sg
Black Brook Pond
Opg
Dg
Baker Pond
Falls (90 feet)
Troscott Pond
Lake Moxie
The Forks
MOSQUITO MT
Dgd
Kelly Brook
PLEASANT POND MT
MIDDLE MT
Pleasant Pond
Caratunk
Dimmick Ponds
GATES HILL
Heald Ponds
BLACK NUBBLE MT
1500
1000
2000
201

MOOSEHEAD
LAKE
BRASSUA LAKE
LITTLE BRASSUA LAKE
SUGAR ISLAND
DEER ISLAND
LILY BAY MOUNTAINS
BIG SQUAW MOUNTAIN
SEBEC LAKE
PISCATAQUIS COUNTY
Greenville
Rockwood
Kineo
The Birches
Somerset Junction
Moosehead
Sugar Island
Squaw Brook
Greenville Junction
Morkill
Power plant
Katahdin Iron Works
Williamsburg
Brownville Junction
Brownville
Shirley Mills
Monson
Monson Junction
Blanchard
Willimantic
Moosehorn
Dover-Foxcroft
East Dover
South Sebec
Milo
Barnard
Benson
The Forks
Troutdale
APPALACHIAN TRAIL
CANADIAN PACIFIC
Dg
Dgg
Dp
Ds
DSs
DSs + Dp
Sl
Oq
Ogp
Dtok
Dtm
Dfm
Dow

PLATE 1

ACKNOWLEDGEMENTS

The entire Central Maine Project was done under the supervision of Robert G. Doyle, Maine State Geologist. Gilbert H. Espenshade of the U.S.G.S. gave freely of his information on the eastern portions of the Moxie-Moosehead mafic body and its immediate country rock. Unpublished geologic information on The Folks quadrangle was generously submitted by Edwin Post of the U. S. Geological Survey. Dr. Lincoln Page, New England U.S.G.S. Branch Chief, was graciously cooperative in obtaining information from the U.S.G.S. personnel working in the project area.

Lawrence A. Wing of the James W. Sewall Company, Old Town, Maine, and his field personnel Willard Bodwell, Harold Downey and William MacIntosh were of considerable assistance in location of outcrops during the stream sediment geochemical testing phase of the project in Area II.

Dr. Robert S. Young of Charlottesville, Virginia, geophysical contractor, and John Fitzgerald, Raynold Holmes, Bruce Champion, James Ellis, Douglas Stoecer and Cary Parsons of Dr. Young's field crews were invaluable in their assistance to the bedrock aspects of the program.

The writer was ably assisted in the field by Gerald Tays and Charles Ipcar during the 1962 and 1963 field seasons respectively.

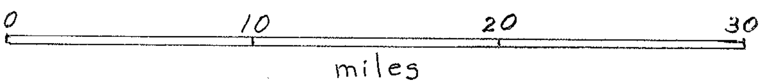
KEY TO PLATE 2

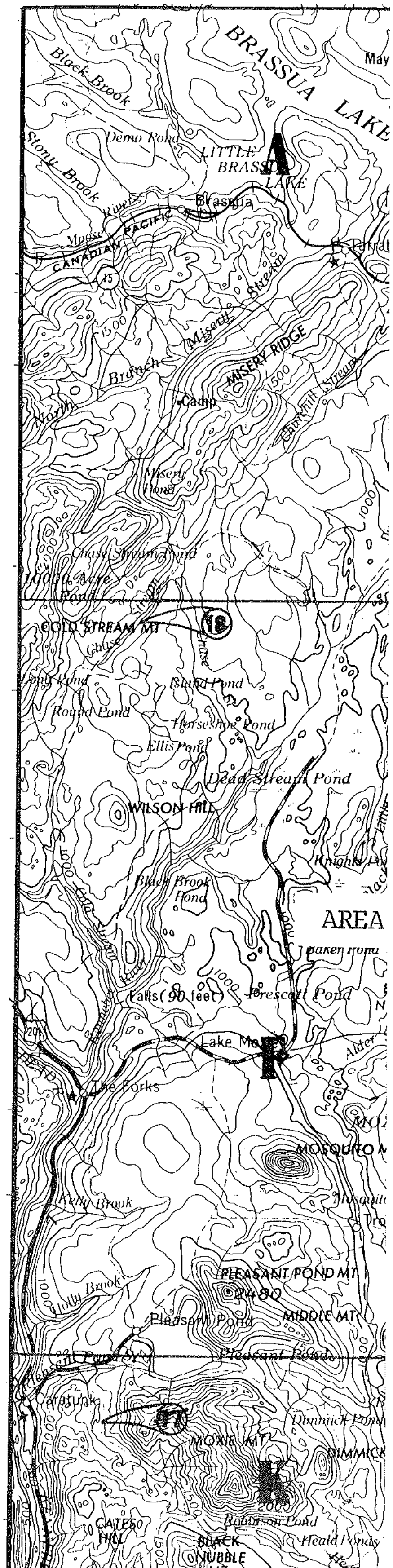
QUADRANGLES

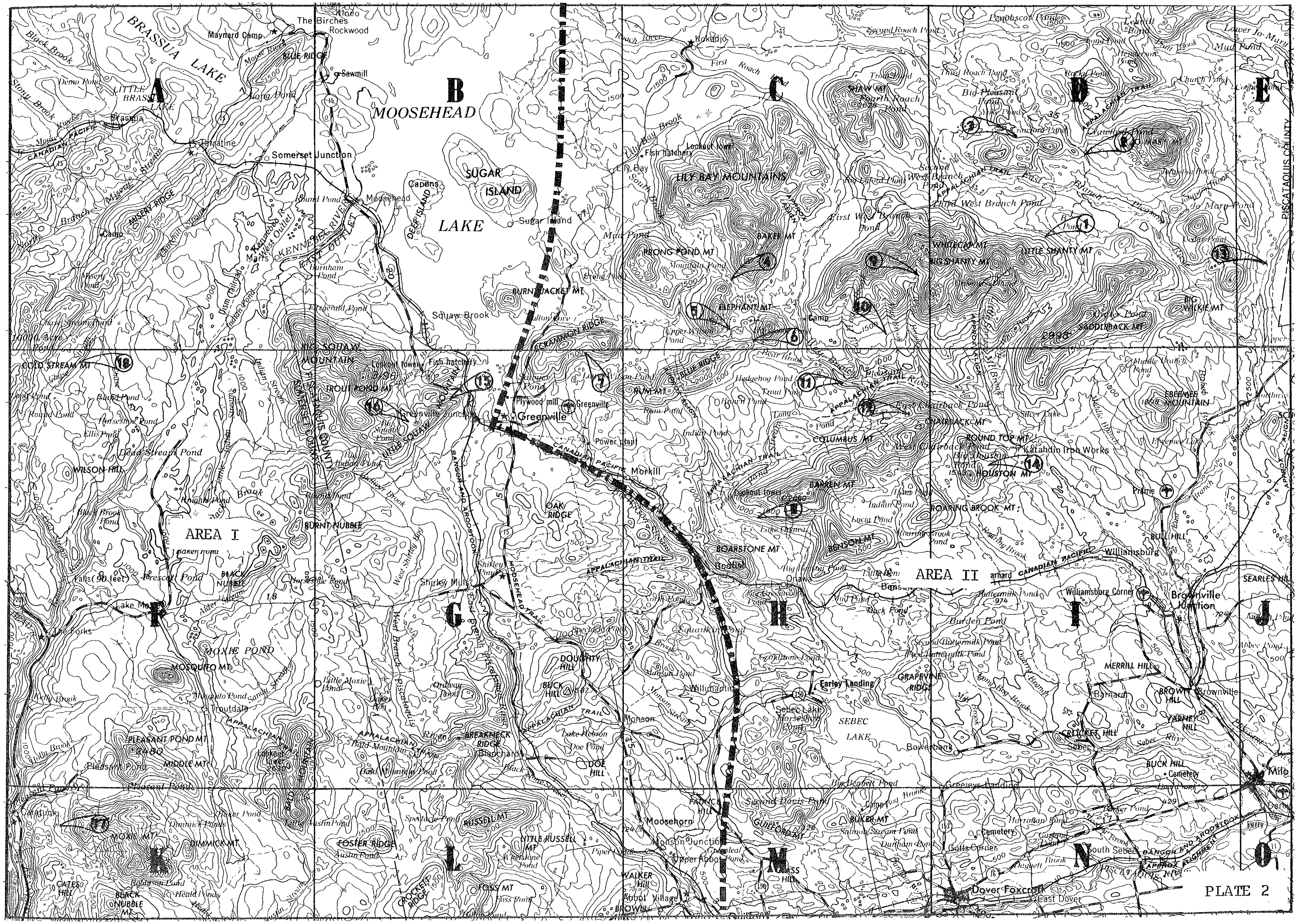
A. Brassua Lake
B. Moosehead Lake
C. First Roach Pond
D. Jo-Mary Mountain
E. Norcross
F. The Forks
G. Greenville
H. Sebec Lake
I. Sebec
J. Schoodic
K. Bingham
L. Kingsbury
M. Guilford
N. Dover-Foxcroft
O. Boyd Lake

PROSPECTS

1. B. Pond
2. Crawford Pond
3. Boardway Ponds
4. Baker Pond
5. Horseshoe Pond West
6. Horseshoe Pond East
7. Scammon Ridge
8. Barren Mountain
9. White Brook
10. Hay Brook
11. Gulf Hagas
12. Chairback Mountain
13. Wangan Brook
14. Katahdin Iron Works
15. Little Squaw Mountain
16. Big Squaw Pond
17. Moore's Bog
18. Chase Stream




BRASSUA LAKE
Black Brook
Demo Pond
LITTLE BRASSUA LAKE
Stony Brook
Brassua
Moose River
CANADIAN PACIFIC
Misery Stream
MISERY RIDGE
North Branch
Camp
Misery Pond
Chase Stream Pond
1000 Acre Pond
COLD STREAM MT
18
Long Pond
Round Pond
Horseshoe Pond
Ellis Pond
Dead Stream Pond
WILSON HILL
Black Brook Pond
AREA
Falls (90 feet)
Prescott Pond
Lake Moxie
The Forks
MOSQUITO
Kelly Brook
Holly Brook
PLEASANT POND MT
2480
MIDDLE MT
Pleasant Pond
Caratunk
17
MOXIE MT
Dimmick Pond
DIMMICK
Robinson Pond
Heald Ponds
CATES HILL
BLACK NUBBLE MT


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
AREA I
AREA II
MOOSEHEAD
LAKE
BRASSUA LAKE
SUGAR ISLAND
DEER ISLAND
The Birches
Rockwood
Maynard Camp
BLUE RIDGE
Sawmill
Brassua
Tarratine
Somerset Junction
Moosehead
Capens
Sugar Island
MISERY RIDGE
KENNEBEC RIVER
EAST OUTLET
Squaw Brook
BURNT JACKET MT
BIG SQUAW MOUNTAIN
Lookout tower
Fish hatchery
TROUT POND MT
LITTLE SQUAW MOUNTAIN
Greenville Junction
Greenville
Plywood mill
Power plant
CANADIAN PACIFIC
Morkill
BANGOR AND AROOSTOOK
MOOSEHEAD TRAIL
COLD STREAM MT
WILSON HILL
Dead Stream Pond
BURNT NUBBLE
OAK RIDGE
Shirley Mills
Prescott Pond
BLACK NUBBLE
Lake Moxie
The Forks
MOXIE POND
MOSQUITO MT
Troutdale
APPALACHIAN TRAIL
PLEASANT POND MT
MIDDLE MT
Pleasant Pond
MOXIE MT
DIMMICK MT
CATES HILL
BLACK NUBBLE MT
Robinson Pond
BREAKNECK RIDGE
Blanchard
DOUGHTY HILL
BUCK HILL
DOE HILL
Monson
Lake Hebron
FOSTER RIDGE
RUSSELL MT
LITTLE RUSSELL MT
CROCKETT RIDGE
FOSS MT
Moosehorn
Monson Junction
Upper Abbot
WALKER HILL
Abbot Village
Kokadjo
First Roach Pond
Second Roach Pond
SHAW MT
Fourth Roach Pond
Lily Bay Brook
Lily Bay
LILY BAY MOUNTAINS
BAKER MT
PRONG POND MT
ELEPHANT MT
Camp
SPRUCE MOUNTAIN RIDGE
BLUE RIDGE
BUM MT
Hedgehog Pond
Trout Pond
COLUMBUS MT
CHAIRBACK MT
East Chairback Pond
BARREN MT
BOARSTONE MT
BENSON MT
ROARING BROOK MT
Onawa
Lake Onawa
Squawkin Pond
Earley Landing
GRAPEVINE RIDGE
SEBEC LAKE
Bowerbank
Big Bennett Pond
GUILFORD MT
BUKER MT
Dover Foxcroft
East Dover
South Sebec
Goffs Corner
Cemetery
WHITECAP MT
BIG SHANTY MT
LITTLE SHANTY MT
SADDLEBACK MT
BIG WILKIE MT
Third West Branch Pond
First West Branch Pond
ROUND TOP MT
Katahdin Iron Works
HOUSTON MT
EBEEMEE MOUNTAIN
Silver Lake
Prairie
BULL HILL
Williamsburg
Williamsburg Corner
Brownville Junction
Brownville
SEARLES HILL
MERRILL HILL
BROWN HILL
VARNEY HILL
CROCKETT HILL
BUCK HILL
Sebec
Milo
Derby
Burden Pond
PISCATAQUIS COUNTY
1
2
3
4
5
6
7
8
9
10
11
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13
14
15
16
17
18
PLATE 2

PREVIOUS WORK

Keith (1933) published a preliminary geologic map of the State, which has been superceded by more recent and detailed work. The northwestern portion of the area (the southern portions of the Brassua Lake and Moosehead Lake quadrangles) has been mapped by Boucot (1961). Boucot, with Griscom and Allingham, conducted a geologic compilation and aeromagnetic study of portions of Northern Maine (1964). Post (1964) has mapped The Forks quadrangle in considerable detail. The Greenville quadrangle has been mapped by Espenshade and Boudette (1964). The northeastern portion of the Moxie-Moosehead mafic intrusion has been mapped and is being petrographically studied by Espenshade (1963). A geologic reconnaissance and aeromagnetic survey of portions of Piscataquis County was presented by Kaiser and Balsley (1954) as part of a regional study by the U.S. Geological Survey. Bowen (1957) described the Moxie Mountain-Moosehead Lake area. Brumbaugh (1964) and Buyce (1964) did reconnaissance geologic mapping in the Sebec Lake and Guilford quadrangle respectively. Miller (1945) and Houston (1956) reported on the geology of the Katahdin Iron Works pyrrhotite deposit and its immediate environment. The geology in the vicinity of Black Narrows and Moxie Pond has been described by Houston (1956).

Philbrick (1936) mapped the contact metamorphic aureole surrounding the Onawa pluton in the Sebec and Sebec Lake quadrangles. Wing (1959) published a reconnaissance geologic and aeromagnetic report on portions of Piscataquis and Penobscot Counties. Wing's area of coverage includes

the extreme eastern margin of the project area. As outcrops are extremely rare in this area because of the thick cover of glacial deposits, much of Wing's bedrock information is based on magnetic data interpretation.

GENERAL GEOLOGY

The entire study area is underlain by sediments and intrusives of Lower Palezoic age.

The northwestern corner of the project area lies on the southeastern limb of the Moose River synclinorium, a large northeast trending series of folds in sandstones, quartzites, siltstones and slates with interbeds of volcanic flows and tuffs, all of Devonian age as described by Boucot (1961). Southeast of this clastic sequence are lowest Devonian and Silurian units which in turn are underlain by eugeosynclinal sediments and volcanics of Ordovician age (Post, 1964). The contact between the Ordovician and Siluro-Devonian units is one of major unconformity and thrust faulting (Boucot, 1961; Post, 1964).

East and southeast of the Ordovician sequence calcareous argillites appear again, overlain by a very thick sequence of cyclically banded dark slates and sandstones - of the Seboomook formation (Boucot, 1961). With local variations, rocks of the Seboomook formation and underlying Siluro-Devonian types stretch across the entire project area south and east of the known exposed Ordovician units.

This entire sequence has been regionally metamorphosed and deformed into a series of vertical and nearly vertical isoclinal folds which repeatedly expose and bury the same units over nearly the entire map area (Post 1964 written communication; Espenshade and Boudette, 1964). The entire sequence is thus repeated several times. Bedding where observed varies from EW trend to NE and occasionally NW, axial flow cleavage strikes essentially are parallel to bedding.

These lower Paleozoic sediments have been intruded by a number of acidic, intermediate and basic igneous bodies. These include the Moxie-Moosehead mafic body, the Katahdin and the Schoodic Lake granites, plus the smaller Onawa granite pluton, Sebec granite, the plutons south of Shirley Mills, at Bald Mountain, the Ore Mountain norite at Katahdin Iron Works and the mafic body at Crawford Pond. In addition, there are several small intrusives northwest of the Moxie-Moosehead mafic body.

With the exception of the Schoodic Lake granite and the norite at Ore Mountain, all intrusive bodies have distinct thermal contact aureoles. This contact hornfels usually forms a resistant ridge girdlying the less resistant intrusive. The Onawa pluton is an excellent example of the hornfels ring.

The entire area has been subjected to glacial activity. Glacial striations are present on most exposures of both sediments and intrusive rocks. A thick mantel of glacial deposits of various types covers much of the area, thus outcrops are somewhat scarce. This is particularly true east of the Onawa and Sebec granites to the map boundary at Schoodic Lake. The valley areas north and south of the Big Shanty Mountain - White Cap Mountain ridge are similarly thickly covered with sands and gravels of glacial origin.

LITHOLOGIC DESCRIPTIONS - AREA I

Metasediments and Associated Volcanics

Ordovician

The oldest units of Area I (see Plate 1) are Ordovician slates, phyllites, "quartzwackes", greenstones and acid volcanics exposed southeast of the Chase Stream - Churchill Stream lineament in the west central portion of the project area, described from oldest to youngest, as follows by Post (written communication and unpublished geology, 1964).

Schistose gritty graywacke, "quartzwacke", calcareous graywacke and limestone conglomerate with thin beds of dark gray phyllite---------------Og*

Light gray, white weathering felsites and quartz porphyry interbedded with the wackes and phyllites of the Og unit as possible flows and tuffs-------------------------------------Of

Greenstone agglomerate-------------------------------Oga

Greenstone flows and pillow lavas-------------------Ogp

Dark gray slates and phyllites locally graphitic, containing pyrrhotite along cleavage surfaces and euhedral pyrite crystals-----Os

Light green quartz sericite phyllite, thin interbedded chloritic quartzite, banded green and grayish-red phyllite and thin greenstone. The lower beds interfinger with the Os unit--------Op

Laminated to thin bedded "pinstriped" chloritic quartzite and dark green phyllite, locally graded bedded, cross bedded and conglomeratic (also massive greenstone (Og))----------------------Opq

Felsite porphyry - brownish gray schistose Felsite with quartz and plagioclase phenocrysts. Intrudes? Opq--------------------------Ofp

Ultramafic rock--------------------------------------Ou

* Post's umpublished legend symbols are maintained for simplicity.

These Ordovician rocks are exposed in a belt five miles wide southeast of the Chase Stream - Churchill Stream lineament and are exposed again in an anticline northeast and southwest of Knight's Pond (Post, 1964).

Silurian

Stratigraphically above the Ordovician rocks on the southeast flank of the Moose River synclinorium is a series of limestones, limy quartzites, sandy limestones and limy conglomerates with interbeds of gray and green phyllite (Sl) and minor greenstones (Sg) (Post, 1964). Post has mapped two belts of this Silurian lithology in The Forks quadrangle and believes the northwesternmost of these extends to the northeast into the Brassua Lake quadrangle (written communication, 1964). The lower contact of the Silurian is in unconformable contact with the underlying Ordovician section (Boucot, 1961) although a portion of the contact is faulted along a lineament at Chase Stream - Churchill Stream (Post, 1964).

Siluro-Devonian

Espenshade and Boudette (1964) mapped three northeast-southwest trending belts of Siluro-Devonian limy sandstones (DSs) in the southern portion of the Greenville quadrangle. They are described as fine grained, medium gray, limy sandstones with thin beds of slate and siltstone, commonly showing graded bedding, and altering to reddish brown in the hornfels zones due to development of biotite (Espenshade and Boudette, 1964).

Boucot (1961) mapped a calcareous unit of Siluro-Devonian slates and phyllites with interbedded coarser clastics on the southeast limb of the Moose River synclinorium. This is probably equivalent to the unit mapped by Post (1964) as Silurian limy sandstones (Sl).

Devonian

Devonian rocks underlie a major portion of the project area southeast of the Moxie-Moosehead intrusive body. The oldest units of Devonian age are the Capens formation (Boucot, 1961) - Whiskey quartzite (Boucot, 1961) equivalents (Dow) as mapped by Post in The Forks quadrangle (Post, 1964). The Whiskey light gray quartzites and conglomerates occur locally, interbedded with the dark red slates of the Capens formation (Post, 1964).

Overlying the Silurian calcareous rocks and the Capens-Whiskey unit, where it occurs, is the Seboomook formation (Ds) of Boucot (1961). This is a very thick sequence (up to 20,000') of cyclicly banded dark sandstones and slates (Boucot, 1961). The lighter colored sandstones grade upward into the darker gray slate beds; fresh surfaces are generally blue gray, weathering renders these a lighter gray (Boucot, 1961). The same Seboomook formation is found southeast of the Moose River synclinorium in The Forks quadrangle by Post (1964) as cyclically and graded bedded dark slates and thin, light gray, fine grained quartzites. The contact between the Seboomook formation and the overlying Tarratine formation is completely gradational, the Tarratine beginning where the sandstones, which are similar in both formations, predominate over the slates (Boucot, 1961).

In the Greenville quadrangle, southeast of the Moose River synclinorium (the synclinorium is the type locality area for the Seboomook formation) Espenshade and Boudette have mapped a thick section of pelitic rocks (Dp) (Espenshade and Boudette, 1964) which are northeast along strike from Seboomook types in the southeastern portion of The Forks quadrangle and, therefore, are probably Seboomook equivalents. These rocks are described as dark gray slates with thin beds of siltstone and fine sandstone commonly graded bedded, and locally containing a thin medium grained feldspathic sandstone member (Espenshade and Boudette, 1964).

The true thickness of the Seboomook formation and its probably equivalents has been greatly exaggerated as the result of considerable tight isoclinal and/or near isoclinal folding throughout. This has been well illustrated in the Greenville quadrangle by Espenshade and Boudette (1964), in The Forks quadrangle by Post (1964), and written communication (1964), and in the Brassua Lake and Moosehead Lake quadrangles by Boucot (1961).

Stratigraphically above the Seboomook formation and grading from it is the Tarratine formation (Dt) (Boucot, 1961). The Tarratine is a predominantly sandstone-siltstone unit exposed only in the northwest corner of the project area, on the southeast flank of the Moose River synclinorium in The Forks quadrangle (Post, 1964) and the Brassua Lake and Moosehead Lake quadrangles (Boucot, 1961).

In the upper part of the Tarratine formation is a very resistant light gray (on both fresh and weathered surfaces) quartzite with thin interbeds of the normal Tarratine lithology named by Boucot the Misery quartzite member (Dtm) (Boucot, 1961). Locally red hematite staining is common and often diagnostic.

Overlying the Tarratine formation with apparent conformity (although contact outcrops are scarce) is the Tomhegan formation (Dto) with its Kineo volcanic member (Dtok) (Boucot, 1961) (Post, 1964). Generally this formation, the youngest sedimentary unit in the area, consists of dark blue-gray, massive, gray weathering sandstone; dark gray tuffaceous sandstone with considerable blue-gray, green weathering felsite and minor quartzite, rhyolite conglomerate, breccia and tuffs. (Boucot, 1961).

Plutonic Rocks

Exposed in the western portion of the project area (Area I) are the Moxie-Moosehead mafic body, the quartz monzonite-granodiorite at Bald Mountain, a similar body south of Shirley Mills and several smaller acidic and mafic bodies intruding Ordovician rocks in The Forks quadrangle.

Extending across the entire project area from Moxie Mountain in the southwest corner of Area I northeastward to Jo-Mary Mountain in Area II is the Moxie-Moosehead mafic body. In the Greenville quadrangle

Espenshade and Boudette (1964) have mapped this as troctolite*, norite and gabbro with olivine rich and pyroxene rich phases. Compositional layering is uncommon, flow structures, indicated by sub-parallel plagioclase laths, have been noted (Espenshade and Boudette, 1964). Young (1964) has noted considerable biotite rich gabbro at Big Squaw Pond and a few outcrops and float of olivine gabbro and olivine pyroxenite at Little Squaw Mountain both in the Greenville quadrangle. Further west in The Forks quadrangle Post (1964) maps this large mafic body as gabbro and norite. Boucot et al (1964) include the Moxie-Moosehead body with other Devonian dark-colored diorites and gabbros in northern Maine. At Black Narrows on Moxie Pond, Houston (1956) describes the southeastern contact as a peridotite grading northeasterly into a more felsic norite phase.

The pluton at Bald Mountain and Bald Mountain Pond has been mapped as a quartz-monzonite and granodiorite body with phenocrysts of potash feldspar giving it a porphyritic texture (Espenshade and Boudette, 1964). This body lies just west of the Piscataquis-Somerset County line in the southern portion of Area I. East of this county line and south of the village of Shirley Mills is a similar quartz monzonite-granodiorite body with a more basic pyroxene-hornblende phase at its southwesternmost extremity (Espenshade and Boudette, 1964). The latter basic phase may represent a magmatic segregation of the above mentioned more acidic phase.

Two small quartz monzonite bodies intruded into Ordovician metasediments, one at Knight's Pond, the other at Black Brook Pond have been noted by Post (1964) in his unpublished geology of The Forks quadrangle, and also a Devonian gabbro intruding the Ordovician rocks southwest of Indian Pond.

*The AGI Glossary defines a troctolite as a gabbro chiefly made up of labraborite and olivine with little or no pyroxene.

LITHOLOGIC DESCRIPTIONS - AREA II

Metasediments and Volcanics

All sedimentary and metasedimentary rocks in Area II are fine to medium grained clastics and admixtures of clastic and precipitated sediments of probable Devonian and Siluro-Devonian age. Minor interbedded volcanics occur in the northern portions of the area. These ages have been assigned on the probability that these rocks are "on strike" equivalents of Devonian and Siluro-Devonian rocks of similar lithology as mapped in the Greenville (Espenshade and Boudette, 1964) and The Forks (Post, 1964) quadrangles to the west. An Ordovician age is possible east of Houston Pond (Doyle personal communication, 1964).

These Devonian and Siluro-Devonian rocks are divided into the following general units; slates and minor interbeds of quartzites (Dp), quartzites and minor interbeds of slates (DSs and Dp), calcareous argillites (DSls), quartzites and sandstones (Dss) volcanics (Dv) and contact hornfels rocks (stippled area) (see Plate 1).

