(12) Hess 22

Contact-metamorphic scheelite deposits occur at the north end of the Tem Piute Range in the west-central part of Lincoln County, Nevada, approximately 85 miles west of Caliente, 100 miles east of Tonopah, and 160 miles north of Las Vegas. The district is reached by 40 miles of desert road from U. S. Highway 93 at Crystal, near Hiko. The deposits are in secs. 25 and 36, T. 3 S., R. 56 E.; secs. 31 and 30, T. 3 S., R. 57 E.; and sec. 1, T. 4 S., R. 56 E.

The range was prospected for silver in the 1860's, and small amounts of silver ore were mined at various times from 1868 to 1883, and again from 1935 to 1939. The scheelite deposits are several miles north of the silver prospects, and were first discovered in 1916. They were not mined or extensively prospected until 1934, when

a number of claims were re-located by Wesley Koyon, in partnership with Mrs. W. Green, C. W. Thiriot, and D. P. Thiriot. The property was leased to Lincoln Mines, Inc., and a small mill was completed in June 1940. In 1945, the Atolia Mining Co. purchased Lincoln Mines, Inc. from D. B. Fegles, and took over the mining lease. The mine was idle in 1946, and was again operated in 1947. From 1940 to 1947 inclusive, Lincoln Mines, Inc., and its successor, the Atolia Mining Co., treated 81,872 tons of ore and recovered 43,390 units of WO_3. More than half this production was made in 1941 and 1942.

The North Tem Piute Mining and Development Co. was organized in 1937 by the Schofield brothers, who had located claims in the district in 1928. In 1943, concentrate containing 32 units of WO_3 was made. The property was leased in 1946 to the Atolia Mining Co.

The U. S. Bureau of Mines explored the deposits in 1942 (E. O. Binyon in charge) and in 1944 (C. H. Holmes, Jr. in charge).

In 1942, trenches were dug across the ore zones at intefvals of 100 feet or less, samples were cut and assayed, and 5 diamond drill holes were completed. In 1944, 8 holes were drilled.[1]

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[1] Anonymous, Tem Piute tungsten district, Lincoln County, Nevada: U. S. Bureau of Mines, War Minerals Report 430, 19 p., 1945.

Geology

The north end of the Tem Piute Range is composed largely of steeply dipping Paleozoic sedimentary rocks. They are invaded by 2 small granite stocks and by several narrow, short basalt dikes. Volcanic tuffs and flows are found in the pediment at the north end of the range.

The Paleozoic sequence, the upper portion of which is mapped on fig. 114, includes rocks of Ordovician, Devonian, and Carboniferous

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Fig. 114. Geologic map of the north part of the Tem Piute Range, Lincoln County, Nevada.

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ages, and is more than 7,000 feet thick. The Ordovician rocks (not mapped) are exposed on the west side of the range where the Eureka quartzite forms prominent outcrops. They are succeeded eastward by Silurian and Devonian rocks, nearly a mile thick, consisting of dolomite, limestone, and a small amount of quartzite. The Carboniferous rocks are exposed on the east side of the range, and consist of a sequence of shale, sandstone, limestone, shale, and limestone.

Two granite stocks invade the sedimentary rocks near the Devonian-Carboniferous contact. The south granite stock is about a mile in diameter, the north stock about 4,000 feet. Both stocks are partly concordent with the invaded sedimentary rocks.

Structurally, the main part of the Toe Piute Range appears to be a homocline that strikes north, with older beds on the west side, younger ones on the east. Most of the beds dip east at steep angles. At the north end of the range, however, beginning in the southern part of the area shown in figure 114, the beds steepen and overturn along

the strike. It is believed that this reversal in dip was brought about by overthrusting from southwest to northeast prior to the granite intrusion, which cuts through the thrust plate. Although enough area has not been mapped to determine the character of the thrust, its presence is attested by anomalous stratigraphic relations, and by the overturn.

For a distance of 700 feet from the granite contacts, the limestone is bleached irregularly and re-crystallized locally. The shaly beds are altered to hornfels, and the sandy ones to quartzite. On the west side of the south stock, part of the limestone is altered by contact metamorphism to thick bodies of tactite in bands parallel to bedding. Around the north stock, only a few narrow lenses of tactite have been found, principally on the northeast side, although the limestone is directly in contact with granite along other parts of the stock.

Tactite is present along the west half of the south stock for a distance of more than 8,000 feet (fig. 115). Directly at the con-

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Fig. 115. Geologic map of the Tem Piute tungsten deposits, Lincoln County, Nevada.

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tact is a continuous band 15 to 110 feet thick, with occasional remnants of limestone along the west side. Adjoining this band is a fairly continuous belt of platy hornfels, ranging in width from 25 to 110 feet, and in part split into 2 beds separated by tactite. Before metamorphism, this hornfels was probably a limy shale. Large masses of tactite lie west of the hornfels, and extend as far as 450 feet from the granite contact. These more distant bands and lenses of tactite are less continuous than the one at the granite contact. No tactite is found farther than 450 feet from the granite, but farther away, in the outer contact aureole, is found a bed of impure limestone irregularly altered to light colored lime silicate minerals (mapped on

figure 116 as "silicated limestone"), and another continuous bed largely changed to hornfels.

A few hundred feet south of the south stock is an irregular granite mass about 400 feet wide by 600 feet long. This granite may be a tip of the south stock separated from it by faulting. It is bordered on the southwest side by tactite.

Along the south stock where the tactite is most plentiful, the contact between granite and sedimentary rocks is conformable both at the surface and in the deepest mine workings and drill holes (fig. 116). The tactite bands are also parallel to bedding. Tactite

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Fig. 116. Geologic sections of the Tem Piute tungsten deposits, Lincoln County, Nevada.

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exposures range in altitude from 6,325 feet to 7,075 feet, and the tactite is penetrated at an altitude of 5,760 feet by the deepest exploration. In this vertical range of 1,300 feet, mineralization

appears to be relatively uniform, and the dip of beds fairly constant. It seems likely that the tactite zone extends to much greater depth, but no data exist upon which to base speculation as to the ultimate depth.

Ore deposits

Scheelite is the only mineral found in commercial amounts in the contact deposits. Although small amounts of gold and silver were formerly produced from veins and replacement deposits farther south in the range, neither of these metals is known to occur near the tungsten mineralization.

The bulk of the scheelite occurs in garnet-tactite, but some rich deposits have been found in small masses of calcite-fluorite-sphalerite rock formed in marble remnants adjoining tactite bodies. Although the tactite masses around the south stock are very extensive and contain in the aggregate a large amount of tungsten, they are of low grade and had not been extensively exploited up to 1948.

Most of the production was from the richer calcite-fluorite-sphalerite rock found in the relatively small Moody ore shoot of the Lincoln mine. Small amounts of fluorite and sphalerite, and possibly bismuth, are potential by-products from this type of ore.

Most of the tactite around the south stock contains some scheelite, but only part of it contains enough scheelite to be considered potential ore. The average grade of material that could be mined in large bodies is estimated at 0.4 percent of WO_3, determined from samples taken by the U. S. Bureau of Mines. On the surface map (fig. 115), rock containing 0.5 percent of WO_3 or more was distinguished from lower grade material on the basis of estimates made in ultraviolet light.

The tactite bodies exposed around the north stock are narrow and discontinuous, and contain too little scheelite to be economically significant; the largest body, on the northeast side of the stock, is composed of a series of lenses with a total length of 400 feet and an average width of 1 to 2 feet.

Mineralogy. -- The minerals observed in the tactite, listed in approximate order of abundance, are garnet, quarts, actinolite, calcite, fluorite, pyrite, pyrrhotite, diopside, sphalerite, scheelite, chlorite, hematite, clinozoisite, epidote, molybdenite, and powellite.

The bismuth mineral, shown to be present in concentrates, was not identified. Limonite is abundant in the surface gossan. Gypsum and manganosiderite occur as linings of solution cavities in the Lincoln mine.

The scheelite, which occurs for the most part in small grains, is white to buff in color. In ultraviolet light, it fluoresces white to pale yellow, indicating that some of it contains a small amount of molybdenum. The molybdenum content of concentrates rarely exceeded the tolerance of 0.4 percent.

Molybdenite is a rare mineral in the deposits. It is found sparingly in a small quarts lens at co-ordinates 4,800 N., 4,670 E. (fig. 115), where it is partially replaced by powellite. In the

tungsten ores and associated bodies of sulfides, molybdenite is rare.

Sphalerite is found in very small amounts in the tactite. It is an abundant mineral in the calcite-fluorite-sphalerite-scheelite ore mined in the Moody ore shoot of the Lincoln mine. This ore averages about 3 to 4 percent of zinc.

The manganosiderite is dark green, scoriaceous appearing material with a honey-comb framework. Jewell J. Glass of the Geological Survey examined the material microscopically and determined it to be a rhombohedral carbonate with an omega index of 1.830, that for the normal iron carbonate, siderite, with some manganese. The material completely dissolved in hot hydrochloric acid with effervescence, and gave strong qualitative tests for iron and manganese, but none for tungsten.

Localization of ore. -- Scheelite occurs in greater concentration on the limestone side of the tactite bands. The ore shoots present in the band of tactite that adjoins the granite (the "Moody"

band) all have limestone remnants between them and the platy hornfels. It seems probable that the bulk of the calc-silicate minerals were introduced at an early stage, and that they were impermeable to subsequent introduction of tungsten-bearing solutions. The un-replaced limestone was a favorable host rock for these later solutions. In most instances, only part of the limestone was replaced.

In the Lincoln mine, fractures and joints that cut across the bedding in the limestone are now mineralized in part; they served as channelways for mineralizing solutions which penetrated out along them from the massive tactite. This relationship is particularly well shown in the Noddy ore body; it is also evident in the Grubstake zone.

Scheelite mineralization in the tactite west of the platy hornfels is very erratic. In the Grubstake zone of the Lincoln mine, several stopes of high-grade ore were mined. Development beneath them showed that the ore bodies were not continuous downward. No infor-

mation was gained whereby to predict the occurrence of ore.

Insofar as is known, the Moody ore shoot is unique in the district. There has been no recognition of surface evidence suggesting the occurrence of similar ore bodies.

Mines

The Lincoln mine and the Schofield mine are about 1.5 miles apart, on the northern and southern extremities respectively of the contact zone. The Lincoln mine has been the major producer in the district, whereas the Schofield mine, prospected sporadically for a number of years, had only produced about 32 units of WO_3 by the end of 1945.

Lincoln mine. -- By 1944, the Lincoln mine was opened by an inclined shaft 220 feet deep, by an adit that intersects the shaft about 40 feet below the collar, and by several winzes (figs. 117, 118, and 119). Workings in 1944 included 4 main levels, several

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Fig. 117. Composite map of workings of the Lincoln mine, Tem Piute district, Nevada.

Lincoln County

Fig. 118. Geologic map of levels 1, 2, 3, and 4, Lincoln mine, Tem Piute district, Nevada.

Fig. 119. Vertical projection of the Moody ore zone, Lincoln mine, Tem Piute district, Nevada.

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sublevels, 3 stopes, connecting raises, winzes, and shafts. There were 5,200 feet of drifts and crosscuts, 1,700 feet of raises, winzes, and shafts. The fourth level, at a depth of 255 feet beneath the adit, was opened from a winze.

Two tactite zones were explored in the mine: the Moody zone, adjacent to the granite contact, and the Grubstake zone, from 60 to 200 feet northwest of the granite. The greater part of the ore mined came from the Moody ore shoot. The Grubstake zone was explored only on the first and second levels, and the only important ore body found was at the north end of the mine above the adit.

In the Lincoln mine, the Moody tactite bed is about 45 feet thick. It consists of bands of different kinds of tactite associated with some residual limestone on the hanging wall. Along the granite

contact is a sulfide-rich tactite 20 to 25 feet thick, which is succeeded outward by garnet tactite with little sulfide. The Moody ore shoot, which consists of calcite-chlorite-fluorite rock, with sphalerite and scheelite, lies between the tactite and the platy hornfels of the hanging wall. Irregular remnants of marble are in places present between the Moody ore and the hornfels.

The sulfide-rich tactite is a dense, hard rock consisting predominantly of pyrite and pyrrhotite with lesser amounts of dark silicate minerals. It appears to fill the entire width of the Moody zone at the south end of the third level, but elsewhere takes up only half the bed or less. At the surface, the rock is oxidized to a limonite gossan which extends only 20 or 30 feet deep. Oxidation is much deeper in the adjoining tactite bands because of their higher porosity.

The rest of the tactite is low in sulfides and consists dom-

insantly of garnet with lesser amounts of quartz and calcite. Some of this rock may contain as much as 1 percent of WO_3, but most of it is of lower grade.

Solution cavities as much as 5 feet across are present along part of the contact between ore and marble. They were formed by surface waters that seeped down along the porous contact, and extend to the lowest workings, although the present water level, before pumping, is above the third level.

The Moody ore body consists of calcite-chlorite-sphalerite-fluorite-scheelite rock in an ore shoot with an average strike length of 200 feet and an average thickness of 10 feet. The thickness ranges from 5 to 15 feet. The shoot rakes 62° NE. (fig. 119). In 1944, it had been mined 300 feet along the rake, from the surface to the fourth level, and had been shown by drilling to continue another 380 feet deeper along the rake. The deepest hole penetrated 4.6 feet of ore containing 0.93 percent of WO_3 at an altitude of

8,755 feet, 615 feet vertical distance beneath the outcrop. The average content of WO_3 is probably about 1.0 percent. The lower limit of the ore shoot is not known.

Schofield mine. -- The property of the North Tem Piute Mining and Development Co., known locally as the Schofield mine, consists of 40 unpatented claims, of which only 4, the Phylis, Rae Ella, Rae Ella No. 2, and Rae Ella No. 3, are known to contain mineral deposits of potential value. These claims are at the south tip of the south stock. A single band of tactite, ranging in thickness from 20 to 110 feet, is present along the granite contact on the west side of the granite, and a narrower band on the east side. Scheelite is widespread in the tactite, but concentrations are found only in the west band along the limestone side of the tactite. From surface sampling and core drilling, it is believed that 4 shoots of scheelite ore are present in a distance of 850 feet; these shoots range in strike length from 95 to 280 feet, in width from 4 to 13

feet, and in grade from 0.4 to 0.65 percent of WO_3. Local enrichments contain as much as 1.6 percent of WO_3, but they are too erratic in distribution to be mined separately. The tactite between ore shoots probably averages about 0.2 percent of WO_3, and much of the tactite from the ore shoots east to the granite contact ranges from 0.1 to 0.2 percent.

The 4 claims are partly prospected by 9 short adits with a total length of 600 feet (fig. 120). At the surface, the tactite was

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Fig. 120. Geologic map of workings, North Tem Piute Mining and Development Co., Tem Piute district, Nevada.

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trenched and sampled, in 1942, at intervals of 50 to 100 feet. Three diamond drill holes, with an aggregate length of 944 feet, were drilled by the Bureau of Mines in 1944 to test the ore zone at depths up to 200 feet beneath the outcrop. The drill holes cored material similar in grade to that at the surface.

It is estimated that the indicated ore to the depth of the deepest

drill hole (elevation 6,670 feet) amounts to 80,800 tons containing 85,600 units of WO_3. Inferred ore estimated at 420 tons per foot of vertical depth extends to unknown depths beneath the drill holes.

NEWS LETTER

NEVADA MINING ASSOCIATION
RENO, NEVADA 89505

JULY 15, 1977

ROOM 602
ONE EAST FIRST STREET

POST OFFICE BOX 2498
TELEPHONE 323-8575

PAUL GEMMILL, Executive Secretary

NUMBER 292

NEVADA MINES, COMPANY REPORTS, ETC.

UNION CARBIDE CORPORATION:- held dedication ceremonies for its Emerson Tungsten Mine and Mill at Tempiute, Lincoln County, Nevada on June 24, 1977. The brochure describing the operation states: "About 150 miles north of Las Vegas, Nevada, is the Timpahute Mountain Range where Union Carbide is operating a new tungsten mine and mill. Named for John F. Emerson, who has guided Union Carbide's mining activities for over 30 years, this mine and mill provides an important new source of this metal for use in cutting tools, light bulbs, drilling bits, aerospace hardware, and many other home and industrial applications. These 8000-foot high mountains contain approximately 20 years of tungsten reserves. The mine and mill can produce and process about 1000 tons of this low-grade tungsten ore per day, yielding about 2-million pounds of tungsten per year. About 200 miners, geologists, engineers, and mill operators as well as maintenance, laboratory and office personnel are needed to operate this efficient facility. Since the U.S. relies heavily on overseas production to meet its needs, the Emerson mine and mill will make the U.S. more self-sufficient in tungsten.

"The mineral scheelite (calcium tungstate) was first discovered in the Tempiute District in 1916. Not until the 1950's did Tempiute see much mining activity. At that time, 160 men were employed in what was then called the Wah Chang mine. This operation was closed down and dismantled in 1957 when the U.S. Government ceased its stockpile buying program and the price of tungsten dropped sharply. In 1968, Union Carbide leased a number of mining claims and did extensive drilling to define the grade and the extent of the tungsten-ore body. At the same time, metallurgical studies were made to evaluate suitable processes for extracting the useful ore from its waste material. This work led to the decision in 1974 to open the mine and build a mill to process the ore. Production at the mill began in mid 1977.....

"Each ton of rock mined contains only a handful of tungsten. Extracting this small amount of tungsten is the job of the mill at Tempiute. The first step in milling is to crush the ore to a powder. This small size is needed because individual grains of scheelite are scattered through the rock and must be broken free of the waste material in order to be recovered. Crushing takes place in two steps. First, ore from the mine containing lumps as large as 30 inches is broken down to 3/4-inch lumps in a massive crusher with a mechanical jaw. Then water is added and the ore is fed to rod-and-ball mills that pulverize the ore into powder. The resulting powder-water mixture is called a

slurry. This slurry must be conditioned in mixing vessels before the tungsten-ore particles can be removed from the rest of the rock. Small amounts of soda ash, sodium silicate, copper sulfate, lime, and soapy oils properly condition the slurry for flotation, where the concentrated tungsten ore is finally recovered. Flotation is a physical-chemical method of removing the ore by bubbling air through the slurry. The chemicals allow the tungsten-ore particles to attach themselves to the air bubbles, which carry them to the top of the slurry to form a mineral-rich froth which is skimmed off. The waste rock sinks to the bottom of the flotation cell and is carried away to the tailings pile. The froth containing the concentrated tungsten ore is then filtered to remove the excess water and shipped to Union Carbide's tungsten operations in Bishop, California. There it is chemically treated to produce a white crystalline compound called ammonium paratungstate. Ammonium paratungstate is the starting material for producing other forms of tungsten, such as ferrotungsten and tungsten metal. Union Carbide produces these products at its plant at Niagara Falls, N.Y. Ferrotungsten is the form of tungsten that is added to steel. Tungsten metal powder is used for tungsten-metal applications or converted to tungsten carbide for metal-cutting and forming uses.

"Tungsten (which is Swedish for 'heavy stone') is one of the heaviest metals known. It also has the highest melting temperature - 6170°F (3410°C) - as well as high strength at high temperatures and excellent wear resistance. These characteristics are used in many applications in our daily lives. For example, light-bulb filaments are made of tungsten. (In fact, 1 pound of tungsten powder can be drawn into a wire 8.5 miles long to provide filaments for 23,000 60-watt light bulbs.) Dentists use high-speed drills containing tungsten while doctors use tungsten surgical instruments. Tips of ball-point pens last longer when they contain tungsten, as do distributor points in cars. Tungsten is also found in TV sets, X-ray machines, dyes, paints and glass. Even more important are the uses of tungsten in industry. Tungsten-carbide tools outlast tool steels by 10 times as they drill, cut and shape metals, even at red-hot temperatures. The mining and construction industries rely on tungsten to increase the life of rock-drilling bits and wear-resistant parts. The aerospace industry uses tungsten heat-protection shields in rocket nozzles and tungsten-bearing gas-turbine blades in jet engines that operate at high temperatures.....

"The Emerson facility at Tempiute is the third tungsten mine and mill operated by Union Carbide worldwide. The Corporation has been mining and processing tungsten ores at Bishop, California, in the High Sierra since 1937. Early in 1977, Union Carbide started up a new tungsten mine and mill at Boca de Lage in Northeastern Brazil....."

All present at the dedication ceremonies were given a copy of "What Mining Means to Americans", a booklet published as a public service by the American Mining Congress.

KENNECOTT COPPER CORPORATION:- reported consummation of the sale of Peabody Coal Company on June 30, 1977 for $1.2-billion face amount of cash and securities. All shares of Peabody Coal were sold to Peabody Holding Co., Inc., a corporation owned by Newmont Mining Corporation

HOUSTON OIL AND MINERALS CORPORATION:- has a 6-months option to buy Minerals Engineering Company's silver-lead-zinc mine and mill near Creede, Colorado, and will pay $850,000 if it exercises the option. Up to now, Houston oil has paid $453,000 to Minerals Engineering, mainly for Minerals Engineering's interests in prospective uranium property in western Colorado and eastern Utah, and in prospective gold-silver property in the Comstock Lode area near Virginia City, Nevada. Earlier this year, Houston Oil acquired all the mining properties of Summa Corporation (the mining arm of Hughes Tool Company) in Nevada.

