TERRITORY OF ALASKA
DEPARTMENT OF MINES

ANTIMONY AND TUNGSTEN DEPOSITS IN THE FAIRBANKS AND ADJACENT DISTRICTS

Briefly described here are deposits of antimony and tungsten in the Fairbanks and adjacent districts, on which development work has been done during the past few years. Also described are deposits on which no recent work has been done, but which may, nevertheless, be considered as good prospects. Omitted are descriptions of antimony deposits in the Kantishna district, because no first-hand information is available to the writer.

In the districts considered here the only known base metal deposits that can at present be profitably mined are those of antimony and tungsten. Occurrences of other metals, notably of mercury, nickel, chromium, tin and molybdenum are known, but apparently they are all too small or low-grade to be of economic importance. Silver is also found in several lead and zinc prospects; in most cases, however, development has not been sufficient to determine if it can be profitably mined.

Conclusions are drawn as to whether additional development of the various antimony and tungsten prospects is warranted. These conclusions are based on what is known of the size and tenor of the deposits, and also on their accessibility and on transportation costs.

ANTIMONY DEPOSITS

FAIRBANKS DISTRICT

Hi Yu Prospect, Fairbanks Creek 1/ p-1149-96

About ½ mile northwest of the Hi Yu mill on Fairbanks Creek, an occurrence of high-grade stibnite was found in 1941. Where exposed in the bottom of a small prosect pit, the ore was about 20 inches wide and assayed over 60 percent

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1/ Reported in Dept. Mines Pamphlet No. 1, May, 1942.

antimony. Overburden is about 6 feet deep.

No prospecting was done during the summer of 1942, but 2 men were reported to be working in October. Apparently the orebody pinched out rapidly, so that only about 15 tons of ore was found, according to reports. The prospect has not been visited since the recent development work started.

Because of the high quality of the stibnite and because of the convenient location of the prospect close to the Fairbanks Creek road, additional surface prospecting along the strike of deposit is warranted. This could be done rapidly and economically with a bulldozer, since the overburden consists chiefly of residual soil and small schist fragments. It is thawed during the summer.

Fairbanks Creek, vicinity of Hi Yu prospect

Several other occurrences of stibnite are known on the north side of Fairbanks Creek, both east and west of the Hi Yu prospect. Most of the prospect pits are now caved and little definite information can be obtained about the deposits. It is probable that surface prospecting in this area would uncover workable bodies of stibnite.

McCarty Mine, Fairbanks Creek 1/2/

Lenses and kidneys of high-grade stibnite have been encountered on all levels of the McCarty mine. Deposition of the stibnite was later than the gold-bearing quartz, but it generally occupies the same fissure. About 15 tons of stibnite containing 50 percent antimony has been hand sorted during the past year.

1/ Reported in Dept. Mines Pamphlet No. 1, May, 1942

2/ Joesting, H. R., The McCarty Mine, Fairbanks District, Alaska. Nov. 13, 1941

Of this, about 5 tons was combined with an equal amount from the Cleary Hill mine and shipped to the Strategic Minerals Purchasing Depot in Fairbanks, and about 10 tons remains on the dump. In addition, a considerable amount of stibnite was not sorted from the gold ore, with the result that when the mixed ore was milled most of the mercury and amalgam was stripped from the plates.

It would not be feasible to operate the McCleary mine solely for stibnite. It would be feasible, however, to mine out any remaining bodies of stibnite that are now exposed underground.

Homestake Mine, upper Wolf Creek

Several bunches of stibnite were reported in the Homestake Mine during development operations several years ago. In the summer of 1942, Justus Johnson of Fairbanks planned to mine the known antimony ore, but the plan was abandoned when analyses of samples indicated the presence of an excessive amount of arsenic.

It is not likely that any considerable amounts of stibnite could be taken from the present workings.

Willie Claim, head of Wolf Creek

During the summer of 1942 a small amount of hand-prospecting was done by the U.S.S. R. & M. Co. on the Willie Claim, at the head of Wolf Creek, ¼ mile southeast of the Homestake Mine.

Several pits were dug through overburden that is from 3 to 6 feet deep. No ore in place was found, although about 200 pounds was collected from the overburden. From its appearance the ore mineral was jamesonite, boulangerite, or a related lead antimony sulfide. An analysis of a picked specimen showed an antimony content of only 19 percent. A report on its lead and silver content has not yet been received. 1/

1/ A lead content of 46.6 % was reported on Dec. 5, 1942.

ANTIMONY AND TUNGSTEN DEPOSITS

Although the source of the float is doubtless nearby, additional prospecting for it is hardly worthwhile, in view of the low antimony content of the ore. However, since several stibnite prospects are reported to have been found a number of years ago in the vicinity of the Willie Claim, the area in general is considered promising. It is part of the same zone that contains the Fi Yu, McCarty, Chatham and other stibnite prospects.

Chatham Mine, Chatham Creek

In 1916 stibnite was produced from the Chatham mine, from a vein that is said to cross-cut the main gold-quartz vein. Left on the dump after the last war was about 20 tons of ore containing about 40 percent antimony. In the summer of 1942 about 8 tons of this ore was shipped to Fairbanks by Howard Sparks; the remainder will presumably be shipped in 1943 when the Ore Purchasing Depot reopens.

