

SILVER-LEAD-ZINC DEPOSITS OF THE KENO HILL - GALENA HILL AREA, CENTRAL YUKON

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WATSON, K.W., 1986. Silver-lead-zinc deposits of the Keno Hill - Galena Hill area, central Yukon; *in* Yukon Geology, Vol. 1; Exploration and Geological Services Division, Yukon, Indian and Northern Affairs Canada, p. 83-88.

INTRODUCTION

This paper is intended as a review of the silver lode deposits of the Keno Hill - Galena Hill area.

Two deposits, Husky and Husky S.W., are briefly described; they are among 30 silver-lead-zinc past and present producers in the district. The Husky Mine is currently United Keno Hill Mines Limited's single largest producer of silver. Husky S.W. is United Keno's most recently developed under-ground deposit and may represent a type of mineralization new to the district.

The Keno Hill - Galena Hill area is located in central Yukon, 354 kilometres (220 miles) due north of Whitehorse (Fig. 1). Mining has taken place in the district for the last 70 years, with mine head production to date (March, 1985) totalling 6.407 billion grams (206 million ounces) of silver.

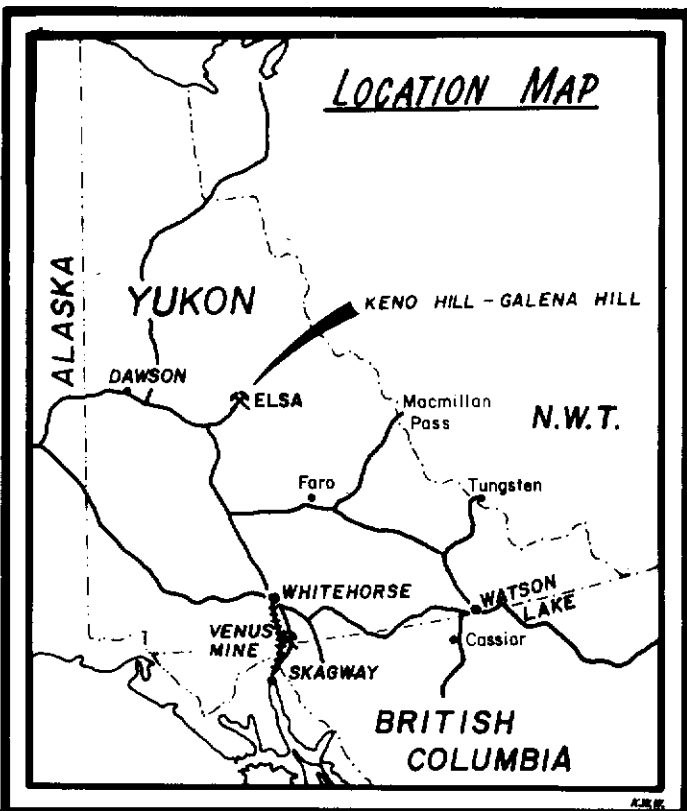


Figure 1. Location map of Keno Hill - Galena Hill area.

History

Prospecting for placer gold began in the Keno Hill - Galena Hill area in the late 1890's.

The first silver vein discovery in the district was in 1906, when the Silver King vein was located on Galena Creek near the base of Galena Hill (Fig. 2). Small scale silver production from the Silver King vein began in 1913.

In 1919, silver vein discoveries were made on Keno Hill and this precipitated a staking rush in the area. Treadwell Yukon Company Limited initiated large scale development on Keno Hill in 1921, under the management of Mr. Livingston Wernecke. In 1925, the company built a 113 tonne (125 ton) per day mill at Wernecke Camp on Keno Hill.

The Sadie, Ladue and Lucky Queen mines were the main silver producers during the 1920's. By 1929, most of the favourable ground on both Keno Hill and Galena Hill had been staked, and was being actively prospected and mined by numerous companies and individuals.

The Wernecke mill was shut down in 1931, and in 1936 a 136 tonne (150 ton) per day mill commenced operation in Elsa, on Galena Hill. The main suppliers of ore for this mill were the Elsa, Silver King, Hector and Calumet mines, all located on Galena Hill.

The sudden death of Livingston Wernecke in 1941, coupled with low silver prices, led to a cessation of virtually all organized mining in the district by 1942.