Siluro-Devonian

Unit (DSs and Dp) consists of interbeds of fine to medium grained, medium gray sandstones; calcareous sandstones; greenish quartzites; and fine dark gray siltstones which often times grade to dark gray and black lithic slates. The calcareous members which become lime silicate quartzites near igneous contacts, are particularly abundant in the section between the Onawa pluton and the Sebec Lake granite. A typical section of this entire unit is exposed in Big Wilson Stream from

Willimantic to Bodfish. These limy clastics are probably equivalent to the limy sandstones (DSs mapped by Espenshade and Boudette (1964) to the west.

Fine argillaceous limestones (DSls) occur in the southern portions of Area II (north of Guilford and Dover-Foxcroft) which may be finer grained equivalents of the limy quartzites to the north. These argillaceous limestones are fine grained, light gray, much thinner, lenticular and purer than the limy quartzites. At several locations west of Milo and south of Buck Hill in the Sebec quadrangle, this unit has been quarried for its lime content. The linear topographic low area underlying this unit north and northeast of Dover-Foxcroft is some indication of the purity and consequent solubility of the limestone. Best exposures are on the road between Sebec and South Sebec and in a small quarry south of Buck Hill.

Devonian

Underlying the major part of Area II is the slate and minor interbedded quartzite unit (Dp). This unit consists of thick beds of very fine grained, dense, dark gray to black slate, with interbeds of medium to dark gray siltstones and medium gray to light greenish gray quartzites. Typical exposures of this unit are along the Canadian Pacific Railroad from Morkill to Bodfish. In the southern third of the area these quartzite interbeds are often slightly calcareous. Lighter gray, slightly calcareous, phyllitic slates of the Dp unit make up the southernmost unit in the map area from Abbott Village east to

South Sebec. More highly metamorphased phyllitic, steel gray slates of the Dp unit are also common near the hornfels zones, this is particularly well illustrated in the section cut by the West Branch of the Pleasant River in Gulf Hagas gorge. Streaks, blebs and occasional cubes of iron sulfides are common in all Dp unit lithologies. Cleavage is well developed in the argillaceous members.

Several thick quartzite members (Dss) have been delineated at the west end of the Onawa pluton and in the southern portion of Area II north of Guilford and Dover-Foxcroft. Those adjacent to the Onawa pluton are fine to medium grained massive, dark gray quartzites with thin, dark slate partings. Disseminated iron sulfides plus the development of biotite near contacts give these quartzites a reddish brown color in many locations. The sandstone or quartzite member across Area II from Walker Hill to Buck Hill is characteristically red brown from the oxidation of iron sulfides and ankerite. Several 3" - 6" bands of pyrrhotite bearing amphibolite are also diagnostic of this unit.

Very resistant fine grained dark green, light brown weathering andesite has been mapped on or near the tops of two small knobs south of the Yoke Ponds in the northern portion of Area II. These volcanics (Dv) probably represent sills which have been sheared and folded along with the enclosing metasediments. Similar but smaller outcrops have been noted on Little Shanty and Big Shanty Mountains.

Plutonic Rocks

Major plutonic bodies in Area II are the Moxie-Moosehead mafic body, Onawa pluton, Katahdin batholith, the Sebec Lake granite, and the Schoodic Lake granite.

The northeastern portion of the Moxie-Moosehead mafic body lies in this eastern half of the project area with its eastern terminus at the foot of Jo-Mary Mountain. The eastern half of this variable intrusive represents a more acidic phase not represented further west in Area I. The diorite phase is first noted in the deep valley just east of the northern end of Baker Mountain and extends eastward through B Pond and to the south side of Jo-Mary Mountain. A fine to medium grained biotite rich (particularly near contacts) diorite with minor pyroxene characterizes the intrusive. Best exposures of the diorite phase are noted in the vicinity of First and Second West Branch Ponds and Big Lyford Pond. Espenshade (1963, and personal communication 1963) indicates that the valley area of First, Second, and Third West Branch and B Ponds (see Plate 1) is underlain by diorite and/or quartz monzonite which is a border phase of the southern extremity of the Katahdin batholith to the north. The writer, however, after a detailed search northward from Second West Branch Pond, was unable to find any outcrop evidence of such a link between these Katahdin batholith and diorite. In this report, therefore this diorite will be presumed as the eastern acidic phase of the Moxie-Moosehead mafic body which is last exposed as an ultramafic south of Big Lyford Pond two-thirds of the way between this pond and the hill east of Horseshoe Pond.

It should be noted, however, that exposures are limited in this deeply weathered valley in relation to the adjacent very resistant hornfels contact rocks. West of Horseshoe Pond, exposures of the Moxie-Moosehead mafic body are not common, however, Espenshade (1963, and personal communication, 1963) has noted several around the base of Elephant Mountain which appears to be a hornfels "island" of biotite rich metasediments.

Generally the mafic portion of the Moxie-Moosehead body east of Moosehead Lake is a medium- to coarse-grained pyroxene gabbro characterized by considerable biotite. The biotite content increases in the vicinity of contacts as the result of assimilation of the argillaceous country rock by the intruded magmas. It is interesting to note that west of Moosehead Lake the Moxie-Moosehead mafic body is quite resistant and stands considerably higher than the surrounding area. East of Moosehead Lake the reverse is true.

The southwestern extremity of the Katahdin batholith is well exposed in the northeast corner of the project area. Sheeting surface exposures of this granite are plentiful on the small knobs and hills around Crawford, Rock and the Yoke Ponds and on Trout Pond Mountain. This is a medium-to coarse-grained, slightly porphyritic, light gray to white biotite granite.

West of Jo-Mary Mountain is a small mafic intrusion sandwiched between the Katahdin batholith and the eastern end of the Moxie-Moosehead body. Whether this is a discreet body, or is connected to the above mentioned Katahdin granite has not been determined because connective contact exposures were not found. The latter seems more generally

probable as its composition and texture varies markedly from the Katahdin granite and the adjacent diorite phase of the Moxie-Moosehead body to the south. The mineralogy in this small mafic body varies from the acidic diorite and quartz diorite phases on the northeast and southwest margins to a biotite rich coarse gabbro, locally pegmatitic toward the interior. Although there are several magnetic highs in the area and an AFMAG deflection is recorded in the vicinity, no traces of metallic sulfide mineralization has been noted.

Centrally located in Area II and remarkably well outlined by its contact hornfels is the Onawa pluton, aligned approximately parallel with the regional trends. The Onawa pluton is a fine to medium grained, gray-white, biotite granite with various types of basic border phases. A diorite or granodiorite zone has been noted on the northwest prong of the body to the west end of Barren Mountain. This diorite is fine to medium grained, biotite rich and shows a slight porphyritic texture where the grain is finest. The southwesternmost prong of the Onawa pluton is a dark gray to black, coarse grained, pyroxene and biotite rich gabbro. Although this phase weathers very rapidly, it is well exposed in several railroad cuts along the Canadian Pacific Railroad from the east end of Boarstone Mountain to the village of Onawa. Houston (1956) also mentions quartz norite occurring at Onawa. This basic phase of the Onawa pluton is indicated by a high magnetic anomaly on the airborne magnetic data of Boucot et. al. (1960 and 1964). No indications of metallic sulfides were found in this basic rock where exposed, however.

In his detailed work on the Onawa pluton Philbrick (1936) described several poorly defined zones within the intrusive; a center of granite surrounding by a quartz monzonite-granodiorite zone in turn enclosed by a basic phase of quartz diorite, orthoclase gabbro, quartz norite, quartz gabbro and gabbro. It has been suggested that the acidic core and basic borders are the result of normal magmatic differentiation (Philbrick, 1936). Houston (1956), however, feels this may be the result of a combination of both assimilation of country rock by the magma and magmatic differentiation. As well as noting several of the more basic zones, this writer also has observed a number of exposures with partially assimilated, biotite rich sediment fragments and stringers in the contact areas, indicating that digested host rock sediments have been of some significance in the composition of the border phases.

A small mafic body occurs at the eastern end of the Onawa pluton on Ore Mountain in the vicinity of Houston Mountain and Silver Lake. Except for occasional outcrops closely adjacent to its included sulfide mass, this body is poorly exposed. The writer has extended the surface areal expression of the mafic body from that described by Miller (1945) and Houston (1956) to the north under Silver Lake on the basis of airborne magnetic data presented by Boucot et. al. (1960 and 1964). It has also been suggested by Kane et. al. (1961) in the interpretation of gravity data that this pluton extends further to the north and northeast and joins the east end of the Moxie-Moosehead mafic body.

Petrographically the mafic body at Ore Mountain is a norite consisting chiefly of plagioclase feldspar, bronzite, augite, olivine and metallic sulfides, with local concentrations of biotite and hornblende near the contacts (Houston, 1956). Miller (1945) described this same body as a coarsely crystalline altered gabbro.

Enclosed within the norite is a massive sulfide body approximately 2,000 feet long (in an east-west direction) and 400 feet wide (Houston, 1956). This sulfide mass grades from a high of 80% pyrrhotite near the center to 40% in the border zone near the norite contact to 3-5% in the norite itself (Houston, 1956). During the last half of the 19th century a gossan cap varying in thickness from 6'-14' was almost completely removed in various open pit mining operations during that 50-year period. Although the exposed pyrrhotite mass weathers readily a few islands of the original limonite gossan remains. No copper, nickel or cobalt areas of concentration within this pyrrhotite mass have been delineated as yet. However, weak assay values of these metals have been noted in shallow diamond drilling (personal communication, Allied Chemical Corp., General Chemicals Division).

The Sebec Lake granite in the southern portion of Area II is a near circular body underlying the western portion of Sebec Lake. Unlike the Onawa and Moxie-Moosehead intrusives the Sebec Lake granite does not follow the structural trends of the surrounding metasediments. The plasticity of the thick sequence of very argillaceous slates of the Dp unit into which it was intruded probably accounts for its stock-like near circular form. (The Onawa and Moxie-Moosehead bodies were thrust into rocks of a more arenaceous nature).

The Sebec Lake body is medium to coarse grained, gray-white, binary granite with local potash feldspar crystals up to 2 inches in length. Brumbaugh (1964) considered this intrusion a quartz monzonite. Its contact hornfels aureole, although not expressed topographically, ranges from biotite to andalusite-cordierite in thermal zones. Unlike most of the other intrusives in the area, there appear to be no mafic and/or sub-mafic border phases. It is possible that the Sebec granite is related to a different magma source than the other plutons in the vicinity which have one or more intermediate to basic border phases.

The western end of a large granitic body referred to here as the Schoodic Lake granite underlies Ebeemee Mountain, Schoodic Mountain and Schoodic Lake on the eastern margin of the map area. This is a light colored, medium grained, biotite granite with apparently little or no contact hornfels zones. Wing (1959) reports granodiorite and gabbro border phases particularly along the northwestern extremity. The small gabbro pod northeast of Ebeemee Mountain does not occur in outcrop, but is indicated by airborne magnetic data as interpreted by Wing (1959). Outcrop exposures of the Schoodic Lake granite are not plentiful as it weathers readily and is well blanketed by a cover of glacial deposits.

METAMORPHISM

Regionally the entire area lies within the green schist or chlorite rank of metamorphism.

Generally all major intrusive bodies in the project area exhibit a distinct thermal, contact metamorphic aureole, in most cases into the sillimanite-cordierite zone.

Espenshade and Boudette defined biotite, andalusite-amphibole and sillimanite-cordierite zones around the granodiorite-monzonite body south of Shirley Mills and similarly for those portions of the Moxie-Moosehead mafic body and the monzonite at Bald Mountain Pond which lie in the Greenville quadrangle (Espenshade and Boudette, 1964). These contact aureoles range in width from one quarter to three miles. It seems probable that the remaining contact areas adjacent to the monzonite body at Bald Pond Mountain and adjacent to those portions of Moxie-Moosehead mafic body west of Moosehead Lake are similar to those described by Espenshade and Boudette.

East of Moosehead Lake the Moxie-Moosehead mafic body has metamorphosed the sediments into a very wide and weather-resistant biotite hornfels zone which holds up the high country of the Lily Bay Mountains, Shaw Mountain and the White Cap-Big Shanty range. The hornfels aureoles adjacent to the Moxie-Moosehead body reach widths of six to seven miles east of Moosehead Lake. Further to the west where this intrusion is more basic, contact zones narrow down to less than a quarter of a mile in width. An andalusite zone has also been noted around the Moxie-Moosehead intrusion particularly on the south side of the mafic body where good exposures of andalusite rich micaceous quartzites occur on Scammon Ridge, in the outlet stream south of Horseshoe Pond, on the summit of Little Shanty Mountain, and on the south slopes of White Cap Mountain in White Brook at approximately 850' elevation.

Philbrick (1936) described three metamorphic zones around the Onawa pluton. From the outermost zone toward the pluton they are as follows: an "andalusite (chiastolite) schist" zone with chlorite and biotite; a "hornfels" zone with muscovite, biotite and andalusite and an "injection hornfels" with biotite, andalusite, corderite and sillimanite (Philbrick, 1936). The latter corderite zone is best seen along the Canadian Pacific Railroad southeast of Bodfish. Corderite and andalusite are also plentiful in the schists along the top of Barren Mountain. North of the Onawa pluton the aureole has a maximum width of two miles, this narrows down to one half mile along the south contact.

The thermal contact zone surrounding the Sebec Lake granite is not quite as resistant or well exposed as the previous mentioned hornfels zones, although the width reaches a maximum of three miles on the east side. The degree of metamorphism around the Sebec Lake granite was not determined in detail, however, corderite schist outcrops are found at Earley Landing and andalusite pelitic schists on the south slopes of Guilford Mountain. Andalusite (chiastolite) bearing pelitic rocks are exposed in several outcrops one-half mile east of Bowerbank in the Sebec quadrangle. It has been suggested by Brumbaugh (1964) that contact zones around the Sebec Lake granite are similar to those around the Onawa pluton, but on a smaller scale. The maximum width of the contact aureole around the Sebec Lake granite is three miles on the east end. A minimum of less than one quarter mile is the case on the north and west margins.

The writer observed only rocks in the biotite zone around the southern end of the Katahdin batholith (exposed in the northeast corner of the project area). It seems probable, however, that higher rank zones have gone undetected as other intrusions in the area show evidence of andalusite-corderite rank rocks in most cases.

Similar to the Sebec Lake granite, the Schoodic Lake body appears to have little or no contact metamorphic hornfels zones. Either the zone has been eroded and covered by glacial deposits or does not exist. No exposures, however, of a contact zone around this body were seen during the field work in this vicinity. In addition, Wing (1959) makes no mention of the existance of contact hornfels zones which seemingly would be brought out in a magnetic examination as he has done.

The hornfels rocks mentioned above here are indicated by the stippled areas on the geologic map (Plate 1). The writer has, for the sake of brevity and map clarity, grouped all contact hornfels lithologies into one map unit (indicated by the stippled areas). As mentioned previously here, the hornfels rocks range from the biotite to the corderite (and sillimanite) grade. Philbrick (1936) reported sillimanite in the contact aureole around the Onawa pluton.

Several different lithologies are represented in the hornfels rocks. Most prevalent are massive red-brown, biotite and quartz rich, fine grained schists and equally massive medium grained, red-brown biotite quartzites. Where original rocks were more aluminous, steel gray, fine grained, andalusite (or chiastolite), corderite schists and fine micaceous, phyllitic, andalusite schists are common.

The massive red schists and quartzites are best exposed in the wide hornfels zones in the Lily Bay Mountains and on Jo-Mary Mountain. The best exposures of the corderite schists are found around the Onawa pluton particularly on Boarstone Mountain. The only other area where the corderite schists are well exposed is on the north and east sides of the Sebec Lake granite. Exposures of the fine grained phyllitic schists are common in most all contact aureoles in the project area.

STRUCTURE

The prominent northeast trend of both drainage and topography in the project area is controlled by bedding, cleavage and fold axes. Although structural trends are predominantly northeast, in the southern portion of Area II trends vary from the northeast to east-west and in a few localities are northwest.

The northwestern corner of the map area is occupied by the southeast flank of the Moose River synclinorium. This portion of the synclinorium is a series of doubly plunging synclines and anticlines with steeply dipping north limbs and gently dipping south limbs (Boucot, 1961). Separating the rocks of the Moose River synclinorium from the underlying Ordovician units is a prominent fault along the Churchill Stream - Chase Stream lineament (Boucot, 1961 and Post, 1964). West of the area of discussion here Boucot (1961) has described this as a thrust. Lineation along the fault zone suggests a strike slip component of movement according to Post (1964, written communication).

Further south and southeast of this fault all lithologic units are "internally tightly folded with moderately plunging fold axes" (Post, 1964 written communication). To the east in the Greenville quadrangle Espenshade and Boudette (1964) have similarly mapped a series of tight, steeply dipping folds which greatly exaggerate the apparent thickness of the Devonian slates. These same folds undoubtedly extend along strike into the Sebec Lake and Sebec quadrangles. Due to the reconnaissance nature of the writer's field work only the more obvious features were noted such as the anticlinal fold outlined by the quartzites north of Bodfish. This structure is well exposed in the railroad cuts of the Canadian Pacific Railroad. Both limbs dip approximately 65-70^{o} and the axis plunges 14^{o} slightly to the north of east.

Generally throughout the entire project area with a few exceptions bedding dips at or near the vertical and flow cleavage, which is very prominent in the finer clastics, generally parallels the bedding but cuts the coarser clastics more nearly normal to the bedding.

The most obvious irregularity in the bedding altitude is on Jo-Mary Mountain where beds dip at a relatively shallow 8^{o}-20^{o} to the northwest. This altitude is in major contrast to the tightly folded near vertical northwest and east-west bedding trends to the south on the east end of Saddleback Mountain and on Cedar Mountain. Although it is obvious from this reconnaissance work in this area and from examination of aerial photographs and topographic maps that a major structure exists in this area, no explanation is offered here for this extreme change in the attitude of the bedding.

PART II

GEOPHYSICS

By

Robert S. Young

INTRODUCTION

The exploration effort reported on in this portion of the bulletin was specifically designed to investigate geochemical anomalies discovered through the regional geochemical reconnaissance survey (see Part III). Several prospects, other than geochemical anomalies, were investigated and are evaluated because they occur in the general area of interest. As the governing conditions of the 1963-64 exploration program were considerably different from previous exploration supported by the Maine Geological Survey (see Spec. Econ. Studies, Series 1, 2, 3), methods of operation also differed. A greater proportion of available time was utilized in geochemical evaluations and geologic mapping; also, geophysical techniques applied were broadened to include those suited to rapid reconnaissance. The choice of geochemical anomalies for investigation was made after consultation with geologists with the Maine Geological Survey and the Project Director of the geochemical reconnaissance. In addition to the geochemically-defined prospects, six other prospects were examined, Katahdin Iron Works, three areas in the Moxie-Moosehead gabbro, the Crawford Pond magnetic anomaly, and a sulfide occurrence in the Chase Stream area.

The general location of the 1963-64 exploration area is shown on Figure 1 (index map), and in more detail on Plate 2 (prospect locations). The major part of the area lies within Piscataquis County, but there is a westward extension into Somerset County. Basic geological control was provided by the Northern Maine Geologic Compilation (Boucot et. al., 1960); running geochemical control was furnished by the James W. Sewall Company.

Publications describing recent State-supported exploration efforts in Maine (Spec. Econ. Studies, Series 1, 2, 3) contain a relative abundance of background information pertaining to (a) the philosophy of exploration and (b) geophysical-geochemical methods or techniques. Because of the availability of these publications as well as numerous standard references, such descriptive material is not repeated in this report. The geophysical methods utilized in the anomaly or prospect evaluations are considered "standard" in prospecting for metallic ore minerals, and include magnetic, self-potential and electromagnetic principles. For those not familiar with Afmag data and who wish to make full use of the information offered, an article by S. H. Ward (1959) should be consulted. Recent contributions of significance in the general field of exploration geochemistry include articles by Hawkes (1963) and Canney (1964) and a reference book by Hawkes and Webb (1962).

EXPLORATION PROGRAM

Eighteen individual prospects were examined, in more or less detail, during the 1963-64 field seasons. In some cases, investigation consisted of additional geochemical sampling or a single traverse line, but generally a formal grid was established, the dimensions of which were commensurate with the anomaly. Where indicated, evaluations included (1) soil and/or sediment sample analysis, (2) geologic mapping, and (3) geophysical surveying, or any combination thereof. In the 1963 program, geochemical analyses were performed in the field and all data

confirmed in the laboratory; in both instances tests were for cold extractable heavy metals (cxHM). In the 1964 program, samples were systematically collected and all determinations, cxHM and cxCU on all samples, were carried out in a central laboratory. Geophysical methods applied at specific prospects were magnetic, electromagnetic (horizontal-loop EM), and electro-chemical (S-P). Measurements of selected characteristics of the natural electromagnetic field in the audio range (Afmag) were taken in reconnaissance surveys.

The various anomalies and prospects, with general location, follow in tabular form:

Prospect No.	Name	Location
		Piscataquis Co.
1.	B Pond Grid	T-BR11
2.	Crawford Pond Traverse	T-AR11
3.	Boardway Ponds Grid	T-AR11
4.	Baker Pond Traverse	T8R10
5.	Horseshoe Pond, West, Traverse	T8R10
6.	" " , East, "	T8R10
7.	Scammon Ridge, Traverse-Grid	Greenville
8.	Barren Mountain Traverses	Elliottsville
9.	White Brook Area	T7R10
10.	Hay Brook Grid	T7R10
11.	Gulf Hagas Grid	T7R10
12.	Chairback Mountain Area	T7R9, T7R10
13.	Wangan Brook Area	T-BR10
14.	Katahdin Iron Works Grid	T6R9
15.	Little Squaw Mountain Grid	T3R5
16.	Big Squaw Pond Grid	T3R5
		Somerset Co.
17.	Moore's Bog Grids	Caratunk
18.	Chase Stream Area	T1R6

Of all the prospects investigated, eight are recommended for further immediate evaluation; these are 2, 10, 11, 12, 15, 16, 17 and 18.

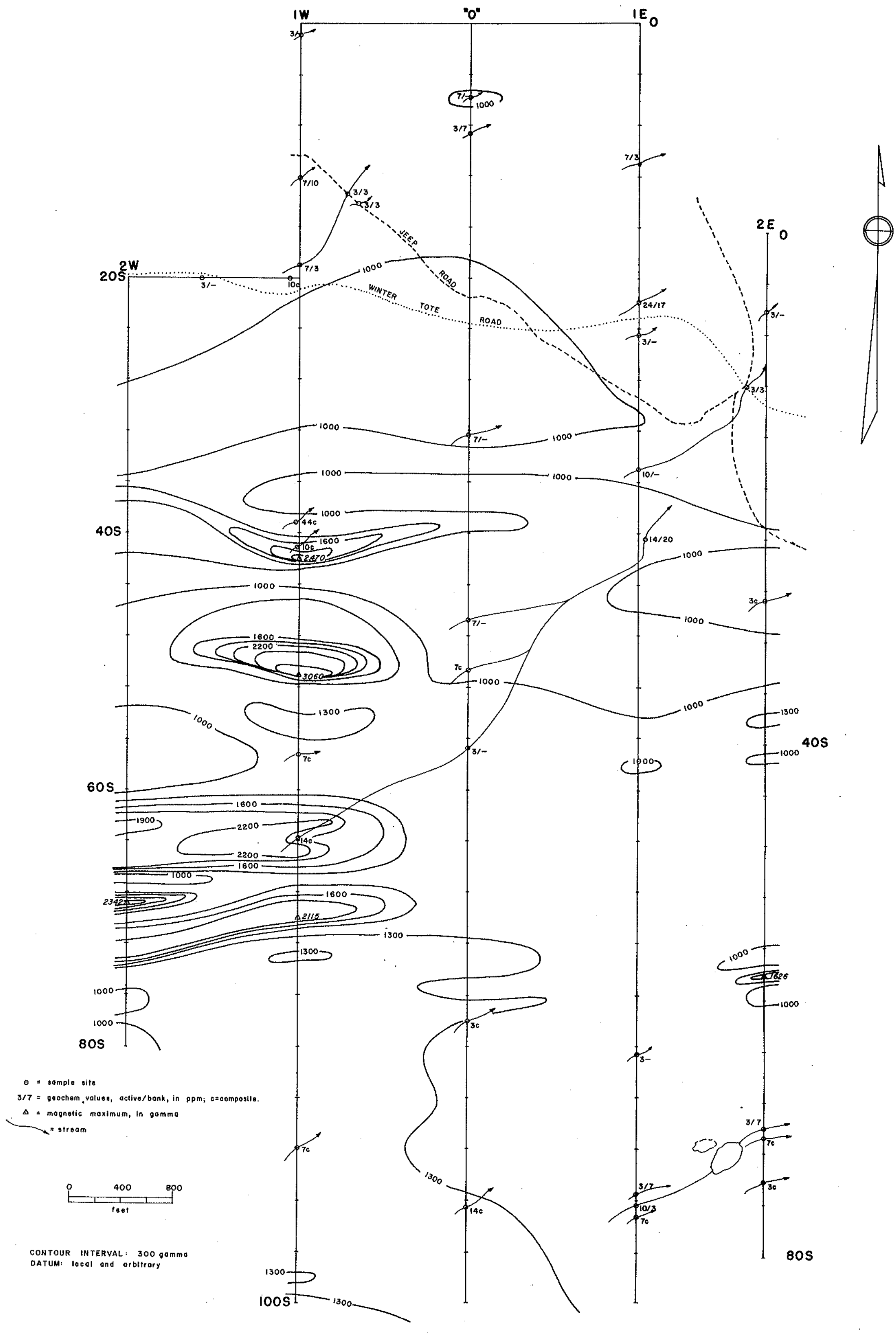
Prospect #1: B Pond Grid

Location: T-BR11, Jo-Mary Mountain 15' Quad.
Piscataquis County

Introduction: The large B Pond grid, consisting of 44,000 feet of traverse (Plate 3), was designed to further test and evaluate a known magnetic anomaly (Balsley and Kaiser, 1954) and reconnaissance geochemical data provided by the James W. Sewall Company. Grid orientation was determined by regional structure and the character of the magnetic anomaly. The entire grid was mapped with magnetometer and self-potential equipment; areas showing anomalous magnetic or polarization effects were also tested for near-surface conductivity. A thorough stream sediment analysis of the 1,000 acre grid area was completed.

Evidence of a very extensive, previous grid was noted; it is reported that Appalachian Sulfides, Inc. carried out geological and geophysical exploration in this area in the mid-1950's.

Geology: Outcrop is generally scarce on the north-facing slope of Little Shanty Mountain; however, outcropping rocks were noted on all grid lines except Line 2E. All outcrops examined revealed nearly identical lithology, quartz-biotite schist or biotitic quartzite, carrying fine pink garnets from place to place. Exposures of "typical" schist may be seen at 2W + 67S and 0 + 93S. Bedding trends generally east-west and dips, quite variably, to the south; nearly all exposures contained minor fold structures. None of the outcrops examined contained sufficient magnetite or sulfides to account for either geophysical or geochemical anomalies.



"B" POND GRID

VARIATIONS IN VERTICAL MAGNETIC INTENSITY (Z)
and
GEOCHEMICAL VALUES

T-BR11

PISCATAQUIS CO., ME.

