MR 112-13

FUNTER BAY AREA

MANSFIELD PENINSULA

ALASKA

FOR

ADMIRALTY (ALASKA) GOLD MINING COMPANY

BY

W. B. Agocs

AERO SERVICE CORPORATION
PHILADELPHIA, PA.

TABLE OF CONTENTS

INTRODUCTION

Admiralty (Alaska) Gold Mining Company had Canadian Aero Service Limited of Ottawa, Canada, make an airborne magnetometer survey of the northwestern part of the Mansfield Peninsula of Admiralty Island, Alaska in June and July of 1948. A second survey was made in this area in June of 1949 between an east-west line through Funter on the north, and an east-west line through the north part of Hawk Inlet to the south.

The purpose of these surveys was to: (1) determine the outline of the "sill" in which nickel-copper mineralization has been found; (2) determine the structure of this sill; (3) locate other "sills" which may be mineralized.

LOCATION

The Mansfield Peninsula of the Admiralty Island is located approximately 26 miles due west of Juneau, Territory of Alaska. The peninsula is located on the extreme northwest part of the island. The village of Funter is located at the head of Funter Bay in the west central part of Mansfield Peninsula.

The coastal zone of northern part of the peninsula is relatively flat, but a ridge rises to 2490 feet within two miles of the coast on the west side. This ridge extends from the southwest part of the peninsula to the north toward Barlow Cove.

GEOLOGY

The Admiralty Island, in general, is typical of the southeastern Alaskan coast. Paleozoic rock of geosynclinal thickness predominates in the area. These have been highly metamorphosed and then intruded by magma differentiates of the batholithic intrusions to the east and south. The sediments consist

largely of volcanics which now make up most of the very abundant greenstone schists. The most common volcanic material is andesite in a number of variations. Phyllite is very abundant along with graywacke, slate and limestone. The limestone has been metamorphosed into a massive, white marble.

The available geologic mapping in the area covers the south and east coast of Punter Bay. The major outcrops in this area are: a coastal zone of greenstone schist and gneiss, which is interrupted by a narrow zone of phyllite, and patches of marble; the coastal zone is followed by glacial till cover; and then by a second zone of phyllite and greenstone.

The structure reportedly is a northwest-southeast trending anticline whose axis is located west of Punter.

A sill of black, coarse grained olivene rich gabbro is intrusive into the thick phyllite series and various types of schist. The basic magma from which the crystallized was probably differentiated at depth from a more silica-rich magma, and then intruded into the already metamorphosed phyllite. The outcrop of the sill is located about 2 miles S 45° E of Punter, and it is on the northeast flank of the anticline. The strike is N 15° W, and its dip is 15° E. Drifting and drilling in this sill show that it is mineralized with nickel-copper minerals.

Dikes of widely varied composition are scattered through the area. It is not known if these dikes are of the same original magmatic source or not.

AIRBORNE MAGNETOMETER STATISTICS

1. Direction of flight lines:

   (a) Northwest - southeast, - Flight 1, north of Funter Bay.

   (b) Northeast - southwest, - Flight 3, immediately north of Funter Bay.

   (c) Northwest - southeast, Flight 2, southeast of Funter Bay.

   (d) East-west, 1955, east and southeast of Funter Bay.

2. Flight Altitude:

   (a) '00 feet, mean terrain clearance on Flights 1, 2, 3 of 1954.

   (b) 3500 feet above sea level, on flight of 1955.

3. Flight Line Separation:

   (a) 1/2 mile north of Funter Bay, Flight 1.

   (b) 1/4 mile, Flight 2 and 3.

   (c) 1/2 mile, 1955 work.

4. Area Covered:

   (a) 48 square miles, Flights 1, 2, 3, 1954.

   (b) 28 square miles, 1955.

5. Intensity of earth's total magnetic field 57,400 gamma.

6. Inclination of earth's total magnetic field 75° north.

MAGNETIC EXPLORATION

The earth's magnetic field was the first to be used as a method of geophysical exploration in the 16th or 17th century in Sweden in the search for the magnetite iron ores. The presence of the earth's magnetic field, and its effect on lodestone (naturally magnetized magnetite), and magnetized needles was known centuries before. However, the Swedes were the first to correlate the fact that there were marked deviations of the magnetic needle in the vicinity of magnetite ores, and use it in the search for new iron ore deposits. Hence, the magnetic compass was the first geophysical exploration instrument.