In 1945, Keno Hill Mining Company Limited acquired all former Treadwell Yukon Company Limited's interests. This company was reorganized as United Keno Hill Mines Limited (U.K.H.M.) in 1946.

The first U.K.H.M. production came from the Hector-Calumet vein system in 1947. In 1949, the mill in Elsa burned down and was rebuilt with a 228 tonne (250 ton) per day capacity. This capacity was increased in 1951 to 450 tonnes (500 tons) per day. By 1958, U.K.H.M. had acquired most of the significant claims in the Keno Hill - Galena Hill area. Production at this time was coming from several underground mines on both Keno Hill and Galena Hill.

The single largest producing mine throughout the 1950's and 1960's was the Hector-Calumet Mine on Galena Hill. Underground mining in the Hector-Calumet Mine ended in 1972 as primary production from the Husky Mine came on-line. Husky Mine has remained the single largest underground producer since that time.

Mining in the Keno Hill - Galena Hill area, from 1913 to present, has produced 4.54 million tonnes (5.0 million tons) of ore with an average grade of 1412 g/t Ag (41.20 oz/ton Ag), 6.84% Pb and 4.60% Zn. Since 1947, U.K.H.M. has produced revenue shipments of some 4.417 billion g (142 million oz) silver, 214 million kg (473 million lb) lead, 150 million kg (330 million lb) zinc and 1.8 million kg (4 million lb) cadmium. Total mine head silver production by all operators in the Keno Hill - Galena Hill area since 1913 has exceeded 6.4 billion g (206 million oz) silver. U.K.H.M. has been the only significant operator in the area since 1958.

GENERAL GEOLOGY

The Keno Hill - Galena Hill area is underlain by Yukon Group metasedimentary rocks (Boyle, 1965).

These rocks include various types of argillite, phyllite, slate, schist and quartzite. Conformable greenstone (altered diorite/gabbro) lenses and sills occur in places and few narrow lamprophyre and quartz-feldspar porphyry dykes occur locally. Granitic bodies have intruded the metasedimentary - greenstone package at several places to the north and south of the Keno Hill - Galena Hill area.

The metasedimentary rocks have been divided locally into three formations; Upper Schist, Central Quartzite and Lower Schist. The Upper Schist consists of quartz-mica schist, quartzite, graphitic schist and minor limestone. The Central Quartzite contains thick- and thin-bedded quartzite, massive quartzite, graphitic phyllite, graphitic schist and calcareous schist. This unit is approximately 700 m (2300 ft) thick and hosts most of the major silver deposits in the area. The Lower Schist includes graphitic schist, argillite, thin-bedded quartzite, calcareous schist, phyllite, slate, sericitic schist and minor thick-bedded quartzite.

These metasedimentary sequences trend east-west and dip 20 to 30 degrees south. In the Keno Hill - Galena Hill area, they

