

EXPLORATION EVALUATION

"ANVIL GROUP"

ANVIL MINING DISTRICT

YUKON TERRITORY

CALGARY, ALBERTA

DECEMBER 1975.

EXPLORATION

"ANVIL GROUP"

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 ATTACHMENT - ANVIL DISTRICT, MAP SHOWING GRAVITY ANOMALIES AND CLAIM BOUNDARIES. SCALE 2" - 1 MILE.	

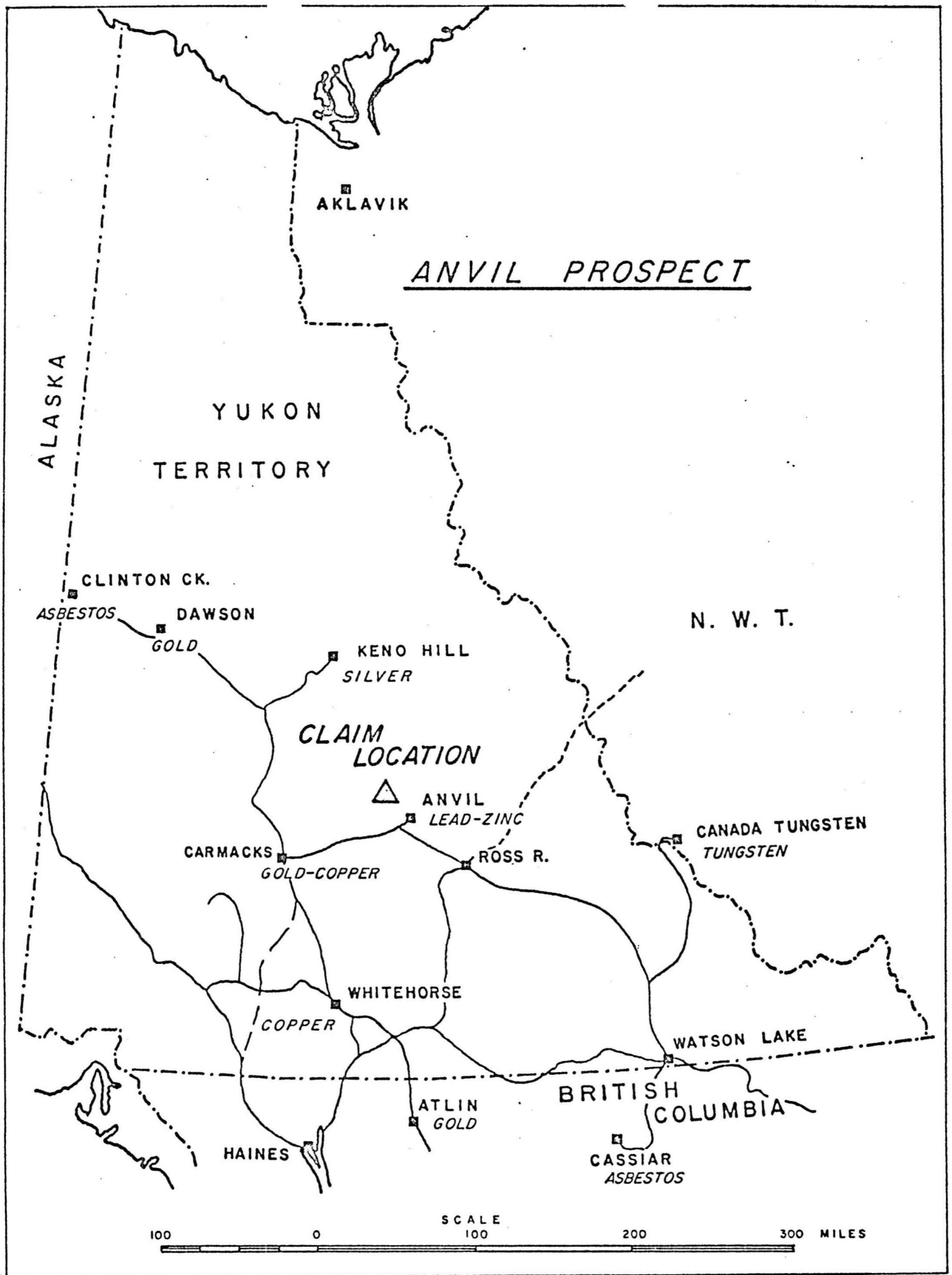


FIGURE I

INTRODUCTION

This report is an evaluation of the exploration work which has been completed to date on several claim groups located in the general Anvil Mining District of the Yukon Territory (Fig. 1).

The claim groups were held by a syndicate of oil companies comprising:

Aquitaine Company of Canada Ltd.,
Canadian Reserve Oil and Gas Ltd.,
Canada Southern Petroleum Ltd.,
Husky Oil Operations Ltd.,
Canadian Occidental Minerals Ltd., and,
Overland Exploration Services (1969) Ltd.,

herein referred to as the "Anvil Group".

The claim groups are northwest of and along geological strike with the known lead-zinc ore deposits of the Anvil District. The deposits are, Faro-Cyprus Mining, Vangorda - Kerr Addison Mines, Grum (AEX) - Kerr Addison Mines and AEX Minerals, and Swim Lakes - Kerr Addison Mines. The ore deposits and the claim groups are marked on the overlay which accompanies Geological Map. Fig. 2.

HISTORY

The subject claim groups were staked by Overland Exploration, as the operator for the "Anvil Group", in the year 1970. Geological and geochemical surveys were carried out during the field seasons of 1970, 1971, and 1972. Gravity surveys were conducted during the field seasons of 1970 and 1971, and in all over 200 miles of this survey were completed. Two small induced polarization surveys were conducted in 1972.