GULF RESOURCES AND CHEMICAL CORPORATION:- announced acquisition of options to purchase all outstanding common stock and subordinated debentures of INDUSTRIAL MINERAL VENTURES, INC. of Golden, Colorado. The options are exercisable at Gulf's discretion and may be renewed by Gulf for a total period of 24 months. IMV has been in a development stage for the last several years. It has large reserves of bentonite, sepiolite, saponite, calcium carbonate and hectorite on the California-Nevada border, approximately 80 miles northwest of Las Vegas, Nevada. Bentonite may be used for fresh water drilling muds and because of its high whiteness, has applications in paint, paper coating and detergents. Sepiolite is used in salt water and high temperature drilling muds and has potential applications in paints, absorbents, and as a suspension agent. Saponite has potential applications in fresh water drilling mud, paint sealants, and in radioactive waste disposal. Calcium carbonate has high whiteness with uses in paint, paper, paper coating and as a filler in plastics. Hectorite has potential applications in organo-clad forms in paints, greases, and printing inks.

GULF OIL CORPORATION:- announced plans to acquire Kewanee Industries, Inc. for about $440.2-million in cash. Boards of the two companies have approved the merger. Kewanee Industries is an oil and gas producer and a partner in Westmoreland Resources, which operates the Absaloka Mine in Hardin, Montana. Other partners are Westmoreland Coal Company, Penn-Virginia Corporation and Morrison-Knudsen Company.

COLBY MINES LTD:- will start exploration on the Paradise Peak property near Gabbs, Nye County, 100 miles southeast of Reno, Nevada. The property has a dual potential, first as an early producer of tungsten-scheelite and second for its large tonnage copper-molybdenum porphyry potential. Colby has also optioned from Gene Sawyer the small tonnage, high-grade Gabbs tungsten property. The mine, 8 miles north of Gabbs, formerly produced from working to a depth of 100 feet and has an unexplored potential which will be tested by Colby Mines in the near future. Acquisition of both properties in Nevada is subject to approval of the regulatory authorities.

ARGUS RESOURCES, INC:- acquired the White Caps Mine at Manhattan, Nevada, which consists of 12 patented and 31 unpatented gold and antimony claims, for 145,000 shares of Argus Resources common stock. Argus now owns the White Caps Mine outright and the old White Caps Mining Company, renamed Transworld Energy Corporation, is now the largest stockholder in Argus.

SIERRA PACIFIC POWER COMPANY:- expects to begin construction of a power plant this fall at Valmy, Nevada, following approval of the Ne-

September 30, 1944

NORTH TEM PIUTE MINING AND DEVELOPMENT COMPANY
Lincoln County, Nevada

(Supplementary memorandum to Wyant report of January 1944)

by
Dwight M. Lemmon
U. S. Geological Survey

I spent September 27 to 29 reviewing geology and ore reserves of the North Tem Piute Mining and Development Co. Mr. George Holmes of the U. S. Bureau of Mines and I went over the results of Bureau drilling, re-interpreted the surface sampling done in a previous Bureau project, walked over most of the property, and examined the Moody ore zone in ultraviolet light. Mr. Ed Schofield of Provo, Utah, one of the promoting owners, was on the property part of the time.

The North Tem Piute Mining and Development Co. holds 40 unpatented claims in the Tem Piute district, Lincoln County, Nevada. Only 4 of these claims, the Phylis, Rae Ella, Rae Ella No. 2, and Rae Ella No. 3, are known to contain mineral deposits of potential value. These 4 claims adjoin the group held by Lincoln Mines, Inc., which lies to the north; the main mineralization is on the same contact as the orebodies worked by Lincoln Mines.

The 4 claims are partly prospected by 9 short adits with a total length of 800 feet. The surface ore zones were trenched at intervals of 50 to 100 feet and sampled by the U. S. Bureau of Mines in 1942. Three diamond drill holes, with an aggregate length of 944 feet, were drilled by the Bureau in 1944 to test the ore zone at depths up to 200 feet beneath the outcrop. The Bureau has completed its work on the claims.

Scheelite is widespread in the surface exposures of tactite; orebodies that appear to have continuity are found only on the west side of the Moody tactite zone against limestone and hornfels. Sampling and core drilling show 4 shoots of scheelite ore in a distance of 850 feet; these shoots have strike lengths ranging from 95 to 280 feet, average widths of 4 to 13 feet, and average grades ranging from 0.4 to 0.65% of WO_3. Local

enrichments may contain up to 1.5%, but are too erratic in distribution to be mined separately. The tactite between shoots probably averages about 0.2% WO_3, and much of the adjoining material east to the granite ranges from 0.1 to 0.2%. It is estimated that the indicated ore in these shoots to the depth of the deepest drill hole (elevation 6570 feet) amounts to 80,800 tons containing 35,600 units of WO_3. Inferred ore estimated at 420 tons per foot of vertical depth extends below the drill holes; the downward limit is unknown, but probably is at least several hundred feet below the indicated block.

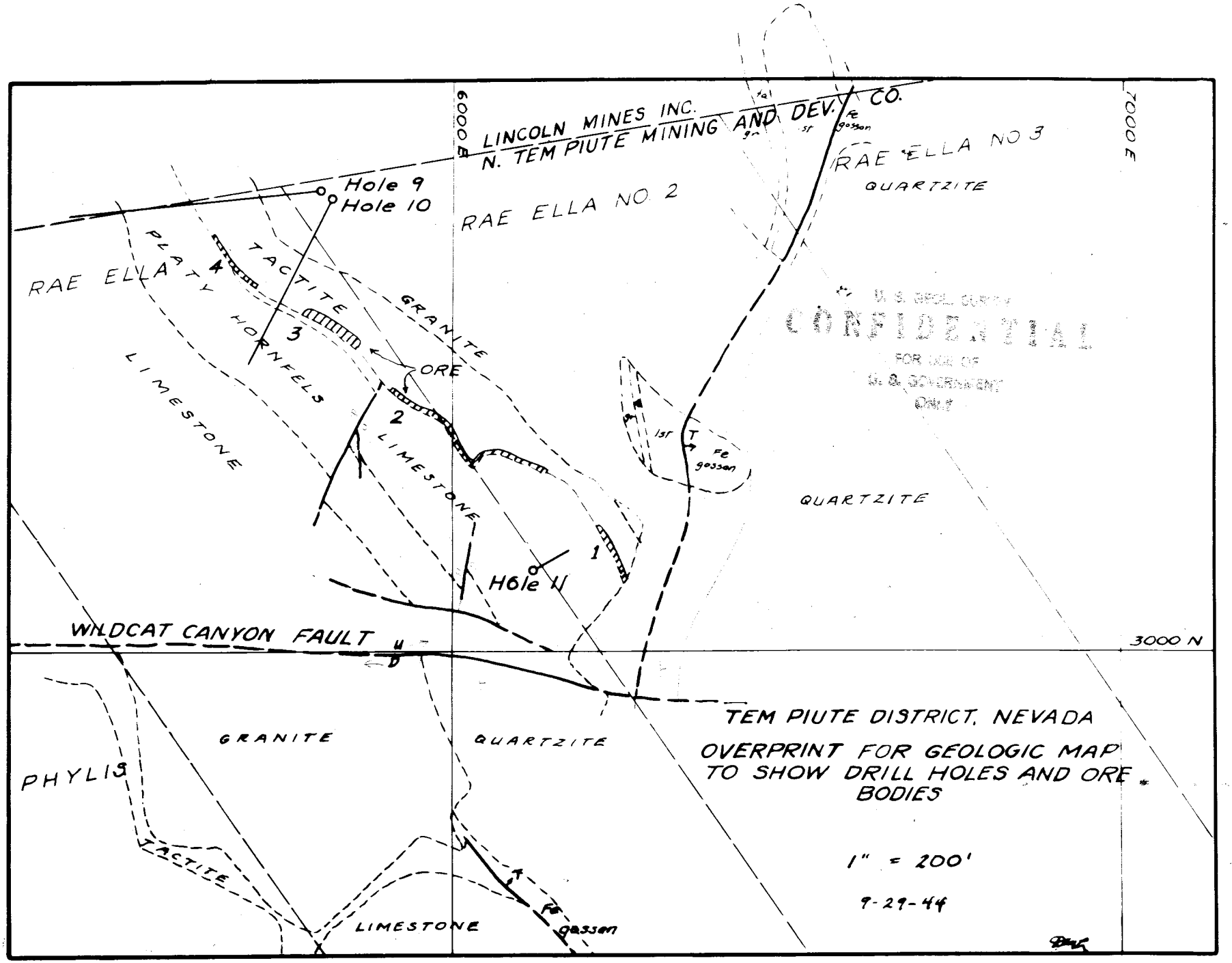
The other mineralized portions of the property are not known to contain scheelite orebodies, although scheelite is present in places. No scheelite or other mineral of value has been found in the limonite gossan that marks the thrust fault between quartzite and limestone, or in the silicified limonitic breccia along the Wildcat Canyon fault. Sphalerite is found in small amounts in the scheelite-bearing tactite, but none of the samples taken by the Bureau of Mines from drill cores or from surface trenches assayed more than a fraction of a percent of zinc. Of 10 smaples picked for zinc by L. D. Thomas of Combined Metals Co. in 1935, only one, representing a local enrichment 1.5' wide, assayed 8.5% of zinc; the others ranged from 0.1 up to 2.0%. The Schofields are attempting to promote the property as a zinc deposit, their hopes being based mainly on the use of a doodle-bug. There is no evidence of bodies of zinc, lead, copper, or silver ore on the claims. In the places where the sulfides have been penetrated by drill holes beneath the oxidized material, they have consisted of pyrite and pyrhottite without values.

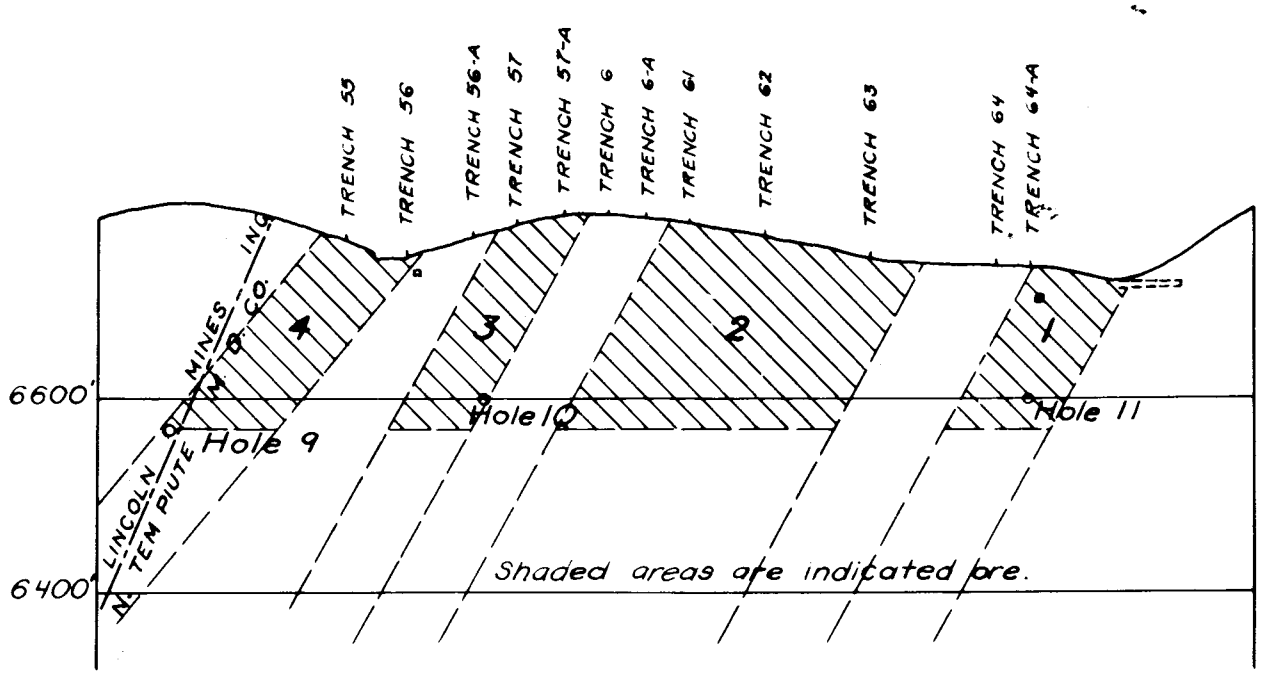
Conclusion. The tungsten mineralization is the only known substance of potential value on the property. The grade of most of the ore is too low and the size of the bodies too small to permit successful operation at current prices for tungsten. The claims have a substantial reserve of marginal to submarginal ore which could be made available for $30 to $40 a unit, other conditions being similar to those prevailing during 1944.

September 30, 1944

Ore Reserves on Rae Ella and Rae Ella No. 2 claims of North Tem Piute Mining and Development Co., Tem Piute District, Lincoln County, Nevada

Block	INDICATED ORE Width	Length	Inclined Depth	Tons	Grade	Units	INFERRED ORE Tons per foot of depth below elev. 6,570'.
1	8'	100	192	16,300	0.40	6,120	96
2	4.3	260	234	26,200	0.41	10,500	134
3	13.2	95	240	30,000	0.43	13,000	150
4	4	100	230	9,300	0.65	6,000	50
		TOTAL		80,800		35,600	430


LINCOLN MINES INC.
N. TEM PIUTE MINING AND DEV. CO.
6000 E
7000 E
3000 N
RAE ELLA NO 2
RAE ELLA NO 3
QUARTZITE
Hole 9
Hole 10
Hole 11
RAE ELLA
PLATY
TACTITE
HORNFELS
LIMESTONE
GRANITE
ORE
1
2
3
4
1ST
Fe gossan
WILDCAT CANYON FAULT
PHYLIS
TACTITE
LIMESTONE
Fe gossan
CONFIDENTIAL
TEM PIUTE DISTRICT, NEVADA
OVERPRINT FOR GEOLOGIC MAP
TO SHOW DRILL HOLES AND ORE BODIES
1" = 200'
9-29-44



TEM PIUTE DISTRICT, NEVADA

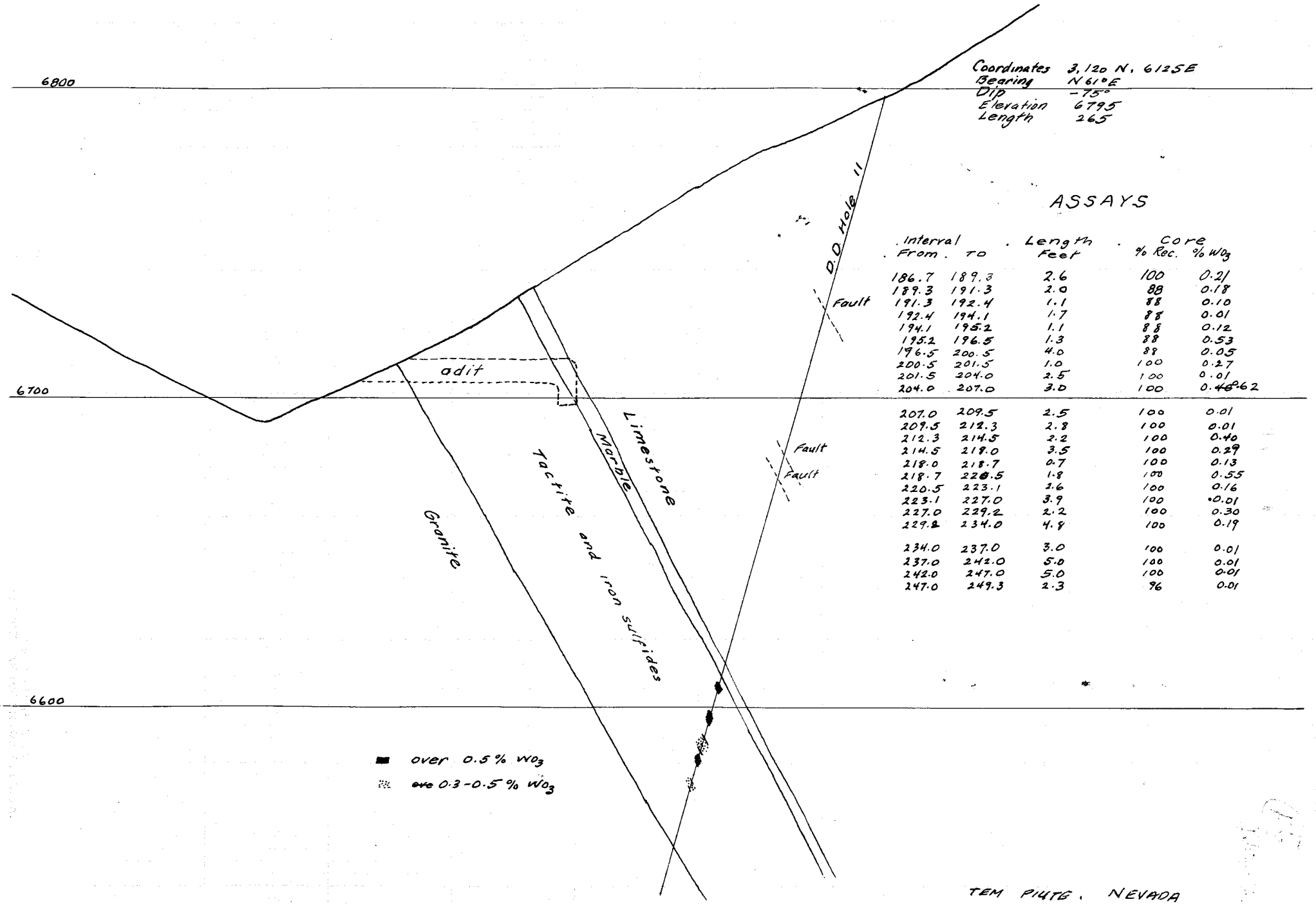
VERTICAL PROJECTION OF MOODY TACTITE ZONE

RAE ELLA AND RAE ELLA NO. 2 CLAIMS

BEARING N 49° W

1" = 200'

D. M. L. 9-29-44



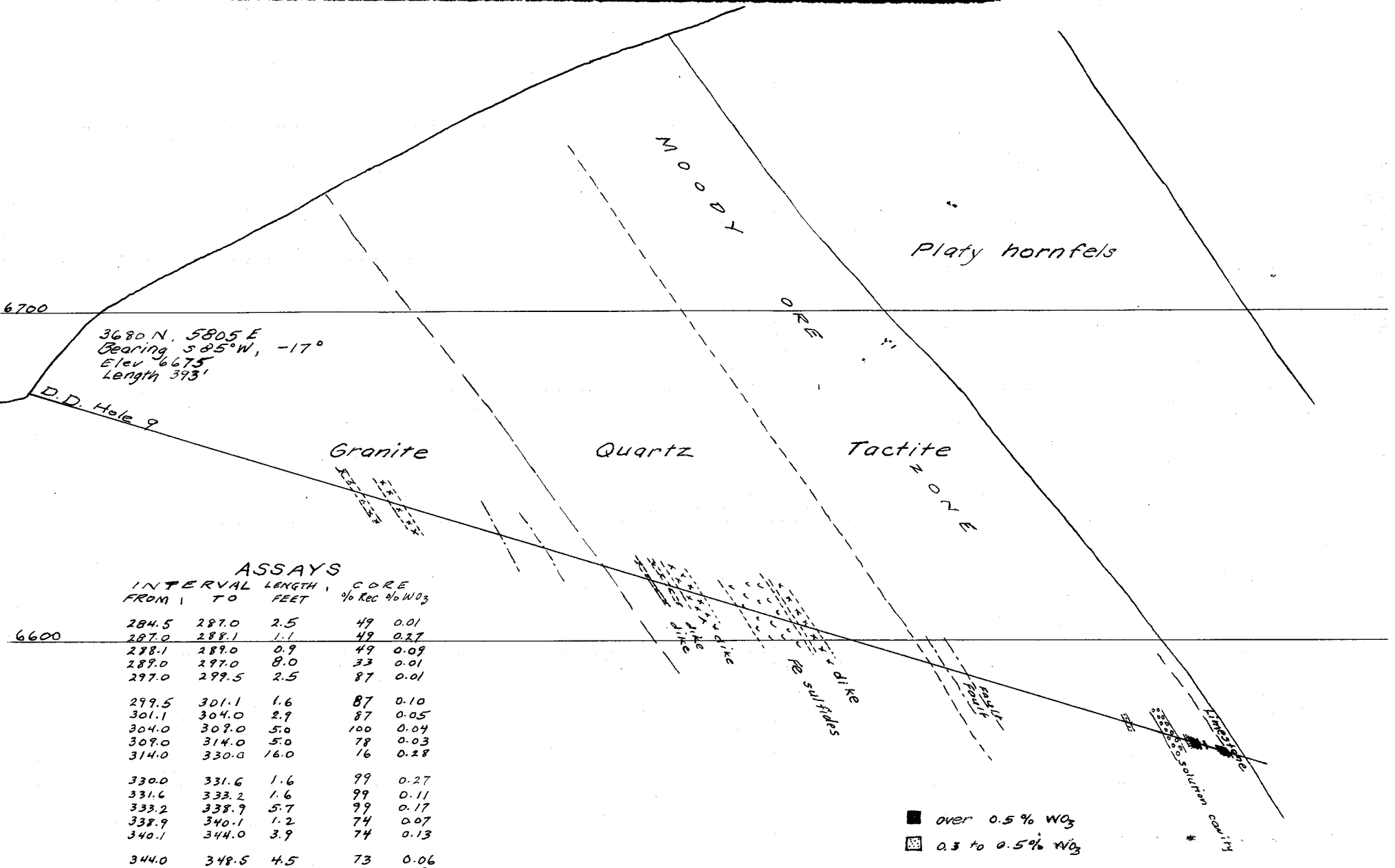
Coordinates 3,120 N. 6125E
Bearing N 61° E
Dip -75°
Elevation 6795
Length 265