According to reports, considerable stibnite remains in the cross-cutting vein; but this could not be substantiated because the old workings are inaccessible. To reach the ore would require cleaning out several hundred feet of the old tunnel and probably running about 200 feet of new drift.

In view of the lack of definite information concerning the amount and tenor of the ore remaining underground, it is doubtful if, at this time, it would be practicable to reopen the mine, since other prospects can be developed more quickly and cheaply.

Cleary Hill Mine, Cleary Creek

As in other mines in the vicinity, bunches of stibnite are found in a number of places in the Cleary Hill mine. Recently about 5 tons of high-grade ore was combined with an equal amount from the McCarty mine and shipped to the Depot in Fairbanks. It is claimed that a much larger amount of easily accessible

ore remains in the mine. If so, it will probably be taken out after gold mining has ceased.

Because of its sporadic occurrence, mining for stibnite alone in the Cleary Hills mine would not be feasible. In this respect it is similar to most of the other gold lode mines in the Pedro Dome area.

Willow Creek Prospect 1/

In the summer of 1942 high-grade stibnite in place was discovered in the placer cut of Hjalmer Johnson, on Willow Creek, tributary of upper Cleary Creek. The ground is owned by the Tolovana Mining Company, controlled by Martin Pinska of Fairbanks. Placer mining rights are leased to Hjalmer Johnson, while a lease for lode mining is held by Joseph Martin.

The stibnite occurs in several parts of a wide quartz zone that strikes across Willow Creek and has been exposed for about 200 feet. The largest occurrence of ore appears to be continuous for about 75 feet. Neither its width nor its relations to the enclosing quartz zone could be determined, because the bedrock in the cut is deeply weathered.

Further development of this prospect is strongly recommended, since a relatively small amount of work will determine if there is sufficient ore to make mining worthwhile. In addition, the prospect is favorably situated with respect to transportation; it is close to the Steese Highway and only about 24 miles from Fairbanks.

1/ Joesting, H. R., Preliminary Report on an Antimony Prospect on Willow Creek, Fairbanks District, Alaska, Oct. 29, 1942.

ANTIMONY AND TUNGSTEN DEPOSITS

Soo Mine, Dome Creek 1/

Numerous small bunches of stibnite were encountered when the Soo mine was worked several years ago. About 8 tons of high-grade ore was left on the dump when operations ceased. This was hauled to Fairbanks in the fall of 1942 by Howard Sparks.

Although definite information is lacking, no large bodies of stibnite ore have been reported in the Soo mine. For this reason it is considered unlikely that it would pay to reopen the mine for the purpose of mining stibnite.

Marcovich Prospect, Head of Spruce Creek 1/

During the summer of 1942 intermittent prospecting was done by Mike Myntti on the Marcovich property at the head of Spruce Creek. According to Mr. Myntti, stibnite occurs in bunches and lenses, several of which were exposed during surface prospecting. About 16 tons of ore, containing 38 percent antimony, was taken out and shipped to the Depot in Fairbanks. Prospecting was discontinued late in the summer.

Apparently, additional propspecting is warranted; however, this property was visited in 1942 by geologists of the U. S. Geological Survey, and in an effort to avoid excessive duplication of work it was not examined by personnel of the Department of Mines.

Eagle and Independence Creeks

Crossing upper Eagle and Independence Creeks is a stibnite-bearing zone, which is apparently a southwestern extension of the zone that parallels Fairbanks

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1/ Described in Dept. Mines Pamphlet No. 1, May, 1942

Creek and continues westward across upper Wolf, Chatham and Cleary Creeks. Most of the antimony produced in the Fairbanks district during the last war came from the Scrafford mine on Eagle Creek, near the west end of this zone.

During the last few years, some intermittent lode prospecting in the Eagle Creek area has been done by Al Goodwin, who, so far as is known, has found nothing of commercial value. Mr. Goodwin reports that in 1918 he found kidneys of stibnite 3 to 4 feet wide at a depth of 90 feet in an inclined shaft on the east side of Eagle Creek, opposite the Scrafford mine. The shaft which is now caved was sunk through a zone of soft gouge and brecciated quartz. This appears to be the same shear zone that was encountered in the Scrafford mine. A small amount of high-grade stibnite, together with vein quartz and considerable gouge, remains on the dump of the old shaft. It is doubtful, however, if it would be worthwhile to sink a new 90 foot shaft to reach the prospect. Since stibnite apparently occurs irregularly distributed in lenses and bunches in a mineralized zone, surface prospecting would probably be more effective

Several hundred tons of screened waste, consisting of quartz and stibnite, remain on the dump of the Scrafford mine. Vertical channel samples taken from several pits dug in this waste assayed an average of 8 percent antimony. A picked sample, taken to determine if a suitable jig concentrate could be obtained, assayed 29.6 percent antimony. Apparently this material could be concentrated to yield a marketable product, but because of the small amount available it would be practicable only if equipment could be procured cheaply.