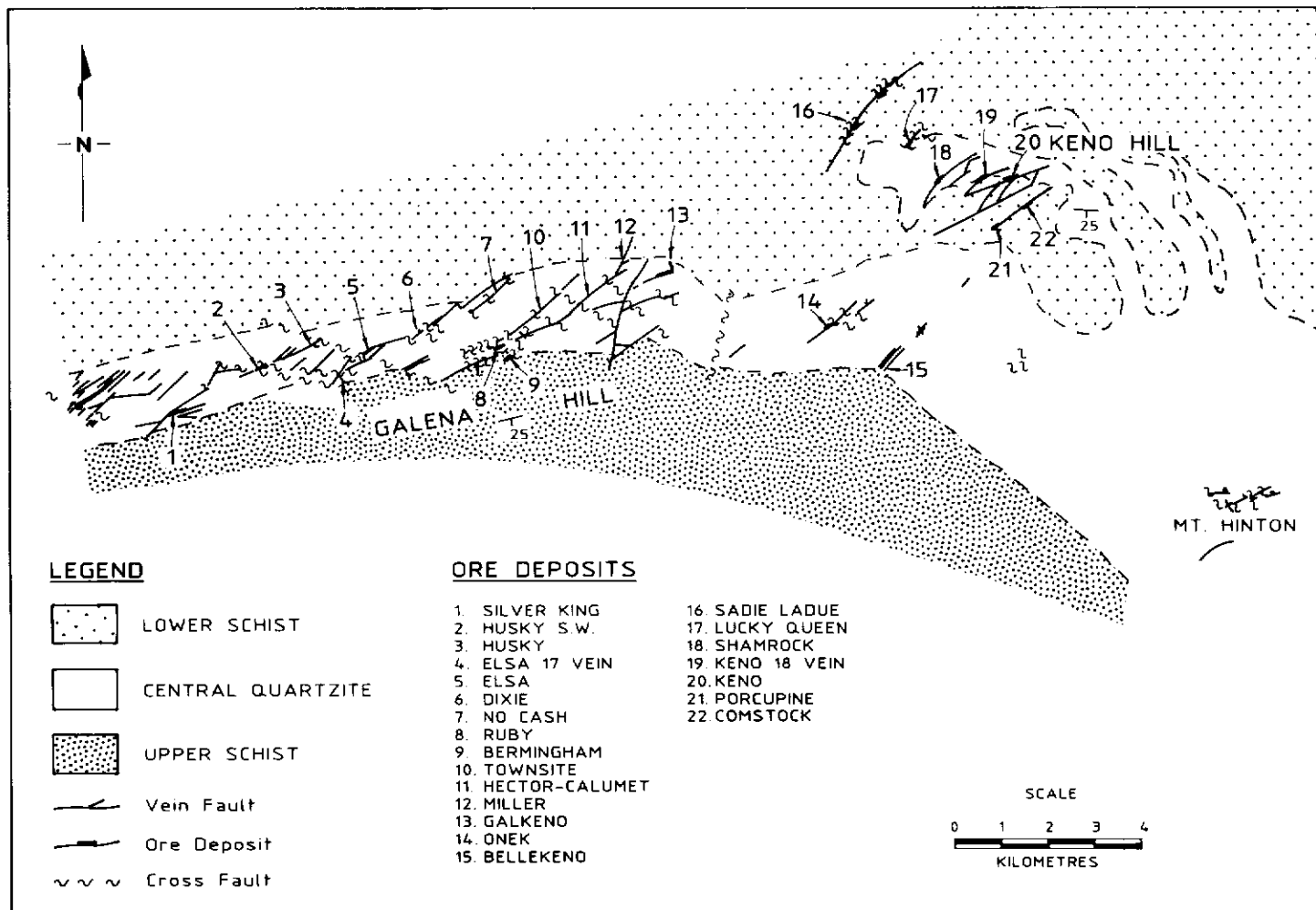


Figure 2. Geology and location of ore deposits in the Keno Hill - Galena Hill area.

form the southern flank of the McQuesten anticline.

A series of faults, striking northeast and dipping steeply southeast, host the silver-lead-zinc lode deposits. These vein faults exhibit left lateral movement, commonly offsetting the surrounding metasedimentary sequences by over 150 m (500 ft). Vein faults range in width from 0.3 m to over 30 m (1 to 100 ft).

The vein faults are offset in places by two types of unmineralized faults. The first type, known as cross faults, strike northwest and dip 40 to 60 degrees southwest. These cross faults are typically normal, right lateral faults with apparent horizontal movements ranging from 1 to 610 m (3 to 2000 ft). The second type of unmineralized faults are bedding plane thrust faults which exhibit movements ranging from 1 to 30 m (3 to 100 ft). Both cross faults and bedding plane faults show indications of post-ore movement. Several ore zones within the area have been offset by cross faulting. Some limited post-ore movement is also evident within the vein faults.

ORE DEPOSITS

In excess of 65 ore deposits and prospects have been identified within the district. These deposits are contained within vein faults with a combined total strike length in excess of 160 km (100 mi). All the economically mineable silver lodes located to date have been contained within an area of 26 km (16 mi) long by 1.6 to 6.4 km (1 to 4 mi) wide.

The principal lode deposits occur within the Central Quartzite in areas where brittle failure of the competent quartzite has allowed open areas conducive to ore deposition. Where the vein faults pass into schistose units, they generally become narrow and normally contain little or no ore. Ore zones are also known to occur in the Lower Schist where a competent unit, such as a greenstone lense, forms one or two of the walls of the vein fault. Most

ore zones (ore shoots) in this area have had their shape and size boundaries defined on a greater than 515 g/t Ag (15 oz/ton) basis.