ASSAYS

Interval From	Interval To	Length Feet	Core % Rec.	Core % WO_3
186.7	189.3	2.6	100	0.21
189.3	191.3	2.0	88	0.18
191.3	192.4	1.1	88	0.10
192.4	194.1	1.7	88	0.01
194.1	195.2	1.1	88	0.12
195.2	196.5	1.3	88	0.53
196.5	200.5	4.0	88	0.05
200.5	201.5	1.0	100	0.27
201.5	204.0	2.5	100	0.01
204.0	207.0	3.0	100	0.~~48~~62
207.0	209.5	2.5	100	0.01
209.5	212.3	2.8	100	0.01
212.3	214.5	2.2	100	0.40
214.5	218.0	3.5	100	0.29
218.0	218.7	0.7	100	0.13
218.7	220.5	1.8	100	0.55
220.5	223.1	2.6	100	0.16
223.1	227.0	3.9	100	<0.01
227.0	229.2	2.2	100	0.30
229.2	234.0	4.8	100	0.19
234.0	237.0	3.0	100	0.01
237.0	242.0	5.0	100	0.01
242.0	247.0	5.0	100	0.01
247.0	249.3	2.3	96	0.01

TEM PIUTE, NEVADA

Holmes 8-44 1" = 40'



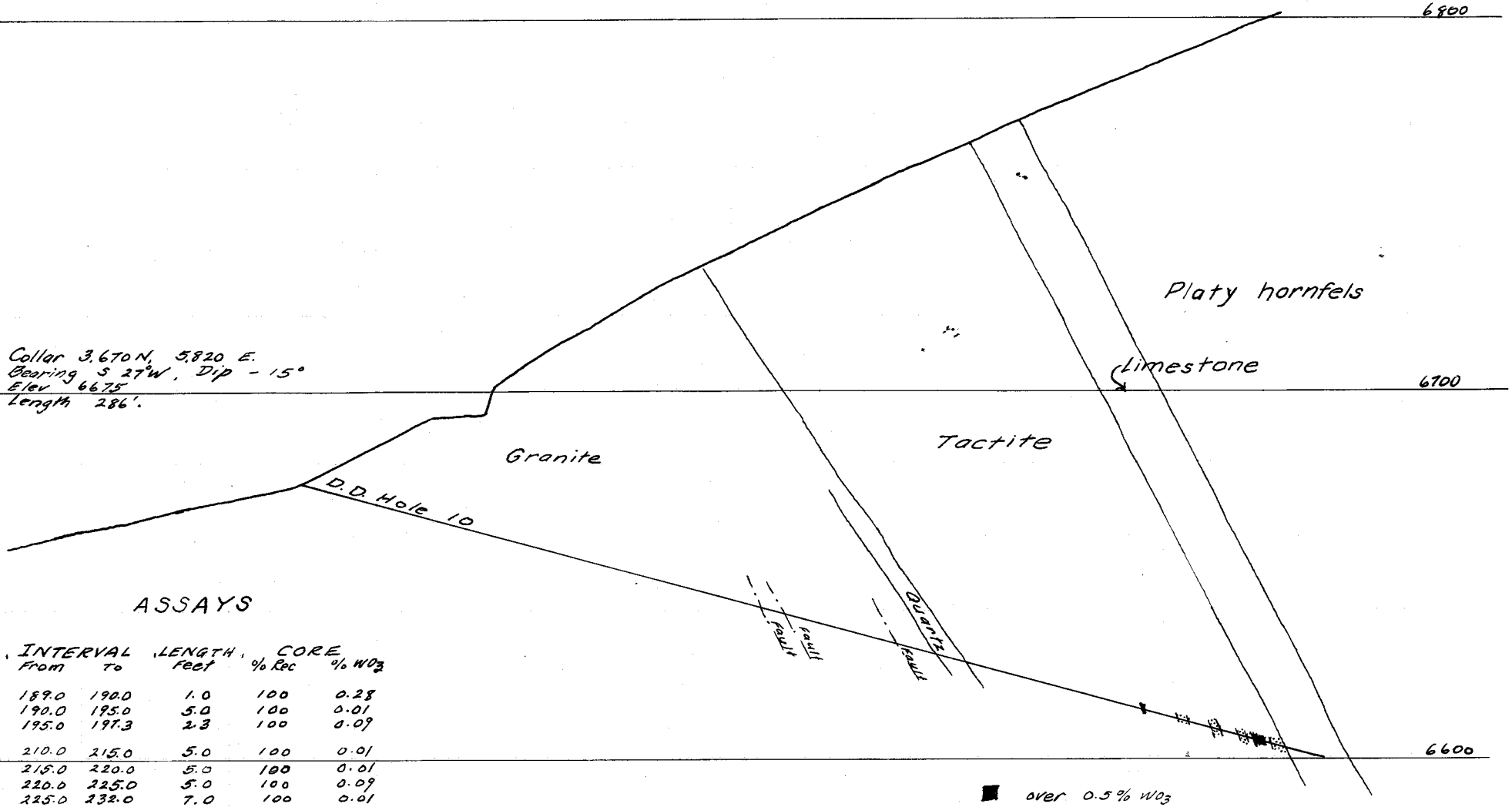
ASSAYS

INTERVAL FROM	TO	LENGTH, FEET	CORE % Rec	% WO_3
284.5	287.0	2.5	49	0.01
287.0	288.1	1.1	49	0.27
288.1	289.0	0.9	49	0.09
289.0	297.0	8.0	33	0.01
297.0	299.5	2.5	87	0.01
299.5	301.1	1.6	87	0.10
301.1	304.0	2.9	87	0.05
304.0	309.0	5.0	100	0.04
309.0	314.0	5.0	78	0.03
314.0	330.0	16.0	16	0.28
330.0	331.6	1.6	99	0.27
331.6	333.2	1.6	99	0.11
333.2	338.9	5.7	99	0.17
338.9	340.1	1.2	74	0.07
340.1	344.0	3.9	74	0.13
344.0	348.5	4.5	73	0.06
348.5	349.5	1.0	100	0.34
349.5	351.5	2.0	100	0.01
351.5	353.9	2.4	100	0.14
353.9	365.2	11.3	37	0.06
365.2	367.0	1.8	100	0.42
367.0	368.5	1.5	100	0.80
368.5	370.0	1.5	100	1.70
371.2	371.5	0.3	100	1.34
371.5	375.5	4.0	51	0.13
376.0	378.0	2.0	51	1.32
378.0	380.0	2.0	51	0.51
380.0	380.6	0.6	51	0.76

TEM PIUTE TUNGSTEN
LINCOLN COUNTY, NEV

Holmes U.S.B.M. Proj. 717-A 8-44

1" = 40'



ASSAYS

INTERVAL From	To	LENGTH feet	CORE % Rec	% WO_3
189.0	190.0	1.0	100	0.28
190.0	195.0	5.0	100	0.01
195.0	197.3	2.3	100	0.09
210.0	215.0	5.0	100	0.01
215.0	220.0	5.0	100	0.01
220.0	225.0	5.0	100	0.09
225.0	232.0	7.0	100	0.01
232.0	234.6	2.6	87	0.14
234.6	235.1	0.5	87	0.69
235.1	238.4	3.3	87	0.27
243.0	247.1	4.1	99	0.33
247.1	247.9	0.8	99	0.08
252.1	253.1	1.0	100	0.23
253.9	256.2	2.3	100	0.45
256.6	260.3	3.7	100	0.20
260.3	261.6	1.3	99	0.24
261.6	263.6	2.0	99	0.48
265.5	268.7	3.2	99	0.69
269.2	273.0	3.8	82	0.30

TEM PIUTE TUNGSTEN
LINCOLN COUNTY, NEVADA

1" = 40'

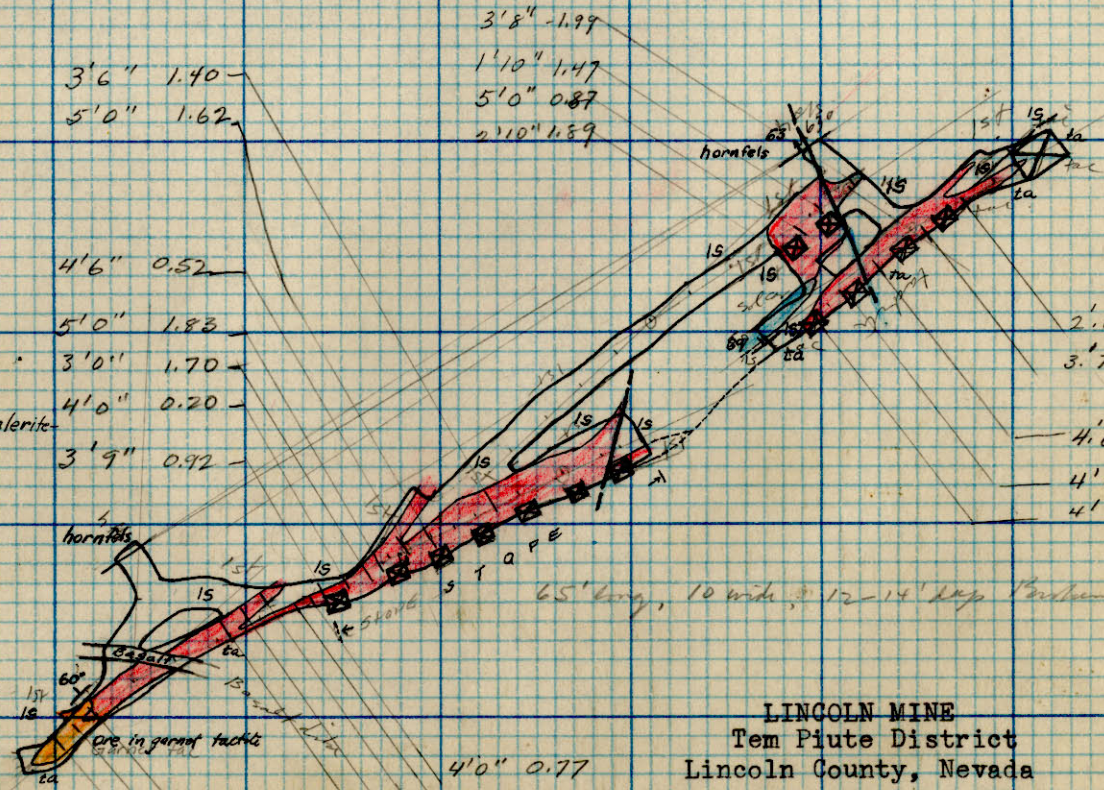
G. W. Holmes U.S.B.M. Proj. 717-A 8-44

176
Item 32

S 49 W 28'
N 3 E 17 28

70' N 47 E

N 58 E 50' = S 52 W
Tank SHOW
S 60 E 15'
N 56 E 36'



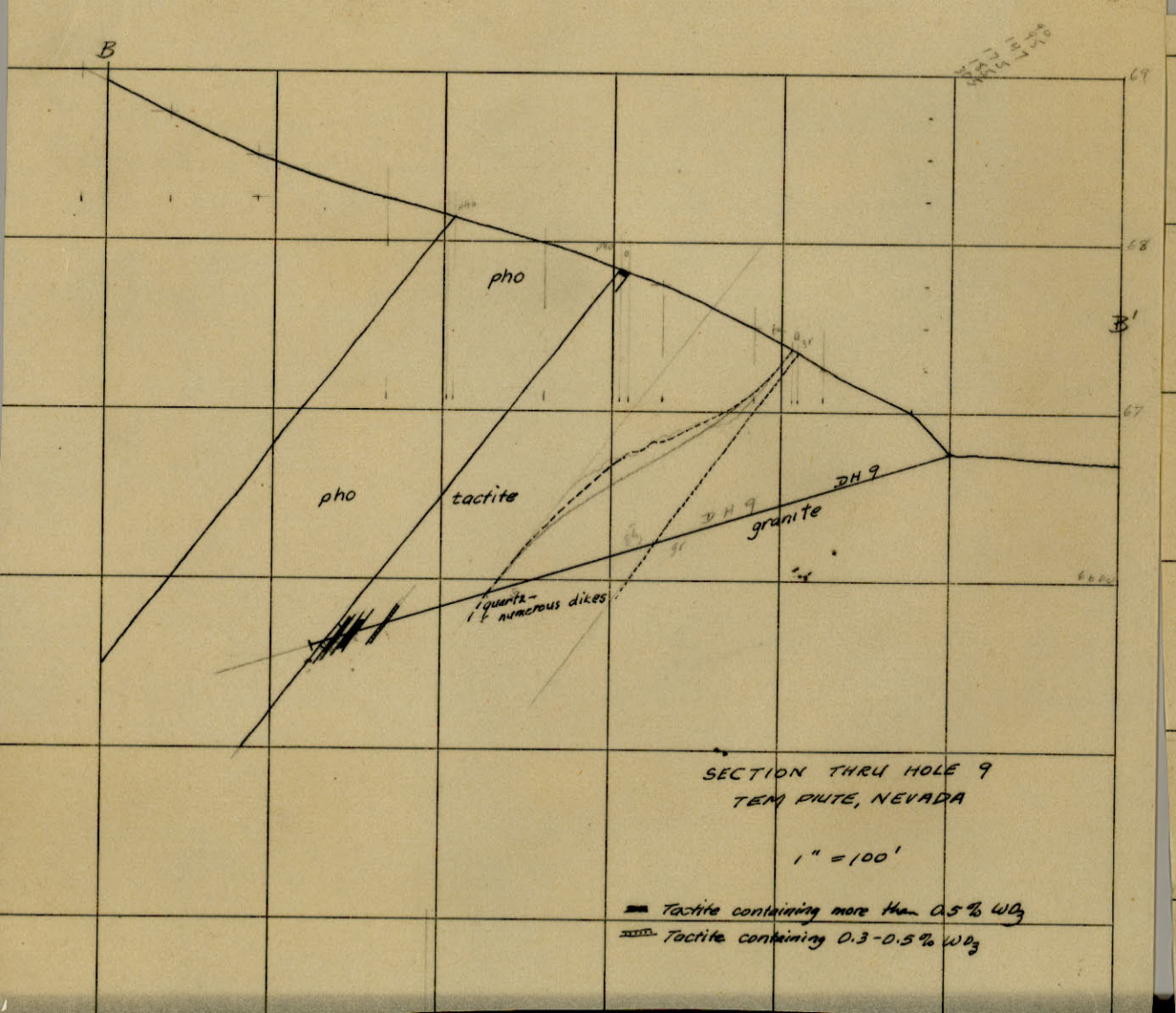
LINCOLN MINE
Tem Piute District
Lincoln County, Nevada

LEVEL 4

10-1-44

1" = 40'

DML

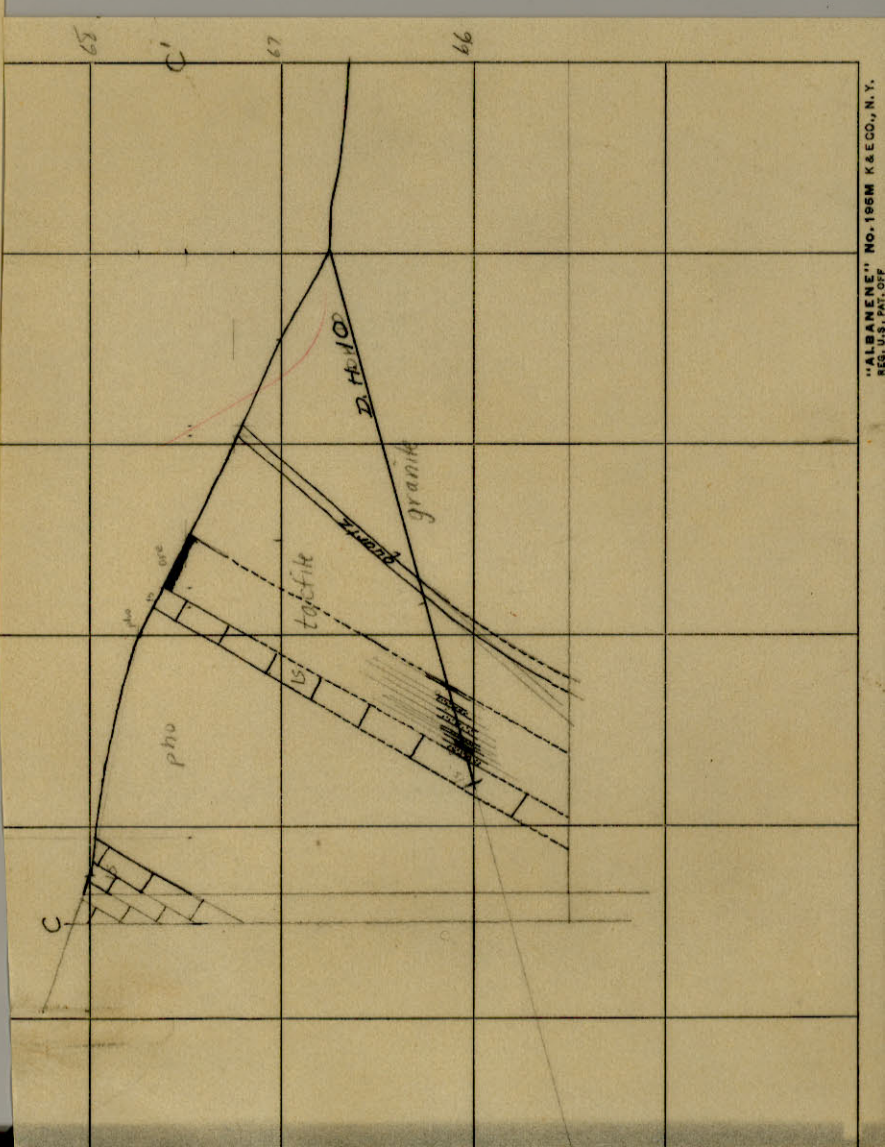


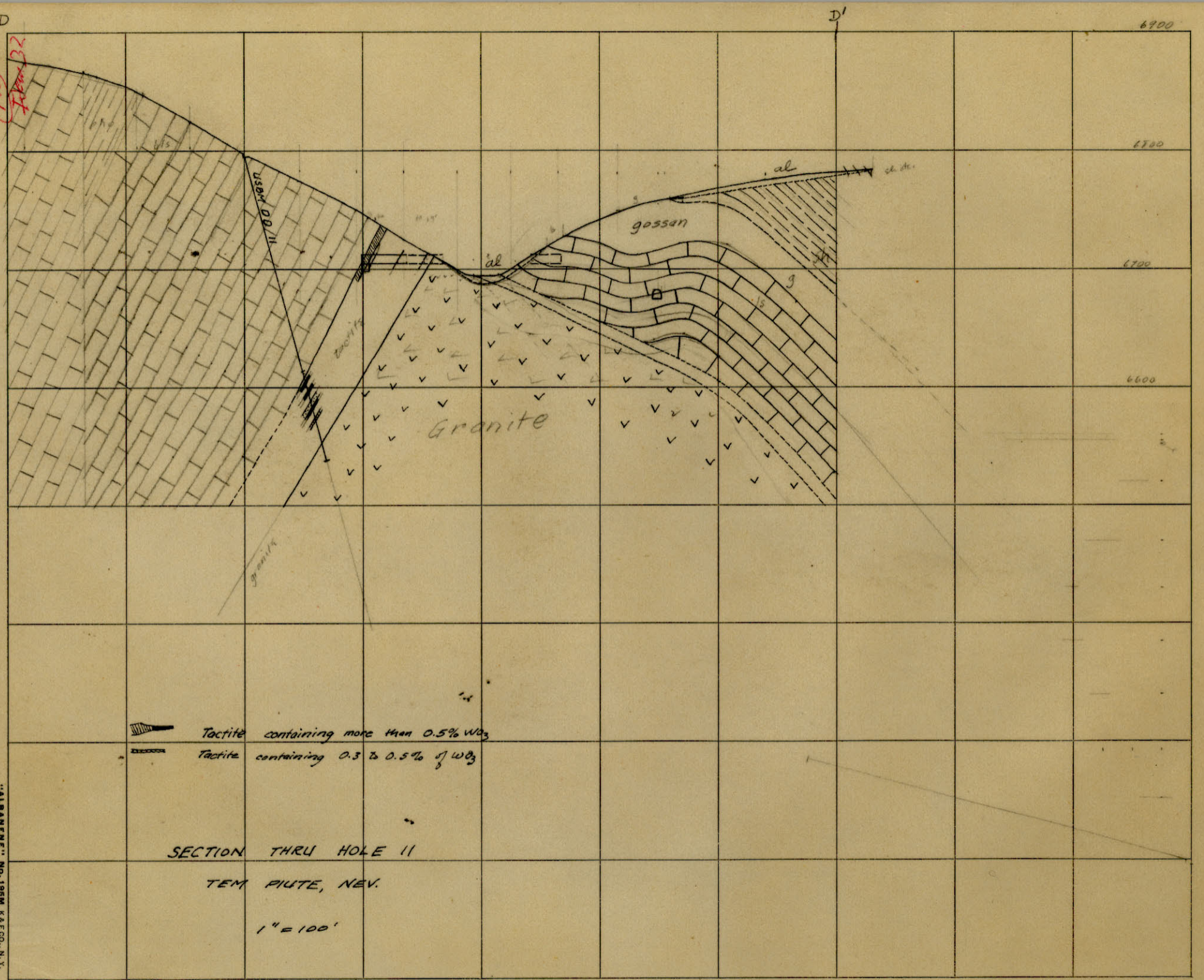
SECTION THRU HOLE 9
TEM PIUTE, NEVADA

1" = 100'