In view of the productiveness of the Scrafford mine, and of the occurrence of other stibnite showings nearby, additional surface prospecting is warranted. In the Scrafford mine the stibnite was found as large lenses in a wide shear zone, and other prospects were found on what appears to be a continuation of this shear zone. It is probable that electrical or magnetic geophysical methods could be used advantageously to trace the zone and thereby localize surface prospecting.

ANTIMONY AND TUNGSTEN DEPOSITS

Mohawk Mine, St. Patricks Creek

Several years ago, during the course of gold mining operations, a wide vein or lens of stibnite was encountered in the Mohawk mine, in a raise driven from the main level to the next level above. At least 20 tons of high-grade stibnite ore was taken out. Of this ore, 5 tons was stacked on the dump, about 15 tons was left on the floor of a drift driven from the raise, and a considerable but unknown amount was placed behind the lagging.

According to reports of miners who worked in the Mohawk mine, stibnite ore remains in the raise. Mining was discontinued here because the gold-quartz vein had gone almost entirely to stibnite, which carried low gold values and which also interfered with gold recovery from the free-milling ore. Although this part of the mine is now inaccessible, the stibnite left on the floor of the drift was recently found, and thus the report is substantiated. Stibnite ore is also said to have been found in a winze sunk from the main level, but the winze is now caved.

To reach the ore in place would require cleaning out and retimbering part of the old workings, a relatively inexpensive operation. This is recommended because the work could be readily done, and also because the Mohawk mine is situated on a good road only about 12 miles from Fairbanks.

Through an agreement with John McGinn, owner of the mine, Howard Sparks will collect and ship the ore already taken out. About 5 tons was shipped to Fairbanks in the fall of 1942; the remainder will presumably be shipped in 1943.

Cosgrove Prospect, Happy Creek 1/

About three years ago, several hundred pounds of high-grade stibnite float was found in prospect pits on a claim staked by Ross Cosgrove, on the south side of upper Happy Creek. Two bulldozed trenches were made, but they were apparently

1/ Reported in Dept. Mines Pamphlet No. 1, May 1942.

below the source of the float and ore in place was not found.

In view of the characteristically discontinuous nature of stibnite occurrences in this area, it is doubtful if an extensive search is warranted.

Sourdough Creek Prospect

On Dempsey Pup, a left limit tributary of upper Sourdough Creek, is a quartz vein containing small lenses and stringers of stibnite. This vein was prospected for gold about 20 years ago, by means of several short tunnels. Lenses of stibnite up to a foot thick are said to have been found.

A brief examination was made in September, 1942. Two tunnels remain partly open; in these only a few thin seams of stibnite were seen. On the dumps is perhaps 50 tons of mineralized quartz, some of which contains thin, discontinuous seams of stibnite. It is doubtful if more than a few hundred pounds of marketable ore could be hand sorted from the dumps. According to the results of work already done, additional prospecting for stibnite is not warranted.

WOOD RIVER DISTRICT

Kansas Creek Prospect 1/ 2/

In 1941 a promising stibnite prospect was discovered by the Department of Mines near the head of Kansas Creek, in the Wood River area. In 1942 the prospect was staked by Howard Sparks, who did sufficient surface work to indicate that it is large and worth additional development. A few small trenches showed that at least 200 tons of high-grade stibnite is recoverable from float; and

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1/ Reported in Dept. Mines Pamphlet No. 1, May, 1942

2/ Joesting, H. R., Preliminary Report on Stibnite Prospect on upper Kansas Creek, Wood River District, Alaska. Sept. 12, 1942

that in one place, at least, the orebody is more than 5 feet wide.

Additional surface work should be done to determine the extent of the deposit, before underground development is initiated.

The deposit appears to be favorably situated for mining, since it will probably be feasible to take out ore from a tunnel driven into the steep sidehill, from near the level of the creek bed. Transportation costs, however, will be relatively high, because ore must be hauled by tractor down the Wood River and across the Tanana valley to the Richardson Highway at a point near Birch Lake, and thence to Fairbanks by truck. An alternate method would be to ship ore and supplies by airplane. A landing field for large planes could be made on a low bench of the Wood River below the mouth of Kansas Creek, about 3 miles from the prospect. In any event shipping costs for a minimum of several hundred tons of ore would probably be in the neighborhood of $50 a ton. For this reason it would be desirable to block out a considerable amount of ore before starting production.

Development has been delayed, partly because of difficulties in securing airplane transportation. On November 9, 1942, however, Mr. Sparks and one assistant returned to the prospect. They plan to establish a camp and then bring in a bulldozer from Portage Creek. The bulldozer will be used to strip overburden.

BONNIFIELD DISTRICT

California-Totatlanika Creek Area

In September, 1942, several occurrences of ~~stibnite~~ antimony in the Bonnifield district between California and Totatlanika Creeks were examined by the Department of Mines. One occurrence is at the head of Fourth of July Creek, a tributary of Totatlanika Creek; a second is on the divide between Lynx and Eagle Creeks, about 3 miles east of California Creek; and others are in the canyon of California Creek, near the mouth of Elsie Creek.