Principal ore minerals are argentiferous galena, freibergite (argentiferous tetrahedrite - "greycopper"), and pyrrargyrite ("ruby silver"). Polybasite, stephanite, argentite and native silver occur locally in minor amounts. The principal gangue mineral is siderite.

Vein faults can take the form of 'simple' veins, breccia zones and sheeted zones.

'Simple' veins consist of a gangue of siderite, commonly with some quartz. Mineralization consists of discontinuous bands and lenses of silver-bearing sulphides. Some brecciation is always present with fragments of country rock included in the vein.

Breccia zones consist of generally angular rock fragments (quartzite, phyllite, greenstone) in a matrix of siderite, commonly with some quartz. In some areas, the breccia fragments have been rounded or ground into a clay or sandy gouge. Breccia fragments normally account for 20 to 50% of the vein but may exceed 80% in places.

Sheeted zones consists of rectilinear slabs of quartzite or greenstone separated by narrow (1-10 cm; 0.5-4 in) breccia or gouge filled fractures. The breccia fragments and rectilinear slabs are cemented by siderite, sulphides and some quartz within the ore shoots. The fractures are barren or contain only a few carbonate minerals outside of ore shoots. Vein faults may grade from breccia to sheeted zones.

Several vein fault systems consist of two or more distinct, parallel to sub-parallel, vein faults. The inter-vein material between these vein faults in some locations consists of country rock shot with narrow mineralized fractures. In areas where the density of the mineralized fractures is sufficient this inter-vein material may produce ore.

Vein faults are typically made up of a series of slips or fault planes. Slickensides are common on wall rock, siderite and

sphalerite along these fault planes.

The transition from an ore shoot to a barren section of vein fault typically exhibits no changes in vein appearance other than a decrease in silver-bearing minerals.

Ore shoots range from 0.3 to 30 m (1 to 100 ft) in thickness. Strike length and dip extension of individual ore shoots range from 30 to 335 m (100 to 1100 ft). Several ore shoots commonly occur in a single vein fault.

Ten deposits in the Keno Hill - Galena Hill area have had documented silver production in excess of 31.1 million g (1,000,000 oz), eight more deposits have produced from 3.1 to 31.1 million g (100,000 to 1,000,000 oz) and a further seven have produced in excess of 311,000 g (10,000 oz).

The largest single producer is the Hector-Calumet Mine which has produced 2,383,543 tonnes (2,627,406 tons) of ore with an average grade of 1237 g/t Ag (36.09 oz/ton Ag).

Two stages of vein mineralization are distinguished in the area. The first stage deposited quartz, pyrite, some arsenopyrite, trace gold and some sulphosalts in the vein faults. Following movement on the vein faults, a second stage of mineralization deposited siderite, galena, sphalerite, pyrite, freibergite, and pyrargyrite. Most of the economically mineable ore deposits to date have been stage two types. Supergene enrichment has occurred, but is not believed to have been an important ore forming process. The oxidation zone extends from a few metres to 150 metres (10 - 500 ft) below surface. Within this zone, minerals such as limonite, pyrolusite, cerussite, and anglesite are common. Native silver, argentite and jarosite may occur locally.

Ore zones, within vein faults in the Central Quartzite, appear to be spatially associated with some or all of the following features: a) adjacent to and in the footwall of cross faults; b) the junction of two or more veins; c) cymoid loops; d) areas where the vein fault changes dip; e) directly beneath the contact with the Upper Schist. The ore deposits are believed to be of hydrothermal origin and the listed features have produced areas of lower pressure and temperature within the vein faults, conducive to ore deposition.

The origins of the Keno Hill - Galena Hill mineralized vein faults are still a subject of much debate. K-Ar dating has returned an age of .90 Ma for the mineralized vein faults (Sinclair *et al.*, 1980). Granitic intrusions occur to the north and south of the district and are of similar age to the vein mineralization. It is assumed that these granitic intrusions, or a buried intrusion below the district, acted as a heat pump for the hydrothermal systems. Temperature of formation of the deposits has not been clearly determined.

All deposits known to date have been located in a near surface environment. This may be due in part to exploration techniques which have been directed towards shallow lying deposits. One current theory is that deeper, buried deposits may be present, but have yet to be found.