Tactite containing more than 0.5% WO_3

Tactite containing 0.3-0.5% WO_3

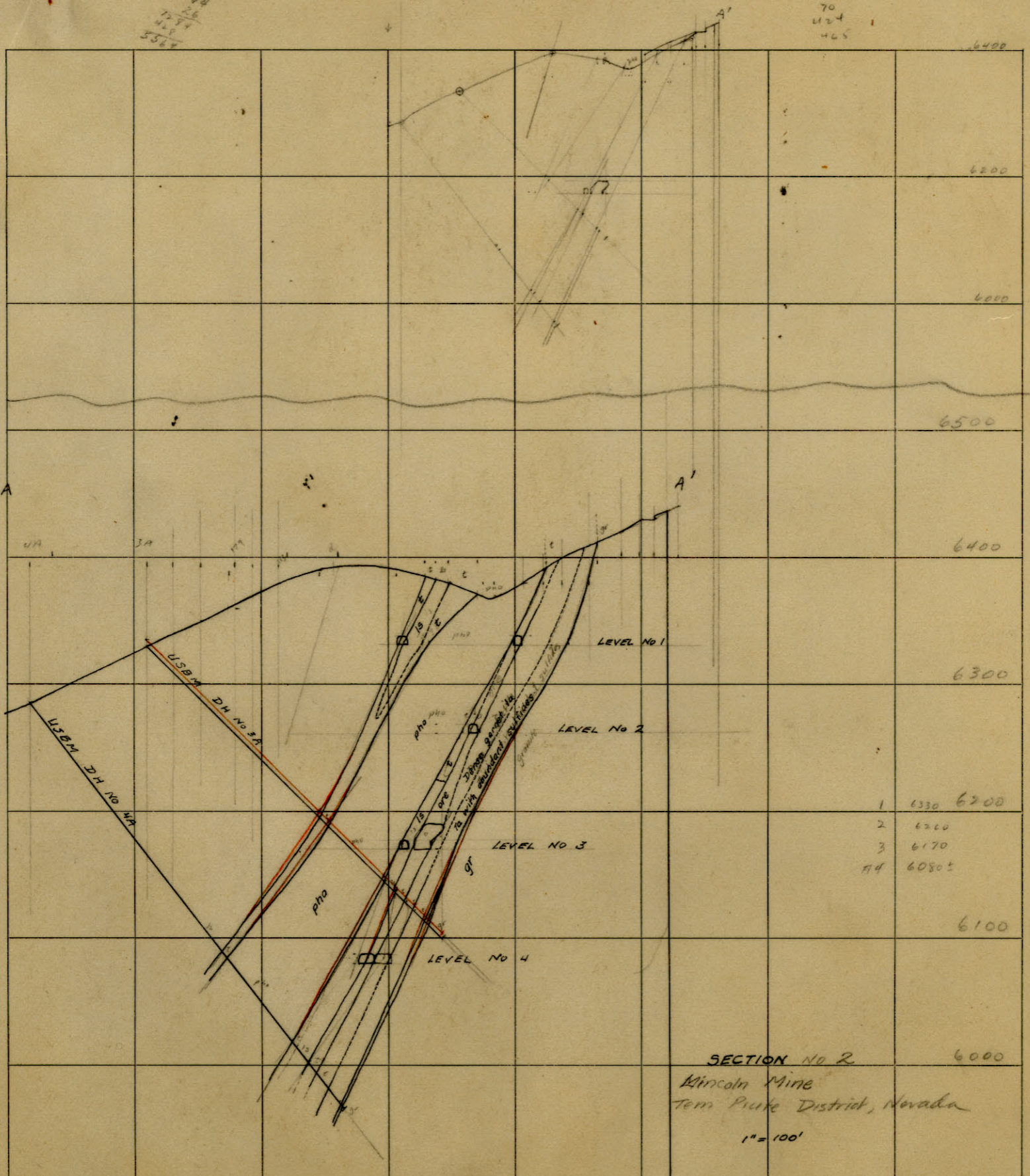




SECTION THRU HOLE 11

TEM PIUTE, NEV.

1" = 100'

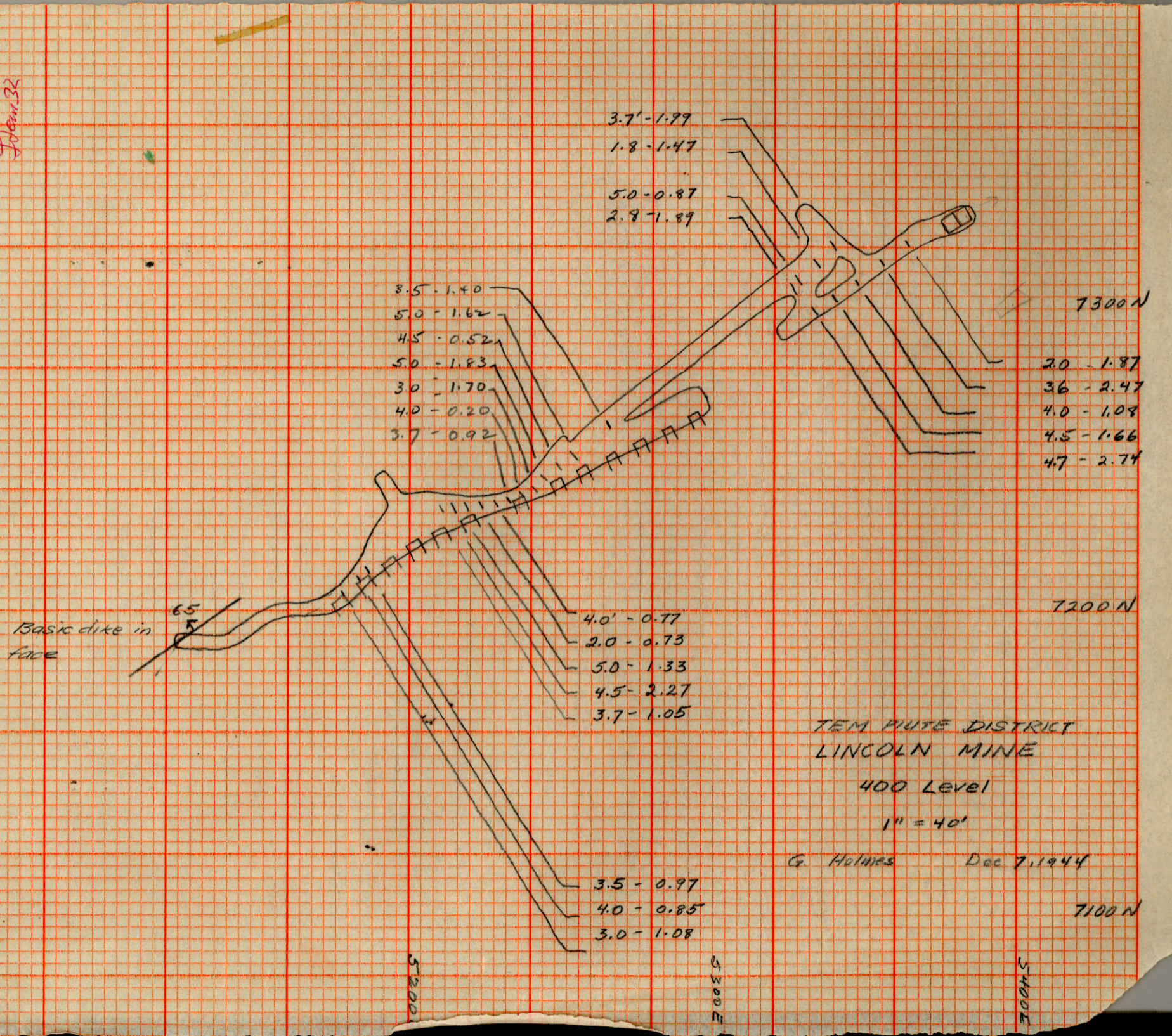


SECTION No 2

Lincoln Mine

Tem Piute District, Nevada

1" = 100'



TEM PIUTE DISTRICT
LINCOLN MINE
400 Level
1" = 40'
G. Holmes Dec 7, 1944

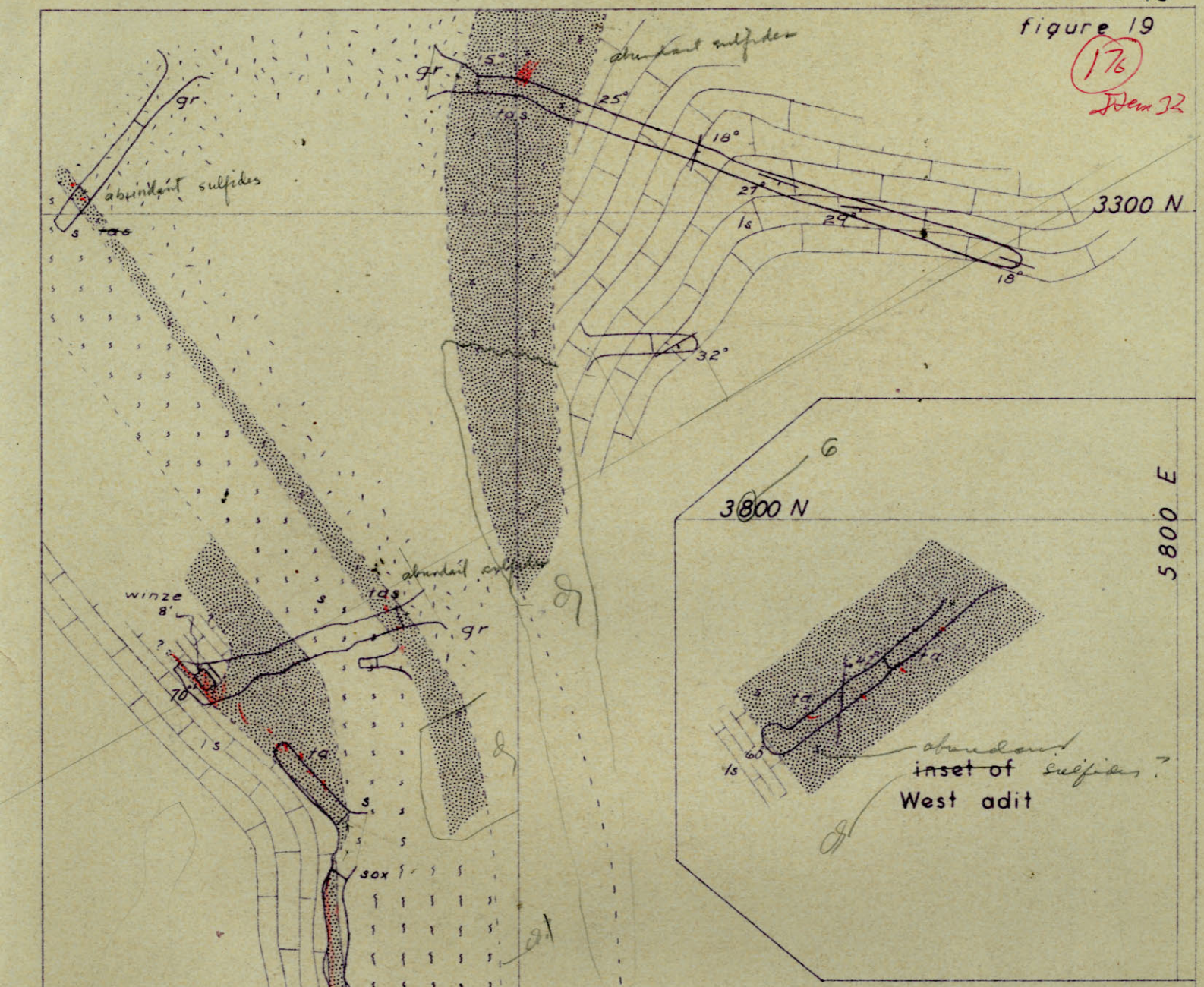
"PERFECT" CROSS SECTION
10 X 10 = ONE INCH
EUGENE DIETZGEN CO.

Dark

figure 19

176

Item 32



U. S. Department of Interior

Geological Survey

Map of Workings
North Tem Piute Mining and Development Co.

~~PART OF SCHOFIELD MINE~~

Tem Piute, Lincoln County, Nevada

scale in feet:

0 40 80 120 160

July 1942 geology by P.C. Bateman

Tactonite containing 0.5% or more of WO_3

" less than 0.5% WO_3

tactite:
0.5% or more of WO_3
0.49% or less of WO_3
~~sulfid-rich tactite~~
massive sulfides
Gossan → ~~oxidised sulfides~~
granite
limestone

contact, dashed where covered
fault, showing dip
strike and dip of beds

27,200
~~25,400~~ tons indicated ore between 400 level and hole 14 below. Includes holes 4-A, 12, and 14 and 25 feet below hole 14. Average grade 1.0% WO_3

Inferred ore 13300 Tons 1.0% WO_3 below 4-A stope to clear hole 14.

Inferred ore 2400 tons 1.0% WO_3 on South side indicated block

total 43000 tons

Calcite - fluorite - chlorite ore

Garnet ore

Pyrrhotite

Production 1943

Ore	3615 Tons	2276.61 units	
Tails	33 21	346.59	
Middlings		839.64	
		3462.84 units	

1944

Jan, Feb, Mch — No prod.

~~August~~	902 u.
May	776
June	594
	2272 u.

U.S.B.M. Project 717-A
Tem Piute 1944

DD# 12

Coordinates 7563 N, 4990 E
Bearing S 44°30' E
Dip - 46°30'
Elev. 6233
Length 495.0

	WO_3	Zn	Fe	Corrected Width
312.0-313.6	0.12	0.2	8.91	1.5
313.6-320.7	0.02	0.2	7.51	6.7
320.7-328.8	0.01	0.2	1.99	7.7
427.7-429.0	2.50	0.2	4.09	1.2
429.0-431.7	~~2.7~~ 0.33	0.6	8.75	2.6
431.7-433.4	0.37	0.2	9.33	1.6
433.4-434.4	0.01	0.3	8.50	0.9
434.4-436.0	0.44	0.3	12.81	1.5
436.0-438.4	0.74	0.2	11.27	2.3
438.4-439.3	0.70	0.2	11.91	0.9
439.3-446.5	0.38	0.2	21.27	6.8
446.5-448.7	0.03	0.2	13.64	2.1
448.7-452.0	0.38	0.2	13.05	3.1
452.0-455.2	0.01	0.2	20.43	3.0
455.2-459.0	0.16	0.2	16.38	3.6
459.0-463.0	0.69	0.2	23.80	3.8
463.0 465.3	0.14	0.2	14.18	2.2
465.3 467.0	0.64	0.2	12.82	1.6
467.0 468.7	0.17	0.2	15.40	1.6
468.7 471.6	0.07	0.2	39.99	2.7

5
2.61

10
30.5

DDH # 14

Coordinates: 7563 N 4990 E

Brg S 68°E

Dip -66°

Elev. 6233

Length 583.0

		True Width	WO_3	Zn	
523.5	525.2	1.2	0.20	0.3	4.6 ft 0.92%W
525.2	526.0	0.6	0.57	1.1	
526.0	527.0	0.7	0.03	0.3	
527.0	529.5	1.8	1.99	0.5	
529.5	529.9	0.3	0.13	4.2	
529.9	534.5	3.4	0.06	4.2	
534.5	535.3	0.6	0.03	2.6	
535.3	538.0	2.0	0.10	0.4	
538.0	540.0	1.5	0.08	0.4	
540.0	545.0	3.7	0.01	0.2	
545.0	548.7	2.7	0.01	0.1	
548.7	550.2	1.1	0.03	1.9	
550.2	555.0	3.5	0.01	0.2	
555.0	559.0	2.9	0.01	0.2	
559.0	561.0	1.5	0.01	0.1	

#62,461.91

#89,684.88

Idem 32

(176)