....in 1972....2

Three core holes were drilled, one each on gravity anomalies, in the fall of 1971. A small ground magnetometer survey was conducted over one gravity anomaly in 1975.

ANVIL MINING DISTRICT

GEOLOGY

The Anvil Mining District, as outlined on Figure 2, lies immediately northeast of the major Tintina fault zone. The structure consists of a northwest trending 20 - by 40 - mile doubly plunging, arch-like uplift with the Anvil batholith as a core.

The Anvil batholith is composed of biotitic granodiorite, quartz monzonite, granodioritic porphyry and volcanic equivalents of Cretaceous age. The batholith is flanked on the northeast by a series of Permo-Devonian rocks that comprise andesite, cherty conglomerate and limy slate. More importantly, the batholith is flanked on the southwest, towards the Tintina fault, by Cambrian metasediments, phyllite and schistose rock, that are host to the known massive lead-zinc ore deposits of this district. Within the phyllite host rock the sulphide deposits are confined to a stratigraphic sequence of quartz-rich phyllite, the lower section of which is commonly graphitic.

ORE CONTROL AND MINERALIZATION

The main ore deposits, Faro, Vangorda, Grum and Swim Lakes, occur as large stratiform iron-zinc-lead sulphide replacements of thinly laminated limy to arenaceous phyllites. The ore is localized in gently plunging flexures parallel to the main Tintina fault, along the southwest flank of the Anvil batholith. Although the sulphide deposits are restricted to a wide