Most deposits mined to date have been mined to a depth of 90 to 150 m (300 to 500 ft) below surface. A notable exception has been the Hector-Calumet Mine which was mined to a depth of 336 m (11200 ft) below surface. Part of the apparent depth limitation is man-made, with contributing factors such as the topographic location of adits and the predetermined depth of shafts. Several mines appear to have ore zones continuing below the lowermost level of the mine.

Metal zonation has been difficult to establish. There appears to be a trend towards a regional lateral zonation of silver and gold. Silver is predominant within the central lode deposits of the district. Gold has never been an important economic constituent within these lodes. Outside the central core are several gold and gold-silver lodes such as those on Mt. Hinton and in the Dublin Gulch area. Most of these are hosted by quartz-rich veins. Even within the central core, elevated gold values have been noted at the extremities, in the Husky S.W. and Silver King vein systems, the Moth vein and some of the Keno Hill vein systems. The significance of this zonation, if any, has yet to be determined.

Vertical zonation within individual deposits is also a matter of some debate. An overriding theory in this area, developed in the 1920's, maintains that all deposits bottom out in zinc. This has been a self-fulfilling theory in some mines with decisions made to bottom a mine based on elevated zinc values rather than on a lack of silver values. The depth of oxidation, when compared to the

depth of the workings in many mines, may be significant. Zinc depletion within this oxidation zone may be a contributing factor to the apparent zonation which indicates a significant increase in zinc with depth.

There does not appear to be any well defined trace element zonation within or around individual ore shoots. A workable exploration technique utilizing trace elements has yet to be developed.

Alteration haloes surrounding vein faults are commonly not distinct. Alteration within the sedimentary sequences may take the form of minor pyritization, some small chemical changes and irregular carbonate leaching. The leached zone may extend up to 4.6 m (15 ft) away from the vein zone. Other alteration rarely extends more than 15 m (50 ft) from the vein fault.

A fracture zone, consisting of small stringers of siderite with sulphides, is common in all types of country rock, for distances up to 7.6 m (25 ft) away from the main vein fault.

Alteration haloes are distinct, but narrow where the vein faults cut greenstone. The alteration zone commonly extends only a few centimetres away from the vein fault. It consists of a carbonate + sericite zone adjacent to the vein fault grading to a carbonate + chlorite zone grading to unaltered greenstone.

The origin of the silver lodes located within vein faults of the Keno Hill - Galena Hill area is still an enigma. More studies are required to fully define the genesis of these deposits.

HUSKY DEPOSIT

Husky Mine, which was discovered by rotary percussion drilling in the mid 1960's, is currently the main underground producer. The Husky Mine is located near the base of Galena Hill, a half mile downslope from the Elsa townsite. Ore production from Husky to December 31, 1984 has totalled 359,450 tonnes (396,230 tons) grading 1450 g/t Ag (42.32 oz/ton). This production figure includes some recent production from the Husky S.W. Deposit which is currently serviced by the Husky shaft.

Husky is serviced by a 129 m (423 ft) deep, three compartment shaft. Three levels, the 125, 250 and 375 foot levels were developed from the shaft. In 1977, a decline was driven to develop a 450 foot level for the mine.

The Husky Deposit has a strike length of 520 m (1700 ft) and has been mined to a depth of 140 m (460 ft) below surface. The deposit is still open below the lowermost mining level. The deepest ore intersection to date has been an 8468 g/t Ag (247.0 oz/ton) intersection over a 0.64 m (2.1 ft) vein width, located 170 m (560 ft) below surface.

There are two principal veins in the Husky Mine, the #1 and #2 veins. These veins vary from 'simple' veins to highly brecciated zones. Vein widths are from 1 to 4.5 m (3 to 15 ft). These two veins are separated by 4.5 to 9.0 m (15 to 50 ft) of country rock, normally quartzite. This inter-vein quartzite is commonly moderately to highly fractured with siderite infillings.

Ramifying structures in some areas have produced up to four parallel to sub-parallel vein or fracture/breccia structures. The fractured inter-vein material between the #1 and #2 veins contains 34 to 1715 g/t Ag (1 to 50 oz/ton). The main ore mineral in Husky is argentiferous galena. In a few areas, pyrargyrite is the primary ore mineral. Stephanite and polybasite occur locally in minor amounts. The host rock for the Husky vein faults is quartzite with interbedded graphitic and micaceous schist and some greenstone sills. The primary gangue mineral in the veins is siderite with some quartz. Calcite and barite occur locally in minor amounts within the vein faults.