PLATE 3

Magnetic data suggest the possibility that the northern part of the grid may be underlain by rocks of the granite clan. Boulders of medium to coarse grained biotite granite are fairly abundant locally.

Geophysics: All five traverse lines were run with magnetometer and potential-measuring instruments (S-P). Those areas identified by either anomalous S-P or magnetic values were further tested with a horizontal-coil electromagnetic unit.

Magnetic Survey: Variations in vertical magnetic intensity were measured at 50-foot intervals on all traverses. The overall magnetic pattern is shown on Plate 3. As expected, magnetic relief encountered through the ground survey (about 2,300 gamma) was considerably greater than that measured by airborne equipment (about 800 gamma). The very regular anomaly shown on GP 116 is misleading in its simplicity; in detail, the gross positive anomaly consists of no less than a half-dozen discrete positive poles underlying the west-central portion of the grid. Unfortunately, at no place was it possible to correlate, directly, anomalous magnetic values (more than 1,600 gamma) with bedrock. However, certain of the profiles, notably Line 1W, shows remarkably close similarity to magnetic profiles for several traverses, especially "R", surveyed in Penobscot County (Doyle et al, 1961). In the Lee-Springfield area of Penobscot County, the low-relief, regular portions of the profiles are thought to represent a granitic environment and the irregular, and often high-relief, portion the contact aureole and border metasediments. The same situation may be present under the B Pond grid.

Self-potential Survey: Variations in spontaneous polarization were also measured at 50-foot intervals on all traverses except the extreme northern end of Line 2E (0 - 12S), which was excessively wet. S-P anomalies are fewer and less well-defined than the magnetic zones and are of relatively low magnitude. The best individual S-P anomalies are at Sta. 49-50, Line 1E and Sta. 34-36, Line 2W; that on Line 1E is without apparent magnetic confirmation, whereas there is fair correlation between potential and magnetic zones near Sta. 36 on Line 2W. There appears to be slight, and perhaps fortuitous, agreement between magnetic and potential variations at Sta. 38 and 58 on Line 1E and Sta. 42 on Line 1W. The specific cause(s) for variations in self-potential are unknown.

Electromagnetic Survey: Portions of four traverse lines, displaying magnetic and/or potential anomalies, were tested for shallow zones of conductivity with a horizontal-coil EM unit. Specifically, the areas thus evaluated were: Line 2E, Sta. 32-62; Line 1E, Sta. 40-64; Line 1W, Sta. 30-75; Line 2W, Sta. 25-45. Although some variation in response was noted, especially in-phase values, they could be attributed in nearly every case to excessive relief between receiver and transmitter coils. As a result of the HEM survey, it is concluded that there are no near-surface conductive zones associated with the mapped S-P or magnetic anomalies.

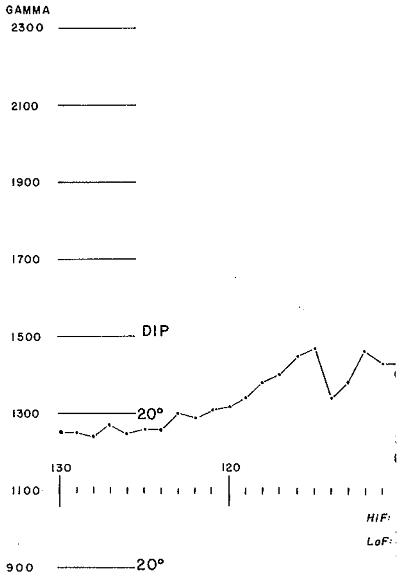
Geochemical Survey: Stream sediment or soil samples from approximately forty sites within the grid were analyzed for readily extractable heavy metals. Results of these analyses are shown on Plate 3, in relation to magnetic values. The highest value recorded (44 ppm) was for a composite sample, highly organic, from a small spring-seep at 1W + 39S. The only other locations of significance appear to be 1E + 21S (24 ppm, active) and 1E + 40.5S (20 ppm, bank). It should be noted that the highest cxHM value (1W + 39S) is found in close proximity to a large magnetic anomaly, the only such instance of geochemical-geophysical confirmation.

Prospect #2: Crawford Pond Traverse

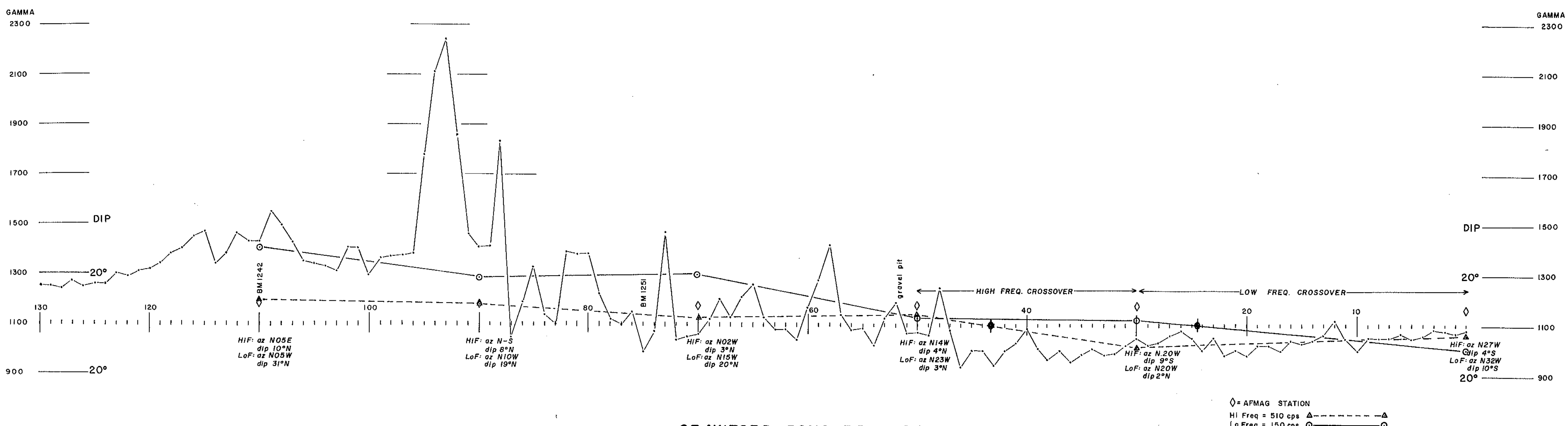
Location: T-BR11, Jo-Mary Mountain 15' Quad.
Piscataquis County

Comments: Because of the significant magnetic anomaly mapped by the U. S. Geological Survey (Balsley and Kaiser, 1954) and evidence of a gabbroic body in the area, magnetic, EM and Afmag traverses were run along the road adjacent to Crawford Pond. Em and magnetic data were taken at 110-foot stations on a line 14,300 feet long; Afmag stations were established at one-half mile intervals. Magnetic and Afmag data are given on Plate 4.

The magnetic survey refined the shape of the anomaly in cross-section, and indicated a ground-level magnetic relief of approximately 1,400 gamma. As with the B Pond magnetic high, the smooth curve anomaly on GP 116 is in detail quite complex, although remaining a net positive area (Plate 4).



GAMMA
2300
2100
1900
1700
1500
DIP
1300
20°
130
120
1100
HIF:
LoF:
900
20°



CRAWFORD POND TRAVERSE

T-A R11
PISCATAQUIS COUNTY, ME.

MAGNETIC PROFILE and AFMAG DATA

PLATE 4

The horizontal-coil EM survey, with readings taken on the previously established magnetic stations, revealed that there are no near-surface (150 feet or less) zones of conductive materials underlying this particular traverse.

The Afmag survey, part of a more extensive traverse, was apparently successful in locating a deep, large (?) conducting zone. Afmag data (station location, azimuths and dip-angles) on which the foregoing conclusion is based are listed on Plate 4, and are related to magnetic variations. There are a number of ways in which such data may be depicted, and azimuth-dip data portrayed graphically as vectors will aid in interpretation. It should be noted that (a) the high and low frequency cross-overs do not coincide, and (b) that both cross-overs lie considerably to the south of the main magnetic anomaly. It is not possible to fully evaluate the significance of the apparent Afmag anomaly, or its relation, if any, to local magnetic features on the basis of a single profile. Certainly, attempts should be made to confirm the indicated conductor and map the local area, in detail, with an Afmag unit.

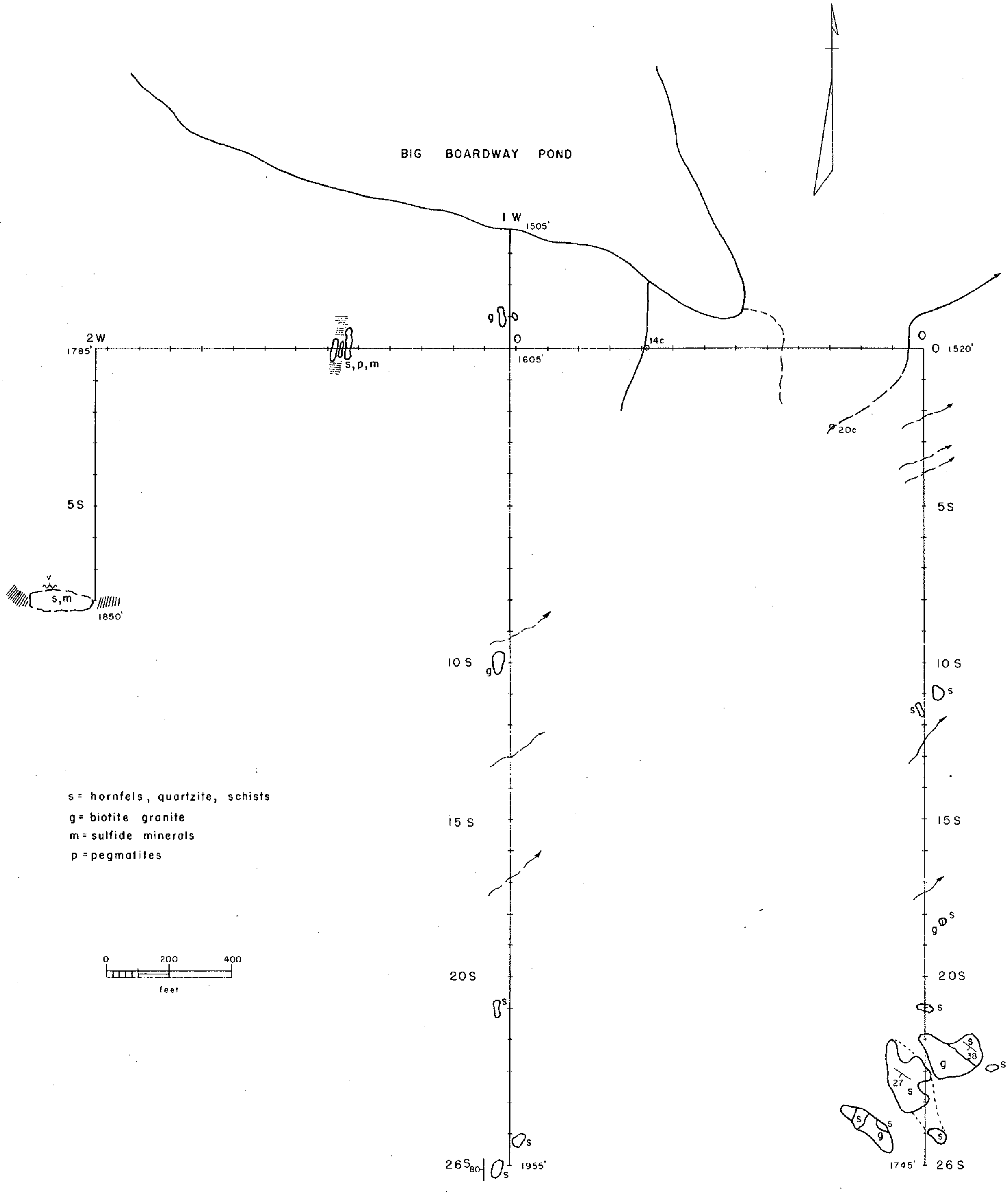
None of the stream sediment samples taken in this local area contained significant heavy metals, according to the Sewall survey.

Prospect #3: Boardway Ponds Prospect

Location: T-BR11, Jo-Mary Mountain 15' Quad.
Piscataquis County

Introduction: Several of the stream sediment samples taken in reconnaissance from the Boardway Ponds drainage contained interesting heavy metal values. Additional geochemical sampling and geological evaluation indicated the desirability of systematic examination. On the basis of local geologic trend, a north-south grid of 8,600 feet of traverse and baseline was established (Plate 5). The grid was surveyed with S-P equipment and magnetometer, and all rock exposures on or near traverses were examined and mapped.

Geology: It is difficult to define the geologic situation existing within the grid limits. Fundamentally, the rock types mapped are granite and metasediment; in detail there are many variations of both types. The granite is basically a normal biotite granite, with the grain size ranging from fine in chill-zone environments to medium in a number of isolated outcrops. Xenoliths of sediment in granite are common in the southeast corner of the grid. The most abundant sedimentary type is best described as "impure" quartzite, which, adjacent to granite, becomes a biotite-garnet hornfels. The hornfels, because of the high biotite and garnet content, is a very distinctive purple-brown color. Despite local heavy alteration, bedding can generally be determined, even in close proximity to granite. Of especial interest are the large outcrop areas near "2W" + 8S and 18.5W + 0, both of which contain



BOARDWAY PONDS PROSPECT

T-A R11

PISCATAQUIS COUNTY, ME

GEOLOGY

PLATE 5

disseminated sulfides. The exposures near "2W" + 8S are of very fine-grained, highly "bleached" (white) meta-sediment. Locally, bedding is disturbed but in general the beds trend N. 20° E. and dip steeply (about 60°) northwest. Parts of the bedrock exposure, which crops out on the south facing steep bluff, are cut by prominent east-west sheeting, suggesting nearby shearing. Because of the relatively high sulfide content, much of the outcrop surface is stained ("burned") by iron oxides. The sulfides, in places comprising 10% of the rock, identified in hand specimen are: pyrrhotite, pyrite and chalcopyrite. The sulfide-bearing outcrop at 18.5W + 0 is much like that at "2W" + 8S, except for lower sulfide content and invasions of granite and pegmatite. The only sulfides positively identified here are pyrite and pyrrhotite. Sheeting is less pronounced, but there are some N. 70° W.-vertical fractures in the mineralized outcrop. The quartzite has been cut by normal granite with pegmatitic pods made up of clear quartz, feldspar, muscovite, and schorlite.

Spatial relations, hornfels zones, pegmatites, and xenoliths all suggest that this geologic environment is the hood area of a granitic intrusive.

<u>Geophysical Surveys</u>: Surveying with magnetometer and S-P equipment did not detect a zone of anomalous magnetic or potential activity.

<u>Geochemical Survey</u>: A large number of sediment samples were analyzed in an attempt to delineate the source(s) of the heavy metals found in the reconnaissance survey. The highest values for a site were detected in both active (88 ppm) and bank (31 ppm) samples at Station "g" (Plate 5),

apparently representing drainage from the northeastern part of the grid area. Up-drainage, at 3W + 2.5S, a single composite sample contained 20 ppm. Other samples of apparently anomalous nature were collected at: 0 + 2S on the grid (24 ppm, active); Station "l" (31 ppm, active); and Station "c" (34 ppm, active).

The values for all geochemical sample stations follow in tabular form.

Table 1. Sediment sample values, Boardway Ponds area; See Plate 5 for site locations.

Sample Station	Type	Heavy Metals, cx
a	active	14 ppm
a	bank	7
b	active	17
b	bank	10
c	actuve	34
c	bank	10
d	active	24
e	composite	10
f	active	3
f	bank	7
g	active	88
g	bank	31
h	active	3
h	bank	3
i	composite	3
j	active	7
j	bank	3
k	active	7
l	active	31
l	bank	10
m	active	3
m	bank	7
n	active	7
o	active	14
o	bank	7
p	composite	10
q	composite	7

Prospect #4: Baker Pond Traverse

Location: T8R10, First Roach Pond 15' Quad.
Piscataquis County

Comments: Sediment samples from the inlet to Baker Pond were rated in the "anomaly" class in the regional survey. On the basis of this sample a single traverse was laid out, originating at the head of the beaver bog which feeds Baker Pond. This line, bearing N. 15° E., is one-half mile long. It was surveyed with S-P instruments and magnetometer, neither of which mapped significant local variations. Outcrop was located about 300 feet northwest of the traverse termination; the exposure proved to be fine to medium grained gabbro, barren of sulfides.

A number of sediment samples were collected and later analyzed. The results of these analyses follow.

Table 2. Geochemical data; stream sediment samples in Baker Pond area.

	Sample Data	cxHM
1.	Brook at head of beaver pond; active.	3 ppm
2.	Brook flowing north out of beaver pond; composite.	10
3.	Same as #2, 150 yds. to north composite.	7
4.	Beaver pond outlet at dam; composite.	3
5.	Brook into pond, just above lake level; composite.	7
6.	Brook into pond, at lake level; composite.	7
7.	Traverse, 0.6N, composite.	14
8.	" , 1N, active.	37
	" , 1N, bank.	20
9.	" , 21.9N, active.	10
	" , 21.9N, bank.	7
10.	" , spring 100' west of of 25N, active.	10
	" " , bank.	14

It should be emphasized that lack of "positive" geophysical data in no way precludes this area from further exploration. Geochemical samples should be collected at intervals sufficient to define the apparent heavy metal anomaly; further geophysical prospecting should await such definition.

Prospect #5: Horseshoe Pond, West Traverse

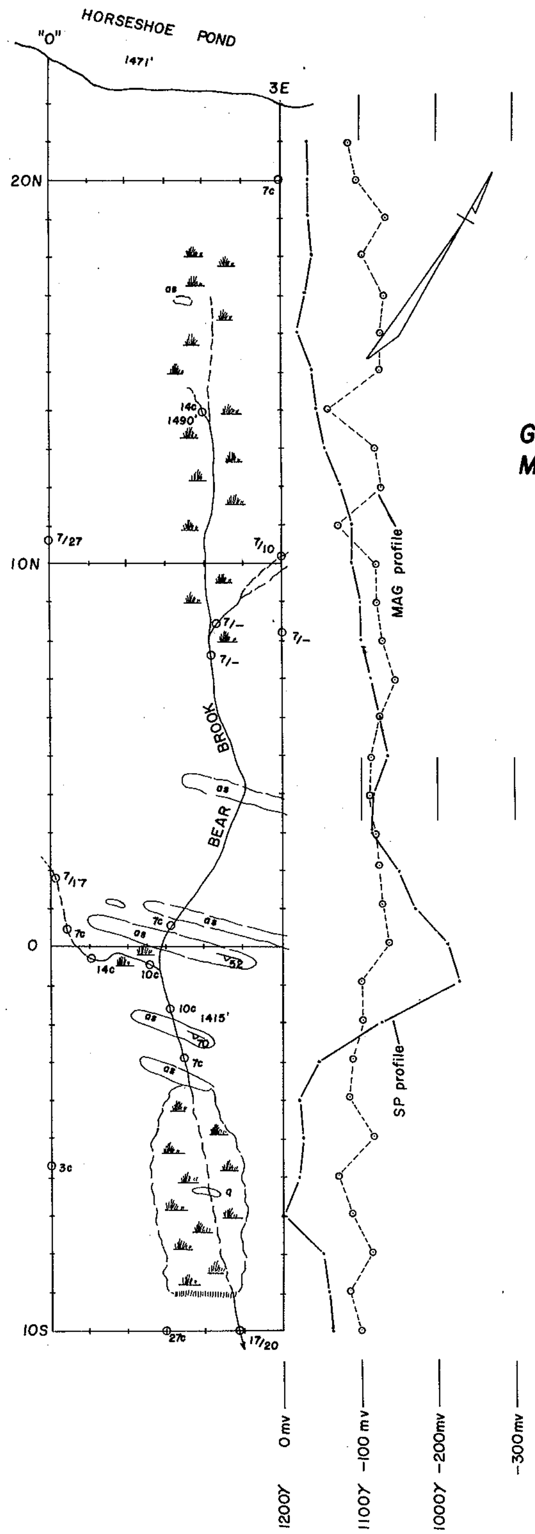
Location: T8R10, First Roach Pond 15' Quad.
Piscataquis County

Comments: A stream sediment sample with anomalous heavy metal values was collected, in the regional survey, from a small stream draining the southeast side of Elephant Mountain. A 2,000-foot traverse, bearing N. 55^{o} W., was established to further test the restricted drainage area. Variation in vertical magnetic intensity along the grid line was about 200 gamma, but there was no spontaneous polarization effects to enhance the magnetic features. This fact, plus the lack of geochemical confirmation, eliminated this immediate area from further consideration.

HORSESHOE POND EAST

GEOLOGY-GEOCHEMICAL VALUES MAGNETIC-SELF POTENTIAL PROFILES

T8R10
PISCATAQUIS CO., ME.



as – andalusite schist
q – quartzite

⊙ – sample site
12/15 – sediment sample, cxHM, active/bank

0 200' 400'

PLATE 6

Prospect #6: Horseshoe Pond, East Grid

Location: T8R10, First Roach Pond 15' Quad.
Piscataquis County

Comments: The regional survey sample site, which led to grid layout, is located approximately one-half mile south of the lake shore on Bear Brook. Because of the simple and restricted nature of the drainage basin, the survey grid consisted of two primary traverses, 600 feet apart, extending over 3,000 feet southward from the lake. The traverses were tied, for control, at four points. Plate 6 shows the relation of the grid to the local drainage pattern.

Topographic relief on the grid is moderate and outcrops are plentiful in the southern half of the grid (Plate 6). Insofar as can be determined, the grid is underlain entirely by non-carbonate metasediments, principally andalusite-bearing, dark gray schist; massive, impure quartzites are also present. Bedding and schistosity are parallel, or nearly so, both trending nearly east-west and dipping steeply to the south. No sulfides were observed in outcrop.

Both traverse lines were run with magnetometer, S-P and horizontal-coil EM units. No conductive zones were mapped on either line and little magnetic or potential relief was found on Line "0". A fairly broad S-P feature of approximately 200 millivolts exists near the area of best outcrop, cross-line "0" (Plate 6). The reason for this potential variation is not apparent.

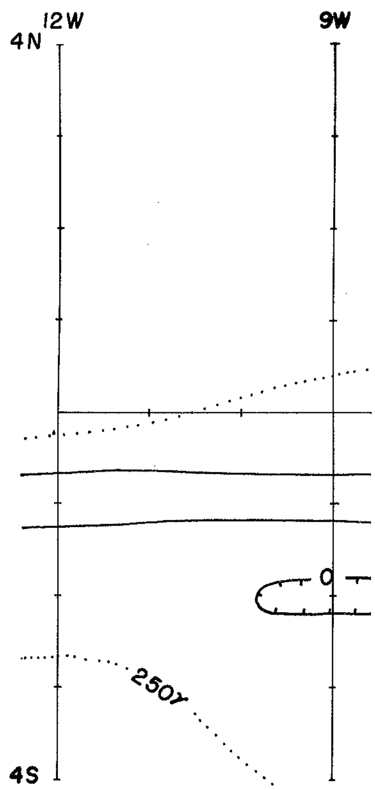
Sediment samples, taken within the grid, yielded disappointingly low metal values. Of the three samples containing anomalous concentrations, two were from sites immediately below the beaver bog; the other is at 0 + 10.6N (Plate 6).

Prospect #7: Scammon Ridge Grid

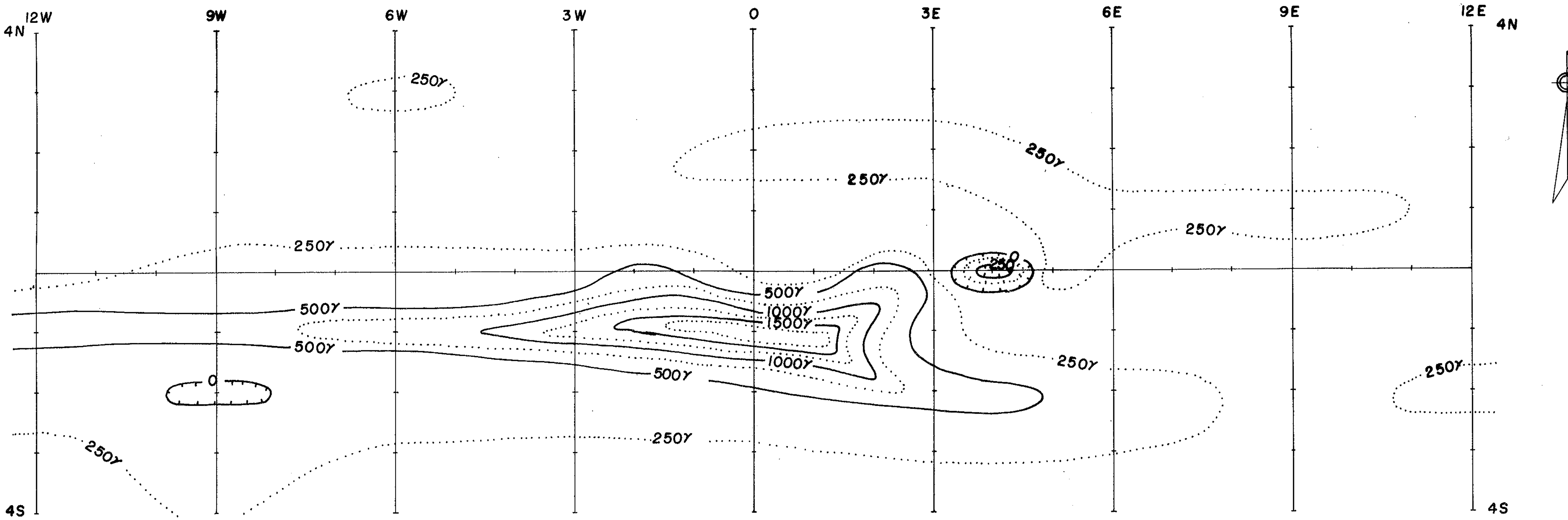
Location: Greenville, Greenville 15' Quad.
Piscataquis County

Comments: Although the local drainage basin tested by Sewall sample #1834 contained only threshold value in total heavy metals, it was reported that the Cu: total HM ratio was anomalously high. This being the first copper "anomaly" then known in the area, it was decided to run at least one reconnaissance geophysical traverse. The initial traverse, originated ten feet north of the road and five feet west of the creek; it was oriented N. 10^{o} E. and extended 4,000 feet, crossing the crest of Scammon Ridge. Topographic relief encountered on the line is about 500 feet. Positive magnetic and S-P results on the reconnaissance line led to the establishing of a small detail grid.

Geology: Outcrops are abundant along the traverse and the crest of Scammon Ridge. All of the exposures examined were clastic metasediments, non-carbonates. Impure, fine-grained quartzites and metasiltstones predominate, but quartz-biotite schist exposures are common. Thin quartz veins, barren of sulfides, are abundant. Of especial interest are highly oxidized ("rusty") quartzite outcrops along the crest of the ridge; these are spatially related to significant magnetic and potential variations.



12W
9W
4N
4S
0
250γ



C. I. = 250γ
DATUM: ARBITRARY

MAGNETIC SURVEY, SCAMMON RIDGE
PISCATAQUIS CO.