ANTIMONY AND TUNGSTEN PROSPECTS

According to the small amount of float found near the first two prospects, they are not large; however, insufficient work was done to expose the ore in place. Since the overburden is only a few feet deep, it should be possible for the claimants to locate the source of the float by doing a small amount of hand prospecting. This would also fulfill the legal requirements for staking a lode claim

Several small antimony-bearing veins are found in the canyon of California Creek. The ore is complex; it consists of a lead antimony sulfide that is probably jamesonite, and also sulfides and sulfantimonates of copper, arsenic and silver, as well as small amounts of bismuthinite, arsenopyrite and pyrite. Polished sections of the ore will be necessary to identify the minerals with certainty.

One small fissure vein, known as the Danzinger lode, was mined for silver about 10 years ago. The venture was unsuccessful. A sample taken from this vein in 1941 assayed 0.27 oz. gold and 259 oz. silver. Other samples are said to have assayed up to 600 oz. silver per ton.

All of the known veins on California Creek are small; in addition their antimony content is below commercial grade. They are prospects of silver, rather than of antimony, and as silver prospects some of them may be worth developing. So far as is known, all of them are open for staking. Assay returns from samples taken in 1942 have not yet been received.

Cody Creek Prospect 1/

On Cody Creek, about 6 miles northeast of Ferry, is a stibnite showing that

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1/ Reported in Dept. Mines Pamphlet No. 1, May, 1942

has been prospected by three tunnels, one of which is 90 feet long. A few bunches of ore were found, but the vein is cut off by a large fault and it is unlikely that any considerable amount remains. About 3 tons of ore, containing an estimated 40 percent antimony, is stacked on the dump. A picked sample, taken in 1941, contained 47 percent antimony.

BROAD PASS DISTRICT

Antimony Creek Prospect 1/

An old stibnite prospect on Antimony Creek, near Colorado in the Broad Pass district, was reopened by Howard Starks in June, 1942. This prospect was subsequently examined by Eskil Anderson of the Department of Mines, who found that the ~~antimony~~ ore pinched out along the strike of the vein, and that additional work is not warranted. About 4 tons of high-grade stibnite was sorted out during the course of prospecting. It was sacked and left on the dump, since the cost of shipping this small amount of ore would be prohibitive.

FORTYMILE DISTRICT

My Creek Prospect 1/2/

A stibnite prospect on My Creek, tributary of the upper Middle Fork of the Fortymile River, was staked in 1941, by Dan Manske of Fairbanks and Fred Purdy of Chicken. This prospect is said to have been discovered in 1918 by Ted Machette, who sunk several prospect pits. About 4 years ago it was restaked by Paul Glasgow, who apparently did no development work. Some pits were sunk in the summer

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1/ Reported in Dept. Mines Pamphlet No. 1, May 1942

2/ Joesting, H. R. and Anderson, E., Preliminary Report on My Creek Stibnite Prospect, Fortymile District, Alaska. Oct. 10, 1942.

of 1942 by Manske and Purdy. Application for an R. F. C. development loan is being considered; meanwhile they plan to take in a bulldozer from Chicken and strip the overburden.

An examination of the prospect was made in the summer of 1942 by Joesting and Anderson of the Department of Mines. No ore in place was found, since seepage water in the overburden made it difficult to bedrock prospect pits, but a large amount of high-grade float was encountered during prospecting. About 4 tons of ore was sorted from the overbourden and stacked on the surface.

This prospect is remote from any roads, so that mining and transportation costs would be high; nevertheless it is recommended for development because it is likely to be large and of an exceptionally high grade.

TOK RIVER DISTRICT

Boulder Creek Prospect 1/2/ 1941

On Boulder Creek in the Tok River district is a large stibnite deposit, the existance of which has been known for many years. In 1940 the deposit was staked by Sam Gamblin, and in the winter of 1940-41 sufficient work was done to expose it across its full width of 11 feet.

In general, the deposit consists of banded quartz and stibnite near the walls and irregular lenses of high grade stibnite in the central portion. According to results of sampling by Joesting in 1941 and by the U. S. S. R. & M. Co. in 1942, most of the mineralized zone is too low-grade to be mined. Mineable ore, assaying about 20 percent antimony over a width of about 2 feet, is found in the central portion, but even this ore is below shipping grade. It is likely, however, that lenses of richer ore will be encountered along the strike of the deposit.

1/ Reported in Dept. Mines Pamphlet No. 1, May, 1942

2/ Joesting, H. R., The Stibnite Prospect on Boulder Creek, Tok River District, Alaska. Oct. 31, 1941.

A disadvantageous feature of the deposit is that fine-grained quartz, which is the only important impurity in the higher grade ore, occurs intimately mixed with the stibnite. For this reason, hand sorting to obtain shipping grade ore would not be feasible; it would be necessary to grind the ore to relatively small dimensions before efficient concentration could be effected.

In spite of this disadvantage, the prospect was recommended for development in 1941, chiefly because of its large size and because of the possibility of encountering higher grade ore. Since then, its merits have been enhanced by the construction of the Slana-Tanacross highway, which passes within about 10 miles of the prospect, and which, therefore, makes it easily accessible.