Instruments

The dipping circle followed as a magnetic exploration instrument. In the dipping circle, the pivot is horizontal, and the needle rotates in the vertical plane of the magnetic meridian. The dipping circle measures the angle between the horizontal and the angle of rest of the north end of the magnetic needle in the plane of the magnetic meridian.

The dip needle is the same as the dipping circle, but a counter weight is placed on the south end of the needle. The needle is free to rotate in the vertical plane of the magnetic meridian, and the angle above or below the horizontal is recorded.

The dip needle was followed early in the 20th century by the Schmidt magnetic balance or magnetometer which measures changes in the VERTICAL or HORIZONTAL component of the earth's magnetic field. This instrument is an extremely sensitive dip needle, but it is a calibrated instrument.

With all the above instruments, observations are made at distinct points of the earth's surface, and they require an acceleration free platform of some kind to observe the readings.

The saturable core magnetometer which permitted the use of unstable moving equipment, and the continuous recording of the variations of the earth's magnetic field was introduced about 1940, and perfected during World War II as a submarine detector. This instrument uses the earth's magnetic field to orient the sensitive element, and the fact that the core becomes saturated by the earth's magnetic field as a means of electronically detecting the changes in the magnetic field.

Force Units

The unit of measure of the earth's magnetic field is the gamma. The basic unit from which the gamma is derived is the oersted, and the gamma is the one-one hundred thousandth part of the oersted. Both of these units are FORCE units, much as the inch and the foot are units of length.

A concept of the units of force that are being dealth with may be gained when one considers that a field of 1 oersted strength exerts a force of 4/100,000th ounce on a unit magnetic pole, and we are measuring fields to 1 gamma, which is 1/100,000th of this magnitude.

Cause of the Earth's Anomaly Field

The earth's magnetic field would vary uniformly from the magnetic pole, if the distribution of magnetic material in the earth's crust were uniform, and if other sources of magnetic disturbance were absent. However, the magnetic material in the earth's crust is not distributed uniformly, which is fortunate for geophysical exploration by this means.

It is a known fact that magnetic materials "concentrate" the magnetic field, and hence, these concentrations of the magnetic field can be used

to detect such materials by means of the "anomaly" they create in an otherwise normal field. Within the earth's crust, magnetite is the chief magnetic material which causes the anomaly field due to variations in its concentrations.

The magnetite is found in igneous rocks, but rarely is it found in the sedimentary rocks excepting in the "iron formations". Furthermore, the magnetite content of the different types of igneous rocks is different. For instance granite has a low percentage of magnetite, but gabbro has a high magnetite concentration.

By means of a magnetometer survey it is possible to map the magnetic variations, and correlate them with the igneous rock types which would cause the anomalies.

The shape, type, distribution, etc. of the magnetic anomalies can be interpreted as to depth to the cause, its shape, structure, and so forth, by the experienced interpreter.

The correlation of the structure and rock type determinations with geologic knowledge permits the localizing of features which may be of interest, and limits considerably the area of further search.

The final check of an interpretation is based on the results of drilling, and a re-correlation of this information so that the full benefit of these geophysical data may be realized.

From the above, it is seen that the magnetometer is used to map the magnetic field, and that the variations of the magnetic field are due to magnetite and one or two other magnetic minerals, but the magnetic data can be used to locate structure, and rock type which should be favorable for the concentration of economic minerals.

INTERPRETATION

AEROMAGNETIC SURVEY - FUNTER BAY AREA

Low Level Control

The low level aeromagnetic control was obtained during June and July of 1954 to the north and immediately to the southeast of Funter Bay. As pointed out in the section on STATISTICS, three flight patterns were used. Flight 1 was flown N 30° W on a line spacing of 1/2 mile; the southern end of the traverse lines of Flight 1 were flown N 60° E on a line spacing of 1/4 mile; and southeast of Funter Bay, Flight 2, was flown north-south with a line spacing of 1/4 mile.

The magnetic control in the area shows a local zone of intense magnetic anomalies immediately to the west of Funter. This zone extends northwestward, paralleling the flight lines in the western part of the area. The remaining anomalies in the area are gentle, minor anomalies.