(4A)
7454N
5038E

3A
7383N
5098E

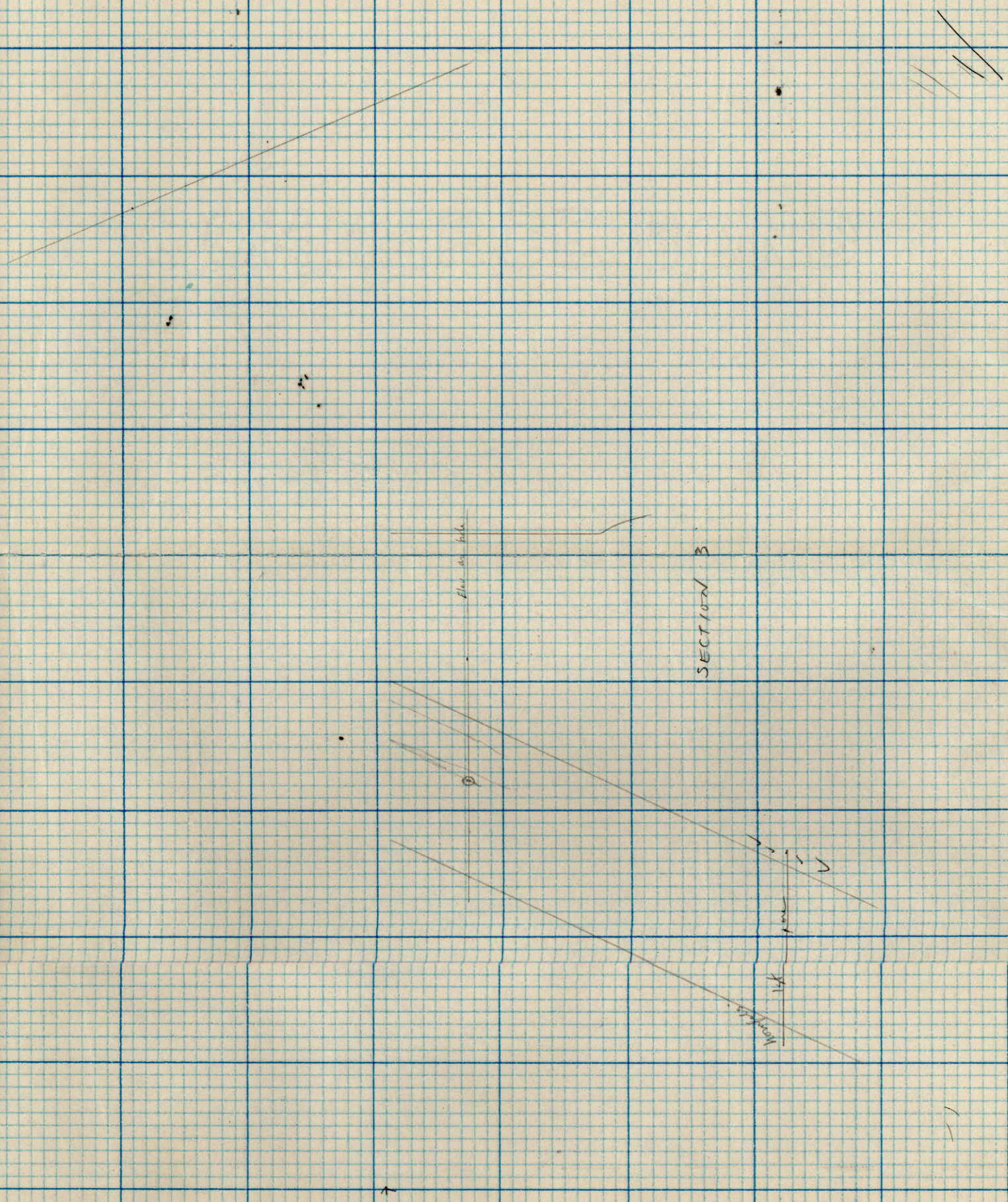
Hole 13
7332N
5215E
Elev 5901
N48°W

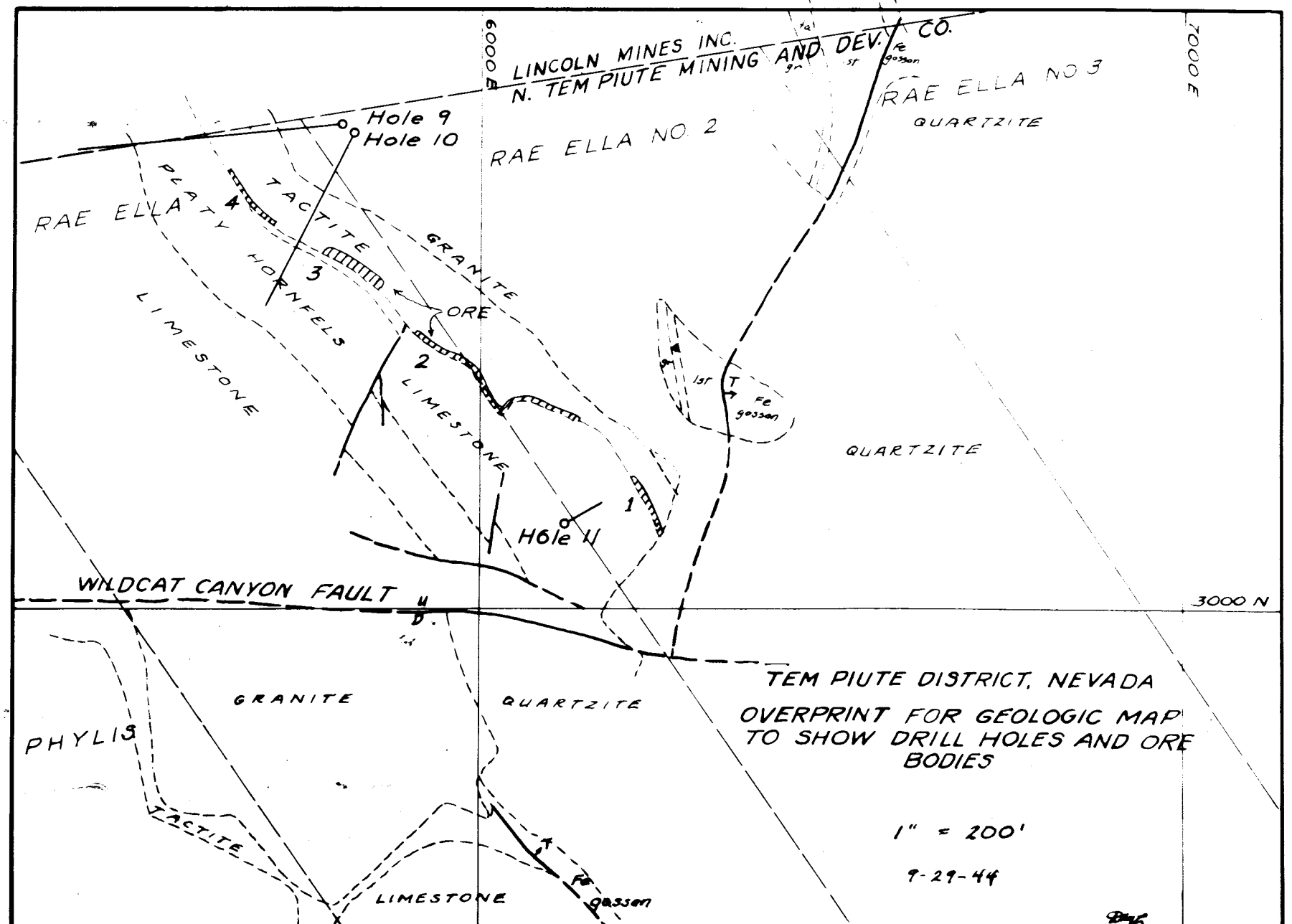
H.L. V
7368N
5352E
Elev 6001
N47½W

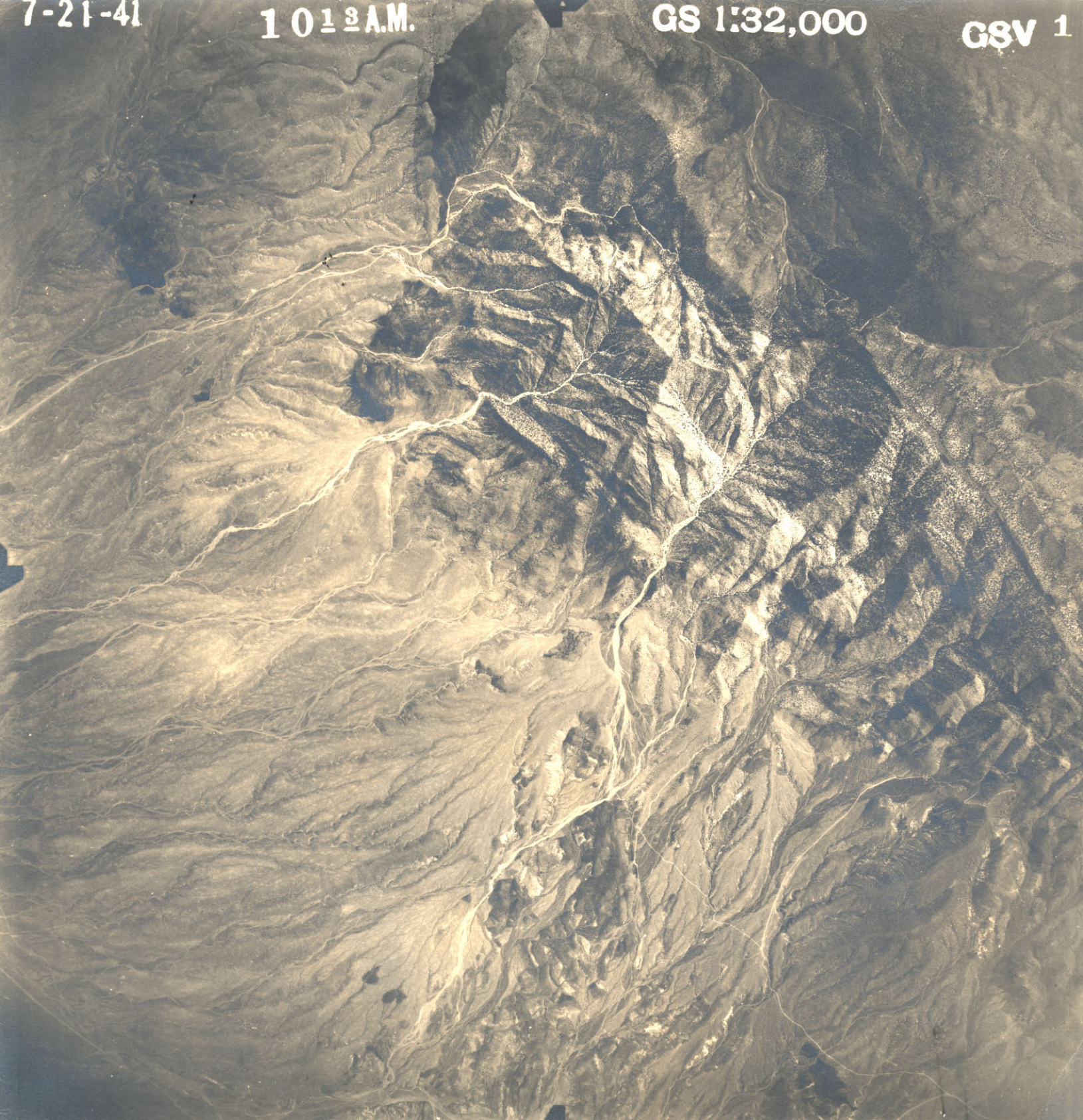
6001

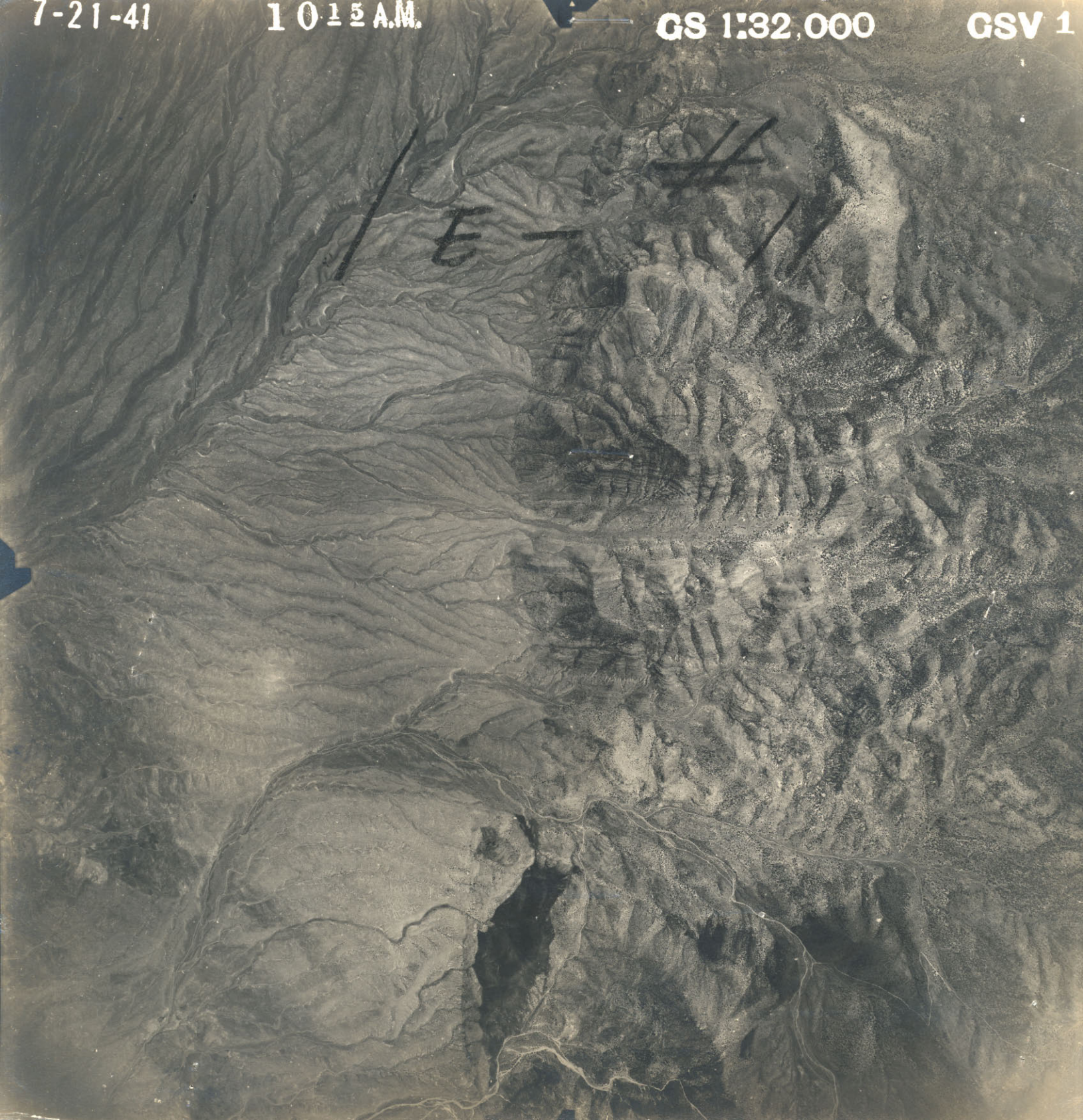
SECTION 4

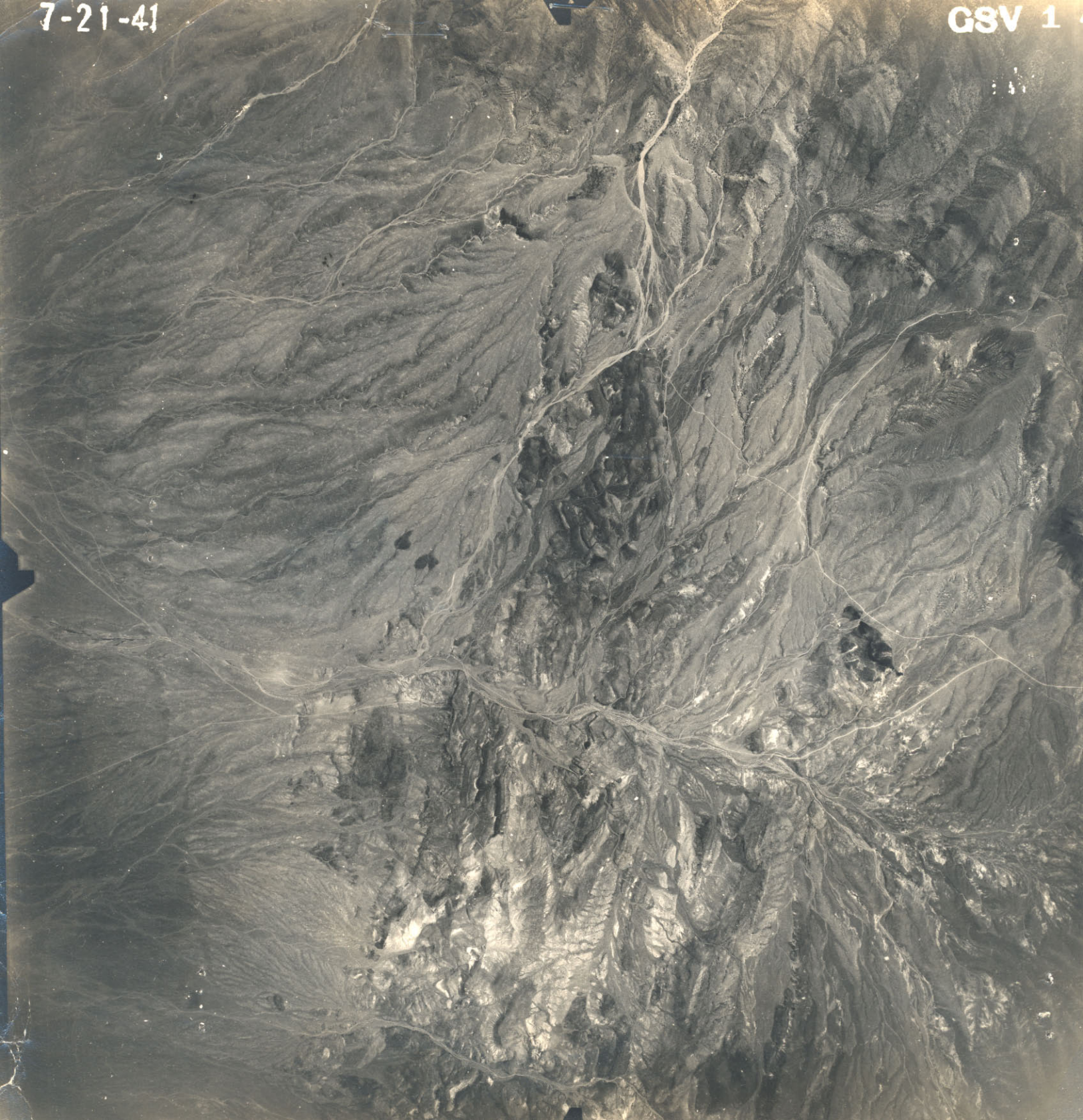
N 6° E 83' -23°

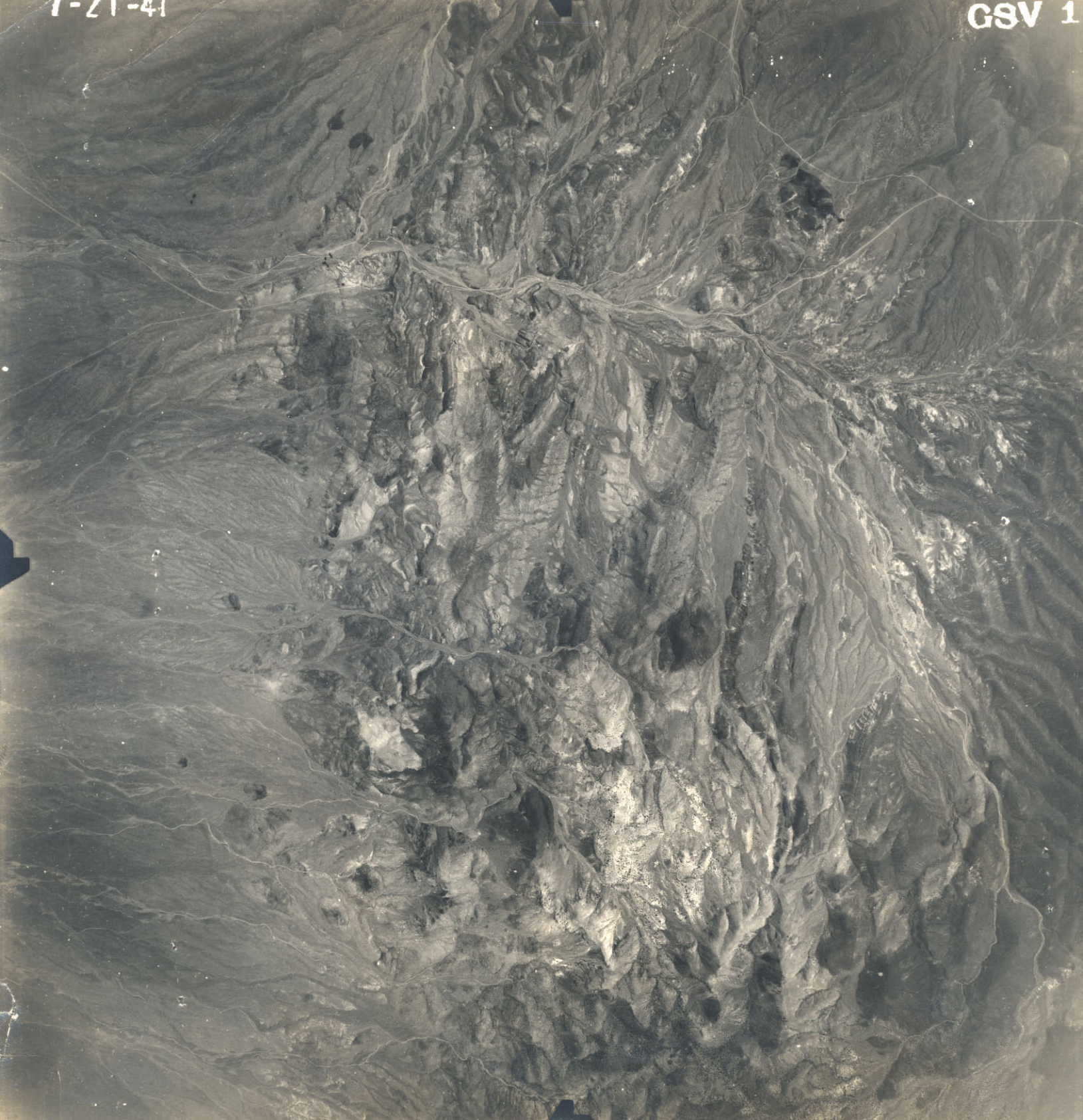



LINCOLN MINES INC.
N. TEM PIUTE MINING AND DEV. CO.
6000 E
7000 E
3000 N
Hole 9
Hole 10
Hole 11
RAE ELLA NO 2
RAE ELLA NO 3
QUARTZITE
RAE ELLA
PLATY
TACTITE
GRANITE
ORE
HORNFELS
LIMESTONE
1st
Fe gossan
WILDCAT CANYON FAULT
U.
D.
PHYLIS
GRANITE
QUARTZITE
TACTITE
LIMESTONE
Fe gossan
TEM PIUTE DISTRICT, NEVADA
OVERPRINT FOR GEOLOGIC MAP
TO SHOW DRILL HOLES AND ORE
BODIES
1" = 200'
9-29-44


7-21-41
10 1/8 A.M.
GS 1:32,000
GSV 1


7-21-41
10 15 A.M.
GS 1:32,000
GSV 1


7-21-41
GSV 1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GSV 1

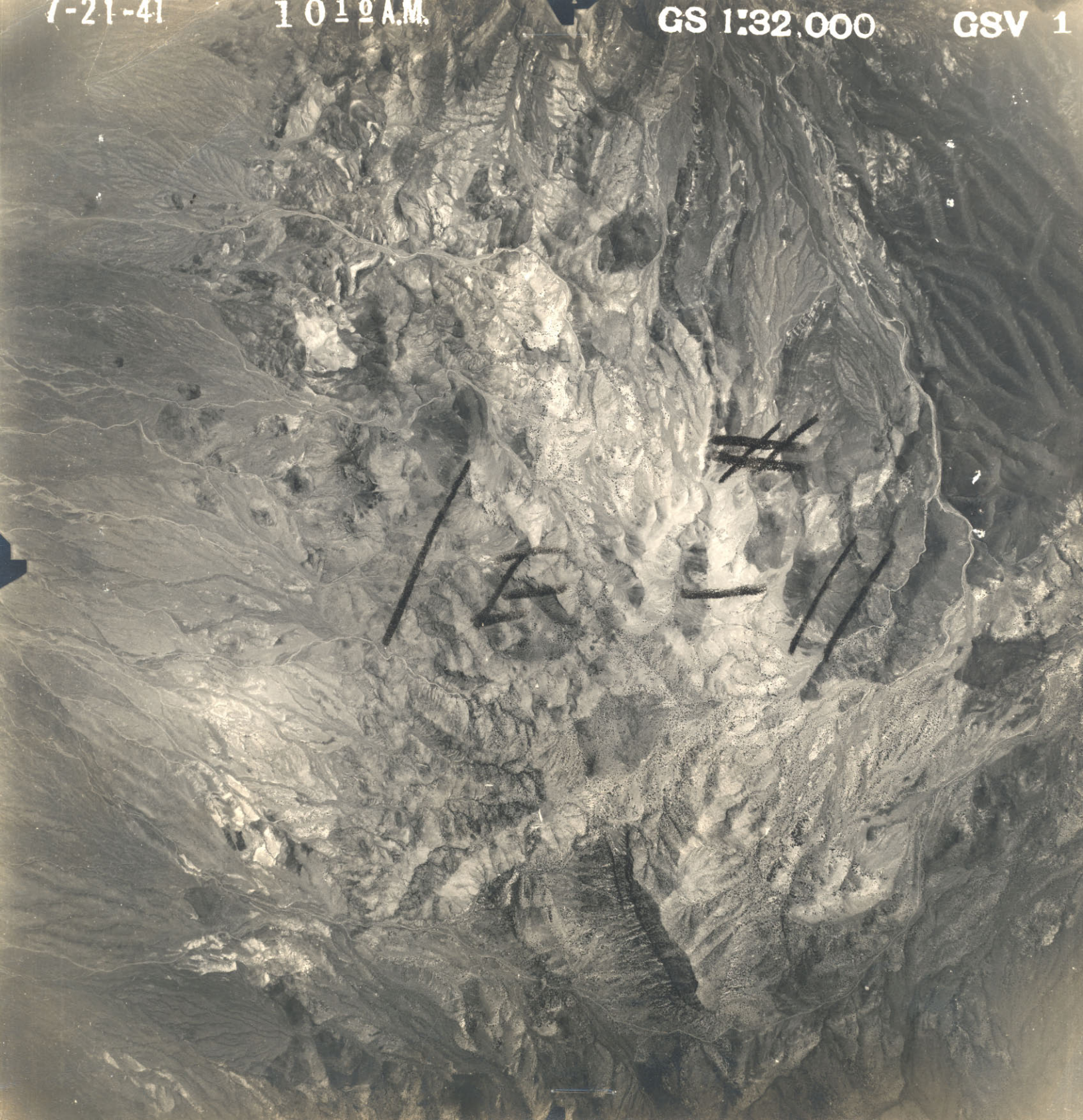

7-21-41
10½A.M.
GS 1:32,000
GSV 1

fig 25

Item 22

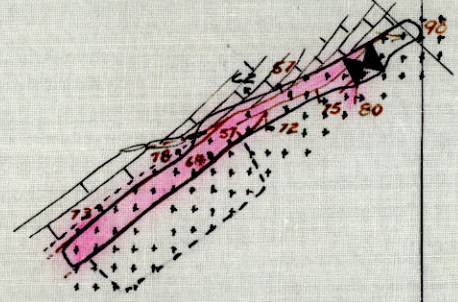
5200 E

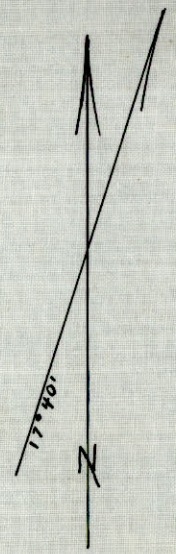
5400 E

7400 N

section 4

section 3





3 SUBLEVEL (6130')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

EXPLANATION

solution cavities

ta tactite: 0.5% + of WO_3

0.5% -

m marble

contact

fault

scale in feet:

0 40 80 120 160

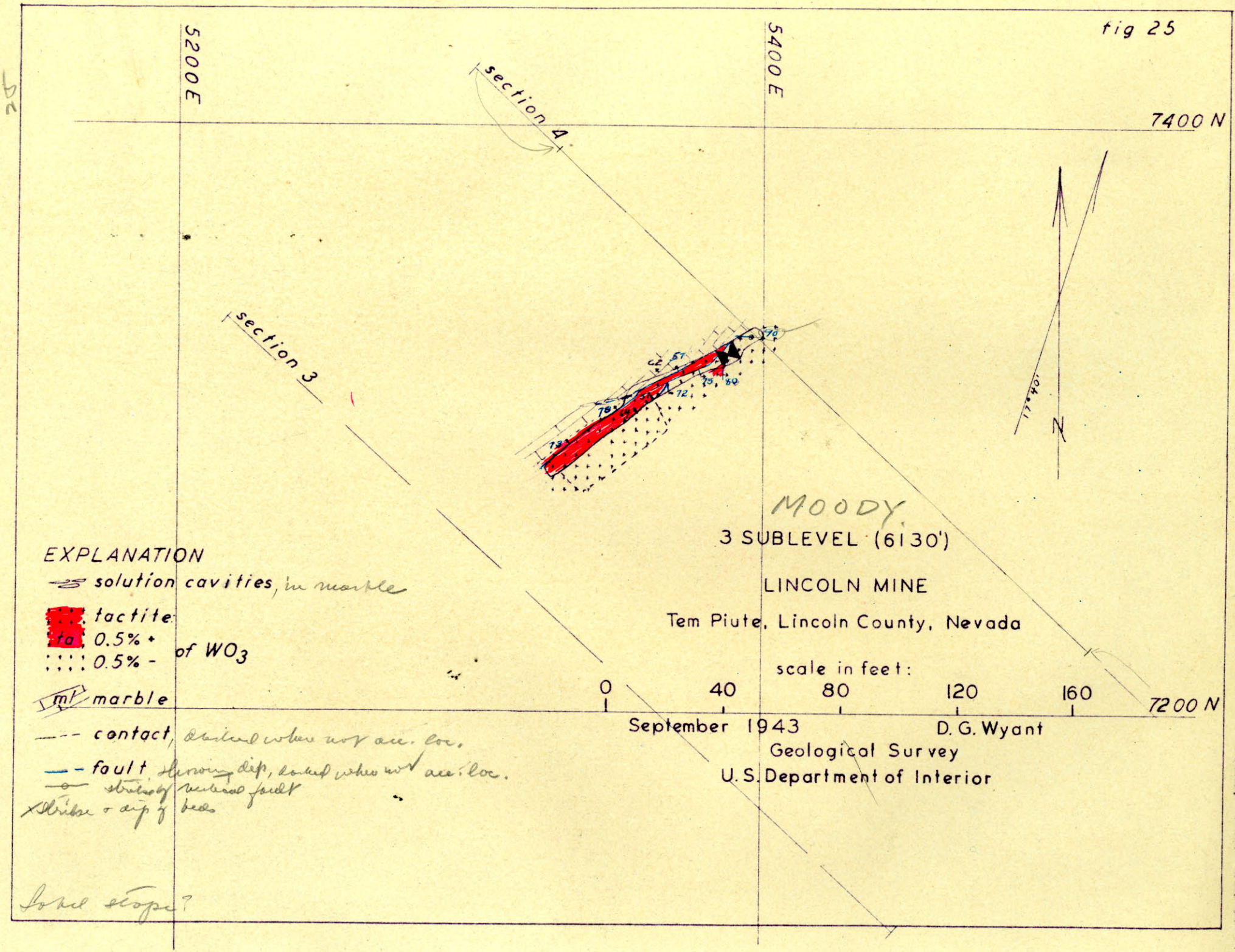
7200 N

September 1943 D. G. Wyant

Geological Survey

U.S. Department of Interior

fig 25


5200E
5400E
7400 N
7200 N
section 4
section 3
11°40'
N
MOODY
3 SUBLEVEL (6130')
LINCOLN MINE
Tem Piute, Lincoln County, Nevada
scale in feet:
0
40
80
120
160
September 1943
D. G. Wyant
Geological Survey
U. S. Department of Interior
EXPLANATION
solution cavities, in marble
tactite
ta 0.5% +
0.5% -
of WO_3
mr marble
contact, dashed where not acc. loc.
fault showing dip, dashed where not acc. loc.
strike & dip of bedding
Strike & dip of beds
Local slope?

176 Item 32

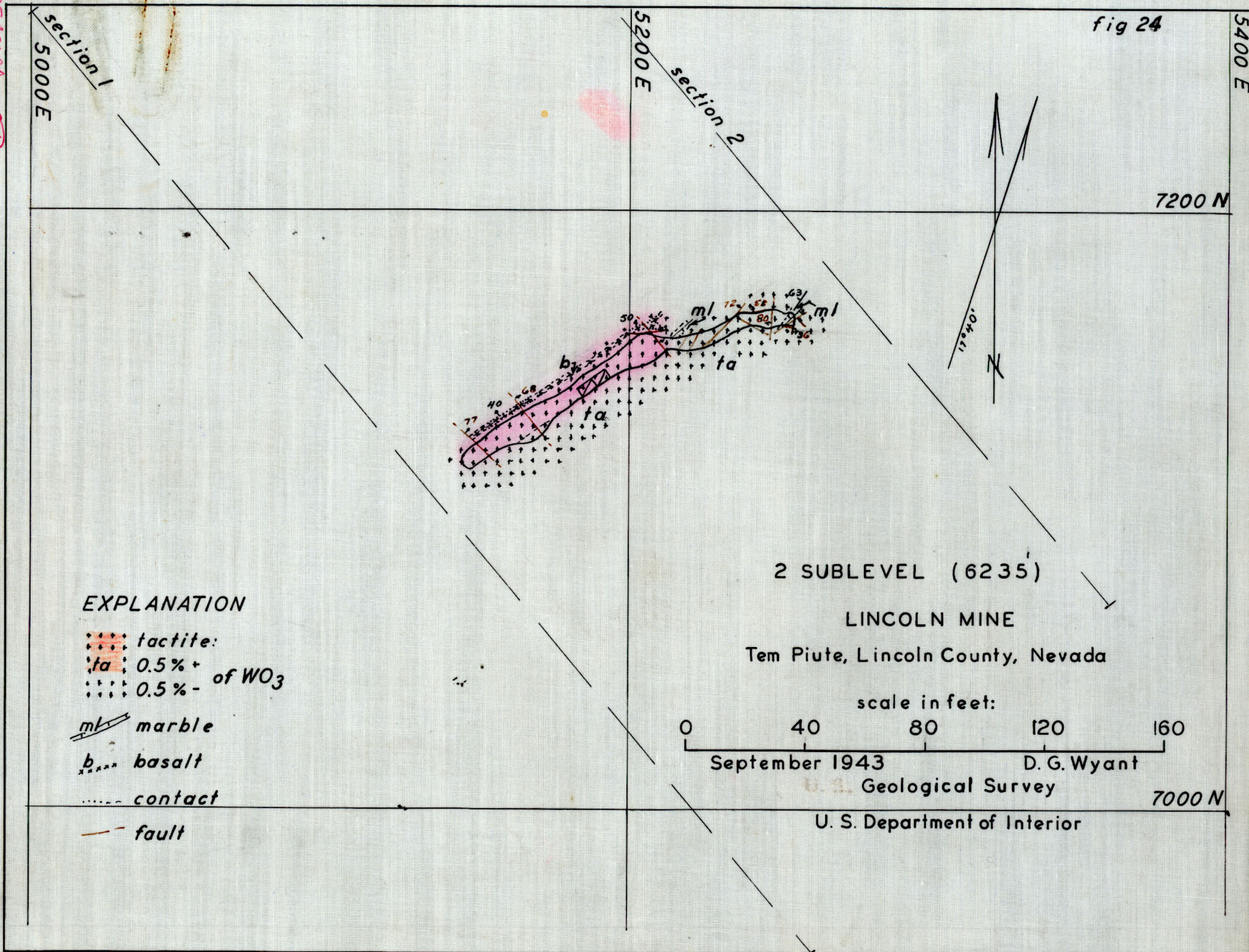
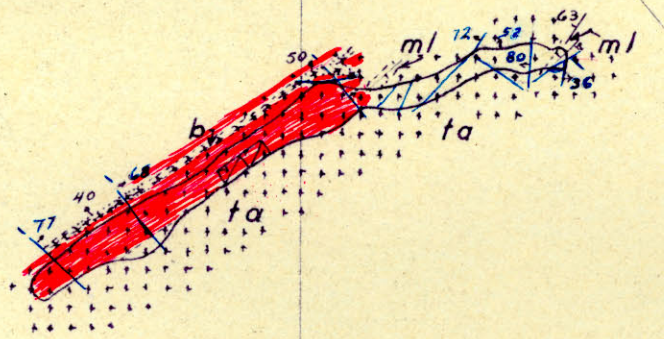


fig 24
section 1
section 2
5000E
5200E
5400E
7200 N
7000 N
17°40'
N
ml
ta
b
2 SUBLEVEL (6235')
LINCOLN MINE
Tem Piute, Lincoln County, Nevada
scale in feet:
0
40
80
120
160
September 1943
D. G. Wyant
U. S. Geological Survey
U. S. Department of Interior
EXPLANATION
tactite:
ta 0.5% + of WO_3
0.5% -
ml marble
b basalt
contact
fault

fig 24



MOODY ORESHOOT

2 SUBLEVEL (6235)

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

scale in feet:

0 40 80 120 160

September 1943 D. G. Wyant

Geological Survey

U. S. Department of Interior

EXPLANATION

ta tactite: 0.5% + of WO_3
0.5% -

ml marble

b basalt

contact, showing dip (?) dashed where concealed by surface loc.

fault, showing dip " " " "

section 1

5000 E

5200 E

section 2

5400 E

7200 N

7000 N

17°40'

fig. 20 (176)
Item 37

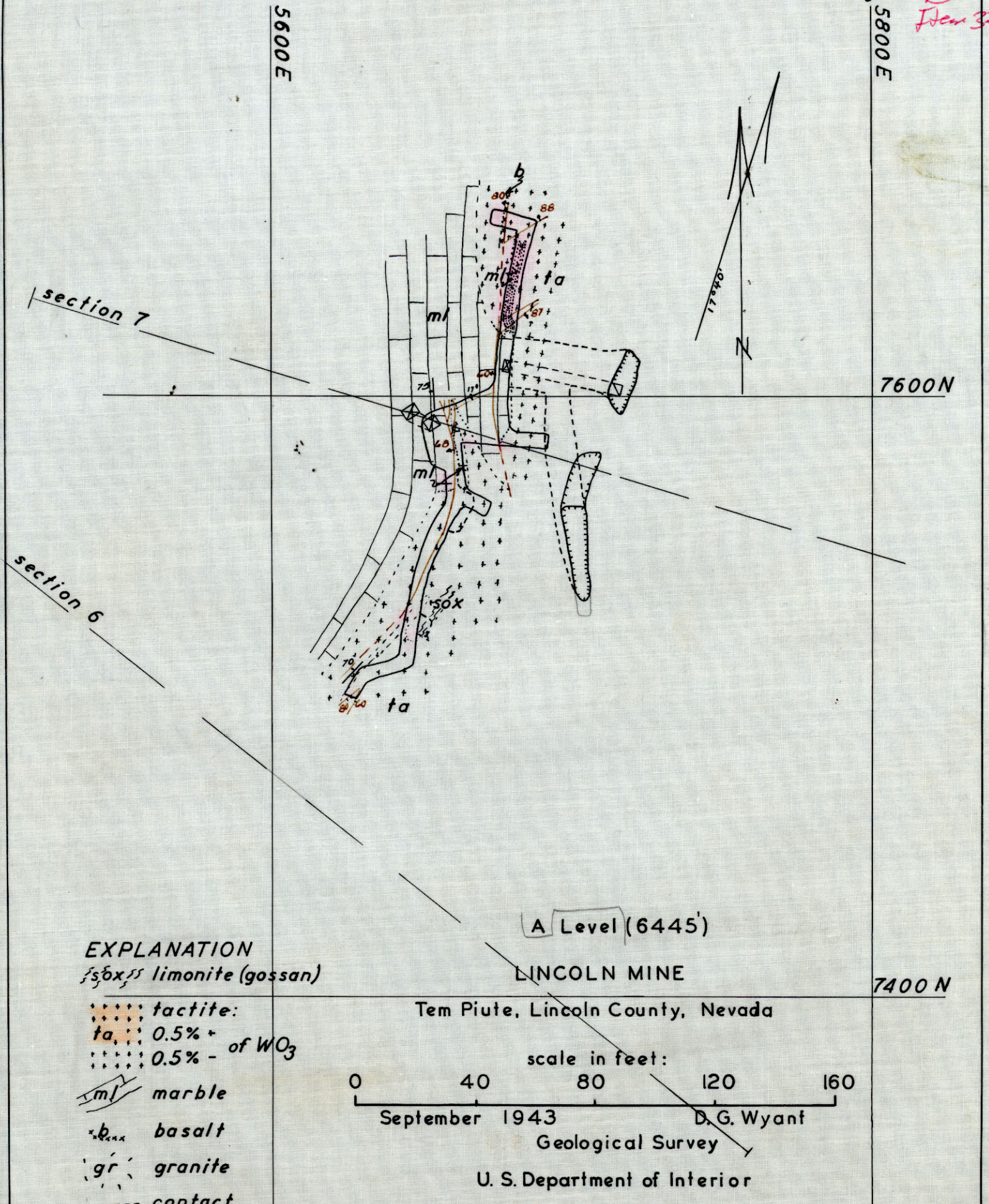
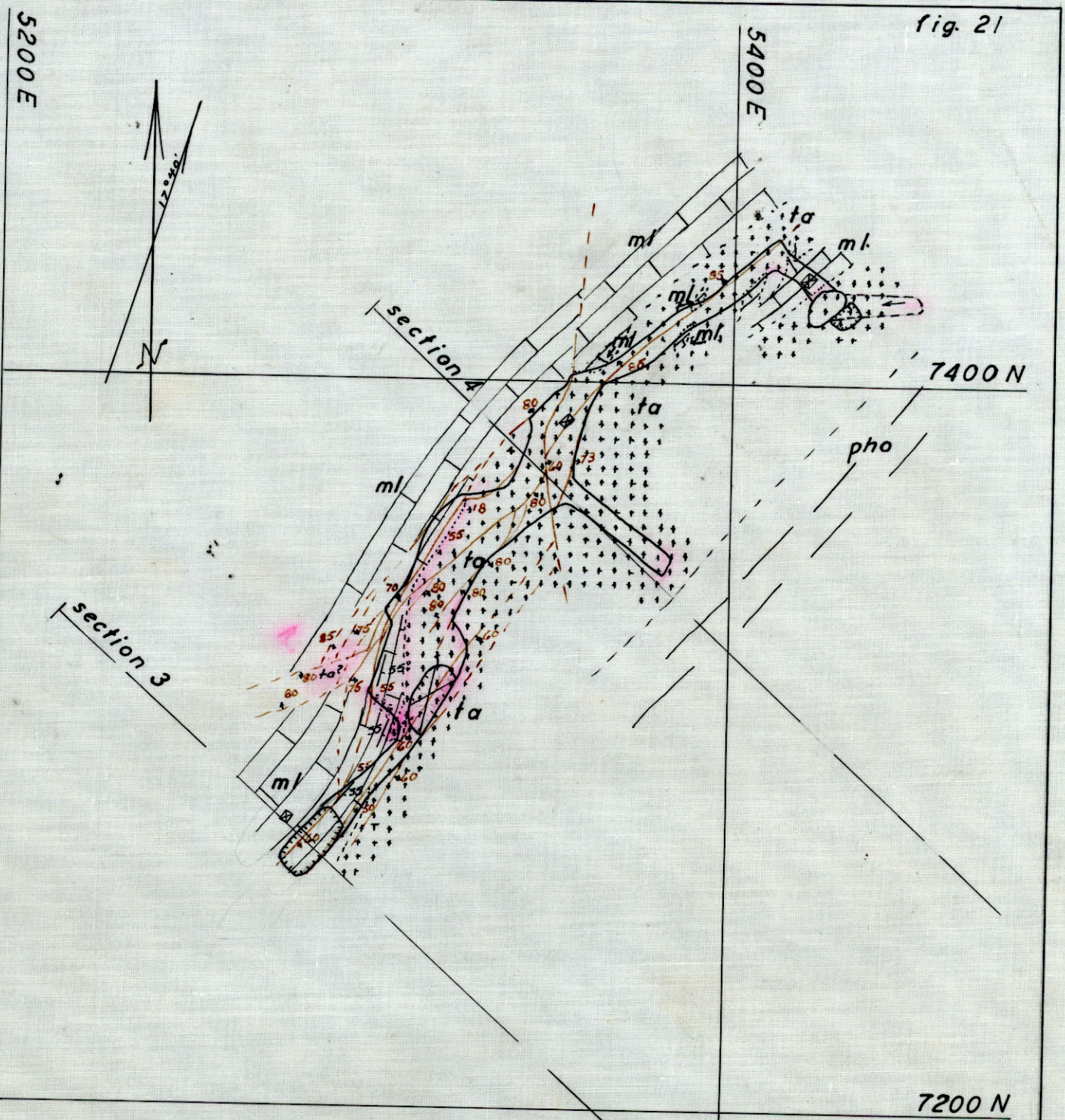


fig. 21



EXPLANATION

- tactite: ta — 0.5% + / 0.5% − of WO_3
- ml — marble
- pho — hornfels, platy
- contact
- fault
- strike and dip of bedding

8 STOPE SUBLEVEL (6385')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

scale in feet: 0 40 80 120 160

September 1943

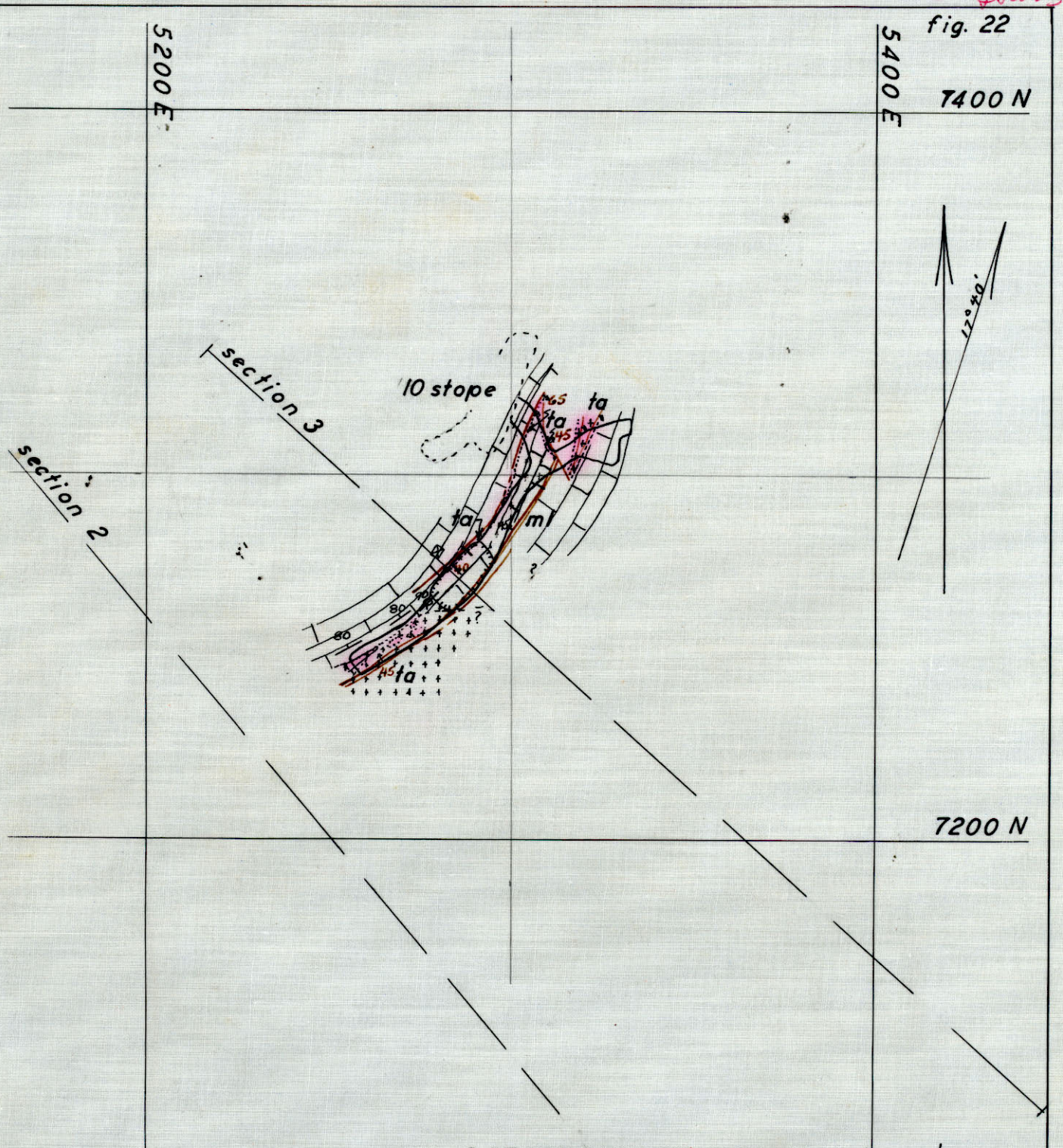
D. G. Wyant

Geological Survey

U.S. Department of Interior

(176) Item 32

fig. 22



EXPLANATION

- ta: tactite: 0.5%+ / 0.5%- of WO_3
- m: marble
- contact
- fault
- 50: strike and dip of bedding