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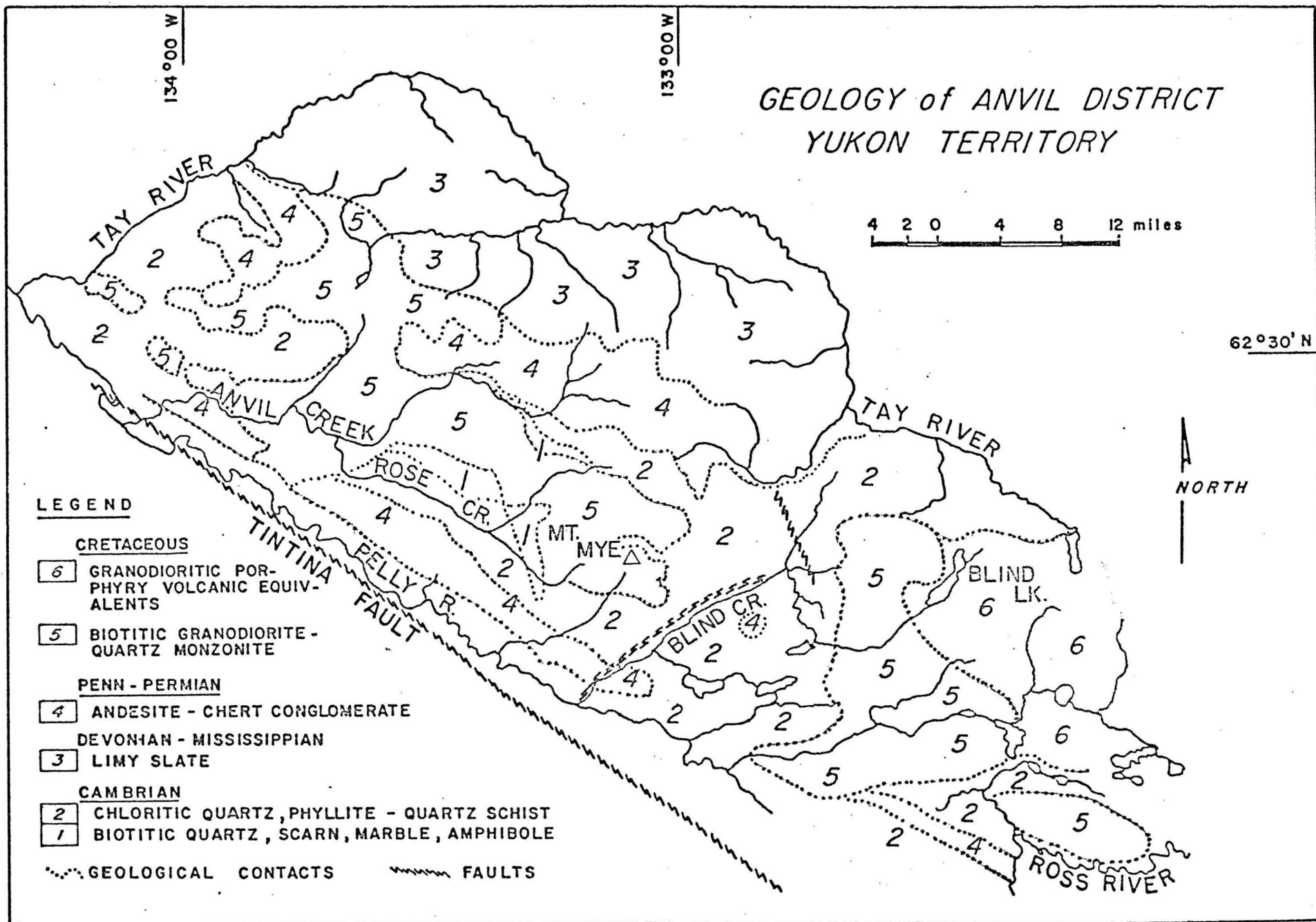


FIGURE 2

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sequence of quartz-rich phyllites, there is no apparent relation to a particular stratigraphic horizon.

The metamorphic grade of the host phyllites varies from a biotitic, moderate grade at Faro, through a chloritic, intermediate grade at Vangorda and Grum to a sericitic low grade at Swim Lakes.

Chloritic tuffaceous greenstone outcrops are close to the sulphide deposits but nowhere immediately against ore. Graphite is present in the phyllites but is far more prevalent around the Swim Lakes deposit than near the Vangorda or Faro deposits.

Alteration of the host rock is evident in a zone of silica-rich, bleached rocks that surround the sulphide deposits.