The massive 240 gamma circular anomaly, located to the west of Funter, is interpreted as being due to the outcropping, or near surface expression of an ultra-basic intrusive. This magnetic expression extends to the northwest, and it is a continuation of the ultra-basic mass, but its depth increases in this direction. Depth estimates show that it is 1100 feet sub-flight level, or 600 feet sub-surface. The displacement of these magnetic anomalies is interpreted as due to a shear zone located immediately to the north of T-10, between T-6 and T-8.

To the east of Funter, between T-5 and T-6, and crossing T-10 to T-14, the narrow, elongate, northwest - southeast trending anomaly is due to the surface expression of a shallow or surface dike.

The circular anomaly located between lines T-4 and T-6, and crossed

T-10 to T-14 is interpreted as a sill. The depth to this sill is found to range from 500 to 1000 feet sub-flight, or from the surface to 500 feet sub-surface.

To the southeast of Funter, in the area covered by Flight 2, a massive anomaly is mapped partially by T-1 and T-2. This anomaly is due to the southeastward extension of the massive gabbroic intrusive located to the west of Funter. East of this feature, a local, flattering of the magnetic anomalies is observed. This is interpreted as being due to the sill of gabbro in which the nickel-copper mineralization has been located in the Mertie Gabbro Lode.

This minor magnetic anomaly must be due to a sill which may be an "offshoot" from the main mass of gabbro "pipe" or stock, the magnetic anomaly would be of the type and magnitude of those located to the west of Funter, on the northwest shore of Funter Bay.

The length of this sill as determined from the magnetic control is about 4500 feet in the northwest - southeast direction and its width is 2500 feet in the northeast- southwest direction. The depth to this mass has been determined as 600 feet sub-flight on its northwest flank, and 700 feet on its northeast flank. The strike of the mass as determined from the magnetics is northeast - southeast. The thickness of the sill is determined to be about 125 feet. The existing drift into the sill was made on the northwest flank of the mass.

High level Control

The high level aeromagnetic control was obtained 3500 feet above sea level in June of 1955. This survey was made in the area southeast of

Punter Bay on control lines separated by 1/2 mile, and it extended the control to the east shore of the Mansfield Peninsula.

The magnetic control shows the presence of a massive anomaly in the western part of the area which is the southeastward extrusion of the main ultra-basic igneous mass located on the western side of the island. This zone is marked as Anomaly A.

Anomaly B is the location of the sill which has been interpreted from the low level magnetic control. On this survey, the increased altitude has REDUCED the resolution, and the areal extent of the magnetic anomaly has been increased as a result of the increased terrain clearance, and of the increased flight line spacing.

Anomaly C is an elongate anomaly located to the southeast of Anomaly B. This anomaly is due to a dike at a depth of 700 feet sub-flight level. This dike may be located in a fault zone, and it may be proven to be mineralized.

Anomaly D is an elliptical anomaly located in the center of this survey area. The anomaly of about 20 gamma is interpreted TENTATIVELY as due to a sill of gabbro whose depth is 1000 feet sub-flight.

CONCLUSIONS

The re-interpretation of the low level aeromagnetic survey has not added materially to the previous interpretation. The sill located to the

east of Punter Bay, and the known mineralized sill to the southeast of Punter Bay remain unchanged.

The high level control obtained in 1955, confirms the presence of the mineralized sill as a weakly resolved anomaly, and it is indicated as Anomaly B. However, the eastward extension of the survey has located a dike at Anomaly C, and another probable sill-like mass of basic igneous rock at Anomaly D.

The aeromagnetic survey has located similar magnetic conditions to the north and east of the mineralized sill location of Anomaly B. These other features are due to basic intrusives which are associated with the massive gabbroic intrusion, and with dike intrusions.

RECOMMENDATIONS

The airborne magnetometer survey has revealed the areal extent of the mineralized sill. On the basis of this control, it would be recommended that possibly four (4) core holes be drilled to determine the limit of the sill, and the extent of the mineralization. It may be that the highest probability of mineralization will be located at the intersection of Anomaly C which is due to a dike and accompanying fault, and Anomaly B. This latter would also test the possibilities of Anomaly D.

Further work should be considered to check the mineralization and then the extent of Anomaly D, and dike-sill combination located from the low level flying to the east of Punter.

W. B. Agocs

Philadelphia, Pa.

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AERO SERVICE CORPORATION
PHILADELPHIA, PA.