The lead and zinc content within Husky Deposit averages 3.96% and 0.27% Zn. The 10.7:1 silver to lead ratio (ounces silver to percent lead) in the Husky Deposit is the third highest among the district's major silver producers (Lucky Queen = 12.8:1 and Elsa = 12.6:1). Zinc content is significantly lower than any other major deposit of the district (district average = 4.6% Zn). The low zinc content is also unusual in light of the fact that the Husky Deposit exhibits very little evidence of oxidation.

HUSKY S.W. DEPOSIT

The Husky S.W. deposit is located, 1400 m (4600 ft) southwest of the Husky shaft. This deposit occurs on the primary Husky

-Silver King structure, but is separate, both spatially and mineralogically, from either of those deposits.

Husky S.W. was found by overburden drilling in the early 1970's and later follow-up diamond drilling in the late 1970's. Current exploration sub-drifting has revealed a strong vein structure, varying in width from 1.5 to 12 m (5 to 40 ft), carrying excellent silver grades. The first stope level on ore above the 250 level has now been mined and returned an average grade of 1584 g/t Ag (46.2 oz/ton) over a 5.2 m (17.1 ft) width and a 38.7 m (127 ft) strike length.

The Husky S.W. vein zone is a highly fractured breccia structure with a quartz-rich gangue. Mineralization occurs as native silver with some argentite (acanthite) and stephanite within fracture veinlets with a pyrite/graphite matrix. Some native silver also occurs as microscopic wires within the quartz gangue. The ore is completely non-visual; barren portions of the vein are identical in appearance to mineralized sections.

There are two distinct veins on the 250 level separated by 3 to 6 m (10 to 20 ft) of country rock. Diamond drilling has indicated only one vein below the 250 level, but further work will be required to confirm this.

The ore shoot does not occupy the full width of the vein. The #1 vein (hanging wall) is 6.1 m (20 ft) wide just above the 250 level and the ore shoot varies from 3.6 to 5.5 m (12 to 18 ft) wide. The ore shoot in the #2 vein (footwall) in this area is 1.8 m (6 ft) wide. The width of the #2 vein is not currently known.

Below the 250 level, the average diamond drill indicated true width is 10.7 m (35 ft). The widest vein intersection is 22.2 m (73 ft), located 140 m (460 ft) below surface. The ore shoot, below the 250 level, has an average width of 3 m (10 ft).

Underground diamond drilling has indicated that the Husky S.W. ore shoot lengthens along strike to 76 m (250 ft) at a depth of 122 m (400 ft) below surface. This drilling has also indicated that the Husky S.W. deposit is still open at a depth of 183 m (600 ft) below surface.

The amount of lead and zinc within the Husky S.W. deposit is very low (0.2% Pb and 0.03% Zn). The galena in Husky S.W. has a silver to lead ratio of 1:1. Gold occurs in this deposit and appears to be tied closely to silver. The silver:gold ratio varies from 1200:1 in the upper portions of the deposit to 300:1 in the lower portions. These ratios are preliminary; further work is required to develop a statistically valid data base.

Husky S.W. is anomalous in many respects when compared to the other silver deposits of the district. The silver to lead ratio of 195:1 in this deposit is an order of magnitude higher than in any deposit ever mined in the area (district average is 6:1). The zinc content in Husky S.W. is an order of magnitude lower than in any deposit ever mined in the district. There is almost no siderite associated with Husky S.W. The Husky S.W. deposit contains more gold than any other silver lode deposit on Galena Hill or Keno Hill.

It may be that Husky S.W. is a silver-rich stage 1 type deposit or an unusual combination (for this district) between stage 1 and stage 2 type mineralization. Mining in Husky S.W. began in 1984 and the data base is still too small to be able to draw any significant conclusions regarding this deposit.

A second ore shoot, very similar in appearance to Husky S.W., is located 200 m (655 ft) northeast of Husky S.W. on the same vein (between Husky and Husky S.W.). This ore shoot, known as the Husky Central Zone, appears to be slightly more pyritic than Husky S.W. Little is known about this zone since only limited exploration has been conducted on it.