TOLOVANA DISTRICT

Sawtooth Mountains Prospect

In the fall of 1942, Fred Wackwitz reported the discovery of a large stibnite deposit at the head of Chocolate Creek in the Sawtooth Mountains, about 35 miles, WSW of Livengood. This deposit may have first been found many years ago, but Mr. Wackwitz supplied the first definite information as to its location. When the recent discovery was made known, it was too late in the fall to make a surface examination, consequently it has not been examined by the Department of Mines. The ore is said to outcrop on a ridge well above timber, at an altitude of over 4,000 feet.

According to Mr. Wackwitz, the stibnite ore is high-grade and about 6 feet thick. A sample submitted by him to the Territorial Assay Office at College contained 50.8 percent antimony. This sample was probably not representative.

Ore from the deposit would have to be hauled by tractor and sled down the West Fork of the Tolovana River to Livengood and thence by truck to Fairbanks; consequently, transportation costs would be high. But since a large quantity of ore is reported in sight, it is recommended that an examination be made early in the summer of 1943, as soon as the snow is gone.

ANTIMONY AND TUNGSTEN DEPOSITS

KOYUKUK REGION

Tributaries of Nolan Creek

Several small stibnite lodes are found on Smith and Fay Creeks, tributaries of upper Nolan Creek, and about 8 miles from Wiseman. The existance of at least one of them has been known since the early days of the camp.

Because of the increased demand for antimony, some prospecting was done in the summer of 1942. At the head of Fay Creek, a 6-inch vein of moderately high-grade stibnite was exposed in a pit dug by Sam Gamblin and Mark Ferguson. On upper Smith Creek, about 5 tons of stibnite float was recovered from the gravel during ground sluicing operations by Robert Jones and partners. This ore probably contains less than 50 percent antimony, according to the appearance of samples submitted by Mr. Jones. Its source is a small vein exposed in a placer cut a short distance upstream..

These lodes are not of commercial importance because of their small size and because of high shipping costs. The prospect on Fay Creek was examined in 1942 by Mr. Coleen of the U. S. Geological Survey.

TUNGSTEN DEPOSITS

FAIRBANKS DISTRICT

Geologic Features

During part of the 1942 field season a geological survey of the principal tungsten areas of the Fairbanks district was made by the Department of Mines. Following the geological survey an experimental magnetometer survey was run over part of one of the mineralized areas. Briefly described here are the important features of the deposits together with a description of the several mineralized areas and of current prospecting. A more complete report will be prepared after ore and rock specimens have been examined microscopically, and after computations based

on the magnetometer survey have been made.

Scheelite is the chief tungsten mineral in the Fairbanks district. It occurs in significant amounts in three areas. These are: (1) the area at the heads of Gilmore and Yellow Pup Creeks, known locally as Gilmore Dome, (2) the area at the heads of First Chance, Engineer and Steele Creeks, generally called Tungsten Hill, and (3) the Pedro Dome area. Scheelite is also found in varying amounts in many of the stream placers and as a minor constituent of some of the gold-quartz veins. Wolframite is apparently much less abundant and less widely distributed; it has been reported only on Fairbanks Creek, and on Pearl Creek just below Yellow Pup, where it occurs sparingly in placers.

Most of the scheelite deposits have been found in replaced zones in beds of limestone or calcareous schist, which are members of the schist that is the predominant country rock of the Fairbanks district. Their source is believed to have been tungsten-bearing solutions expelled from underlying granite rocks, which reacted with the calcareous rocks and deposited scheelite and associated calcium-bearing minerals, chiefly by replacement processes. Although in some cases the deposits are several thousand feet from the nearest known granite contact, the genetic relationship between the tungsten and the igneous rock is indicated by the occurrence of small amounts of scheelite disseminated in granite dikes that are offshoots from the main igneous mass.

Several granitic intrusions are known, around which scheelite mineralization has taken place. One of these is the porphyritic granite that outcrops in a 2 by 8 mile area, between Yellow Pup and Pear Creeks on the east and Engineer Creek on the west. Near its east end are the Gilmore Dome deposits, while at the west end are those of Tungsten Hill. Other intrusions around which scheelite has been found are in the Pedro Dome area. Here the chief rock-type is quartz diorite, although several smaller areas of porphyritic granite as well as a number of granitic dikes have also been found. Most of the intrusions are elongated east-west, or parallel to the general strike of the country rock.

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All of these granitic rocks are probably differentiates of the same magma, intruded during the same general period. Their order of intrusion has not been established, but it is likely that the quartz diorite antedates the porphyritic granite, while dikes from both rock-types represent end phases of the intrusions. To determine these relations, as well as to find the remaining bedrock sources of the scheelite, would require a detailed examination of a large area covered for the most part by unconsolidated material.

Gilmore Dome Area 1/

Description of Deposits

In the Gilmore Dome area scheelite deposits have been found in at least two zones in the schist. Associated with the scheelite are typical replacement minerals: notably amphiboles, pyroxenes, epidote, vesuvianite, lime-garnet and calcite. Quartz is locally abundant and is often associated with the richest ore. Scheelite was apparently one of the first minerals to be deposited, while quartz was for the most part one of the last. Establishment of the complete paragenetic sequence must await microscopic study of the ore.