Primary sulphides of the ore deposits, in order of abundance, include pyrite, pyrrhotite, sphalerite, galena and minor chalcopyrite. Tetrahedrite, bournonite and arsenopyrite have been identified as minor or trace constituents. Marcasite is the important secondary mineral; anglesite, geothite and gypsum occur sparingly. Quartz is the only important gangue mineral. Proportions of the various sulphides are remarkably constant throughout individual deposits and between deposits. The deposits probably average 50 per cent sulphides.

The full extent of the mineralized Anvil belt is as yet undefined.

ORE DEPOSITS

The FARO deposit of Cyprus Mining, consists of massive, banded and disseminated sulphides in two main deposits. Faro No. 1 orebody is about 4,700 feet long, up to 1,100 feet wide and up to 200 feet in thickness. It is overlain by an average of 56 feet of glacial overburden and by up to 300 feet of rock

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cover. Its deeper extent has not yet been fully delimited. The orebody is basin-like in longitudinal section and is cut by two faults, with apparent vertical displacements of 160 feet and probably about 300 feet. Faro No. 2 orebody, 500 feet to the south, which is about 1,200 feet long, 1,000 wide and up to about 30 feet in thickness, lies under shallow overburden and is open to the southeast.

Ore reserves have been calculated at 63.5 million tons of assured ore averaging 3.4 per cent lead, 5.7 per cent zinc, and 1.2 oz. silver per ton, assuming a density factor of 8.5 cubic feet per ton. Of this tonnage, 58.3 million tons are in No. 1 orebody, with 2.6 million tons of additional possible ore, and 5.2 million tons in No. 2 orebody, which contains an additional 0.6 million tons of possible ore.

The VANGORDA deposit of Kerr Addison Mines, consists of a series of flat-lying overlapping lenses of massive to disseminate sulphides, 3,200 feet long, 490 feet wide and up to 150 feet thick, enclosed in a chlorite-sericite schist which in turn is underlain by graphitic schist. Only one part of the ore deposit is exposed that being in the gorge of Vangorda Creek. The remainder of the deposit is covered by 25 - 80 feet of glacial till. The deposit contains a total of 9.4 million tons averaging 3.16 per cent lead, 4.9 per cent zinc, 0.27 per cent copper, 1.76 oz. silver and 0.02 oz. gold per ton, with an additional 12.6 million tons of lower grade ore.

The GRUM deposit is presently being developed by the team of Kerr Addison Mines (60%) and AEX Minerals Ltd. (40%). The deposit to date is approximately 4,500 feet long, 1,400 feet wide and up to 200 feet in thickness.

The sulphide mineralization has replaced several beds of the host Cambrian phyllites that form a large recumbent fold with

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a horizontal axis and plunge gently to the northwest along strike. Depth of the mineralized beds vary from 145 feet at the south end of the deposit to in excess of 1,200 feet at the farthest northern extension. The orebody is still open to the northwest. Indicated reserves of the Grum deposit at August 31, 1975, approximated 32 million tons of 10 per cent combined lead-zinc and 2.00 oz. silver per ton with a zinc-lead ratio of two to one. (Northern Miner, November 1975).

The SWIM LAKES deposit of Kerr Addison Mines, consists of a 1,200 foot-long zone and two moderately dipping lenses of sulphides interconnected by a thinner lens and underlain by another layer of sulphides. The sulphides are localized in bleached phyllites, which in turn are enclosed by moderately dipping graphitic-chloritic phyllites. Approximately 5 million tons averaging about 9.5 per cent combined lead-zinc and 1.5 oz. silver per ton, with minor copper and gold values, has been outlined. The deposit is covered by glacial till that averages 30 feet in thickness.

EXPLORATION

Magnetic, electromagnetic and gravity surveys have played an important role in the exploration leading to the discovery of the four massive sulphide deposits of the Anvil district. A short summary of the exploration programs reveals the excellent potential of the geophysical techniques and in particular the usefulness of the gravity method.