Recent exploration work has indicated a good possibility that further ore shoots, with similar geological characteristics to Husky S.W., may exist on other veins in this area.

MINING AND MILLING

The mineralized vein faults in the area vary from 0.3 to 30 m (1 to 100 ft) in width with a steep (70°) dip. The host rocks range from competent quartzite to incompetent schist and crushed fault zones. Due to the presence of the incompetent schist and the amount of fracturing and faulting, ground conditions in the mines can be described as "heavy."

All the underground mines operated by U.K.H.M. are tracked mines using small electric locomotives and 1.4 to 2.7 tonne (1.5 to 3 ton) ore cars to tram the ore. Most of the underground mining

requires the extensive use of timber for ground support. In most mines, square set timber mining is employed which allows a 1.5 to 1.7 m (5.0 to 5.5 ft) minimum mining width. Open stoping is employed in a few areas with competent host rock. Some mines which contain narrow veins use round timber stoping, which allows a 1.2 to 1.4 m (4.0 to 4.5 ft) minimum mining width.

Due to the topographic relief in the area, most of the underground mines have adit access. The Husky Mine is the only operating mine with shaft access.

Open pit mining was introduced as an integral part of the operation in 1977. Most of the open pits mined to date have produced 9000 to 18,000 tonnes (10,000 to 20,000 tons) of ore. The Birmingham Pit was an exception, producing in excess of 145,000 tonnes (160,000 tons) of ore. Mining initially takes place to the hanging wall of the vein. All waste is removed, leaving the vein untouched. A bulldozer is then used to peel off the vein to the footwall. The use of a bulldozer permits very selective mining. Dilution in the open pits can be kept very low. The use of a backhoe allows the recovery of an additional 7.6 m (25 ft) of ore below the floor of an open pit. A backhoe has also been used in areas where narrow vein widths have precluded the economic operation of a formal open pit.

The mill in Elsa has a capacity of 450 tonnes (500 tons) per day. Standard flotation is used to produce a lead concentrate containing an average of 8570 g/t Ag (250 oz/ton). Some 18 to 23 tonnes (20 to 25 tons) of concentrate are produced each day. Current mill recoveries are 85% for silver and 70% for lead. The mill has a cyanide circuit, however it is not being used at the present time. A small smelter, located near the mill, can be used to smelt the cyanide precipitate when available.

Current mill feed tonnage is split 3:2 between open pit production (including stockpiled pit ore) and underground production ore.

EXPLORATION TECHNIQUES

The exploration targets in the Keno Hill - Galena Hill area are small ore shoots located on vein fault structures.

The Keno Hill - Galena Hill area has from 2 to 5% surface outcrop exposure. Surface prospecting in the 1920's identified many of the vein structures within the district. The hand panning of overburden samples to identify galena and the use of ground sluicing served to locate several more veins. By the mid 1930's, most of the veins structures in the area had been identified. Exploration for ore shoots along these vein faults was by surface hand trenching or the use of small prospect adits and shafts.

In the 1960's to the early 1970's, extensive geochemical and geophysical surveys were conducted, with some limited success. When compared to most vein systems in Yukon, ore shoots in the vein faults of this area have poor soil geochemical expressions. Many known ore deposits exhibit very poor geochemical responses. The 3 to 30 m (10 to 100 ft) of overburden cover on the lower portions of the slopes, commonly consisting of glacial till and glacio-fluvial deposits, has contributed to this lack of geochemical response. Much of the area was covered by soil sampling grids in the mid 1960's and very little soil geochemistry has been conducted since that time.

Most geophysical methods, from electromagnetic to gravity surveys, were run in the 1960's and early 1970's. These methods met with limited success. Some of the vein faults produced anomalies, but a combination of graphitic schist horizons which occur in abundance within the Central Quartzite, conductive clays and pyrite within fault zones, and the high density of structural features within the area made interpretation of results very difficult. No new ore zones were located. Ground VLF EM-16 and horizontal loop EM-17 surveys were conducted over a few targets in 1984. In addition to this work, a DIGHEM III survey was flown over all the property in 1984. Preliminary results indicate good success in locating vein faults; however, these methods may not be able to locate ore shoots within the vein faults.