0 100' 200'

PLATE 7

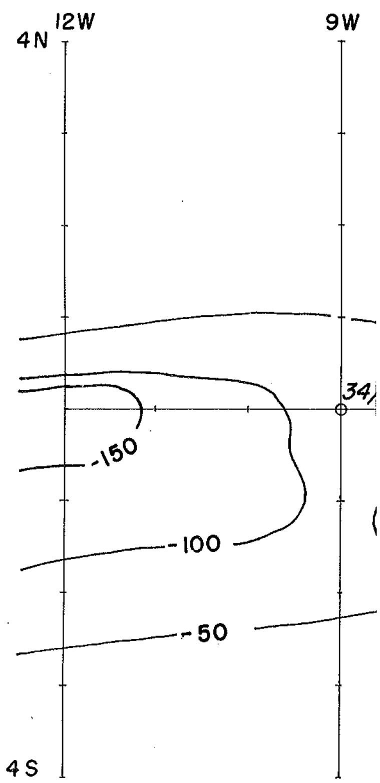
Geophysical Surveys: The original reconnaissance traverse was surveyed with magnetometer and S-P unit. The discovery of a 1,000 gamma magnetic anomaly with -150 millivolt potential confirmation at Sta. 34-36 led to the layout of a detail grid of 45 acres area. This grid was also covered with magnetometer and S-P unit; both surveys confirmed the initial discovery and defined anomalies of significant proportions (Plates 7 and 8).

The magnetic zone, with relief of more than 2,000 gamma, appears generally regular and parallels the strike of the bedrock. It peaks slightly south of the principal potential trough of -250 millivolts. The persistance of the -200 millivolt belt indicates that it is associated with a specific stratigraphic zone.

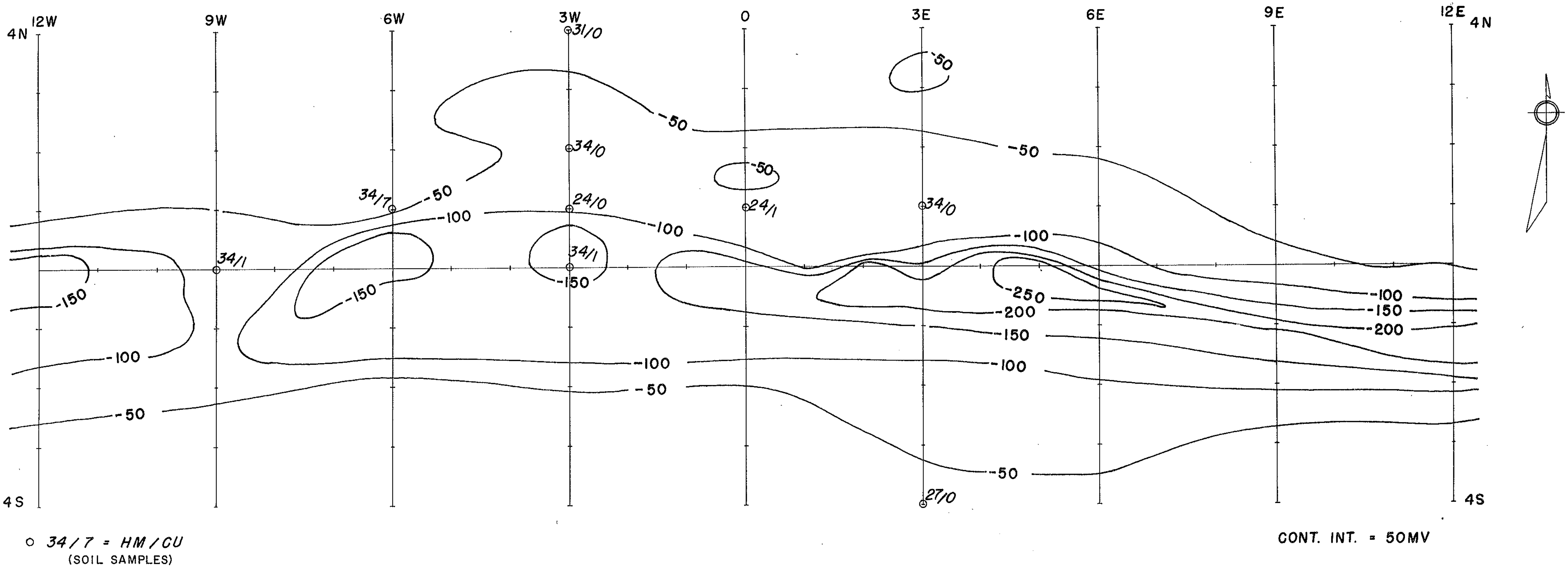
The entire grid was traversed with reconnaissance type EM (VLEM) equipment; no conducting zones were detected.

Further geophysical evaluation, east and west along strike, is definitely in order.

Geochemical Survey: Both the grid area and the stream basin on the south side of Scammon Ridge were closely investigated geochemically. Soil samples were collected, in the "B" horizon with auger, from all established grid stations; all samples were analyzed for cxHM and cxCU. Only one sample contained interesting copper values (6W + 1N). A number of scattered samples show significant heavy metal values; the location of each anomalous sample, with actual value, is shown on Plate 8 in relation to the S-P anomalies. It should be pointed out that the anomalous soil samples are generally concentrated 100 feet north of the baseline, between traverse lines 3E and 6W, and may also be related to a specific stratigraphic zone.



o 34/7 = HM/CU
(SOIL SAMPLES)



SELF-POTENTIAL SURVEY, SCAMMON RIDGE

PISCATAQUIS CO.

0 100' 200'

PLATE 8

The principal stream draining the south side of Scammon Ridge in this local area was sampled in considerable detail by sediments collected at approximately one hundred foot intervals. Although there is a considerable range of values, seven of the nine samples collected in the lower 1,000-foot stretch of the stream contained heavy metals in anomalous concentrations (greater than 30 ppm cxHM). Beginning at a point about 250 feet north of Wilson Pond Road, seven composite samples were taken at 100-foot intervals to the base of the first set of falls in the main stream. The values of these samples are presented below in tabular form.

Table 3.

Number	Location	Value, HM/Cu
SR-1	250' North of road	41/0
SR-2	+100'	54/2
SR-3	+200'	17/0
SR-4	+300'	17/0
SR-5	+400'	37/2
SR-6	+500'	54/0
SR-7	+600'	51/1
SR-8	approximately 400' upstream from SR-8	61/1; 31/2
SR-9	tributary stream at Sta. 9 on recon. traverse	37/2
SR-10	small stream at Sta.24 on recon. traverse	34/0

The persistence of anomalous values in the stream sediments, and their magnitude, indicate the necessity of additional investigation in this vicinity.

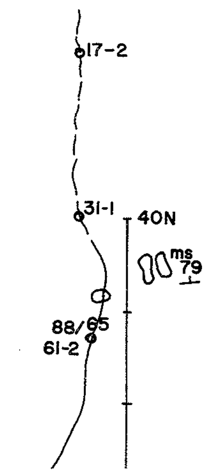
Prospect #8: Barren Mountain Traverses

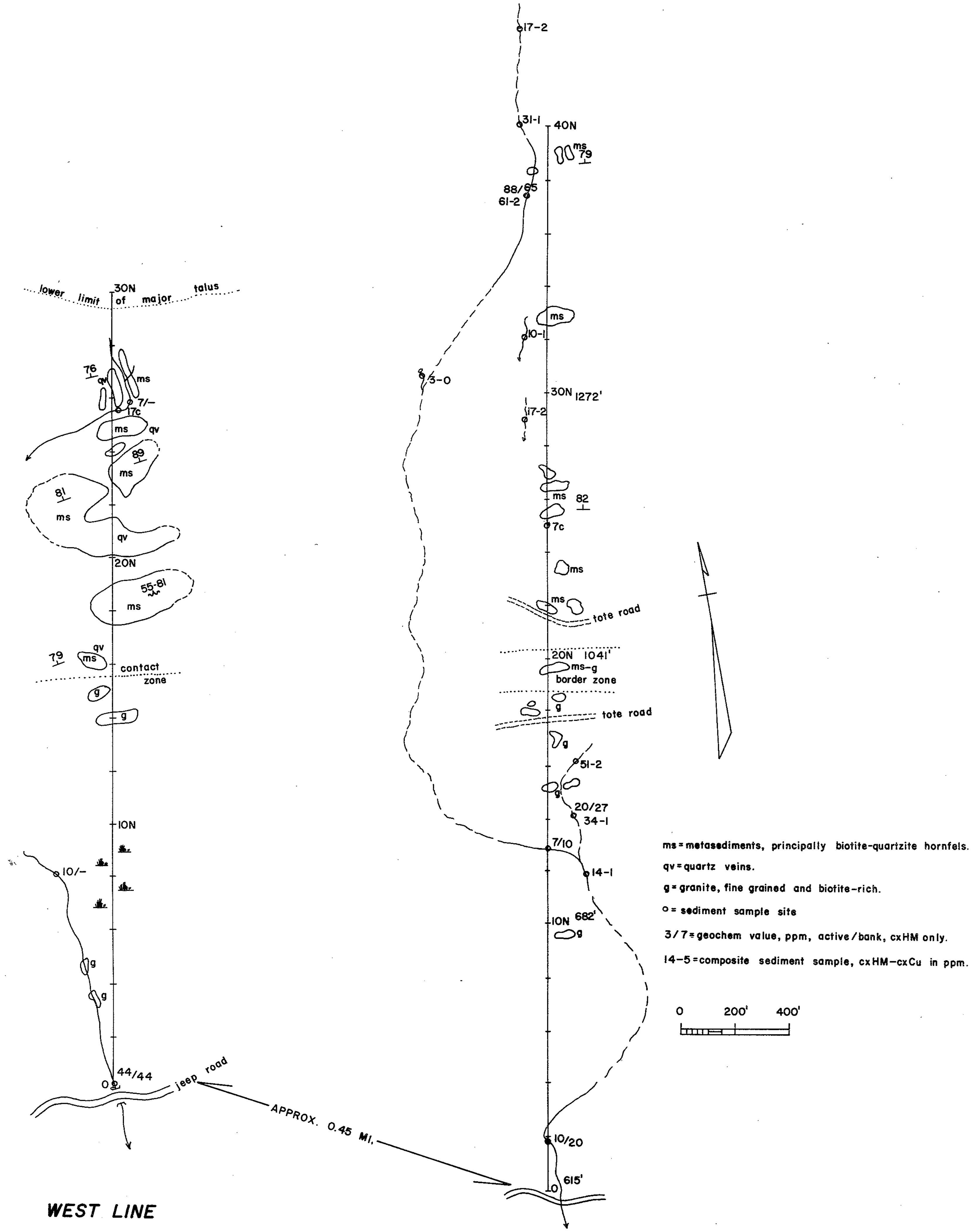
Location: Elliottsville, Sebec Lake 15' Quad.
Piscataquis County

Comments: The regional geochemical reconnaissance delineated three, low-value anomalies in restricted basins draining the south slope of Barren Mountain. The repetition and uniformity of values, in addition to the fact that the basins cut the granite/sediment contact zone, dictated the necessity of geological-geophysical evaluation.

The western and central anomalies were selected for investigation; traverse lines, originating at the jeep road, were cut N. 10° E. for slope distances of 3,000 and 4,000 feet respectively. Bedrock outcrops in close proximity to cut lines were mapped and sediment samples were collected at a number of sites on both lines (Plate 9). The granite contact was encountered about midway of both lines, thus providing maximum information. The granite is a fine-grained, gray, biotite type, displaying a definite border effect (diminution of grain size). Host rocks are metasediments, all some variety of hornfels, but principally biotite-corderite(?). Foliation trend in the metamorphics is relatively constant, whereas the dip is variable in direction and amount. Thin quartz veins are common in the metasediment exposures on the western traverse. No sulfides were observed in outcrop.

Sediment samples from at least one site on each line displayed very high total heavy metal values. Particularly interesting are the sites at Sta. 0.25N on the west line and Sta. 37.5N on the east line (Plate 9), although both are obviously spatially limited.


17-2
31-1
40N
ms
79
88/65
61-2



BARREN MTN. PROSPECT

ELLIOTTSVILLE TWP.

GEOLOGY-GEOPHYSICS-GEOCHEM VALUES

PLATE 9

Both traverses were surveyed with S-P unit and magnetometer, without encouraging results. A minor S-P deflection occurs on both lines in the vicinity of the contact, but no economic emphasis is attached to this fact. A high noise level evident in S-P readings on the entire east line and the northern portion of the west is due to extremely poor electrode contact conditions. The geologic contact can be seen, magnetically, on the east line, but is not perceptible on the magnetic profile measured on the west traverse.

Prospect #9: White Brook Anomaly

Location: T7R10, First Roach Pond 15' Quad.
Piscataquis County

Comments: Approximately 2,000 feet of the west branch of White Brook, T7R10, were explored in some detail through geochemical analysis of stream sediment samples. Because of relatively low heavy metal values (cx) and absence of outcropping rocks, no geophysical surveys were attempted.

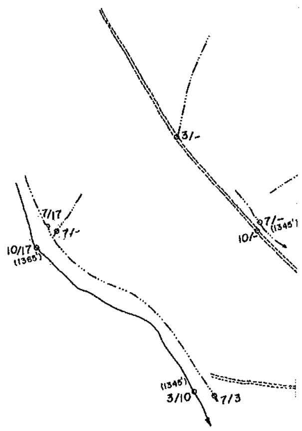
Prospect #10: Hay Brook Grid

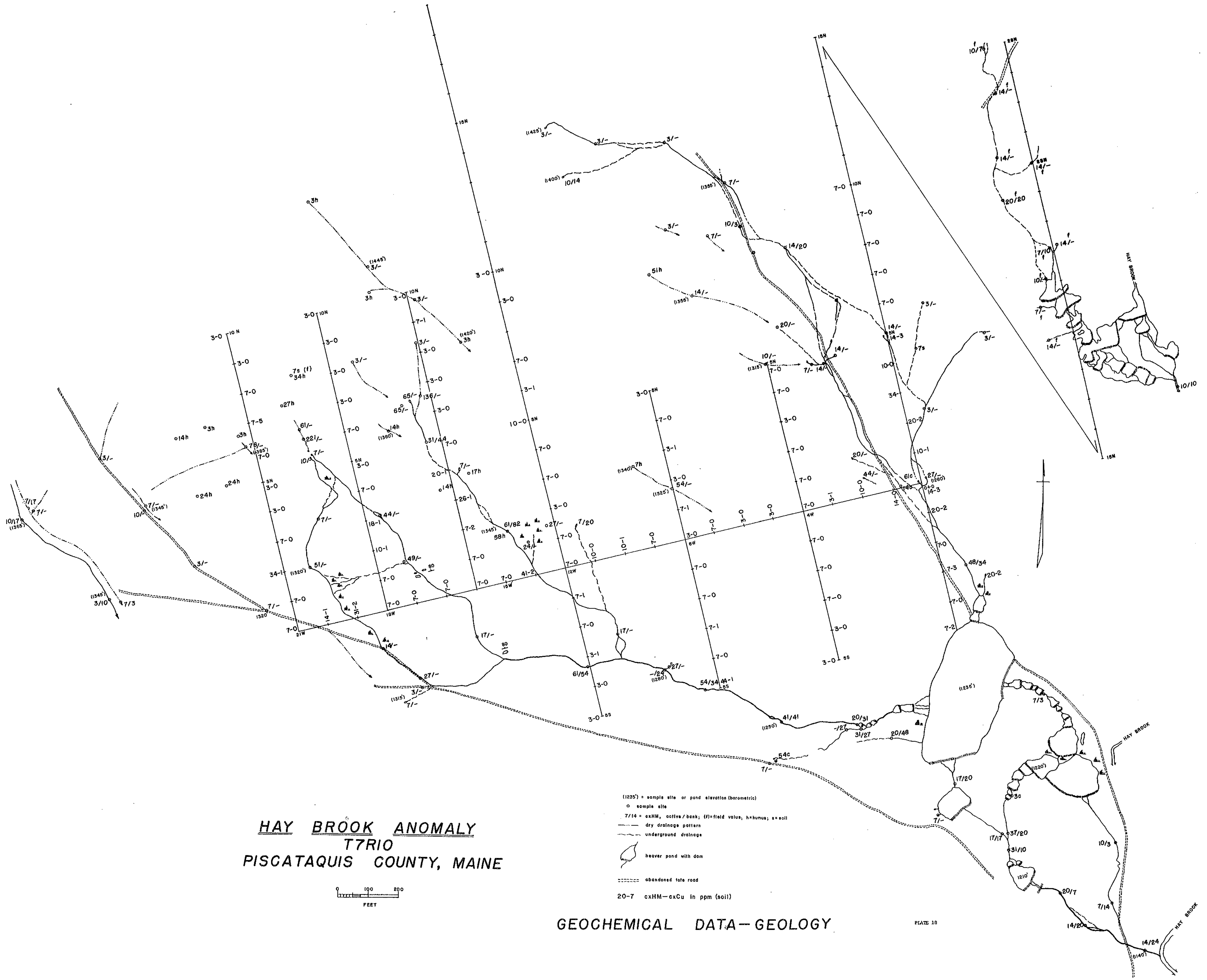
Location: T7R10, First Roach Pond 15' Quad.
Piscataquis County

Comments: Discovery of the Hay Brook anomaly is another testimonial to the effectiveness of the type of regional geochemical survey on which the current evaluation program was based.

A single sample site, at elevation 1,140' on Hay Brook, with a marginal anomalous value of 14/24 (cxHM, A/B) was reported. Because of the unusual nature of the subject drainage basin, broad, low-relief, numerous beaver workings, and heavy glacial cover, an attempt was made to establish a target for geophysical evaluation. As a result of this further reconnaissance, it became obvious that the parent geochemical anomaly was both relatively large and high-value. For location purposes, as well as geophysical control, the prospect grid as shown on Plate 10 was laid out. From the map it will be evident that considerable effort was made to define specific drainage relations, but it is certain that these efforts were not completely successful. Nearly all of the grid is covered by glacial debris of unknown depth and the numerous small streams may disappear for hundreds of feet from place to place.

The heart of the geochemical anomaly appears to be near the west-central part of the grid, where sediment values of 50 ppm (cxHM) are common and samples from two stations gave heavy metal values of more than 100 ppm. The belt of high values, apparently cut off on the west, trends easterly across the grid to the area around 0 + 0, where unusually high metal contents (up to 60 ppm) were observed. This particular anomaly is cut off up-drainage, to the north.


3/-
7/-
(1345')
10/-
7/17
7/-
10/17
(1365')
(1345')
3/10
7/3



GEOCHEMICAL DATA—GEOLOGY

PLATE 10

Another fact which is readily discernible from the map is the near absence of outcrop in this area. The only exposures known are those at 14.6W + 2.25S and 16.65W + 0.90N. Lithologies observed are crinkled black slate and interbedded fine-grained, gray metasiltstones. Sulfides are absent.

The initial grid area was surveyed by magnetometer, S-P unit and horizontal-coil EM unit; the results of all surveys were negative. Grid line "0" was extended to 40N and 12W to 45N and these were also covered by all geophysical instruments, also without positive data.

In 1964, attempts were made to further refine the geochemical anomaly as it was known from the 1963 investigation, described above. Two additional grid lines were established (15W, 21W), the baseline extended 2,500 feet east and west, and soil samples collected from the entire grid. Data obtained through the additional work were generally negative. First, no potential or magnetic anomalies were detected on the added grid lines. Second, although a number of drainage systems were intersected with the baseline extensions, sediment samples from these yielded background concentrations of both copper and total heavy metals. Third, none of the soil samples, except those obviously affected by the present stream distribution, have metal concentrations of significance (Plate 10).

All of the facts now available suggest, strongly, that the mineralized zone from which the heavy metals originated lies <u>outside</u> the present grid area (topography indicates drainage into this area from the north and northwest). This hypothesis is weakened, however, by the

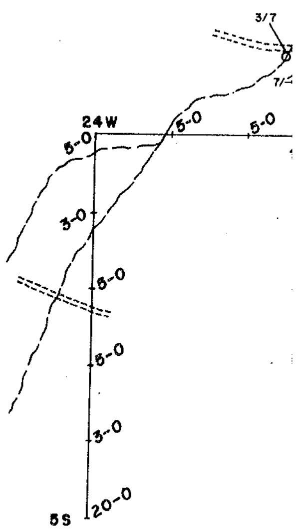
very low metal content of sediment in the two high-discharge springs which issue forth near 19W + 5.5N in the grid area. Sediments in the drainage from these two springs become high in metal values only after the spring water has mingled with local surface drainage. Even with this evidence, however the very low heavy metal content of the soil shows that the metallic ions extracted from the numerous sediment samples in the anomaly range are not indigenous to the grid area.

It appears, then, that the geochemical anomaly stems from a mineralized zone lying outside the present grid limits, probably to the northwest. Further, the parent mineralized zone is likely to be high zinc-low copper in composition. The surrounding terrain should be investigated, geologically and geochemically, in all possible detail. Any additional anomalies discovered should receive complete geophysical coverage.

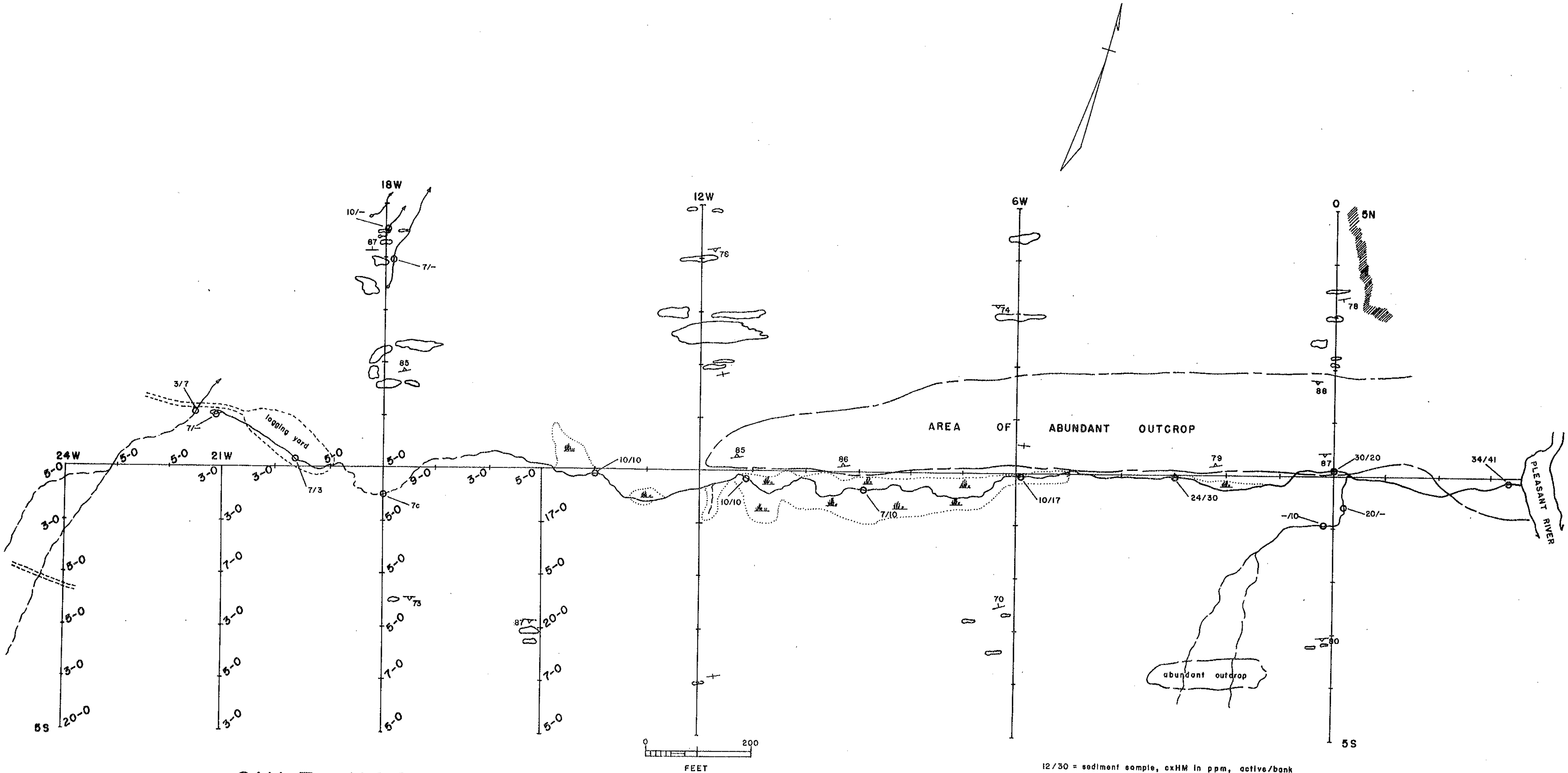
Prospect #11: Gulf Hagas Grid

Location: T7R10, Sebec Lake 15' Quad.
Piscataquis County

Introduction: The Gulf Hagas anomaly, as well as that on Hay Brook, has many puzzling aspects. The specific area was chosen for study because of a relatively high value stream sediment sample (34/41; 31/54) at the mouth of a small, unnamed brook (Plate 11). The original grid of 1,800' x 1,000' (slope distances) was designed to cover the local drainage basin and, thus, permit pin-pointing the heavy metal source.