Sulphide mineralization was discovered outcropping in the cut of Vangorda Creek by conventional prospecting during the field season of 1953. The property, which later proved to be the Vangorda deposit, was explored by Prospectors Airways Company between 1953 and 1955.

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Magnetic and self-potential surveys were carried out over the property, but because of the presence of graphitic schist and greenstone bodies, the surveys could not be relied on to indicate sulphides. Gravimetric work provided results which coincided well with the sulphide zone as later tested by diamond drilling.

Lack of transportation facilities and poor metal prices resulted in curtailment of exploration until 1962 when Kerr Addison Mines, who had taken over Prospectors Airways, resumed exploration near the Vangorda deposit. In 1963 they flew an aeromagnetic survey which led to the staking of several magnetic anomalies thought to be similar in expression to the Vangorda anomaly.

In 1964, Kerr Addison followed up their aeromagnetic results with magnetic, electromagnetic and gravity surveys. One interesting anomaly was diamond drilled, resulting in the discovery of the Swim Lakes deposit.

Dynasty Exploration began a comprehensive exploration program, also in 1964. Regional geologic mapping was carried out in an effort to outline structures and rock units potentially favourable to economic mineralization. Contemporaneous geochemical sampling established a restricted area for an aeromagnetic survey in the fall of 1964. This work led to the staking of the Faro claims. Late in 1964 Dynasty diamond-drilled a coincident gravity, magnetic, geochemical anomaly and intersected minor sulphides. In 1965, Dynasty in a joint venture program financed by Cyprus Mining, rotary-drilled five similar geophysical anomalies the fifth of which resulted in the intersection of massive sulphides of the Faro No. 2 deposit.

In 1974 the team of AEX Minerals and Kerr Addison Mines continued to evaluate geophysical anomalies in the immediate area

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of the original Vangorda deposit. Late in that year they announced the intersection of significant lead-zinc sulphide mineralization in one of their exploration holes. This work led to the discovery of the Grum deposit which at present is still being developed.

GEOPHYSICAL LIMITATIONS

Limitations of geophysical methods are, depth of investigation, and conductivity of sulphide bodies and of the surrounding rock.

The airborne electromagnetic equipment used has a maximum depth penetration of 200 feet so that thick overburden in some areas would largely mask the response. However, on this basis most of the Anvil area is considered susceptible to airborne EM. Ground EM methods can achieve only slightly greater penetration.

Conductive rocks such as the widespread Cambrian graphitic phyllites of the area cause complex EM response resulting in EM anomalies. Neither strength or conductivity of these anomalies can be used to distinguish sulphide deposits from graphite zones. Many magnetic anomalies are caused by greenstone and magnetite-bearing schist and are therefore unreliable. The use of gravity is therefore advisable to narrow down targets. However, unless a gravity anomaly is strong or supported by other evidence, it may be caused by differing rock type or overburden densities.

Neither the airborne nor ground magnetic or the electromagnetic surveys over the Faro deposits showed any real coincidence with sulphide mineralization except in a general way. However, a gravity survey over the Faro property outlined No. 1 orebody very well and even gave a rough estimate of its tonnage when drill hole intersections were introduced into calculations. A properly conducted gravity survey

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therefore appears to be the best tool for defining position of massive sulphides.

EXPLORATION "ANVIL GROUP"

In 1970 Overland Exploration, acting on behalf of the "Anvil Group", commenced an exploration program in the Anvil District of the Yukon Territory. Influenced by the past success in utilizing the gravity technique to locate buried lead-zinc deposits, Overland first completed several combined gravity and geochemical surveys in areas covered by overburden but thought to be underlain by the host Cambrian phyllites.

The results of the initial surveys led to the staking of several claim groups in the Anvil Creek, Tay River and Twopete Creek areas. Follow up ground work during the next two seasons consisted of continued geological, gravity and geochemical surveys, the drilling of three test holes on gravity anomalies, the completion of a small induced polarization survey by an outside geophysical firm, and finally a small ground magnetometer survey over one of the gravity anomalies.