In many places the ore zone is accompanied by a zone of dark green hornblende. Apparently the hornblende zone was formed by replacement and is thus directly associated with the scheelite, but the deposits have been insufficiently exposed to establish this as an invariable association.

Scheelite occurs sparsely disseminated through a good part of the replaced limestone zones. Locally, rich ore shoots are found where vertical quartz stringers intersect the flatter dipping replaced beds. Where these stringers cross mica schist or quartzite schist they contain only small amounts of scheeline and the wall rock is not perceptibly altered. Where they enter a limestone horizon, however, extensive silicification and deposition of scheelite have ~~been~~

1/ Reported in Dept. of Mines Pamphlet No. 1, May, 1942

taken place for several feet on each side of the stringer.

It is thus apparent that scheelite was deposited in two ways. First, some of the mineralization took place by replacement along the gently dipping limestone beds. In this manner, much of the sparsely disseminated scheelite and most of the accompanying minerals were introduced. Second, at least a portion of the scheelite in the rich ore shoots was introduced through the vertical fissures. Whether or not most of the scheelite in the shoots entered through these fissures is still open to question. It is possible that they are merely loci of zones of fracturing, which served as favorable channels for the penetration of mineralizing solutions along the limestone beds.

The ultimate source of the tungsten is believed to be the porphyritic granite intrusion, which surrounds the limestone-bearing schist of Gilmore Dome on three sides. As mentioned previously, scheelite is found sparsely disseminated as a primary constituent in dikes that are connected with the main granitic mass.

Although the best scheelite prospects have been found near the summit of Gilmore Dome, several thousand feet from the nearest granite contact, it is probable that the whole area is underlain by granite at no great depth. Elevations taken during a planetable survey show that the granite at the nearest contacts is from about 300 to 500 feet lower than the prospects. Interpolation of these elevations indicates that the granite itself is domed up under Gilmore Dome; consequently at the summit it probably lies not more than a few hundred feet vertically beneath the surface. In addition, it is likely that cupolas or dike-like extensions of the granite were formed during its emplacement, and these would lie at even shallower depths.

Unconsolidated material, consisting mainly of residual soil and weathered schist, covers bedrock in most of the area to depths of from about 2 to 10 feet. Generally, the ore zones are more deeply weathered then the schist, since some of the replacement minerals are more readily oxidized and dissolved than those in the schist.

ANTIMONY AND TUNGSTEN DEPOSITS

Current Prospecting

During 1942, prospecting in the Gilmore Dome area was done by Cleary Hill Mines, Inc. and by L. D. Colbert. Cleary Hill Mines secured a long-term lease from Mike Stepovich, on a group of claims formerly worked by the Alaska Tungsten Mines Company, and started development work in the spring of 1942. Mr. Colbert began prospecting in the fall of 1941, on several claims adjoining the Cleary Hill holdings on the south and east.

Operations by Cleary Hill Mines during the summer and fall of 1942 consisted of: (1) surface prospecting in which an ore zone was traced for about 800 feet (2) sinking an inclined shaft about 75 feet along the dip of the ore zone and (3) drifting both east and west for about 30 feet from the 50 foot level of the inclined shaft. Incidental work included bulldozing out 3/4 miles of road from the Gilmore Creek road to the prospect, and bringing in a compressor, hoists and other machinery for use in underground development, as well as a hoist house and a tool house.

It was originally planned to discontinue prospecting during the winter and hence no preparations were made for winter work, but the recent ruling shutting down gold mines resulted in a change of plans. In October, 1942, a mess house and wanigans were brought to the property and other preparations were made to house a crew and to carry on winter operations. Hitherto the few men working on Gilmore Dome lived at the company's gold lode camp on Cleary Creek and each day drove the 40 odd miles to and from work. No convenient water supply is yet available, but sufficient water may be obtained from snow for present small-scale operations.

Development during the early winter has consisted chiefly in sinking a winze from the east drift, along a rich ore shoot. In the latter part of November the winze had reached a depth of about 75 feet, or approximately the same distance from the surface as the inclined shaft. About 30 tons of ore, containing an estimated

5 percent WO_3, has been taken from the winze.

An average of about 3 men were employed during the summer and fall. In November a cook was taken on when a camp was established on Gilmore Dome. Plans apparently call for enlarging the crew as soon as conditions at the gold lode mine on Cleary Creek permit transferring miners to the tungsten prospect.

Complete sampling data are not available for this report. It is estimated, however, that the average WO_3 content of the ore zone uncovered by surface prospecting is about 5 percent, over a width of from 1 to 2 feet. While sinking the inclined shaft about 75 tons of ore was mined. Of this, 63 tons containing slightly less than 5 percent WO_3 was shipped to the Depot in Fairbanks, where it sold for enough to pay for most of the cost of prospecting. As might be anticipated, the tenor of the ore encountered both on the surface and in the shaft varied considerably. Several samples taken across width of about 2 feet contained 20 to 30 percent WO_3, while other parts of the zone are practically barren.