PIS



GULF HAGAS GRID

T7 R10

PISCATAQUIS COUNTY, MAINE

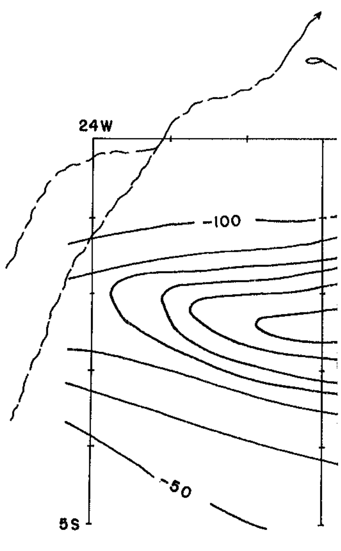
CULTURE – GEOLOGY – GEOCHEMICAL VALUES

PLATE 11

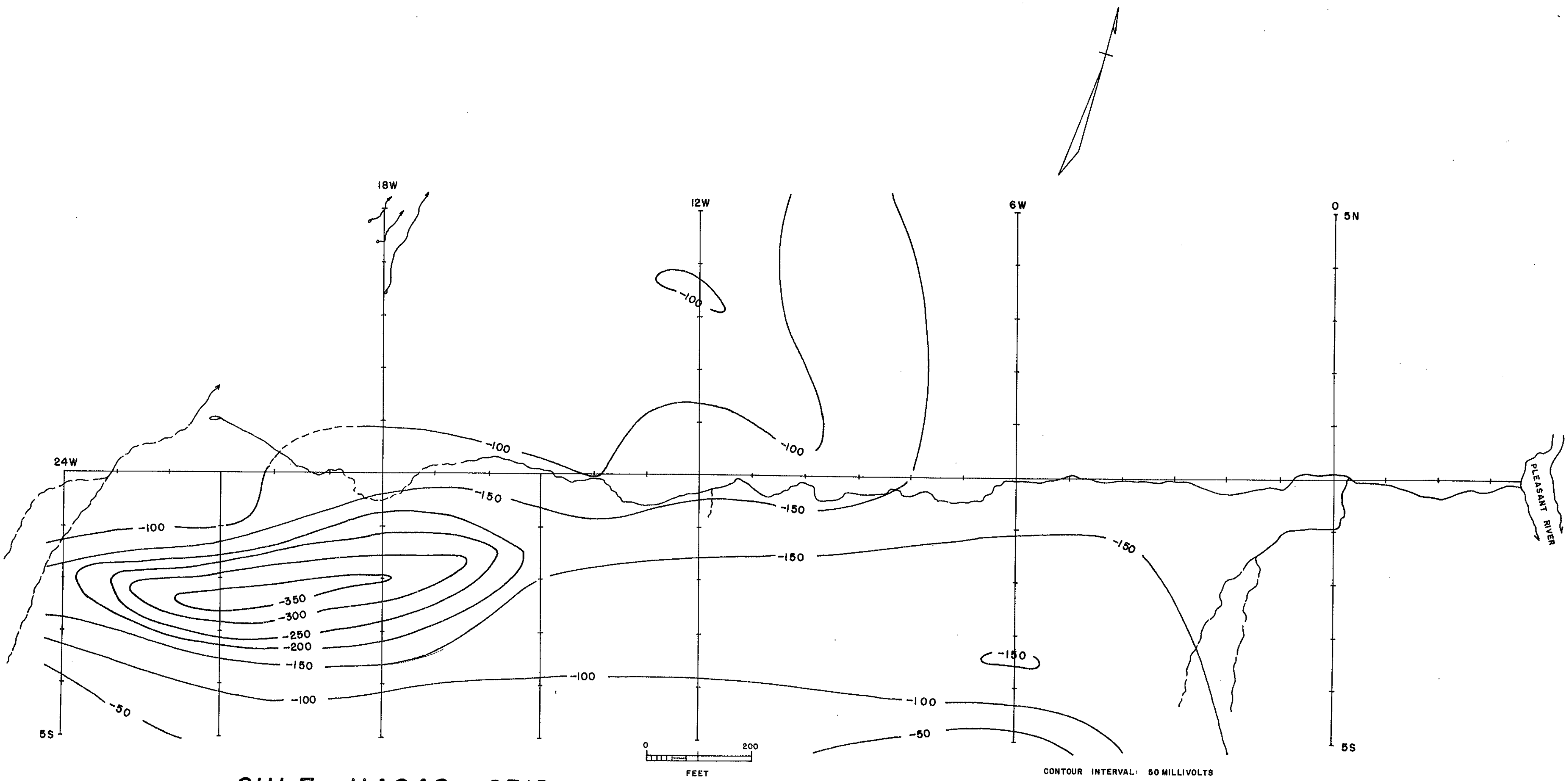
Sediment samples were collected from close intervals along the main stream and adjacent drainages; geochemical data are shown on Plate 11. The grid area was surveyed to detect significant magnetic and/or natural potential variations, and the grid was then adjusted to cover the area of a S-P anomaly.

Geology: Bedrock exposures are particularly abundant along the ridge of the north half of the grid, but are scarce in the southwestern part of the grid (Plate 11). All of the outcrops examined were dark gray to black slate with sparse, interbedded gray metasiltstones. Bedding and cleavage trends are nearly constant; dips are variable but always steep. Quartz veins are scattered through many of the outcrops; these appear to be barren of sulfides. Well developed, clear quartz crystals are abundant in veins exposed in bedrock around Sta. 2E + 0 on the grid.

Geophysical Surveys: Magnetic relief on all traverse lines is completely negligible, thus indicating underlying rocks of uniform lithology. On the other hand, natural potential relief is locally high and the S-P survey was successful in locating and delineating a moderate spontaneous polarization anomaly (Plate 12). High value readings were first mapped on the south end of Line 18W; Lines 15W, 21W and 24W were then cut to refine the potential zone. As now known, the S-P anomaly is approximately 800 feet long and up to 200 feet wide. The cause of this sharp, local potential variation is not known; there is only one small outcrop in the anomaly area and it provides no obvious clue. Due to high local topographic relief, no EM surveys were attempted.



PISCA



CONTOUR INTERVAL: 50 MILLIVOLTS
DATUM: LOCAL

GULF HAGAS GRID
T7R10
PISCATAQUIS COUNTY, MAINE

SELF-POTENTIAL SURVEY

PLATE 12

Geochemical Survey: Geochemical data were disappointing in that they apparently do not specifically locate the soluble heavy metal source. Decrease in heavy metal content appears to be linear up-drainage, as though the metallic contribution was low but equal from all three sides of the basin, thus making the high values in the lower reaches a "mass contribution". Soil samples were taken on grid stations over the S-P anomaly and analyzed for cxHM and cxCu (Plate 11). No anomalous values are present in this area. A more detailed analysis of this area, including adjacent drainages, should be completed.

Prospect #12: Chairback Mountain Anomaly

Location: T7R9; T7R10, Sebec Lake 15' Quad.
Piscataquis County

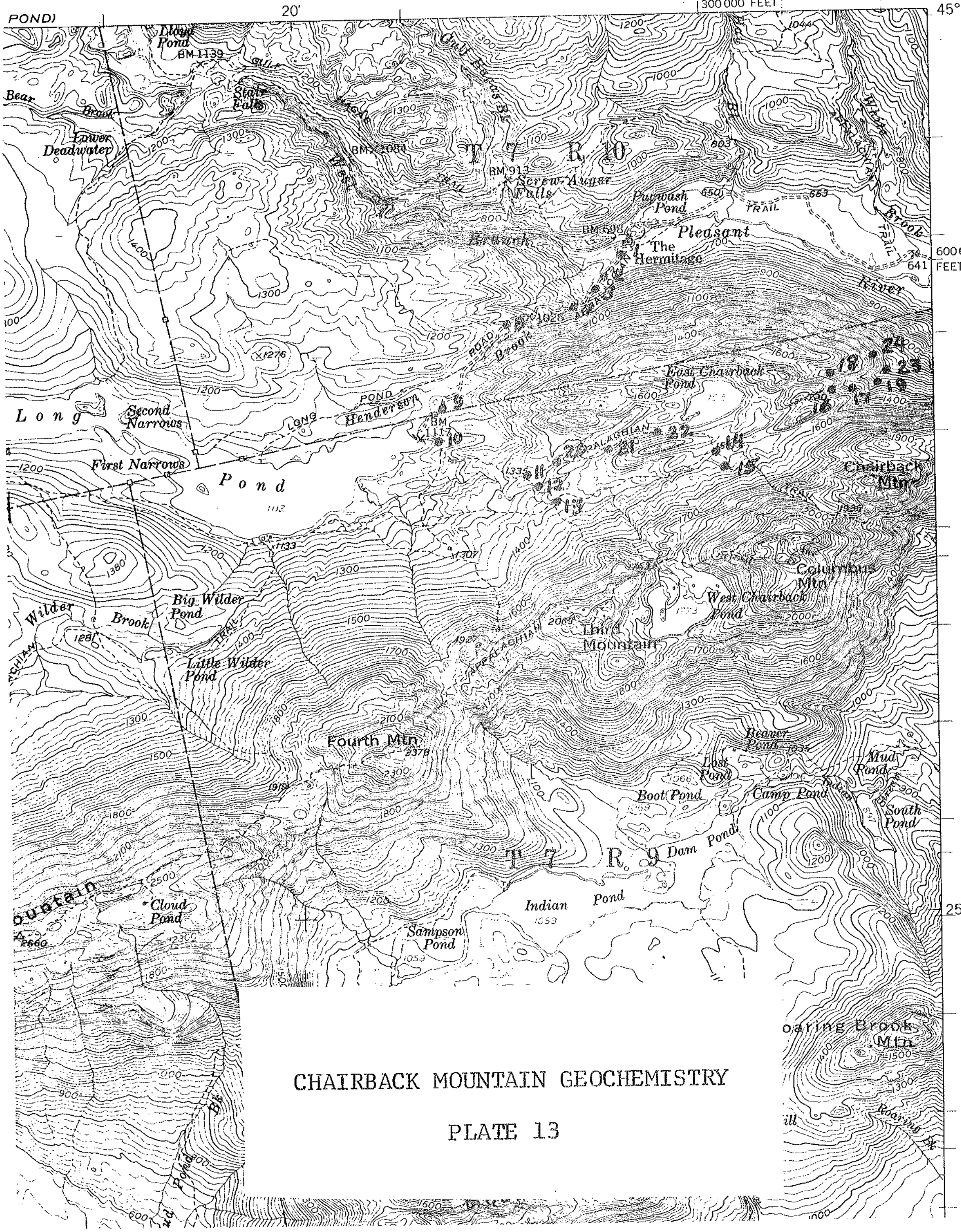
The proximity of the Chairback Mountain structure, evident on both topographic maps and aerial photographs* , to the Hay Brook and Gulf Hagas geochemical anomalies and the Katahdin Iron Works sulfide mass make it a logical exploration target. In this light, the general area was covered by one Afmag traverse (Hermitage-Long Pond trail) and the East Chairback Pond lineament was evaluated in reconnaissance through sediment samples.

The Afmag survey indicates the absence of large, nearby conducting masses, but several of the sediment sites yielded samples with interesting heavy metal values; some of the samples were relatively high in copper.

* Photos MFS-40-5,6,7

SEBEC LAKE QUADRANGLE
MAINE-PISCATAQUIS CO.
15 MINUTE SERIES (TOPOGRAPHIC)

MAINE
COMMISSION



CHAIRBACK MOUNTAIN GEOCHEMISTRY

PLATE 13

Plate 13 shows the location of the sample sites; geochemical values are given below.

Table 4.

Sample No.	Description	cxHM-cxCu, ppm
#1.	Henderson Brk., 200' above river, composite	7 - 0
#2.	dry brk. on Long Pond trail, elev. 720', composite	10 - 0
#3.	small drainage at elev. 760', composite	7 - 0
#4.	dry drainage at elev.815', Long Pond Trail	7 - 0
#5.	dry drainage at elev. 820', Long Pond Trail	7 - 0
#6.	good brook at elev. 820', Long Pond Trail	7 - 0
#7.	Henderson Brook where trail crosses at elev. 840'	17 - 0
#8.	marshy area above BM 1026 on Long Pond Trail	7 - 0
#9.	small tributary to Long Pond, elev. 1120'	7 - 3
#10.	200 yards from camps on Chairback Mtn. trail	10 - 5
#11.	small brook at trail jct., Appa. Trail at 1335'	7 - 2
#12.	East Chairback Pond outlet at trail crossing, bank sample	10 - 0
#13.	West Chairback Pond outlet at 1370', bank sample	7 - 0
#14.	bank sample at elev. 1519' on Appa. Trail	10 - 0
#15.	outlet to small, un-named pond	10 - 0
#16.	elev. 1480', dry drainage, northeast end of mountain	7 - 0
#17.	small drainage, joins #16 drainage from SW,1410'	27 - 3
#18	bank sample from large brook draining ENE	31 - 2
#19	small tributary from southwest, 1270', bank	10 - 1

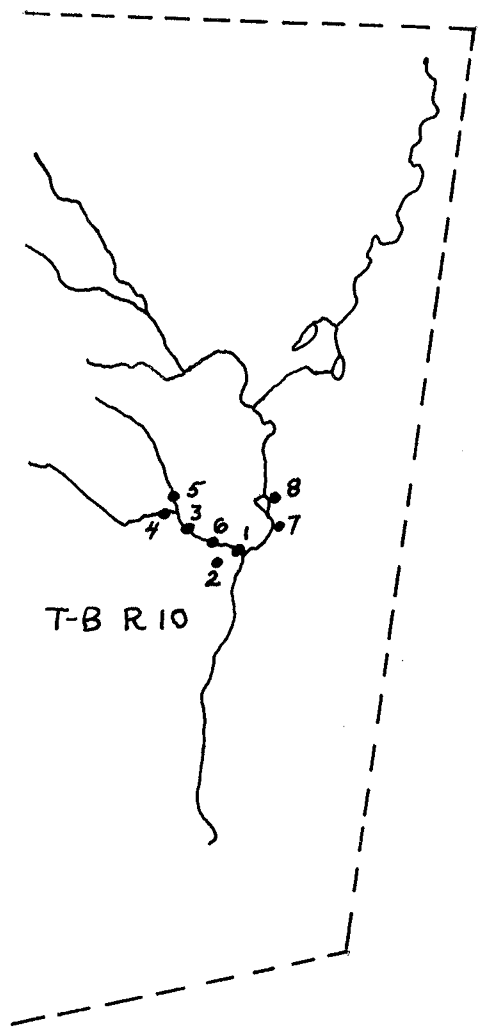
Sample No.	Description	cxHM-cxCu, ppm
#20.	outlet to small pond, 0.35 mi. west of East Chairback Pond, at Appa. Trail crossing	7 - 0
#21.	East Chairback Pond outlet, 1440'	17 - 1
#22.	East Chairback Pond outlet, 1510', Appa. Trail crossing	10 - 0
#23.	spring seep 300' down-drainage from #19	20 - 0
#24.	small brook in gully immediately north of #18 brook	31 - 0
#25.	same brook as #24 sample at logging road, elev. 775' (Sebec Quad.)	7 - 0

The concentration of cxHM values in the 17, 18, 23, and 24 suite indicate that this local area should be accorded further attention.

Prospect #13: Wangan Brook Anomaly

Location: T-BR10, Norcross 15' Quad.
Piscataquis County

The Wangan Brook Anomaly was located through the regional stream sediment survey; two samples (#2384; #2386) from the first tributary above the Deadwater contained heavy metal values above background (12-20 ppm; 20-32 ppm) and another (#2387) contained copper in the range 1.25-3.00 ppm. The local area was re-sampled (in 1964) by sediments from eight locations (figure 2). Sample #1 provided the



WANGAN BROOK GEOCHEMICAL LOCATIONS

Figure 2

1 inch equals 1 mile

sole interesting analysis (31 HM - 1 Cu). Examination of exposed bedrock in the drainage basin failed to provide a clue to the origin of the heavy metal values.

No geophysical surveys were attempted in this area.

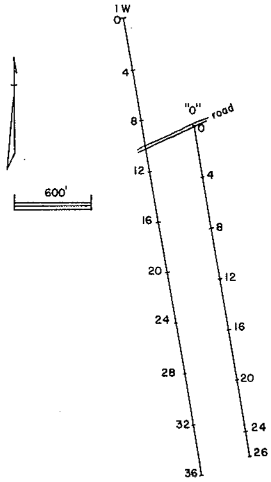
Table 5.

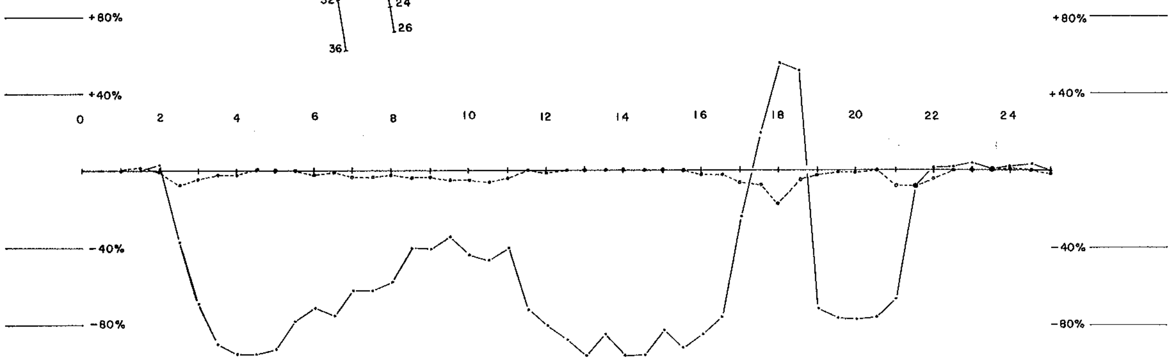
Sample No.	cxHM - cxCu
WB - 1	31 - 1
WB - 2	10 - 1
WB - 3	20 - 1
WB - 4	7 - 0
WB - 5	7 - 0
WB - 6	10 - 0
WB - 7	10 - 1
WB - 8	7 - 0

Prospect #14: Katahdin Iron Works

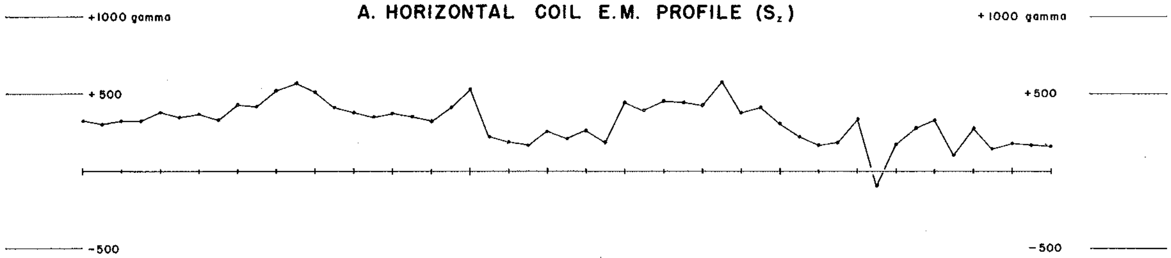
Location: T6R9, Sebec 15' Quad.
Piscataquis County

Comments: It would be most misleading to represent the data taken at K. I. as being in the same category as the other "prospects". It is a well-known fact that this immediate area is the property of a major mineral-producing company, and should probably not be considered in "available" status. The geophysical data presented on Plates 14 and 15 are intended only as furtherance of the knowledge of such orebodies, in the light of their geophysical response. For geologic interpretation, Miller (1945) should be consulted.



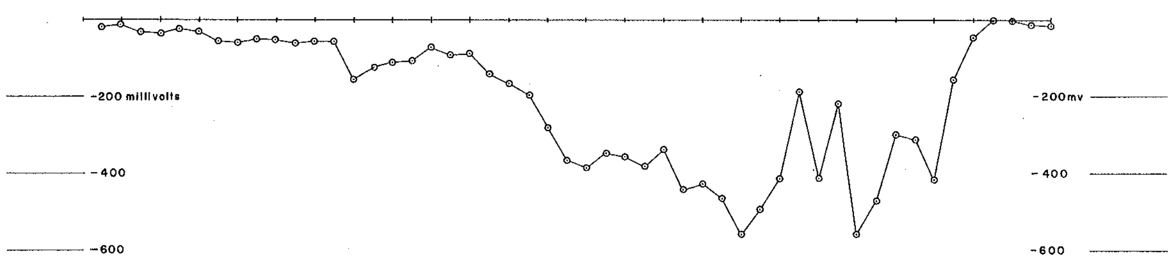


A. HORIZONTAL COIL E.M. PROFILE (S_z)



B. MAGNETIC PROFILE, VERTICAL FORCE (Z)

ARBITRARY DATUM



C. SELF-POTENTIAL PROFILE

LOCAL DATUM

0 200' 400'

KATAHDIN IRON WORKS

T6R9

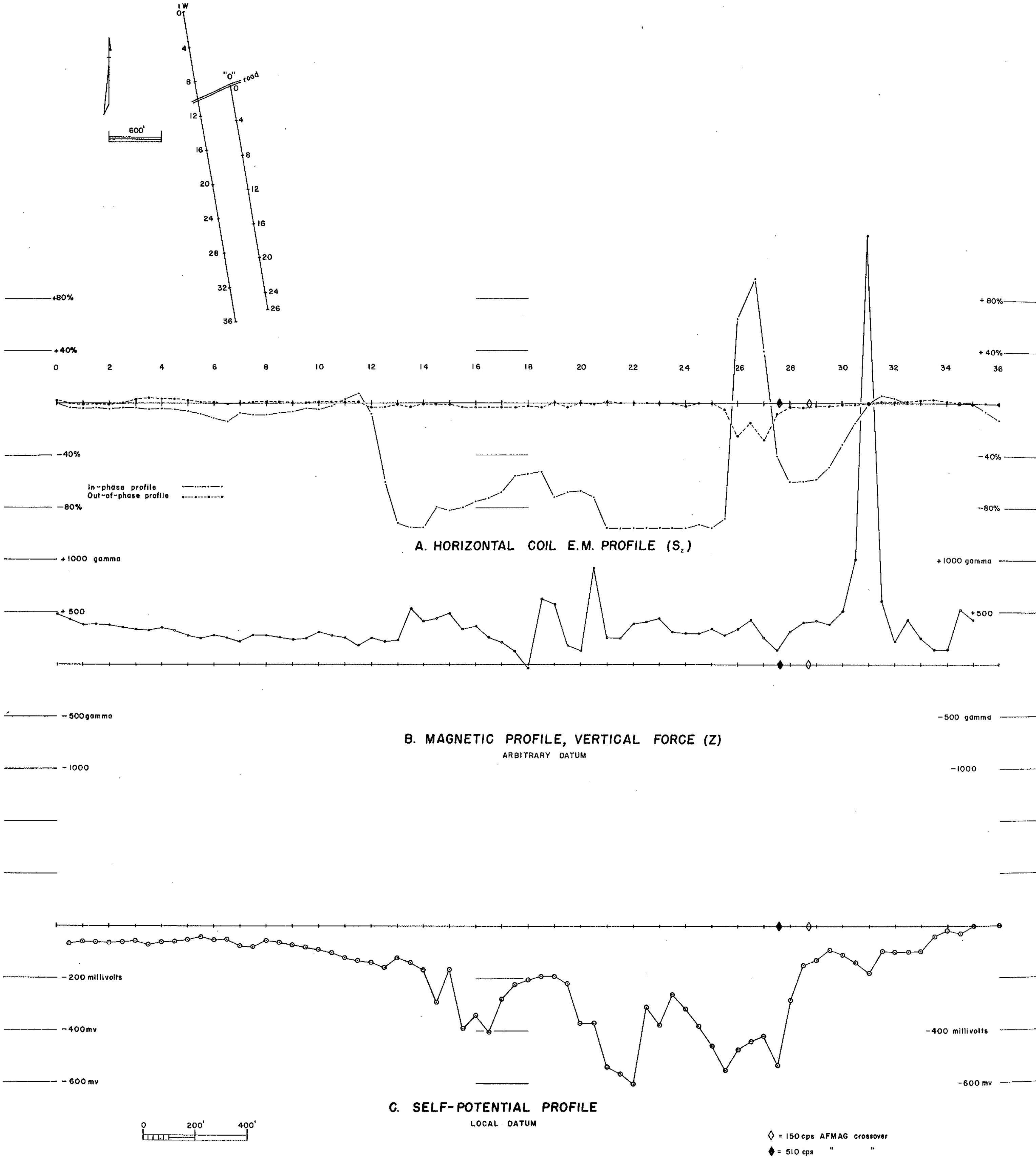
PISCATAQUIS CO., ME.

GEOPHYSICAL DATA, GRID LINE "O"

PLATE 14

One of the obvious reasons behind the U. S. Geological Survey aeromagnetic evaluation of K. I. and environs was the express anticipation of locating similar occurrences. It was pointed out that dip needle surveys indicated that the pyrrhotite body probably would not constitute a recognizable anomaly, but that the high-susceptibility, enclosing gabbro might. The airborne magnetometer survey (Balsley and Kaiser, 1954) seemingly supported this conclusion. However, the ultimate target will remain sulfides, and the presence of gabbro does not guarantee sulfide accumulations. Thus, it appears that magnetic data supported by conductivity measurements would constitute the ideal prospecting procedure. With this aim, an attempt was made to obtain ground-level information on relative conductivity; for direct comparison, measurements were also made on spontaneous potential and variations in vertical magnetic intensity. All of the data, in comparative profile form, are presented on Plates 14 and 15. Two traverse lines, oriented N. 10° W., and separated by approximately 400 feet, were laid out to transect the pyrrhotite body as outlined on GP 116. As well as could be determined, trend of the sulfide mass is about N. 55° E., consequently the profiles do not represent true cross-sections.

Magnetic Survey: Contrary to statements in the text of G 116, the pyrrhotite body does present a recognizable magnetic response, low-value but identifiable. Of course, interpretation of magnetic data is greatly enhanced by either conductivity or electrochemical information. The magnetic expression of the pyrrhotite body is masked by more spectacular magnetic poles in the wall rock, exemplified by the 4,000 gamma anomaly



KATAHDIN IRON WORKS

T6R9

PISCATAQUIS CO., ME.

GEOPHYSICAL DATA, GRID LINE IW

PLATE 15

at 1W + 31. The smaller anomaly between stations 18 and 21 on Line 1W may well be related to a basic rock wedge in the pyrrhotite zone.

Self-potential Survey: As would be expected of a sulfide body of the size and composition of that at K. I., the S-P survey was eminently successful in outlining the body and contributing to an understanding of its make-up. The potential relief is quite high, about 600 millivolts on both lines, with maximum departures coinciding with areas of maximum conductivity; S-P data also suggest the presence of a zone of relatively lower sulfide content near the northern border of the sulfide mass.

Horizontal-coil EM Survey: The profile depicting relative conductivity is certainly most definitive of the three. The walls of the body are clearly defined, indicating an overall width of not less than 1,600 feet, and compositional variations within the mass are perceptible. There is a broad belt, of about 400 feet centered at 0 + 9 and 1W + 18, in which the total sulfide content is considerably less (total of 15-20%) than enclosing zones. This suggests a gabbro "wedge", in the pyrrhotite body, the length of which is not less than 400 feet. The southern half of the sulfide body is, fundamentally, a perfect conductor. On Plate 15, in-phase values of more than 95% are plotted as 95%, thus necessarily providing a misleading curve. Actually, the "perfect" conductor, as seen on Line 1W, is not less than 400 feet wide (Sta. 21-25) and slightly less on Line "0".

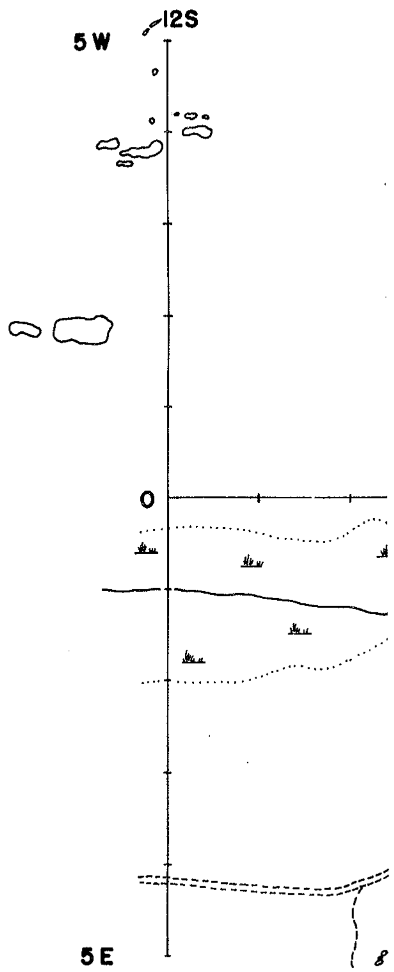
Afmag Survey: A standard, dual frequency Afmag unit was read at 300-foot intervals along Line 1W. High dip-angle reversals were recorded on both frequencies (150-510 cps) near the extreme southern edge of the mineralized area, thus corroborating the other geophysical data. The K. I. pyrrhotite occurrence should be included as part of a series of semi-regional Afmag traverses in order to define the limits of its natural EM effects (area of detectibility).