GRAVITY SURVEYS - The reports of Overland Exploration, which document the gravity surveys conducted in 1970 and 1971, show several excellent gravity anomalies with amplitudes in excess of 1.0 milligals. The anomalies represent a dense mass distribution in the subsurface which have a size and amplitude similar in appearance to the gravity anomalies found over the Faro deposit.

The gravity surveys were conducted to a rigid tolerance, the anomalies having been interpreted with respect to the volume

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of excess mass involved, the depth of the anomaly and the density contrast between causative mass and the surrounding rock. The most interesting gravity anomalies which warrant further exploration are;

<u>AREA</u>	<u>CLAIM GROUP</u>	<u>ANOMALY</u>
Anvil Creek	Mark	W
"	"	S
"	"	A.B. & D.
Tay River	Arrow	A
Twopete Creek	Lolo	A
"	Blue	K

The shape of the gravity anomalies are pod-like with the elongated axis usually several times that of the width. All the anomalies have been mapped to include all values in excess of 1.0 milligals. The "S" and "W" anomalies on Anvil Creek have maximum value of 1.75 and 2.0 milligals, respectively, while the "A" anomaly on Tay River has a maximum value of 1.8 milligals. The best anomaly, the "K" on Twopete Creek has the highest reading, 2.2 milligals. The causative mass of the gravity anomalies in most cases is thought to be slab-shaped and buried to depths of 500-700 feet.

GEOCHEMICAL SURVEYS - Soil samples for geochemical analyses were taken at most gravity stations during the initial survey work done in 1970 and 1971. When possible stream silt samples were also collected for analyses at points where survey lines either crossed or coincided with the drainage of the area. Areas outside the original surveys, such as at the headwaters of Fishook Creek, were sampled during the field season of 1972 by Mr. T. Adamson, Consulting Geologist, (See references).

The most significant geochemical results were obtained in the vicinity of the "K" gravity anomaly on the Blue claims in the

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Twopete Creek area. Silt samples from a small gully just north of and topographically lower than the "K" anomaly gave zinc values of 2,200 ppm, .22 percent.

During the 1972 field season sampling done in the same creek by T. Adamson produced similarly high zinc values. Soil samples taken along the gravity survey grid showed a maximum of 1,800 ppm zinc over the gravity anomaly with average values in the 500 ppm range. Samples taken by T. Adamson in creeks not covered by Overland during the initial surveys, but which are adjacent to the "K" anomaly, also showed high zinc values ranging up to 400 ppm.

On Anvil Creek, Overland collected silt samples in the many gullies and later in 1972 T. Adamson collected soil samples along the gravity survey lines. In this area the results were generally discouraging. The exception is a semi-circle halo of fair zinc values obtained just south of and down slope from the "W" gravity anomaly. The range of these zinc values varied from 200 - 365 ppm. In the Tay River area the geochemical survey indicated a slight anomalous area down slope from the "A" gravity anomaly. Here, values ranged from 155 - 325 ppm zinc.

Mr. T. Adamson's work during 1972 included a geochemical survey of the headwaters of Fishhook Creek. Over one hundred stream silt samples were collected for analyses the results of which indicate a very anomalous area. The zinc values obtained from this survey were consistently high with a range of 206 - 915 ppm and an average in excess of 400 ppm.

GEOLOGICAL SURVEYS - Geological work was done in conjunction with the other surveys, but on the whole this was of a minor nature and consisted mostly of keeping the gravity and geochemical surveys in areas that either exposed or were thought to be underlain with the host Cambrian phyllites.

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During the field season of 1972 T. Adamson mapped all the areas covered by the gravity surveys and he encountered no sulphide mineralization in the outcrops. This is not surprising as the only known mineralized outcrop in the Anvil area is exposed in the gorge of Vangorda Creek.