Prospecting by L. D. Colbert has consisted principally of searching for scheelite-bearing float and then tracing the float to its source by digging small pits through the overburden. By this means he has found several good prospects in a mineralized zone that is apparently distinct from the zone in which Clearly Hill Mines is prospecting.

Since all the work was done by hand, the prospects are not sufficiently exposed to determine their size. Mr. Colbert has merely attempted to find as many prospects as possible, with a minimum of hand labor. Through a verbal agreement with Cleary Hill Mines, made early in 1942, further surface development is to be done with a bulldozer. This work was delayed for various reasons; recently, however, a formal option on Mr. Colbert's claims was taken up by Cleary Hill Mines, so that more active development will presumably be started in 1943.

Tungsten Hill Area [1]

1/ Reported in Dept. of Mines Pamphlet No. 1, May, 1942

ANTIMONY AND TUNGSTEN DEPOSITS

Description of Deposits

As on Gilmore Dome, porphyritic granite is apparently the ultimate source of the tungsten in the Tungsten Hill area. Here, at the west end of the intrusion, the granite-schist contact is extremely irregular, with narrow fingers of granite extending into the schist. Some of them are less than a foot wide, while others, judging from the distribution of float, are considerably wider. The few that were observed in place were found to be sills conformably intruded along the bedding of the schist. Many of them contain sparsely disseminated scheelite.

That scheelite occurs in one or more zones of replaced limestone is evidenced by float found in a number of places, containing garnet, epidote, hornblende, diopside vesuvianite and other replacement minerals, as well as disseminated scheelite. Pieces of unreplaced limestone were also found close to the replaced rocks.

Many old prospect shafts were apparently sunk on quartz stringers, which so far as could be observed, carry only small amounts of scheelite. It is possible that ore shoots were found where some of these stringers entered limestone beds, as is the case on Gilmore Dome.

The examination of the Tungsten Hill area was handicapped by a lack of rock exposures; in addition, all of the old prospect pits and shafts are now caved. However, evidence afforded by float and by rocks left on old dumps indicated that scheelite is not confined to any single zone in the area, but rather is widespread. No high-grade ore was found on the dumps, but this does not necessarily signify that none exists.

Prospecting

Little prospecting has been done in the Tungsten Hill area since about 1918, when shafts and prospect pits were sunk on many claims. Several years ago a small dragline cut was made by Robert Heath and L. D. Colbert, but this has now caved. While the old shafts and pits are now largely inaccessible, their positions and the material remaining on the dumps afford considerable information that would not otherwise be avilable.

ANTIMONY AND TUNGSTEN DEPOSITS

Pedro Dome Area

Description of Deposits.

Little is known of the distribution or methods of occurrence of tungsten in the Pedro Dome area. It is generally known that scheelite was found many years ago at the head of Seattle Creek, tributary of Dome Creek, but a search for this prospect by the Department of Mines in the spring of 1942 was unsuccessful. Abundant scheelite was found in placer concentrates examined by the Department of Mines, notably from the upper parts of Dome, Cleary and Fox Creeks. In the summer and fall of 1942 several lode prospects were found. It was not possible to visit them, however, until late in the fall. At that time thorough examinations were not practicable because the ground was covered with snow.

AM49-265 One prospect was found by Dan Eagan and associates at mile 18 on the Steese Highway, on the west side of Twin Creek. Bedrock had been exposed here in a road cut. The scheelite occurs in small stockworks of quartz stringers in a weathered rock that appeared to be a fine-grained biotite granite. Small amounts are also disseminated through the granite. Where exposed, the scheelite in the stockworks is below commercial grade, but additional prospecting is worthwhile if only because of the favorable location of the prospect.

AM49-266 A second prospect was found by Bob Leslie and Frank Hawks at the head of Seattle Creek. This deposit may have originally been found many years ago, but its location was forgotten. Most of the current prospecting has been done by Duane Franklin and partner, who have secured an option on the property. Development work consists mainly of bulldozing a trench through several feet of overburden and into the weathered schist bedrock. A small pit was then sunk in the bottom of the cut, to a total depth of 8 feet below the surface.

Exposed in the trench was a 3 foot zone of finely disseminated scheelite, containing a few high-grade spots and with an estimated average WO_3 content of from 0.5 to 1 percent. Apparently this zone is part of a replacement deposit. No quartz

veins were seen. Also exposed in the bottom of the pit was what appeared to be a biotite granite dike. Relations could not be determined with certainty, because the prospect was examined in darkness, with the aid of a fluorescent lamp and a flashlight.

A third scheelite occurrence not yet seen by the writer was reported to have been found by Ed Verdin in a placer cut on upper Fox Creek. Bedrock is said to be badly weathered so that relations are obscure. However, a sample of placer concentrates from nearby consisted mainly of scheelite, of the variety that fluoresces yellow, thus indicating that an appreciable amount of molybdenum is present.

The deposits just described are aligned NE-SW, or roughly parallel to the strike of the country rock and to the long axes of the granite intrusives. Their arrangement suggests that mineralization has been confined to a relatively narrow zone, but additional search may reveal other zones.