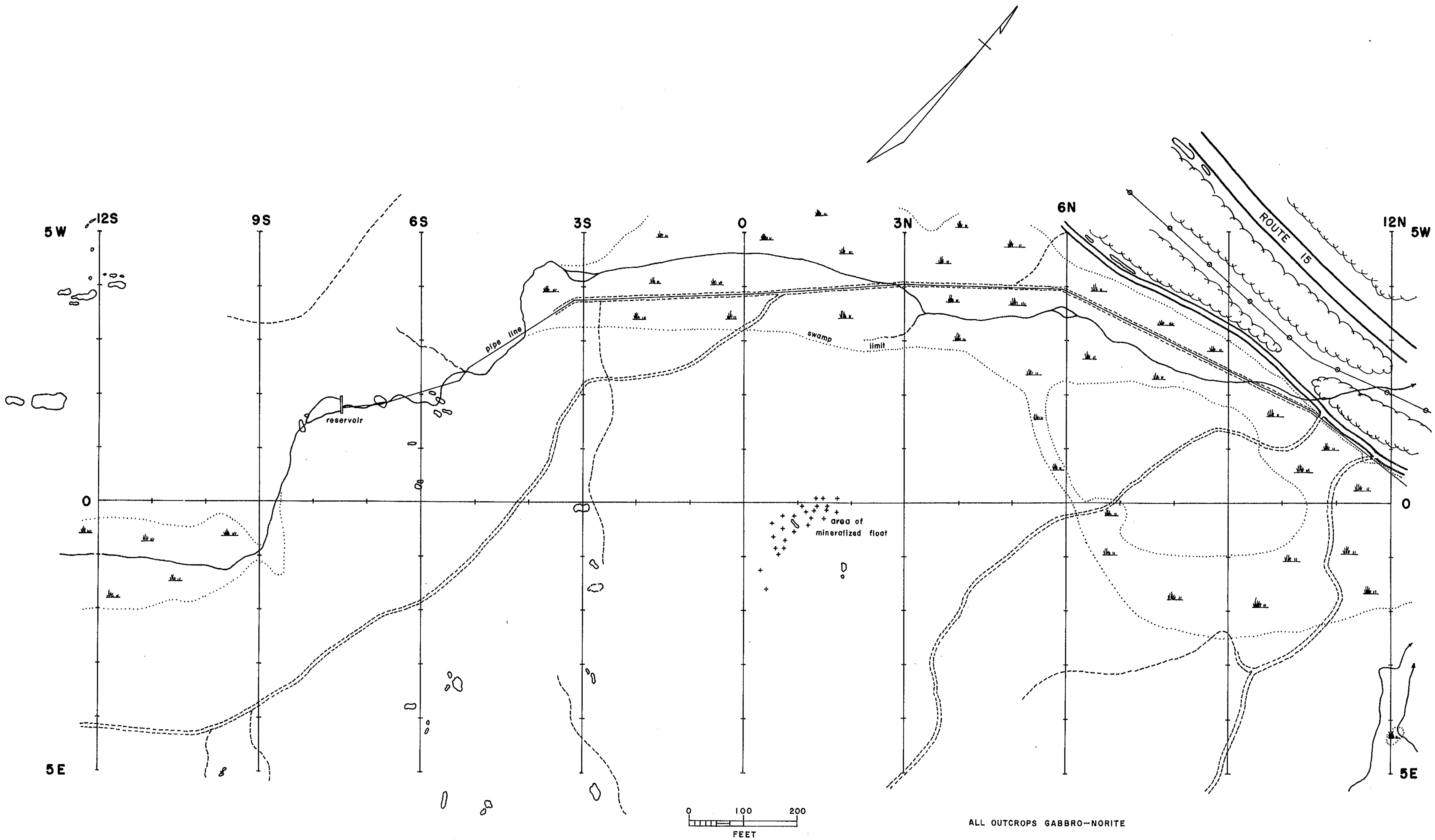
Prospect #15: Little Squaw Mountain Prospect

Location: T3R5, Greenville 15' Quad.
Piscataquis County

Introduction: Credit for the discovery of this, and the following, prospect must go to Donald E. Wyke, geologist for Roland F. Beers, Inc., who was then completing geophysical examination of the eastern contact of the Moxie-Moosehead Lake gabbro body. At that time, the writer was privileged to examine polished sections of "mineralized" float from Little Squaw Mountain. In that no effort was made to further evaluate or exploit either occurrence, both were included in the 1963 program of exploration. All data presented in this report were taken in 1963.

No attempt is made to present the geologic setting of these mineral occurrences although it must be considered vital in any analysis involving origin. Theses by Bowen (1957) and Vishner (1957) provide excellent petrographic descriptions, and the geology of the Greenville 15'


12S
5 W
0
5 E
8



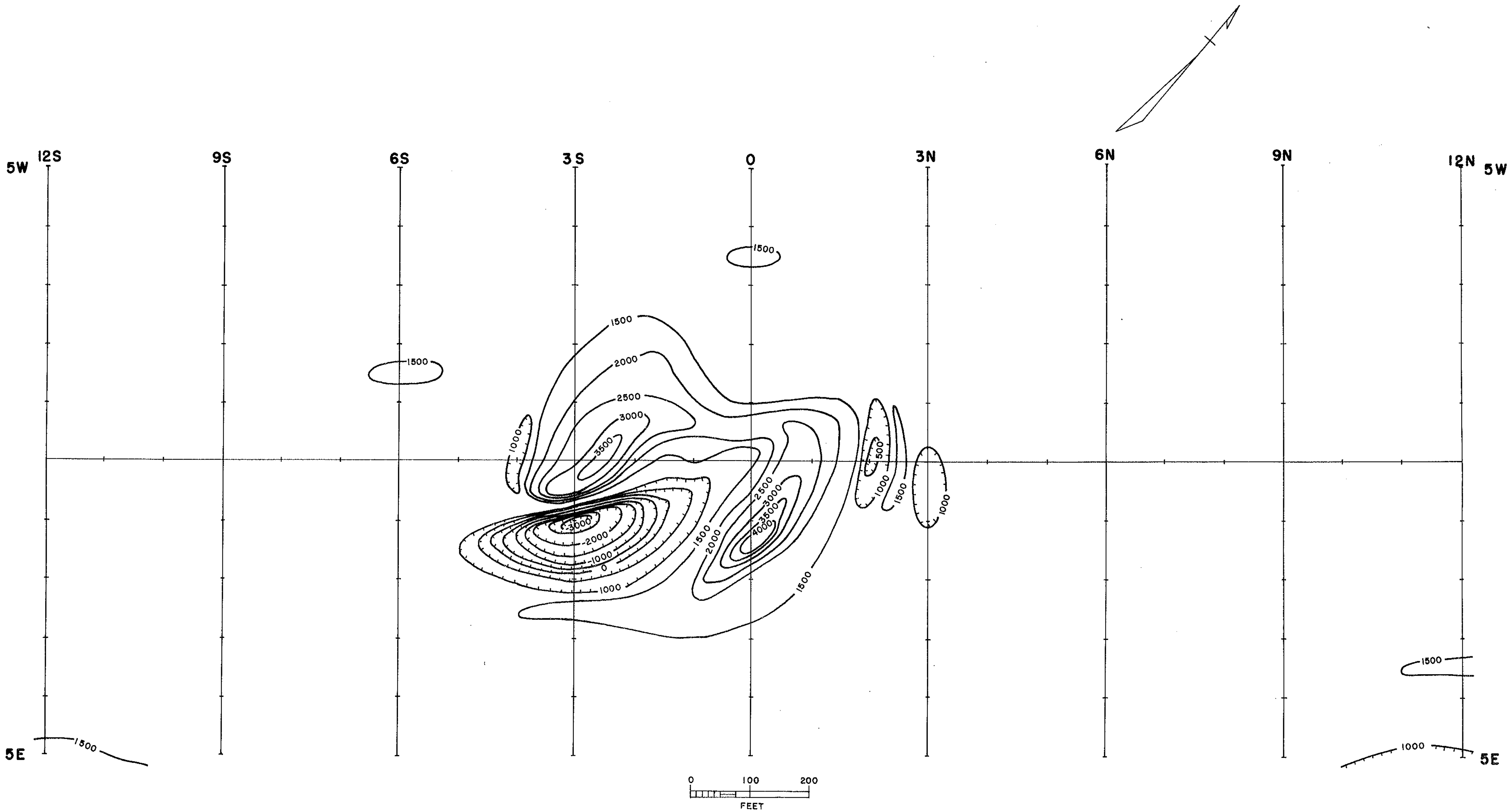
LITTLE SQUAW GRID: CULTURE-GEOLOGY

PLATE 16

quadrangle was recently published (Espenshade and Boudette, 1964). The overall aspects of this major igneous body may be seen on the northern Maine Geologic compilation (Boucot et al, 1960) provided by the U. S. Geological Survey and available from the Maine Geological Survey. However, it must be pointed out that all of the mineralized zones now known to exist in the Moxie-Moosehead gabbro (Black Narrows, Pleasant Pond, Burnt Nubble, Big Squaw Pond, Little Squaw Mtn.) are concentrated along the eastern contact. Many inferences may be drawn from this fact; it is certainly a point of significance.

Local Geology: Although bedrock is exposed at only a few places (Plate 16), it is assumed that the entire grid is underlain by basic rock, identified from hand specimen as olivine-gabbro (or norite). The grain size is typically medium, grading to fine locally, and most exposures show distinct foliation. The coarser-grained gabbro areas almost invariably display clots or segregated zones of biotite. Many outcrops, exemplified by that at 3S +0, are highly oxidized and fractures may be coated by iron oxide. The more or less typical phase is readily seen on Rt. 15 at 8.5N + 6.25W.

The rocks around 1N + 0 (designated "area of mineralized float") are completely different from those surrounding. The rocks here are very massive, high specific gravity, medium- to coarse-grained, and composed almost exclusively of pyroxene and olivine. In hand specimens, the color is almost that of massive sphalerite. Opaque minerals are nearly completely absent. R. A. Bailey, of the U. S. Geological Survey, provided the following petrographic detail (personal communication, 3/20/64).



LITTLE SQUAW GRID

VARIATIONS IN VERTICAL MAGNETIC INTENSITY (Z)

Contour Interval: 500 gamma

Datum: local and arbitrary

PLATE 17

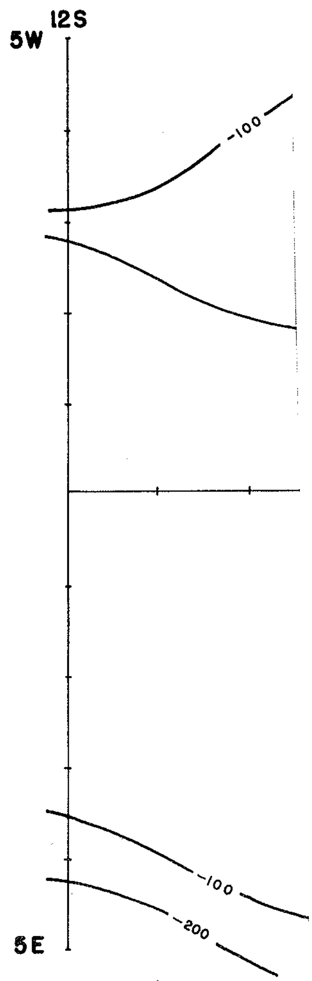
"The rock is an xenomorphic-granular dunite composed of olivine (~85%), Magnetite (~10%), and minor mica, amphibole, apatite, and zircon (~5%). The olivine is in grains up to 2 mm in diameter, has +2V of 75-85° (est.), and hence a composition between $Fo_{80}Fa_{20}$ and $Fo_{50}Fa_{50}$. It is quite fresh except for very minor alteration to serpentine along sparse, thin fractures that cut the rock.

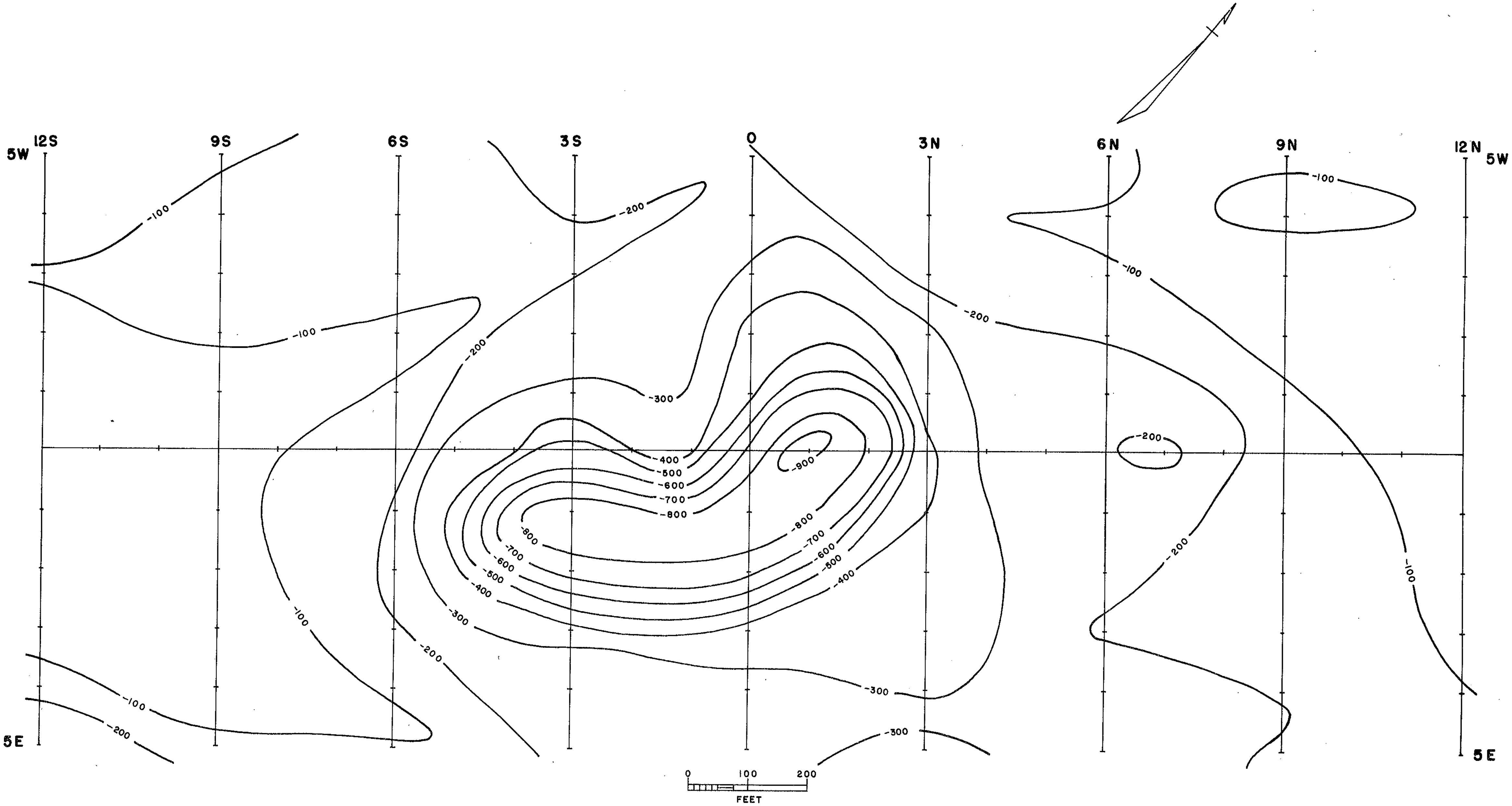
Small, subhedral, early generation (?) magnetite grains are enclosed in the olivine, but the bulk of the magnetite seems to be of late generation and occurs as discontinuous amoeboid-like masses replacing the olivine along grain boundaries.

The mica was initially phlogopite or biotite, but is now bleached pale brown to colorless and largely replaced by colorless amphibole. The amphibole also occurs in sheaf-like clusters and isolated blades that locally penetrate and replace olivine. A small amount of magnetite is intergrown with the amphibole.

Apatite is the most abundant accessory (~1%) and occurs as subhedral grains up to 0.5 mm long.

The rock appears to have consisted initially of olivine, with minor phlogopite, apatite, and magnetite, which during late-stage cooling was partially replaced along grain boundaries by magnetite. The amphibole is probably the product of later metamorphism, during which some of the magnetite was remobilized and intergrown with the amphibole. The small amount of serpentine is of still later generation as the fractures along which it is localized cut the amphibole as well as the other minerals."


12S
5W
-100
-100
-200
5E



LITTLE SQUAW GRID

VARIATIONS IN SPONTANEOUS POLARIZATION

CONTOUR INTERVAL: 100mv DATUM: local

PLATE 18

The contact between the gabbro and host metasediments is well exposed at 9S + 11.5E; here the country rock is very fine-grained, rusty, gray quartzite. This outcrop shows little, if any, contact effects.

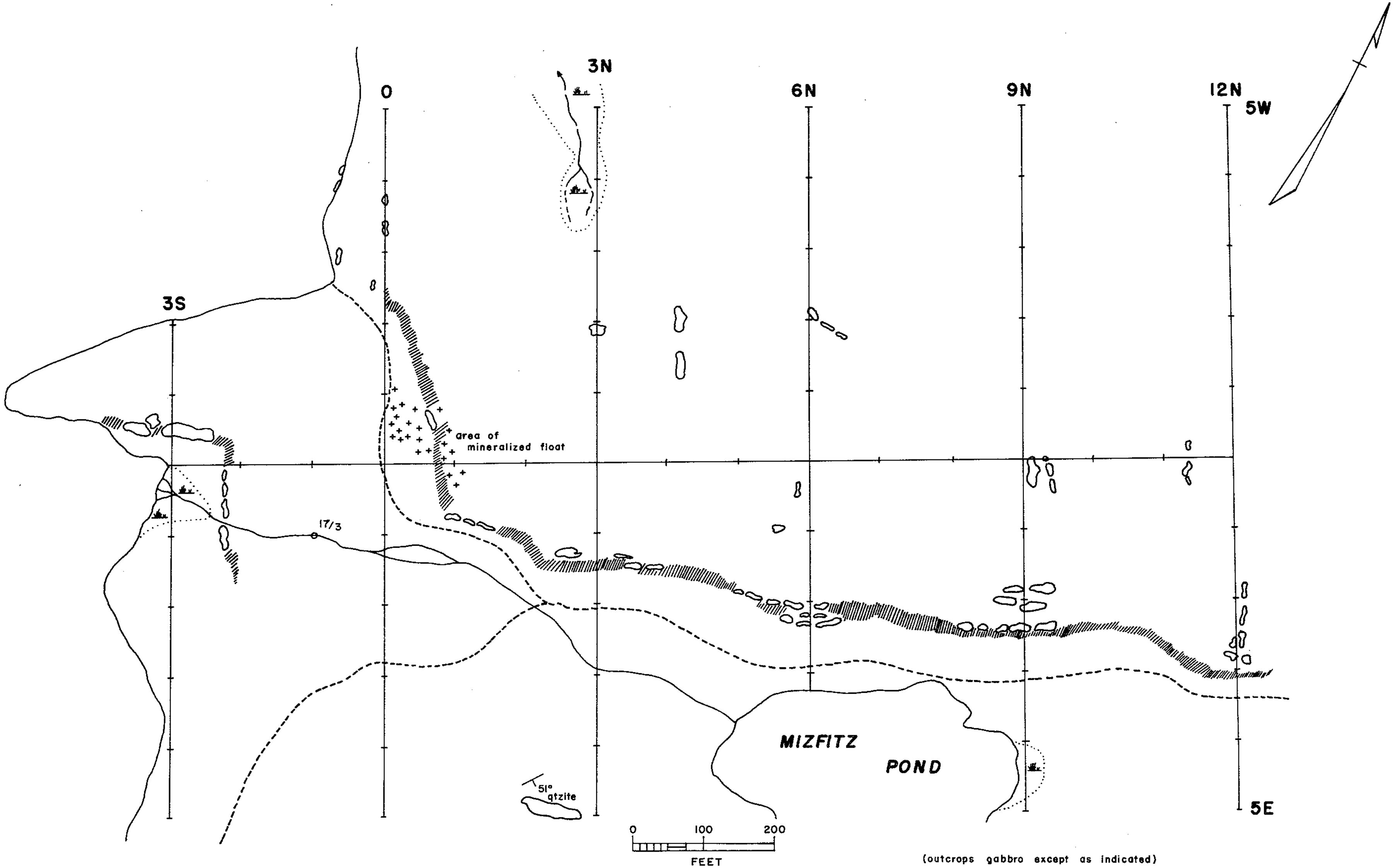
Geophysical Surveys: This grid, along with that at Big Squaw Pond, contains the most unusual geophysical anomaly encountered in the entire region, in degree of local deviation, shape and geological association.

The entire grid, covering about 55 acres, was mapped by magnetometer and self-potential apparatus, at 50-foot stations on traverses separated by 300 feet. Lines 3S, 6S and the baseline from 6S to 6N were tested for conductivity with HEM gear. The initial surveys produced spectacular anomalies, but no zones of conductivity were found.

The strongly dipolar magnetic anomaly has a total relief, within 300 feet, of slightly more than 7,000 gamma (Plate 17). The very local nature of the anomaly suggests a small, shallow source, but vertical gradient measurements would be required to make this a valid assumption.

The natural potential anomaly, arbitrarily defined by the -300 millivolt contour, is somewhat more extensive than the magnetic zone, but also very sharply marked (Plate 18). Local potential relief is a resounding 900 millivolts (compare with that at K. I.), and the major deflections conform with the 7,000 gamma dipole which lies slightly south of the baseline.

The S-P magnetic anomaly was traversed in two directions with a horizontal-coil EM unit. After correcting for topography, there were no anomalous readings, thus indicating that the previously defined anomaly is composed of non-conductive material.



BIG SQUAW POND GRID

CULTURE — GEOLOGY

T3 R5

PISCATAQUIS CO., ME.

PLATE 19

Comments: Stream sediment and shallow soil samples were tested for the usual array of cold-extractable heavy metals. All such samples analyzed were in the regional background range.

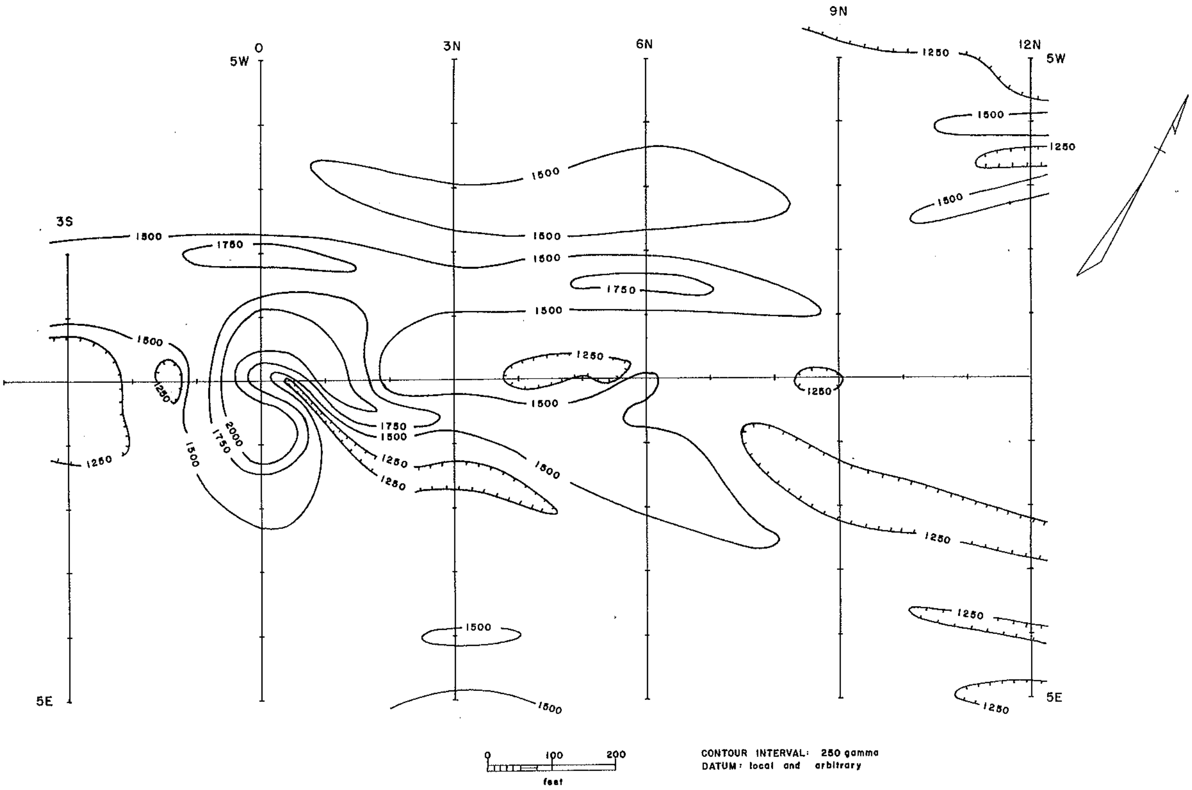
The major problem lies in the explanation of the extremely high-value potential variations. The mineral content of local rocks cannot account for the phenomenon (usually associated only with sulfides or graphite). A brief literature survey failed to locate references to a parallel situation. This occurrence, or anomaly, must be investigated further.

Prospect #16: Big Squaw Pond Grid

Location: T3R5, Greenville 15' Quad.
Piscataquis County

Comments: The geological and geophysical situation described for the Little Squaw Mountain grid might well be repeated for this prospect, with minor changes in detail. In the case of Big Squaw Pond, the "mineralized area", and thus the geophysical anomalies, is much closer to the gabbro-sediment contact, probably within 500 feet (Plate 19).