The geological work has indicated that the Anvil Creek and Tay River claim groups are underlain by the Cambrian phyllites. In the Twopete Creek area the claims are underlain by Permo-Devonian andesites and hornsfel-rich metasediments. All claim groups are in close proximity to exposures of the Cretaceous granodioritic batholith.

DRILLING - In the fall of 1971 three core holes were drilled to test the gravity anomalies on Anvil Creek, Twopete Creek and Tay River.

D.D.H.#1 - "W" anomaly, Mark claims, Anvil Creek. This hole was abandoned at 350 feet still in gravel overburden.

D.D.H.#2 - "D" anomaly, King claims, Twopete Creek. This hole was drilled to a depth of 600 feet in a dense rock described as a fine grained hornsfel. The entire core contained no mineralization.

D.D.H.#3 - "A" anomaly, Arrow claims, Tay River. This hole was drilled to a depth of 600 feet. The rock is described as quartzitic and graphitic phyllites. The interval 597 - 600 feet was found to contain 1.25 - 1.56 per cent copper with the percentage of copper increasing with depth. The copper mineralization is chalcopyrite.

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INDUCED POLARIZATION SURVEYS - In 1972, Peter E. Walcott and Associates Ltd., a geophysical consulting firm, (see references), carried out two small induced polarization surveys over the "D" and "K" gravity anomalies, Twopete Creek area, and over the "A" gravity anomaly, Tay River area.

In the Twopete Creek area the surveys were conducted along short 500 - foot sections on lines 28 and 29 over the "D" anomaly, and along 3,600 feet on lines 24 and 25 over the main "K" anomaly. A 300 foot pole-dipole interval was used in the survey. A pronounced resistivity low was detected on the two lines coincident with the main "K" gravity anomaly.

On the Tay River "A" anomaly the induced polarization survey was conducted on lines 5, 6 and 7, and comprised a total of 5,000 feet. No resistivity low was found on any of the lines.

MAGNETOMETER SURVEY - In May of 1975, Overland carried out a ground magnetometer survey over part of the Lolo claim group in the Twopete Creek area. Previous gravity work over the claims displayed an anomalous zone then designated the "A" and "E" anomalies.

The magnetic interpretation was based on one 4,500 foot line with 200 - foot station to station interval readings. These were made to a common base to allow for diurnal drift correction calculations.

The results of this survey indicate a magnetic similarity to the previous gravity anomaly. On both maps there is a pronounced nose or high extending from the southeast to the northwest through the central part of the claim group. Magnetic variations are not large and therefore the causative mass could be deeply buried or contain only a minor amount of magnetic material.

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CONCLUSIONS -

Examination of the exploration reports submitted on the Anvil claim groups indicate that the anomalous areas as outlined by the gravity surveys and supported by favourable geochemical results warrant further exploration.

The claims by the geologist Mr.T.Adamson that the gravity anomalies in some cases reflect bedrock ridges or are caused by changes in the surface slope are at this time only assumptions and are not justified. A bedrock ridge or change in topographic slope can produce a change in gravity gradient on an individual line but it could not produce a closed gravity anomaly.

The very significant geochemical results obtained at the headwaters of Fishhook Creek received little documentation in Adamson's report. This is difficult to understand and comments will be made regarding this area under recommendations.

Of the drilling done only one hole gave conclusive results. Drill hole #2, "D" anomaly, Twopete Creek area, was drilled to a depth of 600 feet in fine grained hornfels, however, failed to encounter any sulphide mineralization.

Drill hole #1 gave some encouragement to the "W" gravity anomaly on Anvil Creek. The hole was abandoned at 350 feet still in gravel overburden. This thickness of overburden does not detract from the validity of the anomaly, and in fact, enhances this feature as it appears to eliminate the possibility that the source of the density anomaly is a bedrock ridge.

The small induced polarization survey carried out over part of the "K" anomaly, Twopete Creek area, indicated a resistivity low that coincided with the gravity high. This is very encouraging for this anomaly since it is further supported by excellent geochemical results.