8 STOPE SECOND SUBLEVEL (6365')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

scale in feet:

0 40 80 120 160

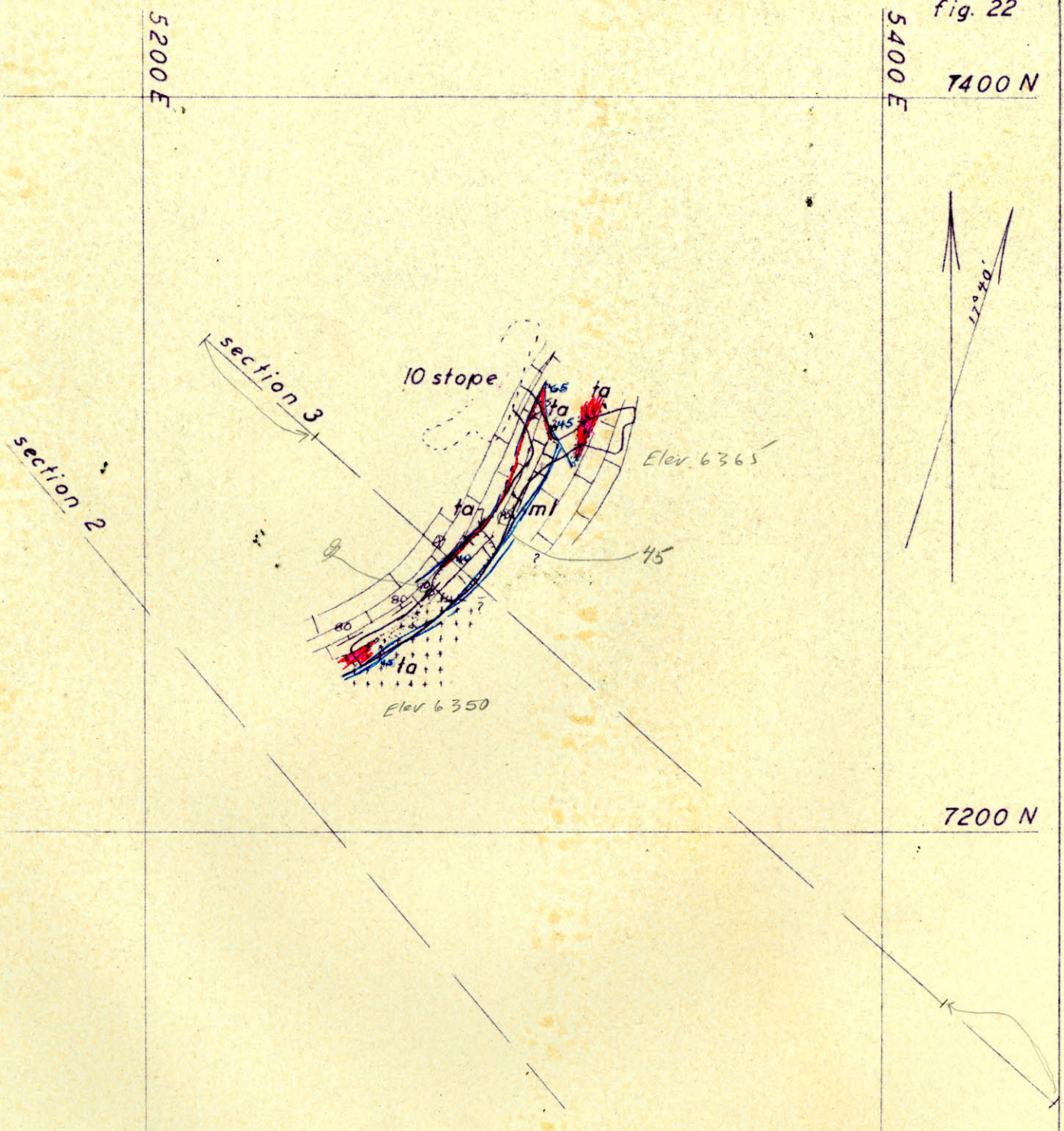
September 1943 D. G. Wyant

Geological Survey

U. S. Department of Interior

(76) Ham 32

fig. 22



EXPLANATION

ta tactite: 0.5%+ of WO_3; 0.5%-

ml marble

contact

fault

50 strike and dip of bedding

" " of vertical bed

8 STOPE SECOND SUBLEVEL (6365')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

scale in feet:

0 40 80 120 160

September 1943 D. G. Wyant

Geological Survey

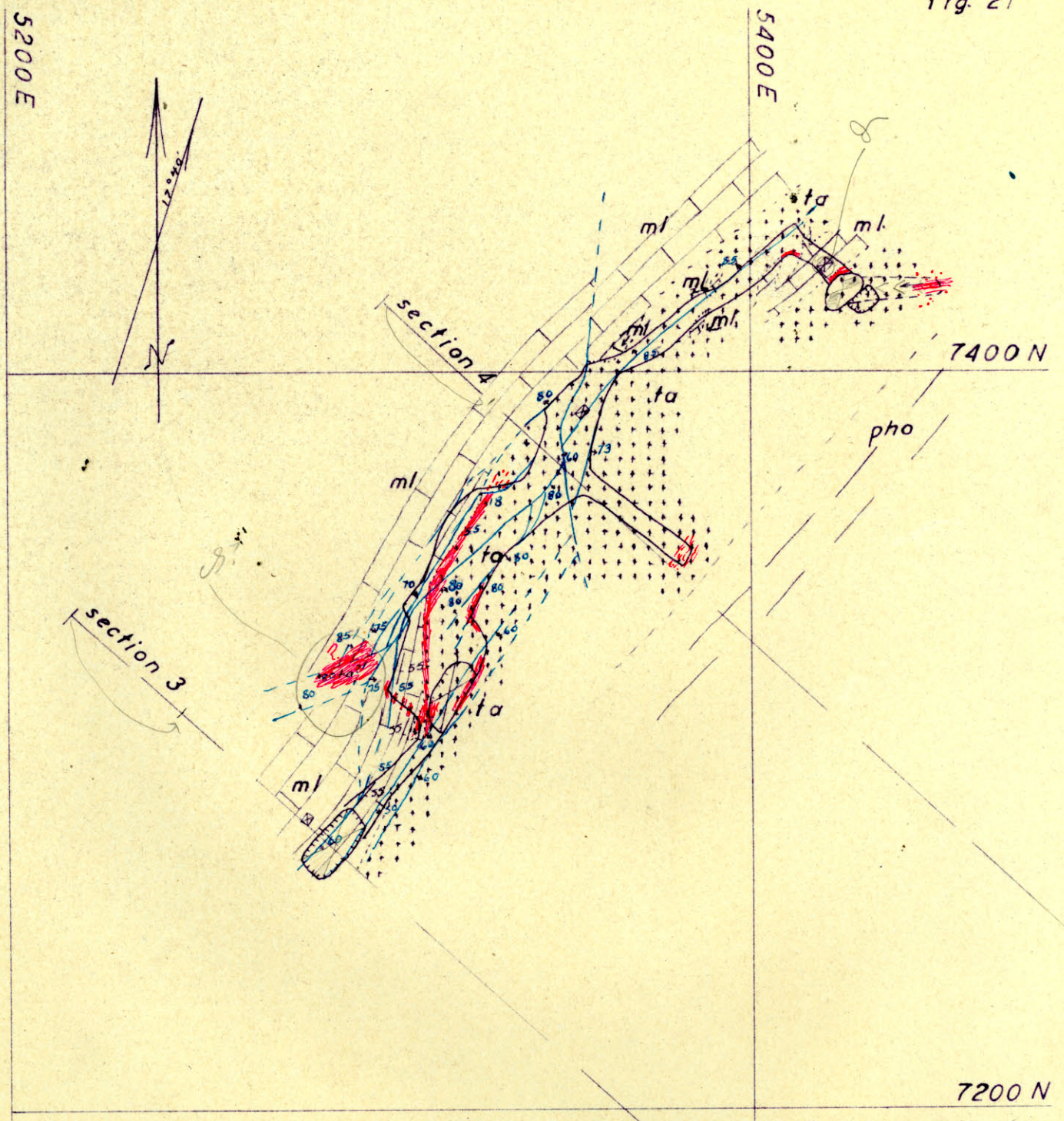
U. S. Department of Interior

Level A (elev. —)
8 stope sublevel (elev —)
8 stope second sublevel (elev —)

Geologic maps of Workings above Level No 1 in Gold Strike Zone -

(76) Item 32

fig. 21



8 STOPE SUBLEVEL (6385')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

EXPLANATION

- tactite:
  - ta 0.5% + of WO_3
  - 0.5% -
- ml marble
- pho hornfels, platy
- ---- contact, dashed where not accurately located
- 60 fault, showing dips, dashed where not accurately located
- 55 strike and dip of bedding

scale in feet:

0 40 80 120 160

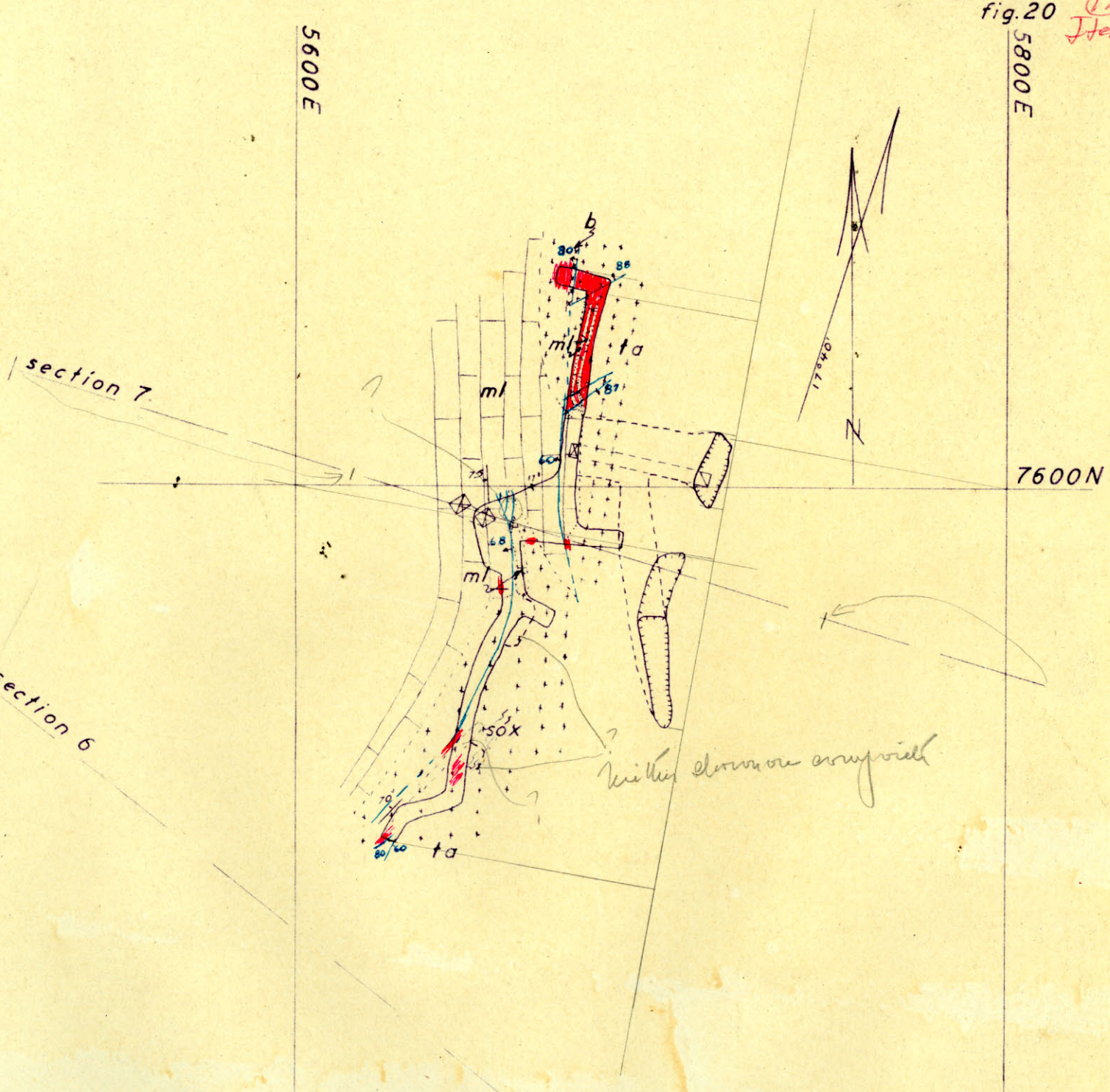
September 1943 D. G. Wyant

Geological Survey

U.S. Department of Interior

Land slope?

fig. 20 (176) Item 32



A Level (6445')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

scale in feet:

0 40 80 120 160

September 1943 D. G. Wyant

Geological Survey

U. S. Department of Interior

EXPLANATION

sox limonite (gossan)

ta tactite: 0.5% + of WO_3

0.5% -

ml marble

b basalt

gr granite — where?

contact

fault — Label stopes & surface openings?

Illustrations

Appendix of maps

Done [illegible]

McCurdy

October 27, 1942.

MEMORANDUM: Mr. Henry DeWitt Smith,
Metals Reserve Company,

FROM: Ira B. Joralemon

SUBJECT: Lincoln Mines, Nevada

Following are notes on a visit to the Lincoln Mines on October 23, 1942. Late trains made it necessary to examine this excellent tungsten mine hurriedly, at night.

LOCATION, FACILITIES, ETC.

The mine is at the north end of the North Tempiute Range, in the Nevada desert 90 miles by road northwest from Caliente. Half of the road is paved, the rest a fair desert gravel road. The good 70 ton gravity mill, which makes 70 to 80% recovery, is at a 200 ft. drilled well in the gently sloping valley west of the mine, where there is abundant good water. The mine is at 6000 ft. elevation, 5 miles by road and 1,000 feet above the mill, on the lower slope of the rugged mountain. Camp facilities are ample for 100 men. About 60 are now working.

The mine is operated through two parallel connected tunnels 700 to 800 feet long, on the two veins or beds, with inadequate winzes 200 feet below the tunnel level. Walls are good and nearly all mining is by shrinkage stopes. A shaft will be needed for larger scale operations. Compressors, hoists, etc., are adequate for present work. Mine and mill are operated by Diesel power. All supplies must be hauled from Caliente.

With 12 new employees just released by the army, an acute labor shortage is ended and development can be resumed.

OREBODIES

Ore replaces garnetized limestone in an arc 6,000 feet long around the northwest, west, and southwest sides of a granite intrusion. The North Tempiute property contains an 800 foot extension of the ore formation southeast. There may be ore around another granite body further north.

The mine is in the northeast 800 feet of the arc, where beds strike northeast and dip 60 degrees northwest, parallel with the contact. Going away from the contact is the following series:

1. 40 ft. of garnet with much pyrrhotite and little scheelite.

2. Moody Bed or Vein, 6 - 15 ft. wide, lean on surface but with 0.5 to 1.2% ore for 650 out of 800 feet length on the tunnel level, 0 to 230 feet below surface. The #2 and #3 levels, 100 and 200 feet below the tunnel, are in the best zone, with 200 feet of good ore on

the 200, and 120 feet of 1.2% ore 12 feet wide on the 300. The south 170 feet on the 300 is barren, and probably in the hanging wall. The better ore, of which 50,000 tons averaging about 1% have been milled, is where the bed is shattered and oxidized. Most of the remaining ore is hard garnet averaging about 0.6% WO_3. Ore carries 2% zinc, which is stored in a middling product.

3. Between the Moody and Grubstake beds is shaly limestone, with two small but rich ore pipes.

4. Grubstake Bed is developed by trenches and an open cut 525 ft. long and 11.5 ft. wide averaging 0.8% WO_3. On the tunnel level the bed is disturbed by many small slips or faults, with short, irregular chimneys of rich ore. Only a little winzing has been done below the tunnel. More crosscutting is needed to prove there is not more ore in the walls.

5. In the hanging wall of the Grubstake is lean garnet, then limestone.

While the whole wide zone may average 0.2%, it will be much better to mine the lenses that average 0.5 to 0.7%. These are irregular in vertical and horizontal section, partly due to faulting, and require much development. Short drillholes would be useful.

ORE RESERVES.

High grade ore in sight, in the Moody Bed between the 200 and 300 levels, totals 10,000 tons averaging 1.2 to 1.4%.

In both veins above the 300 level, in the 800 ft. developed length, it seems likely that there will be 150,000 additional tons of 0.6% ore. This can not be economically treated in the present mill, which has inadequate crushing and grinding equipment for the hard garnet ore.

The U. S. Geological Survey estimated 63,250 tons of 0.7% ore, plus 800,000 tons of possible 0.2 to 0.4% ore. This was before ore was found on the 300 level. As above stated, it will be better not to mine the very lean material.

The 50,000 tons of tailings average 0.3% WO_3. Tests show a recovery of 0.2% by tabling. Flotation tests have been unsuccessful on Lincoln ore or tailings.

POSSIBLE ADDITIONAL ORE.

The U. S. Geological Survey map shows 280 lineal feet of 0.5% or better ore 10 feet wide outcropping in the undeveloped area, plus 960 lineal feet of similar ore averaging 10 feet wide in the undeveloped Lincoln area, and 500 feet in the North Tempiute or Schofield property.

The ground rises rapidly to the south, and an extension of the parallel Moody and Grubstake tunnels will give 200 to 400 or more feet backs.

If the undeveloped area turns out as well as the developed area, the undeveloped part of the Lincoln property may contain 300,000 tons per 100 vertical feet, and the North Tempiute may contain 100,000 tons per 100 vertical feet, with an average grade of 0.6% WO_3.

It seems likely that the Lincoln property may produce 1,000,000 to 2,000,000 tons of 0.6% ore.

The Bureau of Mines has started to drill the property. While drilling has been slow, this work should be of much value. The only two holes completed thus far are under the developed area. The first 30 feet below a barren part of the 300 level, cut 11 feet of 2% ore. The second, 100 feet down the dip from the first, cut 35 feet of 0.3% ore. Details of the drilling were not available.

COMPANY OPERATION AND PLANS.

As long as the property is operated by Mr. D. B. Fegles, the present owner, it is planned to follow and mine the present high grade ore, producing around 1500 units of WO_3 per month. It will take several additional months, at $7,000 per month profit, to repay the investment.

Mr. Fegles realizes the importance of increasing production, and will be glad to consider any plan that will not imperil the return of capital and profit he is assured from developed ore. While Mr. N. Knickerbocker, local manager, and Mr. E. H. Burdick, Consulting Engineer, have done a very good job, Mr. Fegles does not want to take the responsibility of larger operations. He would prefer to turn the property over on lease to Metals Reserve Co., which could give a management contract to any one it desires.

POSSIBLE TERMS FOR LARGER OPERATIONS.

To satisfy Mr. Fegles as well as to continue production, it will be necessary to mine the developed rich ore while the mill is being increased and lower grade ore blocked out for mining. Results would be about as follows:

Ore. 1.1% WO_3. Recover 0.77% @ $24.50 per unit, less frt., or	$18.75 p/t	or
Underlying royalty 15%, or $3.65 per unit or	2.80 p/t	"
Royalty to Lincoln, to give present $7,000 per mo., $5.00 per unit or	3.85 p/t	"
Receipts after royalties, $15.70 per unit or	12.10 p/t	"

The $24.50 price is due to the fact that the high grade concentrates (65% plus) command a premium.

While this should more than cover operating costs, the royalties are excessive. Lincoln will receive the indirect benefit of having leaner material made commercial by a larger mill. It is suggested that Lincoln be offered a $3.00 per unit royalty, in addition to the underlying royalty, for six months.

After a 300 ton mill is in operation, results would be about as follows, assuming that flotation can be made to recover 85% in concentrates half of which would go to the Chemical Plant at Salt Lake.