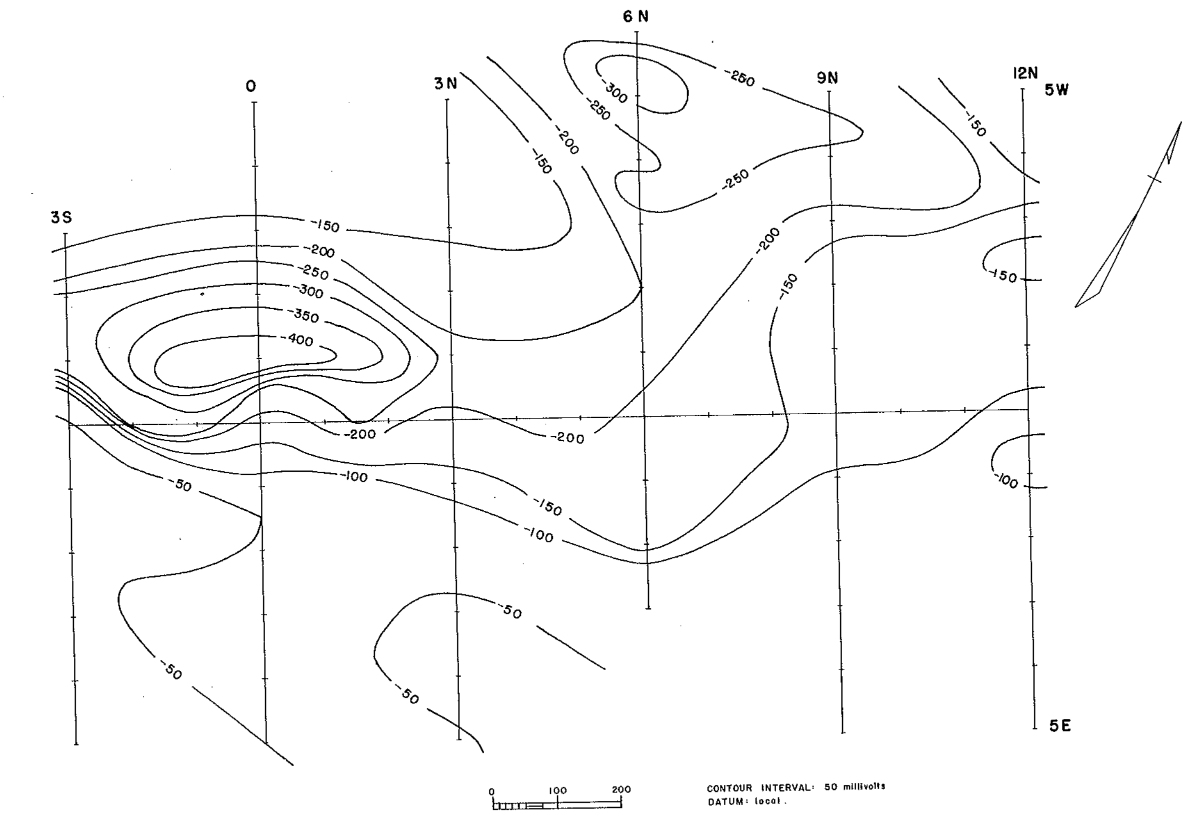
The Moxie gabbro, well-exposed over much of the grid, is medium- to coarse-grained, and contains a much larger proportion of biotite than the "normal" gabbro. Xenoliths of sediment in gabbro are well-exposed in the large outcrop at 3.5N + 1.5E; the included quartzite is heavily impregnated with secondary biotite. Contact effects, notably biotitization, are also quite evident in the quartzite outcrop at 2.5N + 5E.



BIG SQUAW POND GRID
VARIATIONS IN VERTICAL MAGNETIC INTENSITY (Z)

PLATE 20

T3R5
PISCATAQUIS CO., ME.



BIG SQUAW POND GRID
SELF POTENTIAL SURVEY

T3R5
PISCATAQUIS CO., ME.

PLATE 21

The rocks in the vicinity of the S-P and magnetic anomalies are somewhat different from the olivine-pyroxenite at Little Squaw Mountain, being more or less normal gabbro, but quite "rusty" and carrying significant proportions of opaques. The opaques are thought to be a complex intergrowth of magnetite-ilmenite-chromite(?), but this conclusion has not been verified through assays.

Both S-P and magnetic surveys produced well-defined anomalies, mutually confirming in nearly all respects. Relief on both anomalies is much lower than that at Little Squaw, only 1,000 gamma and 400 millivolts, but their configuration is somewhat more complex (Plates 20 and 21). There seems little doubt but that these anomalies are the result of magnetite-ilmenite-chromite(?) accumulations within the gabbro body.

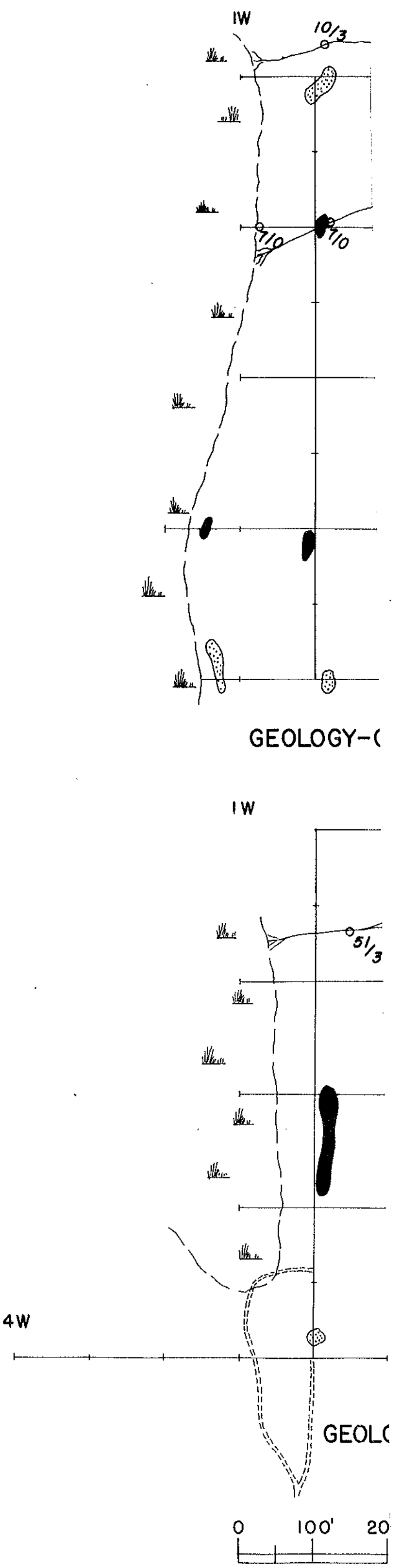
The anomalies at Big Squaw Pond and Little Squaw Mountain are most significant in that they indicate the potential of metallic deposits within the gabbro in an area where none were previously known. The eastern gabbro contact should be searched carefully in the area between Squaretown and Greenville to examine the possibility of economic deposits of iron, titanium, chromite, nickel, cobalt and copper. The search should be comprehensive, utilizing geochemical and geophysical methods as well as detailed geologic investigation.

Prospect #17: Moore's Bog Prospect

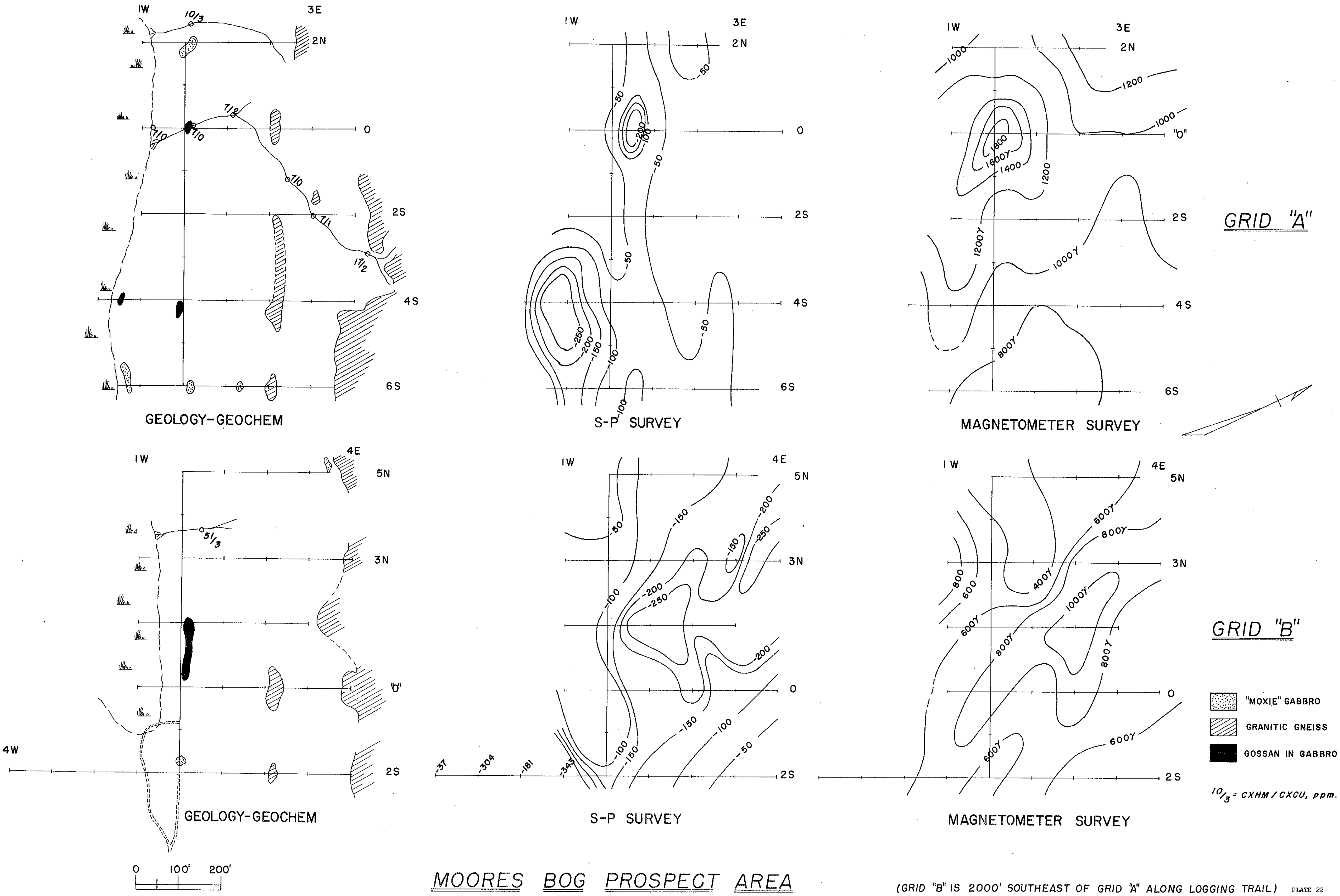
Location: Caratunk Twp., Bingham 15' Quad.
Somerset County

The presence of "gossan" in the swampy area south of Moore's Bog has been known for several years. The gossan crops out here in a series of low hummocks and is associated with larger areas of gabbro. Because of generally poor outcrop distribution, the precise physical relationship between the pyroxene-rich gossan and feldspar-rich gabbro cannot be determined. Despite the abundance of iron oxide ("limonite") in the gossan zones, the fresh pyroxenite has a very low sulfide content. It appears that the gossan may be derived from the iron-rich silicates rather than from sulfide breakdown. These basic rocks occur in a prominent northwest-trending linear (shear zone?), especially striking on aerial photographs, and may actually be satellite to the main Moxie-Moosehead gabbro mass. The prominent cliff making up the northeast wall of the valley here is held up by granite gneiss, pegmatite-bearing in places.

The local area around two gossan zones, about 2,000 feet apart, was covered by small grids, which were surveyed by magnetometer and S-P equipment. In both surveys, anomalies were mapped (see Plate 22), but the S-P method appears to have been the most definitive. Of especial interest is Grid "B" where (1) both S-P and magnetic data indicate a larger basic rock mass than is exposed, (2) the stream sediment yields a strongly anomalous HM content, and (3) S-P data on traverse line 2S indicate the presence of a previously unknown "mineralized" zone.



IW
10/3
7/10
7/10
GEOLOGY-(
IW
51/3
4W
GEOL(
0
100'
20



MOORES BOG PROSPECT AREA
SOMERSET CO., ME.

(GRID "B" IS 2000' SOUTHEAST OF GRID "A" ALONG LOGGING TRAIL)

PLATE 22

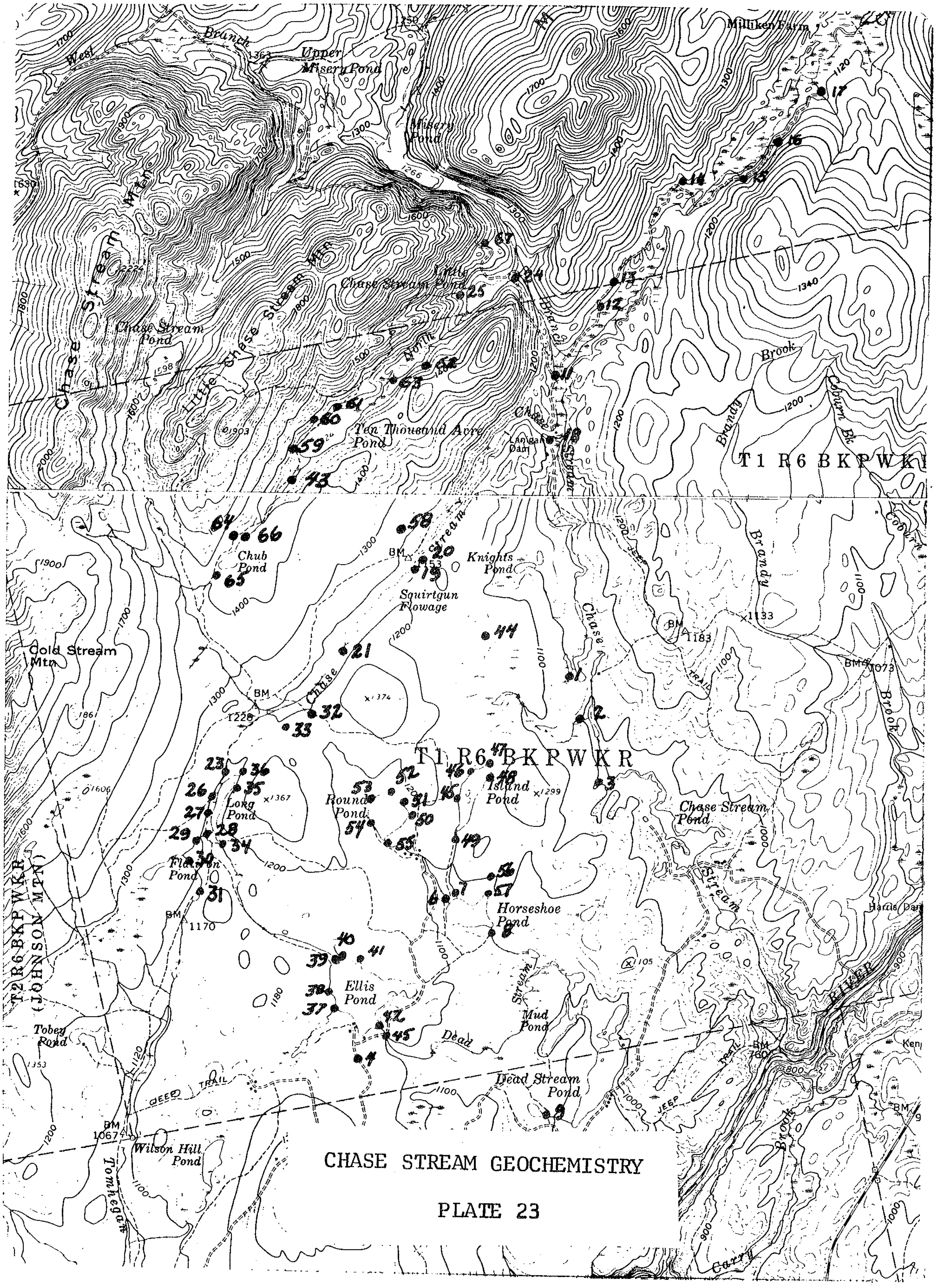
Because of the known association of nickel-cobalt-copper minerals with similar ultrabasic areas in the Moxie-Moosehead gabbro (Black Narrows, Burnt Nubble), the Moore's Bog-Robinson Pond trend should be thoroughly prospected.

Prospect #18: Chase Stream Area

Location: T1R6 (10,000 Acre Tract, Chase Stream Tract)
Somerset County

According to information made available to the Maine Geological Survey by Wm. L. Philbrick, Waterville, Maine, the 10,000 Acre and Chase Stream Tracts were the subject of an intensive exploration effort by the Scott Paper Company in the late 1950's. The results of the exploration program are not available for publication.

T1R6 is crossed by one of the most spectacular structural features of the entire region, referred to variously as the "Ordovician-Devonian Break", "Lanigan Lineament", or "Chase Stream-Churchill Stream Lineament". This feature, thought by some to represent a major shear, extends for at least twenty miles northeasterly across Somerset County. Fossiliferous Devonian sandstones outcrop northwest of the linear, whereas Ordovician(?) schists and slates make up the southeast wall. Many of the dark-colored schists and slates are pyritiferous and graphitic. The best exposure of mineralized rock known in the area is to be seen in the southeast bank of Chase Stream immediately down-stream



CHASE STREAM GEOCHEMISTRY

PLATE 23

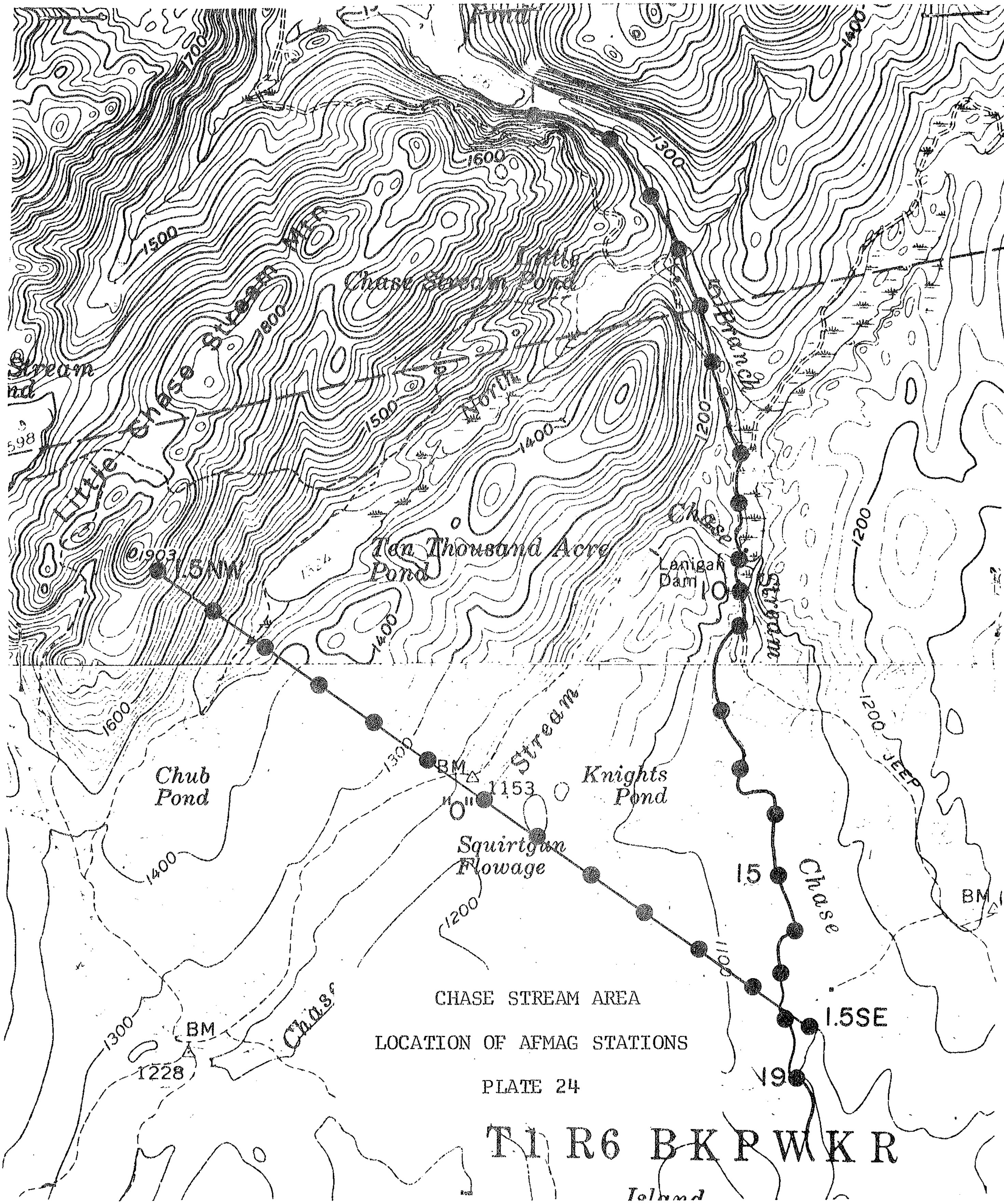
from the Squirtgun Dam Flowage. At this point, significant amounts of chalcopyrite and pyrite occur as disseminated grains in chloritic schist. It is reported that this local occurrence was tested through several drill holes.

In the 1964 M.G.S. evaluation, stream sediment samples were collected from more than 60 sites in the general area and two ground Afmag profiles were run to cross the structural break in the area of known sulfide occurrences. Both surveys indicate that areas of significant mineralization may be more widespread than previously known.

Plate 23 shown the location of the sediment sample sites in the Ellis Pond-Chase Stream area. Except as specifically indicated, the samples represent active and bank composites. Analytical data appear in the following table.

Table 6.

Sample No.	cxHM	cxCu
1	10	1
2	31	1
3	7	2
4	7	2
5	17	2
6	10	0
7	10	0
8	10	0
9	5	1
10	10	0
11	14	0
12	7	0
13	14	0
14	20	1
15	3	0
16	7	0
17	14	0
18 Active	34	3
Bank	85	6



CHASE STREAM AREA

LOCATION OF AFMAG STATIONS

PLATE 24

Sample No.	cxHM	cxCu
19 Active	34	4
Bank	10	1
20	139	10
21	48	2
22	7	0
23	48	0
24	10	1
25	48	1
26	14	0
27	31	0
28	17	0
29	7	1
30	7	0
31	10	0
32	7	1
33	14	1
34	14	0
35	119	1
36	14	0
37	20	1
38	10	0
39	5	0
40	14	1
41	10	0
42	20	0
43	14	0
44	17	1
45	10	0
46	7	0
47	7	0
48	7	0
49	10	0
50	31	2
51	10	1
52	7	0
53	7	0
54	10	0
55	10	0
56	5	0
57	20	1
58	10	1
59	10	1
60	10	2
61	24	2

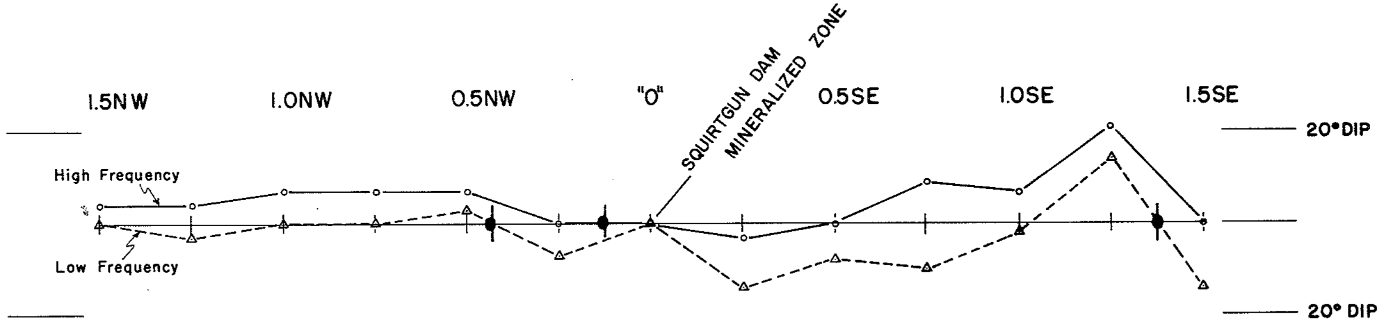
It was anticipated, of course, that samples from Site #19 would yield anomalous values; actually, the values obtained appear to be unusually low. The HM values at Site #18, 1.5 miles downstream, hold up quite well and suggest a contribution in addition to that at Squirtgun Dam. Certainly a surprising attribute of the geochemical data in this region is the high HM:Cu ratio, indicating a higher Zn content in mineralized zones than seen at the Squirtgun Dam outcrop.

In addition to much more detailed sampling along the lineament, presently available data indicate that the local Long Pond area should be thoroughly investigated. Round Pond and Little Chase Stream Pond are also valid anomaly areas.

One of the most important contributions to the Central Maine evaluations appears in Afmag data from the two local traverses run in this area. To test the extent, attitude and degree of sulfide concentration at the Squirtgun Dam occurrence, a 3-mile traverse, with stations at ¼-mile intervals, was laid out normal to the geologic trend and centered at the dam. Complete data for this traverse are presented below; dip angle data are profiled on Plate 25.

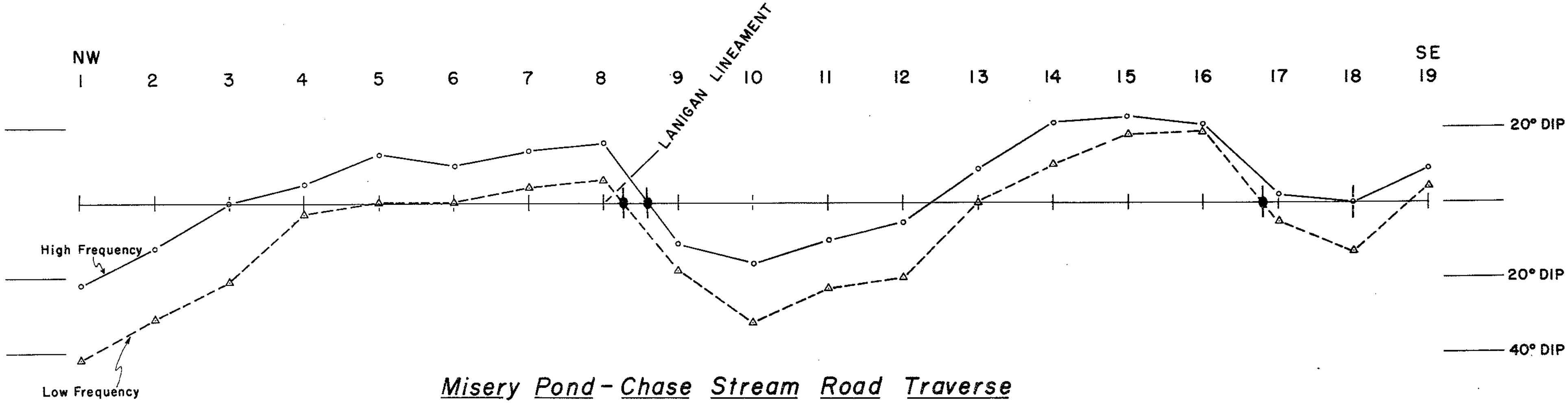
Table 7.

Station No.	Azimuth	Dip
1.50N.W.	LF:* N19E	0
	HF:* N20E	4°N
1.25NW	LF: N20E	3°S
	HF: N20E	4°N
1.00NW	LF: N10E	0
	HF: N15E	7°N
0.75NW	LF: N15E	0
	HF: N15E	7°N



Squirtgun Dam Traverse

TRAVERSE N.55°W.



Misery Pond - Chase Stream Road Traverse

TRAVERSE APPROX. N.11°W.

(= NORMAL CROSSOVER)

(ALL STATIONS AT 1320' INTERVALS)

AFMAG PROFILES, CHASE STREAM AREA SOMERSET CO.