In his report, Peter Walcott, geophysicist, claims that the resistivity low over the "K" anomaly is caused by graphitic rock. Since graphitic schists outcrop over the entire area I concluded that this is not probable. The coincidence of resistivity low and gravity high in an area void of topographic relief could indicate the presence of a buried sulphide deposit. Mr. Walcott also states that the induced polarization technique is inconclusive in determining the cause of the gravity anomalies, and suggests that the decision for further investigation be based on geological information.

RECOMMENDATIONS -

One cannot help but be enthusiastic about the results of the gravity surveys conducted over the subject claim groups. The success of the gravity tool in outlining buried lead-zinc deposits in this area is well documented.

It appears that the better gravity anomalies are also supported by encouraging geochemical results. The one induced polarization survey over the "K" anomaly and the drill hole results also appear to enhance the better gravity anomalies rather than detract from them.

With this in mind, I suggest that the gravity anomalies can now only be validated by drilling. I therefore recommend a drilling program on the following gravity anomalies:

- (1) "W" anomaly, Anvil Creek. Deepen the previous hole, D.D.H.#1, to a depth of at least 400-500 feet in bedrock.

Reasons - one of the best defined gravity anomalies in the survey, 2.0 miligals.
- reasonable assurance that the density high is not due to a bedrock ridge.
- fair geochemical results indicating zinc values downslope from the anomaly.

(2) "S" anomaly, Anvil Creek. Test hole should be drilled to a depth that penetrates at least 500 feet of bedrock.

Reasons - one of the better defined gravity anomalies, 1.75 milligals.

- adjacent to and northwest of the "W" gravity anomaly.

(3) "A", "B", & "D" anomalies, Anvil Creek. A test hole should be drilled on at least one of these anomalies. Keep in mind that Cyprus Mining drilled five anomalies before encountering sulphide mineralization in the fifth hole.

Reason - these are a series of fair gravity anomalies scattered over a very large area.

(4) "A" anomaly, Tay River. A must is to deepen the previous hole, D.D.H. #3, to a depth that completely penetrates the zone of copper mineralization.

Reasons - D.D.H. #3, encountered three feet of copper mineralization in the bottom of the hole at 597-600 feet. Assay results show that the degree of mineralization, 1.25-1.56 percent copper, is increasing with depth.

- fair gravity anomaly, 1.8 milligals.

- geochemical survey shows minor zinc values downslope from anomaly.

(5) "A" anomaly, Twopete Creek. Test holes should be drilled in area of maximum gravity amplitude.

Reason - this fair gravity anomaly is also supported by the magnetometer survey which shows a pronounced magnetic high coinciding with the gravity anomaly.

(6) "K" anomaly, Twopete Creek. This anomalous feature definitely warrants several test holes.

Reasons - the best gravity anomaly, 2.2 milligals

- feature made up of several gravity highs.

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- best geochemical results, maximum 2,200 ppm zinc downslope from anomaly.
- supported by small induced polarization survey that shows a resistivity low coincident with the gravity high.

The geochemical results obtained in the Fishhook Creek area cannot be ignored. I would recommend that a gravity and an electro-magnetic survey be carried out over the area of interest as outlined on mapping done by Mr. T. Adamson.


M.J. Cooper

P. Eng. Geol.
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CERTIFICATION

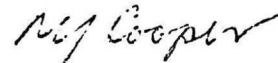
I, MICHAEL J. COOPER OF THE CITY OF CALGARY,
ALBERTA, HEREBY CERTIFY THAT;

I am a graduate of McGill University, Montreal,
Province of Quebec, in 1957, with a B.Sc. degree in
Geology and Mathematics.

I have practiced my profession in exploration
for the past 18 years.

I am a member in good standing of the Association
of Professional Engineers of Alberta.

I hold no interest, direct or indirect, in secu-
rities of Lobell Mines Ltd. or of personal land holdings
in the Anvil district of the Yukon Territory.



M.J. Cooper
P. Eng. Geol.

Calgary, Alta.
December 1975.