In 1963, the rotary percussion drill was introduced as an exploration tool. The drill was originally used to drill vertical holes to penetrate overburden and take samples just above the bedrock surface. These samples were analysed for lead and zinc and the results were used to try to identify veins and ore shoots on veins. Due to this work, the rotary percussion drill is locally referred to as

an overburden drill.

In the mid 1960's, it was found that the overburden drill was successful in penetrating up to 61 m (200 ft) into bedrock. The mast of the drill was angled to drill -60° holes and the drill was used to drill bedrock for vein intersections.

This drill has been the most successful surface exploration tool in recent years. It has been credited with the discovery of the Husky, Husky S.W. and Ruby ore deposits. It has also served to define most of the open pits.

Drill cuttings from every 1.5 m (5 ft) drilled are routinely assayed for silver, lead and zinc. The drill cuttings are examined under a binocular microscope and a drill log is compiled from this work. Grade and tonnage calculations based solely on rotary percussion drill results have been found to be very accurate.

Within the fractured, abrasive quartzite of this district, the percussion drill has been found to have four times the penetration rate of a diamond drill for less than one-fifth of the cost per unit drilled. Vein recovery is excellent, except in some areas containing wet vein (the drill employs an air flush system). This is often better than diamond drill recoveries which can be as low as 5% in some vein intersections.

The limitation of the rotary percussion drill is depth. Holes in excess of 61 m (200 ft) in length are rare. The deepest hole ever drilled with the rotary percussion drill was 122 m (400 ft) in length. It is, however, an excellent tool for locating ore in the near surface environment.

The drill is used by U.K.H.M. as a penetrating tool. Drill fences are run across areas of suspected veins. If vein intersections are made, the grid is tightened up and drill patterns are concentrated over vein locations indicated by the drill fences. The lack of outcrop and poor geochemical and geophysical responses of ore shoots in this area have made the percussion drill an invaluable primary exploration tool. A total of 566,198 metres (1,857,604 ft) of rotary percussion drilling has been done by U.K.H.M. in this area.

Diamond drilling cannot be used as a prospecting tool due to its high cost and slow rate of drilling. Diamond drilling is used as a follow-up tool to test percussion drill indicated ore zones at depth and to test geological, geochemical or geophysical anomalies in areas where the percussion drill has not proven effective. Although a drill log is compiled using percussion drill cuttings, diamond drilling must occasionally be used to clarify the geology of an area.

Bulldozer stripping has proven effective in many areas with less than 6.1 m (20 ft) of overburden cover. In the past, the bulldozer was used to cut trenches across an area of suspected mineralization. It has been found in recent years that stripping is almost as cost effective as trenching and it allows a much more accurate interpretation of bedrock geology. In areas that prove to contain economic mineralization, the exploration stripping turns into the initial stages of pit preparation.

Backhoe slot trenching is beginning to be used as an exploration tool in this area. The ability of a backhoe to rapidly cut deep trenches is very useful in the initial evaluation of an area. Interpretation of bedrock geology between trenches, in areas of faulting and discontinuous vein structures, is often difficult, but the backhoe trenches allow an initial interpretation of bedrock geology and mineralization.

It is believed that much more remains to be located in the Keno Hill - Galena Hill area. Due to the nature of the mineralization, exploration is very difficult. The Silver King - Husky vein system is a good example, with 70 years separating the discovery of the first ore deposit on this system and the most recently discovered deposit. Some mines have been in operation for more than 50 years and new ore is still being located within the ore zone.

Since 1947, U.K.H.M. has maintained an average of three years of documented ore reserves. Surface exploration techniques, primarily rotary percussion drilling, are being used to locate and delineate potential open pits and indicate the presence of larger ore shoots that will require underground mining. For the potential underground deposits, underground exploration and development is required to locate the ore and develop reserves, a very slow process. Given a healthy precious metal market, it is expected that U.K.H.M. will still have three years of ore reserves by the turn of the century.

ACKNOWLEDGEMENTS

I would like to thank the management of United Keno Hill Mines Limited for permission to publish this paper. Background information was aided by discussions with U.K.H.M. geological staff including Jim McFaul, Senior Exploration Geologist and Michael Dufresne, Senior Mine Geologist. This paper has benefited from a thorough review by Pat Watson.

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