PLATE 25

Station No.		Azimuth	Dip
0.50NW	LF:	N05E	3^{o}N
	HF:	N18E	7^{o}N
0.25NW	LF:	N12E	7^{o}S
	HF:	N20E	0
"0"	LF:	N15E	0
	HF:	N20E	0
0.25SE	LF:	N20E	14^{o}S
	HF:	N20E	3^{o}S
0.50SE	LF:	N25E	8^{o}S
	HF:	N25E	0
0.75SE	LF:	N15E	10^{o}S
	HF:	N18E	9^{o}N
1.00SE	LF:	N22E	2^{o}S
	HF:	N25E	7^{o}N
1.25SE	LF:	N15W	14^{o}N
	HF:	N05W	21^{o}N
1.50SE	LF:	N25W	14^{o}S
	HF:	N12W	0

*LF = Low frequency 150 cps.
*HF = High frequency 510 cps.

Afmag data for this traverse indicate two conductors; that nearest the sulfide-bearing zone at Squirtgun Dam is weak and poorly-defined. A very strong conductor is present near 1.50SE.

The second traverse, approximately 5 miles long, was run along the recently constructed road, from Misery Pond along Chase Stream south to the lineament (see Plate 24). Stations were established at 0.25-mile intervals along the road, on odometer control. Data taken at each station are as follows:

Table 8.

Station No.	Azimuth	Dip
1	LF: North	$42^{o}S$
	HF: N03W	$22^{o}S$
2	LF: N20E	$31^{o}S$
	HF: N14E	$12^{o}S$
3	LF: N18E	$21^{o}S$
	HF: N10E	0
4	LF: N10E	$5^{o}S$
	HF: N10E	$5^{o}N$
5	LF: N14E	0
	HF: North	$13^{o}N$
6	LF: N15W	0
	HF: N15W	$10^{o}N$
7	LF: N16W	$4^{o}N$
	HF: N13W	$14^{o}N$
8	LF: N18W	$6^{o}N$
	HF: N17W	$16^{o}N$
9	LF: N30W	$18^{o}S$
	HF: N45W	$11^{o}S$
10	LF: N13W	$32^{o}S$
	HF: N09W	$16^{o}S$
11	LF: N25W	$23^{o}S$
	HF: N40W	$10^{o}S$
12	LF: N35W	$20^{o}S$
	HF: N15W	$5^{o}S$
13	LF: N35W	0
	HF: N20W	$9^{o}N$
14	LF: N40W	$10^{o}N$
	HF: N15W	$21^{o}N$
15	LF: N50W	$18^{o}N$
	HF: N25W	$23^{o}N$
16	LF: N48W	$19^{o}N$
	HF: N40W	$21^{o}N$
17	LF: N43W	$5^{o}S$
	HF: N40W	$2^{o}N$
18	LF: N45W	$13^{o}S$
	HF: N30W	0
19	LF: N30W	$4^{o}N$
	HF: N22W	$9^{o}N$

On this traverse, the Lanigan Lineament is marked by a strong, well-defined dip-angle crossover indicating an excellent conductor. This point takes on added significance with the fact that no graphite is now known to occur in the actual lineament zone, strongly suggesting that the conductor is due to sulfide accumulations. The second conductor, at Sta. 17, is that previously mapped on the Squirtgun Dam traverse; its importance is not known.

Certainly, the Afmag and geochemical data indicate that the entire lineament trend should be carefully investigated for possible mineralized zones.

AFMAG SURVEYS

Approximately 33 line miles of Afmag reconnaissance were run as a basic part of the 1963-64 program. Instrumentation was a standard dual frequency (150, 510 cps) portable unit manufactured by Central Geophysics, Ltd., Winnipeg, Manitoba. The object of these surveys was to detect large scale conductors; thus, stations were established at approximately one-quarter of one-half mile intervals along traverses. Areas selected for Afmag coverage were: (1) Crawford Pond, (2) B Pond, (3) Horseshoe Pond, (4) West Peak-Long Pond, and (5) Chase Stream area.

(1) The Crawford Pond Afmag data were discussed under Prospect #2. In a vectorial plot of azimuth-dip angle values for the entire traverse (low frequency information), the increase in EM field polarization is quite striking as the Crawford Pond magnetic anomaly is

approached from the northwest, as is the dip reversal south of Crawford Pond. It is recommended that another Afmag traverse, from BM1012 to Yoke Pond via the Appalachian Trail, be completed as a part of future exploration in this area.

(2) B Pond: data inconclusive, but no conductor indicated.

(3) Horseshoe Pond: no conductor mapped from the west side of Horseshoe Pond to the west end of Scammon Ridge at the town line.

(4) West Peak-Long Pond: this traverse was run (on existing trails) to check the possibility of large conductors being associated with Hay Brook geochemical anomaly or the Chairback Mountain structure. The results are sufficiently interesting to indicate additional work in this area. An apparent conducting mass is indicated at elevation 1,000 feet on Hay Brook, as well as a less well documented one immediately south of The Hermitage.

(5) Chase Stream area: Afmag data taken in this area are covered in detail in the discussion of Prospect #18.

PART III

GEOCHEMISTRY

By

Lawrence A. Wing

INTRODUCTION

A reconnaissance geochemical survey was carried out during the 1962-1963 field seasons over that portion of Plate 2 (see Part I) indicated as Area II. Some of the laboratory testing extended over into 1964. A few samples were collected outside the limits of the appended map (see pocket) and their locations and values are on file with the State Geologist.

PREVIOUS WORK

The earliest known geochemical sampling in this area is the lake water samples reported by Kleinkopf (1960). He also collected approximately 150 water samples from streams in the area of T7R10 and T8R10 and these were tested spectrographically for nine elements. The most notable anomaly from the work of Kleinkopf is the drainage from the East Chairback Pond area. Post (1963) sampled the area in a broad reconnaissance sense and in general the present work confirms most of his values. The James W. Sewall Company followed up the work of Kleinkopf in portions of T7R10 and T8R10 with an intensive stream sediment program. Some of this data has been released by previous landowners and has been included within the present survey, acknowledgements are due the J. M. Huber Corporation.

The reconnaissance geochemical survey was limited to that portion of the area shown on Plate 2 as "Area II". Some follow-up geochemistry,

in addition to that reported in "Area I", was conducted by Young (see Part II) subsequent to the reconnaissance work. The Sewall Company did none of the sampling or evaluation in "Area I"

METHODS

All samples used were stream sediments collected from the active channel and flood plain where the latter was developed. Care was taken to collect fine-grained sediment as free as possible of organic material although highly organic samples represent the only material available at some stations. The values reported on the appended map represent an average of the active and bank sediment.

All samples were dried and sieved and only that fraction passing the Number 65 stainless steel mesh were tested for cold extractable heavy metals (cxHM) and cold extractable copper (cxCu).

Samples were tested for heavy metals by methods generally similar to Bloom (1953) using an aqueous ammonium citrate solution as extractant and 0.001 percent dithizone in toluene as colorimetric agent. Copper was measured by methods described by Holman (1956, 1963) using an ammonium citrate extractant solution (pH 2.0) and dithizone in hexane-toluene (90-10) as the colorimetric agent. Sensitivity was increased over that suggested by Holman in order to avoid "0" values.

SAMPLE DENSITY AND INTERPRETATION

The nature of the topographic surface and sampling density are critical in the evaluation of results and in understanding to what extent has the area been tested. A single station at the mouth of a stream as large as Gulf Hagas or Hay Brook (see Plate 1 or 2) is rarely effective due to excessive dilution. Hay Brook itself shows only 2 ppm heavy metals immediately downstream from anomalous lateral tributaries.

The effective coverage by Post (1963) of this area (Area II, Plate 2) is probably in the order of 20 percent or less. An examination of the appended map shows approximately 50 percent of the area contributes ground and surface waters to sample stations. The detailed work previously referred to in T7R10 and T8R10 reached approximately 80 percent effective coverage. The relationship between sample density, scale and effective coverage is seen in the following tabulation.

Scale	Stations per Sq. Mile	Effective Coverage
1:250,000	0.5	20%
1:62,500	2	50%
1:12,000	15	80%

From the above tabulation it is clear that geochemistry should not be used as a means of "eliminating ground" but rather as a way of seeking targets for more detailed work. If geochemistry is justified as a reconnaissance method of seeking targets, then <u>all</u> targets so found warrant additional work to (1) confirm anomalous values and (2) if confirmed to seek the source of metals. Little can be done in the

way of interpretation of the type of data presented on the attached map until the interpreter decides to what degree is any given value anomalous. Canney (1965) has stated "Many geochemical surveys are operating today far below their maximum effectiveness. Many reasons contribute but among the principal ones are - and, finally failure to develop an effective system of data interpretation." The writer is in complete agreement with the statement by Canney and much can be done to improve a complete geochemical program. The data presented on the map does not purport to be other than a reconnaissance search for exploration targets and to this end it can be used as a valid guide to areas of interest. The work by Young reported in Part II is a partial illustration of how the data can be used.

It will be noted from the map that divides are indicated by a light dashed line so that the area contributing ground and surface waters to a sampling site can be visualized. It is suggested that only the station symbols be colored for different levels of metal values since filling in the entire drainage area probably is not justified for any except the very smallest area.

Two approaches to completing the map are suggested and the following section on results provides statistical data for either approach. (1) Color the stations according to values such as 0-4 green, 5-9 blue, 10-14 purple and over 15 red. This method is similar to that used by Post (1963) and many others in which either colors or size of symbol is used. (2) An alternate method is to color the stations on the basis of 2x, 3x, 4x etc. as compared to the median value. The second method

offers some advantages, expecially when comparing copper values to heavy metals and this is also the reason for taking copper measurements with greater sensitivity in order to establish a median for ratio purposes. Thus a copper value of 3 ppm is about 5x median copper and perhaps comparable to a heavy metals value of 15-20 ppm.

RESULTS

The appended map shows 720 sampling stations representing approximately 1400 samples and 2800 measurements for heavy metals and copper. The median value for heavy metals is 4 ppm and for copper 0.6 ppm. It will be noted that not all stations show a value for copper although most were tested. Most of those stations reporting no copper value were tested by the methods of Holman with a minimum addition of 1 ml. of dithizone. With no color change this would indicate "0" under the older method. The following tabulations may be used as a guide.

410	Stations	0-4	ppm	HM	=	57%
250	"	5-9	"	"	=	35%
38	"	10-14	"	"	=	5%
23	"	15 or +	"	"	=	3%
5	"	20 +	"	"	=	0.7%
58	"	1.0 or +	"	Cu	=	8%
11	"	1.5+	"	"	=	1.5%

As related to median values, with 4 ppm as median for HM and 0.6 ppm as median for Cu, then

105	Stations	are	2x	HM	median	or	better	=	14.5%
44	"	"	3x	"	"	"	"	=	6.1%
21	"	"	4x	"	"	"	"	=	2.9%
9	"	"	5x	"	"	"	"	=	1.2%
4	"	"	6x	"	"	"	"	=	0.5%
1	Station	is	8.5x	median	HM				
1	"	"	12.5x	"	"				

42	Stations	are	2x	Cu	median	or	better	=	5.9%
4	"	"	3x	"	"	"	"	=	0.5%
3	"	"	4x	"	"	"	"	=	0.4%
1	"	"	8.3x	median	copper			=	0.1%

As previously mentioned, all anomalous values deserve further investigation and the decision of what constitutes an anomaly is frequently more one of economies. From the foregoing tabulations it would seem that at least 3 percent of the original stations warrant further work.

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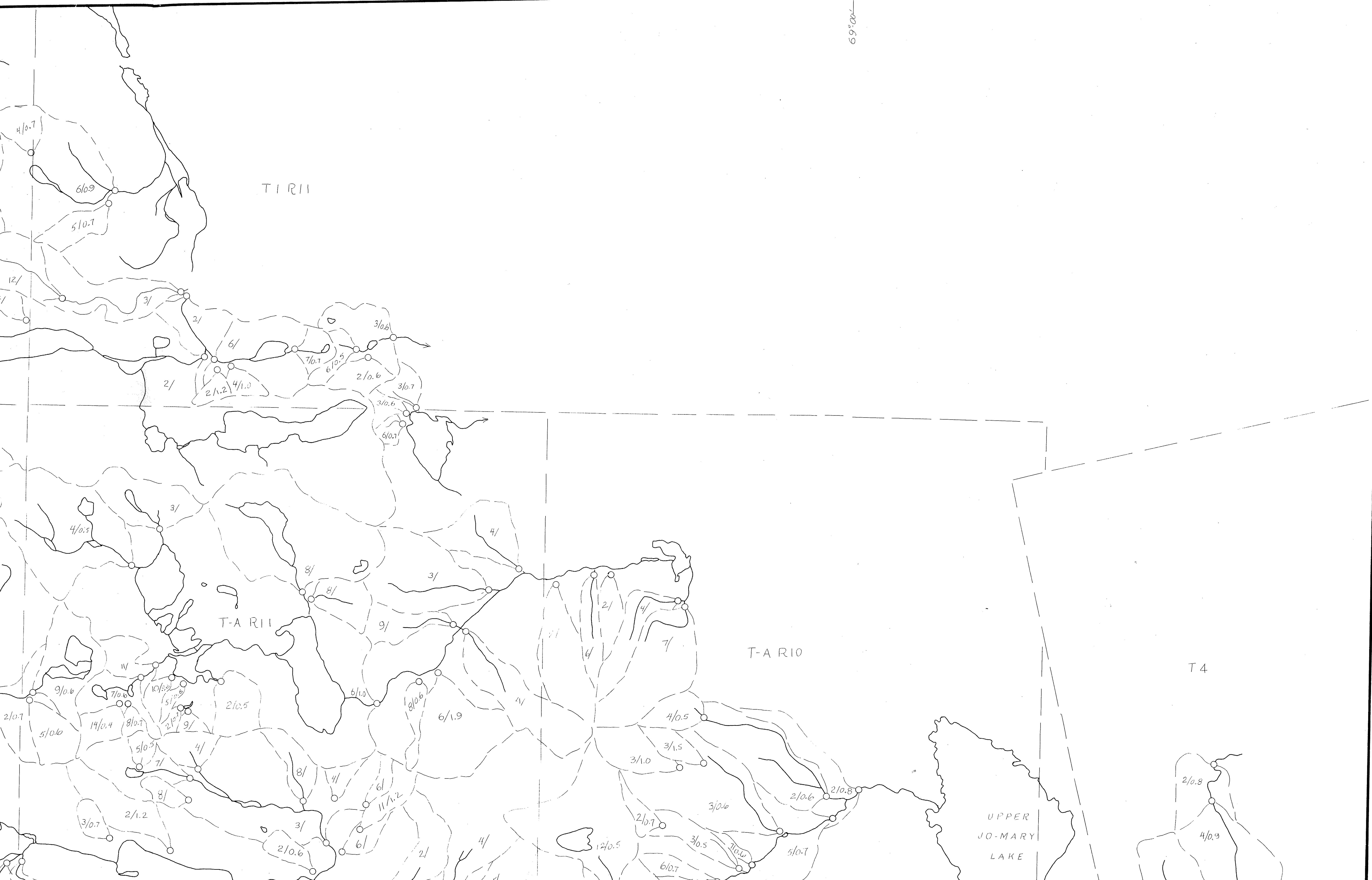
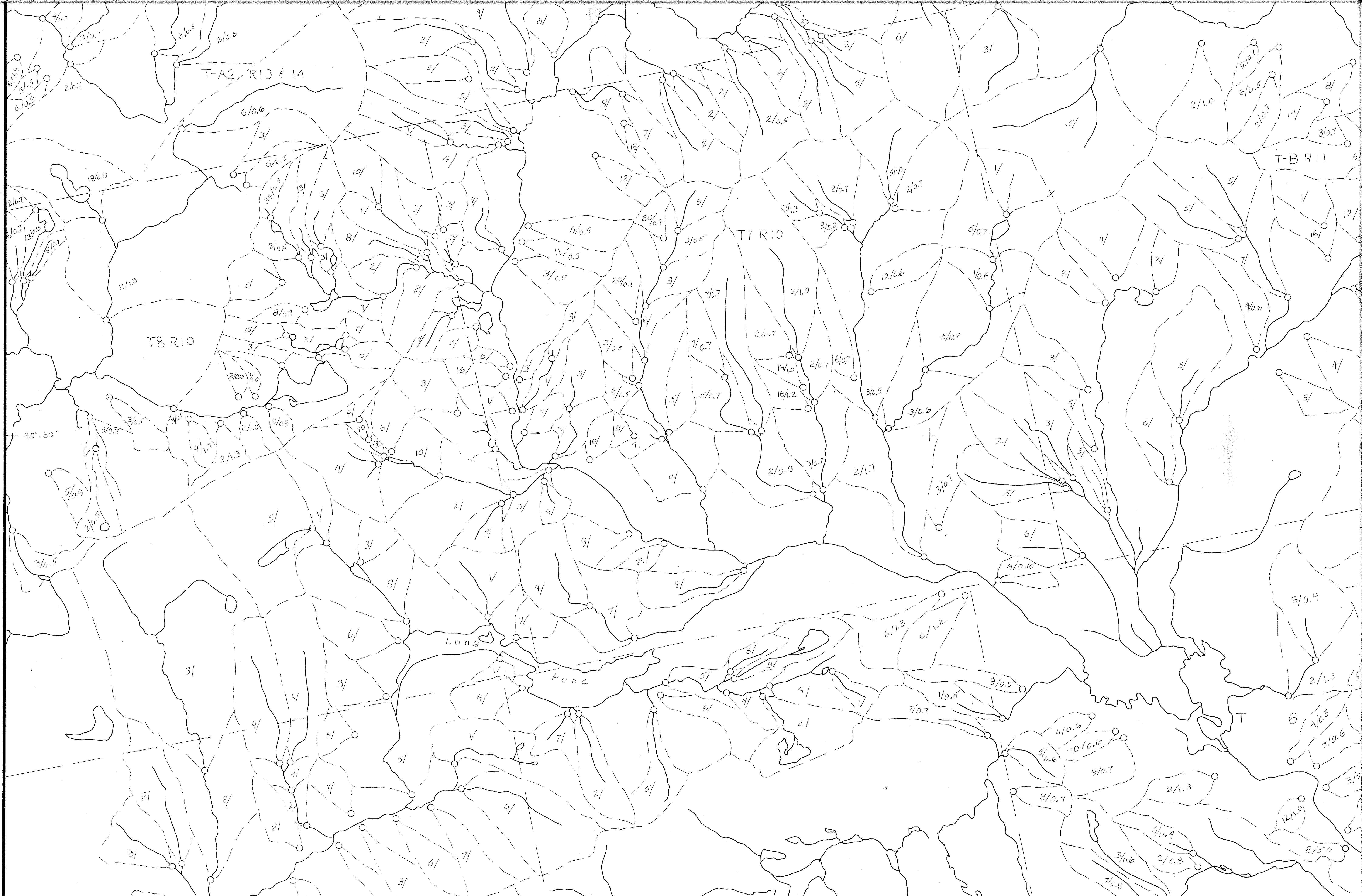
T1 R13
T1 R12
SECOND ROACH POND
FIRST ROACH POND
T-A R13
T-A R12
T-A R11


69°00'
T1 R11
T-A R11
T-A R10
T4
UPPER
JO-MARY
LAKE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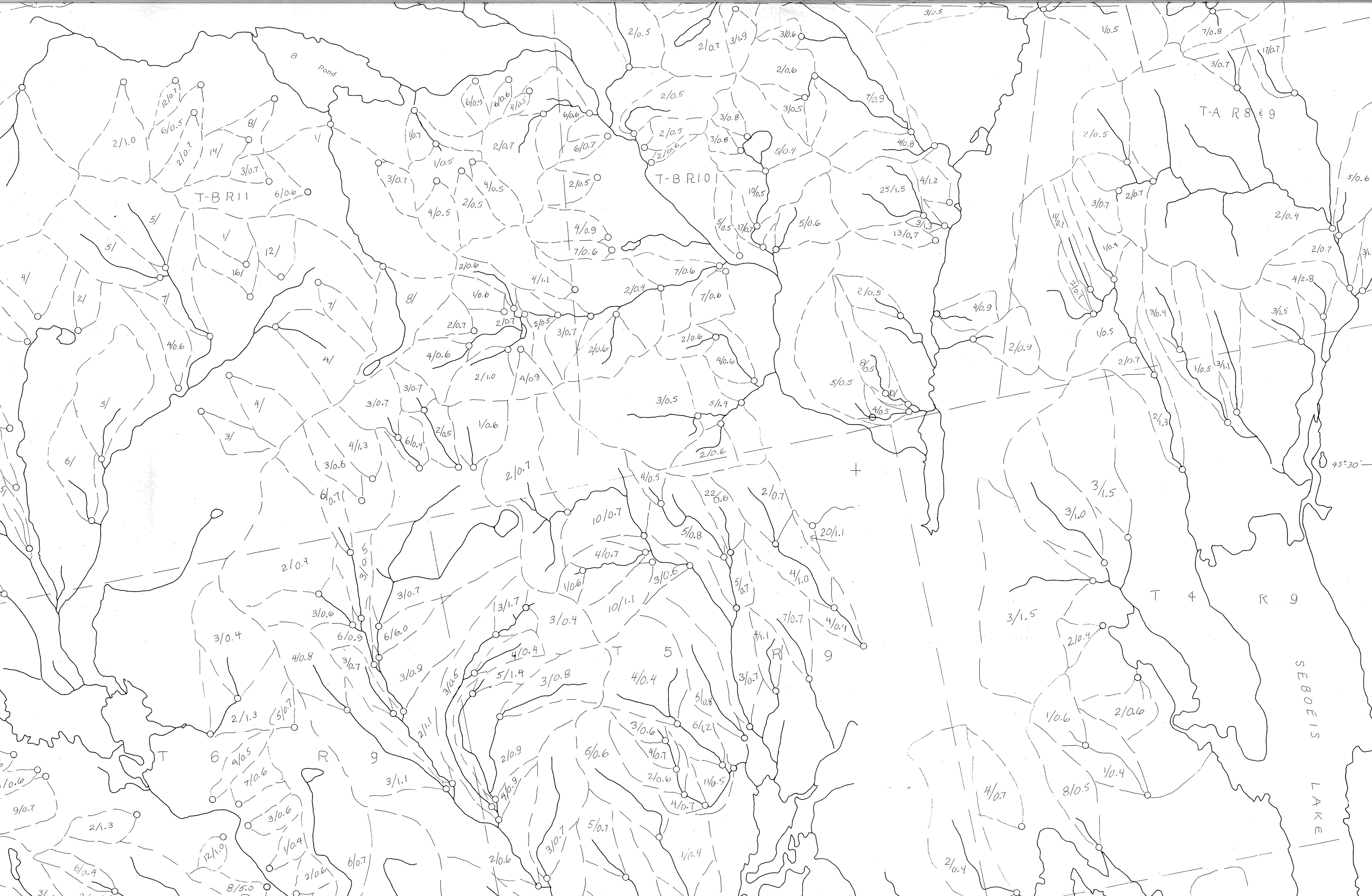
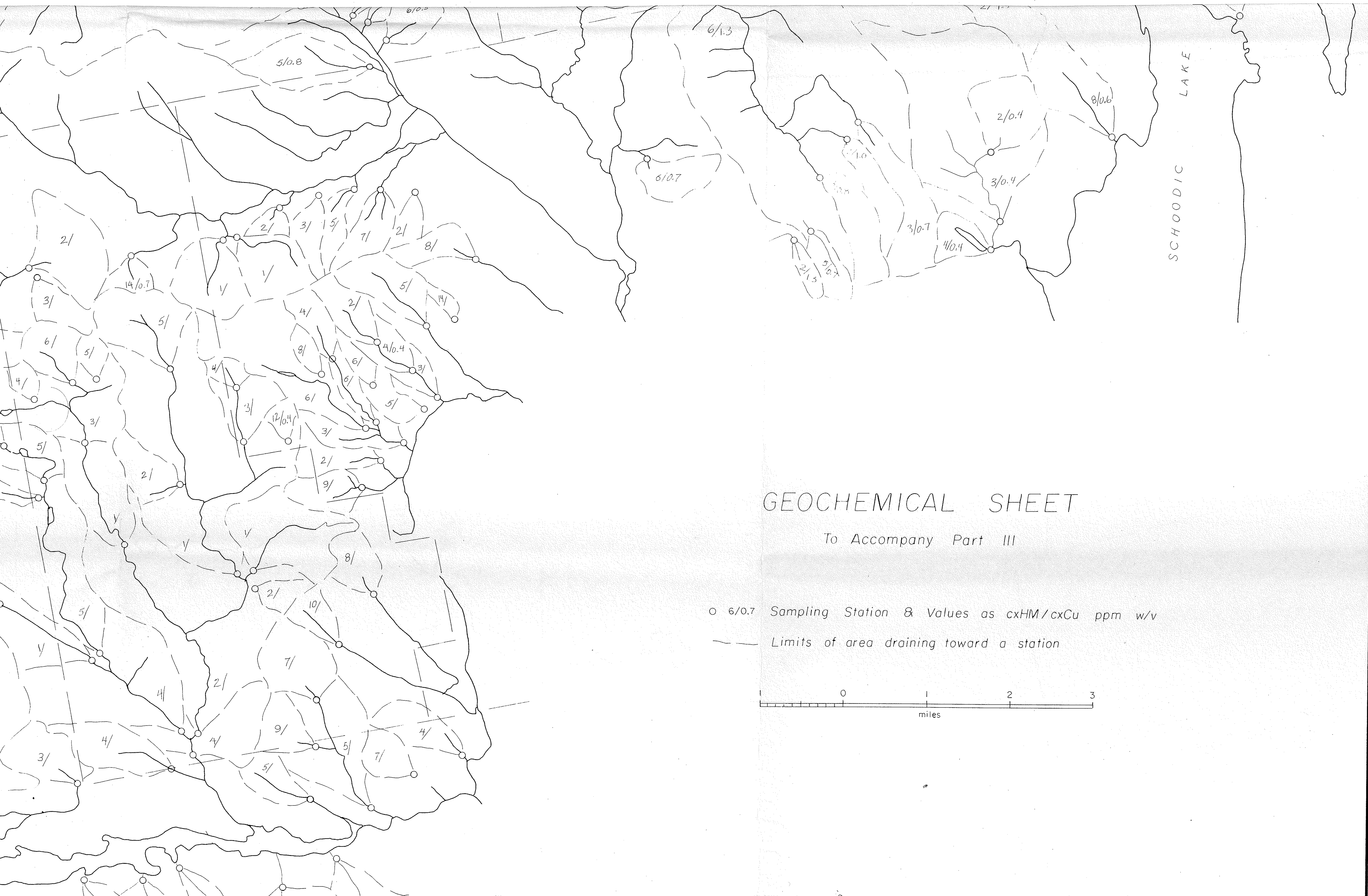
T8 R10
T7 R10
T-B R11
Long
Pond
45°30'
T 6


B Pond
T-B R11
T-B R10
T-A R8 & 9
T 4 R 9
T 5 R 9
T 6 R 9
SEBOEIS LAKE
45°30'


Lake
Onawa
SEBEC LAKE



GEOCHEMICAL SHEET

To Accompany Part III

○ 6/0.7 Sampling Station & Values as cxHM/cxCu ppm w/v

— — Limits of area draining toward a station

1 0 1 2 3
miles