Placer concentrates from upper Cleary Creek contain relatively large amounts of scheelite. Several sources of the tungsten are possible: (1) from the gold-quartz veins in the vicinity, in many of which scheelite is known to occur in small amounts (2) from replacement deposits in limestone beds in the schist and (3) from quartz veins in which gold is subordinate to scheelite.

So far as is known, none of the gold-quartz veins contain scheelites in commercial amounts, although they have doubtless contributed at least a portion of the scheelite found in the placers. Geological conditions are favorable for the occurrence of scheelite in replaced limestone beds. Both limestone and granitic rocks are plentifully represented on upper Cleary Creek; and several replacement deposits containing sphalerite and galena have been found. No quartz veins are known here in which the chief ore mineral is scheelite, although a vein of this type has been found in the Mizpah mine, several miles to the east. Their existence would probably depend on the presence of replacement deposits, as in the Gilmore Dome and Tungsten Hill areas.

ANTIMONY AND TUNGSTEN DEPOSITS

Conclusions

Scheelite deposits in the Fairbanks district occur under generally similar conditions, thereby indicating a similar origin. For the most part, the ore was deposited by replacement, in calcareous beds in the schist. Replacement was accomplished mainly by aqueous solutions, which carried principally iron, fluorine and large amounts of silica, in addition to tungsten. The solutions apparently entered the calcareous beds by two routes: (1) along the beds through joints and cracks and (2) through crosscutting fissures. Solutions advancing along the bedding caused relatively widespread replacement and lower grade tungsten metallization. Solutions entering along fissures, on the other hand, caused intense metallization where a calcareous horizon was entered, but failed to deposit any significant amounts of scheelite where the wall rock was mica or quartzite schist.

According to the results of prospecting, the scheelite areas in the order of their importance are (1) Gilmore Dome, (2) Tungsten Hill and (3) Pedro Dome. Additional prospecting may increase the importance of the Pedro Dome Area.

Because of the high grade of the deposits found thus far, the Gilmore Dome area promises to become one of major importance. Two scheelite zones have been found and partly explored. In view of the large proportion of the area that has not yet been prospected, it is likely that other ore zones occur. Present indications are that the ore mineable under present conditions is localized in rich shoots of relatively small dimensions; but additional development may disclose larger and perhaps lower grade deposits.

Apparently no rich deposits were found in the Tungsten Hill area, in the prospecting during the last war. However, some of the known deposits could possibly be mined under present conditions, and since mineralization in this area is widespread, it is not unlikely that a number of as yet undiscovered deposits exist.

In the Pedro Dome area none of the known deposits contain high-grade ore, but in this area, also, the wide distribution of scheelite, together with favorable

geologic conditions, indicate that commercial ore could be found.

Recommendations for Future Development

In the Pedro Dome area, where little work has been done, a geological survey should precede surface prospecting in order that something may be learned of the factors controlling mineralization. Such a survey would not be entirely satisfactory, because of the lack of rock exposures, but it would at least furnish information of a general nature in a relatively short time.

In the Gilmore Dome and Tungsten Hill areas considerable is already known, through geological surveys and prospecting, of the methods of occurrence and distribution of scheelite. Because little definite information is available concerning the old prospects in the Tungsten Hill area, however, a few of them should be reopened by surface stripping in order to determine something of the tenor and extent of the ore. More surface stripping should also be done on Gilmore Dome so that the limits of the ore zones may be determined, after which additional underground development should be started.

Consideration should be given to the applicability of geophysical methods to tracing ore zones. On Gilmore Dome a zone of magnetic minerals is apparently associated with the scheelite; thus the ore may be traceable indirectly by a magnetic survey. In addition, since the ore zones are generally more deeply weathered than the country rock, earth resistivity measurements may help to trace them. In the other areas one of more geophysical methods, integrated with geological surveys and direct prospecting, may be similarly applicable.

OTHER DISTRICTS

Fortymile District

During a field trip in 1942, placer concentrates from 45 Pup, tributary to Buckskin Creek were found to contain abundant scheelite. The concentrates were submitted by Fred Purdy of Chicken. No detailed examination of the area was made, but

←—conditions were observed to be favorable for the occurrence of scheelite. Numerous beds of limestone were found in the schist country rock, as well as many large and small areas of granite.

Similarly, in the area at the head of the Middle Fork of the Fortymile River, conditions are favorable for the occurrence of scheelite. During a reconnaissance trip in 1942, several replacement-type deposits of copper and lead were found, and it is likely that scheelite also occurs nearby. The area has been little prospected because of a lack of landing fields.

Livengood District

An occurrence of placer wolframite on Steel Creek in the Livengood district is recorded in the College Assay Office files. This record was unaccountably overlooked in 1941 when the files were searched for strategic mineral occurrences. According to the report, a sample of placer concentrates from Steel Creek consisted largely of wolframite. The sample was submitted by L. W. Gates in 1936.

Circle, Chena and Innoko Districts

Occurrences of wolframite and scheelite in the Circle district, and of scheelite in the Chena and Innoko districts, are reported in Departments of Mines Pamphlet No. 1, May, 1942. No additional information is available concerning these occurrences.

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