Recover 85% of 0.6% or 0.45% WO_3		
Receive 0.45 units @ $22.00 or	$9.90	per ton ore
Less frt. & sampl. $10.00 per ton concts.	.10	" " "
Return subject to royalty	9.80	" " "
Underlying royalty, 7.5%, or $1.60 per unit, or	.72	" " "
Hauling Concts. $8.00 p/t or	.08	" " "
Receive before Royalty to Lincoln	9.00	" " "
Probable Costs.		
Mining and Development	3.20	per ton ore
Hauling to mill	.50	" " "
Milling	1.50	" " "
Overhead	.80	" " "
Total Operating	6.00	" " "
Deprec., $150,000 per yr. or	1.50	" " "
Total Expense before royalty to Lincoln	7.50	" " "
Suggested roy. to Lincoln, $2.00 per unit or	.90	" " "
Margin above Op. costs, Royalties and Depreciation	0.60	" " "

The royalty to Lincoln would continue the $7,000 per month it can expect to make by developing and mining more high grade.

Total royalties of $3.60 per unit, or 16.3% of returns, are excessive. Mr. Burdick says the underlying owners have exaggerated ideas, and will listen to no change in the present sliding scale. In view of the fact that the life would be increased by the larger plant treating low grade ore, Lincoln might accept a lower royalty, or say $1.50 per unit after the first six months.

As a basis for negotiation, it is recommended that Lincoln be offered a $3.00 per unit royalty on production for the first six months, and $1.50 per unit royalty thereafter, in consideration for which they would assign the lease and use of all equipment to Metals Reserve Company. Then some efficient medium sized gold company, if possible one with mining and milling equipment that can be easily moved, should be appointed as agent to operate the property for a moderate management fee.

If this is done, the property should produce 40,000 to 50,000 units of WO_3 per year at a very small profit to Metals Reserve Company or its agent.

October 27, 1942.

January 23, 1943.

MEMORANDUM: Henry DeWitt Smith,
Metals Reserve Co.
FROM: Ira B. Joralemon

RE: LINCOLN MINES, Inc.

Following are notes on suggested development of Lincoln Mines, Inc., with Metals Reserve Company funds agreed on at a visit to the mine on January 19th with Mr. J. Fred Johnson of the Salt Lake City office of American Smelting and Refining Company, and Mr. N. J. Knickerbocker, Superintendent of Lincoln Mines, Inc. Illness prevented Mr. E. E. Burdick, Consulting Engineer of Lincoln Mines, Inc., from making the trip. Mr. Johnson is having copies made of the mine section showing present workings and suggested development, and will distribute the section to those who receive this memorandum.

PRESENT CONDITION OF MINE.

Due to unexpected developments, the Lincoln mine is practically out of high grade ore. A sub-drift between the 2nd and 3rd levels, above which the main Moody high grade orebody had been stoped out previously, proved to be 30 ft. lower down than shown on sketch maps. As a result, there were only 6,000 tons of 1 to 1.25% ore between the recent 3rd level north drift and the old stope, instead of 12,000 to 14,000 tons as expected.

A 40 ft. winze was recently sunk below the north end of the 3rd level. The pitch of the north end of the ore was reversed in this winze, and the width rapidly decreases. On the sub-level 35 ft. down the winze, the rich ore is only half as long and a third as wide as on the 3rd level. Only 1,000 tons of ore can be stoped above the sublevel, and this must be mined very slowly.

As a result, milling of ore has been discontinued until a few hundred tons are accumulated. Meanwhile, a little underground development is being carried on in the hope of finding more rich ore, and the mill is being run on old tailings.

A short mill run indicates that nearly 150 tons of 0.27% tailings can be treated daily, with a possible recovery of 0.18 units WO_3 per ton, or 660 units per month. A monthly recovery of 600 units is more likely. This compares with a production of more than 1500 units per month from mine ore for the past few months.

It may be possible to make a small operating profit through milling the tailings, and to carry on a little development. With great good luck another high grade orebody might be found. It is more likely that the mill will have to shut down after making at most $2,000 or $3,000 per month for 6 or 8 months. This is a sad drop from the recent operating profit of $9,000 per month.

The only reasonable chance of extending the profitable life of Lincoln, and of making more than a small tungsten production, lies in development of lower grade ore through a loan on future production by Metals Reserve Company, with a larger mill financed by Defense Plants Corporation if development is successful.

POSSIBLE LOW GRADE ORE.

In spite of a good surface showing, development of the hanging wall or Grubstake vein has found orebodies too small to return the exploration cost. Only 4 or 5 crosscuts to the Grubstake on deeper levels are justified unless these crosscuts find good ore.

Unexplored parts of the footwall or Moody vein in the 1500 ft. southwest of present workings, have more promise. It would take many months to explore this outlying area, and more months to make ore from it accessible for mining. Such development is too uncertain to be worth considering as an aid to wartime production of tungsten.

There remains the area on the Moody Vein from a point 300 ft. southwest of the Burdick Tunnel, where a recent Bureau of Mines drillhole cut 10 ft. of good ore, to No. 5 Stope on the Moody Tunnel Level. The total length of this accessible, promising area is 1400 ft, of which the 750 ft. at the northeast end have been partly developed by the Moody workings.

In the Moody Tunnel itself, two bodies totalling 175 ft. in length have been stoped, with an average width of over 8 ft. and a grade of 1% WO_3. The 400 ft. between the two bodies is a hard garnet and pyrrhotite vein 4 to 11 ft. wide, probably averaging 0.5 or 0.6% WO_3, though no mill tests have been made to prove the grade.

Northeast of No. 5 Stope the Moody tunnel cut oxidized garnet with almost no scheelite. The 150 ft. of the Moody Tunnel southwest of the first orebody is close to the surface, leached, and low grade. The 2nd level is here in 0.5 to 0.7% ore. The short Burdick Tunnel, starting 350 ft. southwest of the portal of the Moody and running southwest, is said to have cut 0.5 to 1% ore.

The second and third levels are too short to give conclusive evidence, but the proportion of stopes (over 0.8%) to lean material is about the same as on the tunnel level.

In the developed area of the Moody about one-fourth of the length has averaged more than 1% WO_3, and the remaining three-fourths have averaged more or less 0.5%, with no accurate tests to prove the true grade of the lean material. If the whole length of 575 ft. had been mined, the grade should have averaged 0.6 to 0.7% WO_3 for a width of 5 ft. or more.

If this ratio of good to lean ore continues, the central area in the Moody Vein above the 500 ft. level, will contain several hundred thousand tons of ore that may average 0.6% WO_3. The plan of development shown on the vein section to accompany this memorandum is intended to develop, at the lowest possible cost, enough 0.6% ore to justify increasing mill capacity to 300 tons per day.

SUGGESTED DEVELOPMENT AND COST

The following table, also shown on the section, gives the proposed development:

340 ft.	inclined shaft @ $60.00	$20,400.00
1660 ft.	of drifts on Moody Vein @ $20.00	33,200.00
500 ft.	of crosscutting to Grubstake @ $20.00	10,000.00
440 ft.	of raises @ $20.00	8,800.00
	Shaff equipment, hoist, compressor, drills, etc.	20,000.00
	Camp, transportation exp., etc.	7,600.00
	TOTAL	$100,000.00

In order to check on values, ore from drifts should be accumulated until there is enough ore for a mill run of a week or more. Then milling of tailings should be temporarily discontinued while the development ore is being milled. Production from this ore would be a credit against development. Returns should be about as follows:

Mill ore from 1500 ft. of drifts, or 4500 tons of 0.6% ore recovering 0.4% at $24.00 per unit or	$43,200.00
Less Hauling, 75¢, and milling $3.25 per ton or	18,000.00
Less royalty at 7.5% or about	3,000.00
Net Possible credit	22,200.00

This credit should more than cover overhead, taxes, etc.

POSSIBLE TONNAGE.

If results of the development are as expected, the following tonnage will be available at the close of the campaign:

Moody Vein

Adit Level to surface, 400' x 100' x 8'	29,000 tons
3rd Level, Main Sto. to #5, 400' x 170' x 9'	56,000 "
" " Main Sto. to Burdick Tun. ½ of 500'x100'x8'	18,000 "
4th Level (New), 800' x 125' x 8'	72,000 "
TOTAL Possible above 4th Level	175,000 "

Grade unknown but possibly 0.6% av.

Grubstake Vein - May add small tonnage.

The heavy garnet ore is figured at 11 cu. ft. per ton.
A large additional tonnage might be developed later on the 3rd and 4th levels further southwest, to the Bureau of Mines drillhole, and below the 4th level.

JAN 28 19

ENLARGED MILL.

The question as to the character and size of mill must depend on results of development and on used equipment available. By the time half the development listed above is completed, it should be possible to make the decision. Metals Reserve Company should of course be allowed to discontinue advances for development at any time, if results of the work or any other considerations make it advisable to do so.

During the early part of the development period, a study should be made of millsites and of available mills. It is possible that the good 300 ton mill of the Western Tungsten Co. may come on the market. There is little room for mill or tailings disposal close to the mine, and water would have to be pumped 5 miles, with 1,000 ft. rise. At the present mill at a well in the flat desert all tailings must be elevated and drainage is poor. A casual inspection suggests that a hillside location 1 mile from the present mill and 300 ft. higher, and 4 miles from the mine, may be most economical. It may be best to put a permanent camp at the proposed mill, moving the present flimsy camp buildings to it.

If good used machinery can be bought at a fair price, as seems likely, and the tables and other adaptable equipment of the present 75 ton mill are used, it should be possible to build the new 300 ton mill for $200,000.

DIRECTION OF OPERATION.

As Mr. Fegles states in his letter of January 6, 1943 taxation makes it advisable for operations to be carried on by the present Lincoln Mines, Inc. While the present management has been adequate for small operations, all agree that if large amounts of government money are spent, the work should be under the direction of an organization such as American Smelting and Refining Company, with extensive experience in large scale mining and milling. It is hoped that this can be arranged between Lincoln Mines, Inc. and American Smelting and Refining Company. A Metals Reserve Company advance for development should be contingent on such an arrangement.

POSSIBLE FINANCIAL RETURNS.

Possible costs and return would be about as follows:

Mine 300 tons per day, or 100,000 tons per year of 0.6% ore.
Recover 75%, or 0.45 units per ton @ $24 per unit, or $10.80 per ton of ore
Produce 45,000 units WO_3 per year.

Costs

Mining (shrinkage)	$2.50	per ton of ore
Development (Current)	1.00	" " " "
Milling	2.00	" " " "
Hauling	0.50	" " " "
Overhead	1.00	" " " "
Underlying royalty, 7.5%, after frt.etc.	.75	" " " "
Total Op. Cost	7.75	" " " "
Operating Profit	3.05	" " " " or
	6.75	" Unit WO_3 recovered or
	$300,000.00	
Probable Inc. Tax, after depr., depl.etc	40,000.00	per yr.
Prob. Profit after tax and before return of advances or pay't. to D.P.C	260,000.00	per yr. or
	5.75	per unit WO_3 recovered.

SUGGESTED RATE OF REPAYMENT OF GOVERNMENT ADVANCES

With this operating profit, it would be fair for Lincoln to pay $1.50 per unit WO_3 recovered to Metals Reserve Co. to return the $100,000 advanced for development. The total development fund would then be returned in 18 months.

As return to D.P.C. for the $200,000 spent for the plant, Lincoln could pay an additional $1.50 per unit. This would return the cost to D.P.C., less probable resale or scrap value of the plant, in about 3 years. It would be fair to allow Lincoln to purchase the plant after the war at cost to D.P.C. less the amount payed as rental, with a small allowance for interest.

These rates would give Lincln a possible cash return of $2.75 per unit WO_3 produced, or $120,000 per year. This is a generous return for a mine that is practically worked out as far as present scale operations are concerned.

Ira Bjornberg

JAN 28 1943

AMERICAN SMELTING AND REFINING COMPANY
WESTERN MINING DEPARTMENT
SALT LAKE CITY, UTAH

J. FRED JOHNSON
RESIDENT MANAGER

January 22, 1943

AIR MAIL

Mr. Ira B. Joralemon
315 Montgomery St.
San Francisco, Calif.

LINCOLN MINES, INC. (TUNGSTEN)
LINCOLN CO., NEVADA

Dear Mr. Joralemon:

Enclosed find longitudinal section showing graphically the proposed new development work for larger exploitation of the Moody Tunnel area this being, in the light of our present knowledge, the most promising part of the ore zone for early production of tungsten for the war effort. The section is to supplement the report you are writing and sending to individuals for whom this letter is earmarked.

It is our understanding that the section shows the general plan of the work but that it will be subject to change in details to conform to findings in the development work as that work proceeds.

Yours very truly

J. FRED JOHNSON

JFJ:ES
cc: All Air Mail
H. A. Guess
H. deWitt Smith, Metals Reserve Co.
Lafayette Bldg. Washington, D.C.
Miles K. Smith, Chief of Ferro-Alloys Branch
War Production Board
Temporary Bldg. R.
Washington, D. C.
D. B. Fegles, Pres. Lincoln Mines, Inc.
Wesley Temple Bldg.
Minneapolis, Minn.
D. B. Fegles
Route 8, Box 251, San Antonio, Tex.
E. H. Burdick
625 Judge Bldg. Salt Lake City, Utah
N. J. Knickerbocker,
Lincoln Mines, Inc. Hiko, Nev.

Revision by Don Lemmon
~~Sept~~ Oct 1946 (176)

J Hem. 3

W dep. of the Tem Pinte Range, Lincoln Co., Nevada

Abstract

3 ✓ Introduction

Location - accessibility - size - altitude

Mining Co.s.

History and Production

✓ Field work and acknowledgements.

Geological Survey work

Acknowledgements:

Bureau of Mines work

3 Geology

2 [illegible]

2 Ore deposits

Mines

3 Lincoln mine

1 Schofield mine

Reserves - [illegible]

Faults (p 7)

Resumes.

Analysis of sulfides floated & rejected?

LIST OF ILLUSTRATIONS - REVISED TEM PIUTE

APRIL 1946

LIST OF ILLUSTRATIONS - REVISED TEM PIUTE

APRIL 1946

Abstract

Scheelite occurs in the Tem Piute range, Lincoln County, Nevada in contact metamorphic deposits formed in the vicinity of 2 small granitic stocks that invade Paleozoic sedimentary rocks. The scheelite deposits are of low grade, with large bodies that contain about 0.4 percent of WO_3. Most of the scheelite is contained in garnet tactite, which is found in several bands, separated by hornfels, along the west side of the south stock. The principal band of tactite extends along the granite contact for more than 6,000 feet, and ranges in width from 15 to 110 feet. The other tactite bands, which lie farther away from the contact but parallel to it, are nearly as continuous. In general, the granite contact and the tactite are concordant with bedding in the sedimentary rocks.

A small ore shoot of higher grade, averaging about 1.0 percent of WO_3, is worked in the Lincoln mine. It consists of calcite-chlorite-fluorite rock with sphalerite and scheelite, and was shown by drill holes to extend to a vertical depth of at least 600 feet. The shoot is 200 feet long where exposed in mine workings, and averages 10 feet in thickness. Up to 1944, this ore shoot provided most of the tungsten production of the district, which amounted to 31,653 units of WO_3 recovered from 56,715 tons of ore. In this orebody, reserves to the depth of the deepest drill hole were estimated in 1944 at 43,000 tons containing 1.0 percent of WO_3.

Reserves of garnet tactite containing about 0.4 percent of WO_3 are estimated at more than 1,000,000 tons of indicated and inferred ore. This estimate includes only ore within a few hundred feet of the surface, and the ultimate reserve may be much greater. The low-grade ore occurs in shoots separated by tactite containing less than 0.25 percent of WO_3. It is not likely that the entire mass of tactite could be mined for ore under any conceivable conditions.

USBM Prod figures 1940-1947 incl.

Tons milled	Concentrates recovered as
33	
81,872	43,390
	69
	43,459

Introduction

The Tem Piute range, in the west-central part of Lincoln County, Nevada, is approximately 85 miles west of Caliente, 100 miles east of Tonopah, and 160 miles north of Las Vegas ~~(fig. 1)~~. It is reached by 40 miles of desert road from U. S. Highway 93 at Crystal, near Hiko.

The range is 5 miles long and trends north. The altitude of the crest is 7,600 feet, and the relief is about 2,000 feet. The tungsten deposits are near the north end of the range, in secs. 25, 36, T. 3 S., R. 56 E.; secs. 31, 30, T. 3 S., R. 57 E.; and sec. 1, T. 4 S., R. 56 E., Mount Diablo Base and Meridian.

~~The~~ Lincoln Mines, Inc. was the only mining company active in the district in 1943. Adjoining properties owned by North Tem Piute Mining and Development Co. were not being worked.

Silver ore was mined sporadically in the old Tem Piute district, on the west side of the range near the south end, from 1868 to 1883, and again in 1935-36. According to bullion tax records, production was about 2,500 tons valued at $74,536.

The scheelite-bearing deposits were first discovered in 1916, but were not mined or extensively prospected until 1934, when a number of claims were relocated by Wesley Koyen, in partnership with Mrs. W. Green, G. W. Thiriot, and D. P. Thiriot. The property was leased to Lincoln Mines, Inc., and a small mill was completed in June 1940. In 1945, Atolia Mining Co. purchased Lincoln Mines, Inc. from D. B. Fegles, and took over the mining lease. The mine was idle in 1946, and was again operated in 1947.

The North Tem Piute Mining and Development Co. was organized in 1937 by the Schofield brothers, who had located claims in the district in 1928. The only production to 1944 was 0.7 ton of concentrate containing 46 percent of WO_3 (32 units).

Up to 1944, Lincoln Mines, Inc. milled 56,715 tons of ore that yielded 30,259 units of WO_3. The company also re-treated or sold 3,432 tons

of tailings and middlings containing 1,186 units of WO_3. Total production from the district to the end of 1943 was approximately 31,653 units of WO_3, sold for $788,530.

Table 1. Tungsten ore and concentrates produced in the Tem Piute district to the end of 1943.

Field work by D. G. Wyant of the Geological Survey extended at intervals from November 1941 to November 1943 for a total of 11 months. He was assisted at times by D. C. Cox, F. M. Byers, Jr., and M. P. Erickson. The mine workings and a small area on the surface above the Lincoln mine were mapped on a scale of 40 feet to the inch, and the entire mineralized zone was mapped by plane table and alidade on a scale of 200 feet to the inch. On a visit to the property in 1942, P. C. Bateman mapped some of the workings on the Schofield claims. In September 1944, D. M. Lemmon spent 2 weeks reviewing the geology in connection with drilling by the Bureau of Mines. Using a topographic base prepared by multiplex method from aerial photographs, he also mapped part of the north end of the range on a scale of 1000 feet to the inch.

In the period 1942-44, the U. S. Bureau of Mines explored the deposits in 2 projects. In the first, extending from March to December 1942, trenches were dug across the ore zones at intervals of 100 feet or less, samples were cut and assayed, and 5 diamond drill holes were completed. In the second project, ~~extending from to November~~ in 1944, 6 holes were drilled. D. W. Butner, E. O. Binyon, and G. H. Holmes, Jr. was each in charge of the work at successive stages.

The Survey geologists acknowledge with thanks the co-operation of members of the staff of Lincoln Mines, Inc. S. P. Holt, engineer and geologist for Lincoln Mines, Inc. 1940-42, provided ~~mine~~ underground surveys, including geology, ~~and~~ of the Lincoln mine, and surveyed surface control points for the plane table map and the multiplex topographic map. D. B. Fegles, president, and N. J. Knickerbocker, general superintendent, furnished lodging and made available maps and records, including production data. Cordial and mutually beneficial relationships existed between project engineers of the Bureau of Mines and geologists of the Survey assigned co-operatively to the exploratory projects.

~~Already~~

Minerals Yearbook, 1937, p 451

"The Tempiute Mining Co., working the Sterling group, was the largest producer in the Tem Piute district in 1936. This company shipped silver ore to a smelter."

Minerals Yearbook, 1938, p. 383

"The Sterling mine produced 1,380 tons of silver ore in 1937 and shipped it for smelting. An Act. of the Silver Gate Mining and Milling Co. sold its lease, under which the property had been operated, to the North Tem Piute Mining and Development Co."

M. Ybk, 1939, p. 409:

"Lessees on the Sterling mine of the Tempiute Mining Co. shipped silver ore to a smelter in 1938."

Couch, B.F. and Carpenter, J.A., Nevada's metal and mineral production (1859-1940 inclusive): Univ. of Nev. Bull., Vol 37, no 4, Geology and mining series No. 38, 1943.

June 20, 1969

Mr. P. E. Galli
District Geologist
Union Carbide Exploration
  Corporation
751 Ryland Street
Reno, Nevada 89502

Dear Pete:

I am sending you a print of the Tem Piute map (1:12,000 scale) requested in your letter of June 3. To obtain a cronaflex transparency, similar to the green line copies of the 1:2,400 map I sent you, we would have to make a photographic negative first. I have not done this because I have not found the original to copy. From the clean print, you might get photostat copies made in Reno, or possibly a photograph.

I am much interested in your exploration at Tem Piute and hope to discuss it with you some time this summer, in the field if we can. I expect to leave Washington for Menlo Park in about 10 days.

Sincerely yours,

cc: OTweto

Dwight M. Lemmon
Assistant Chief Geologist
  for Engineering Geology

A Mixture of Torrid Tips, Timid Tattlings, and Dubious Drivel, overheard in Passing, and Recorded for the Files ~~for~~ Forty-two-sixteen, and MED.

Lincoln Mines, Tem Piute District
Nevada

(Conversation with Fran Frederick at Ima, June 26, 1945)

Atolia Mining Co. purchased for $25,000 cash all Fegles' interest (Lincoln Mines) in the Tem Piute district, which included the mill, mill houses, well, and the lease on the mine and equipment. The mine was originally leased to Fegles for 35 years, with an option on another 35 years; approximately 29 years remain to go on the first lease. The original contract prevented Fegles from removing any equipment from the mine after it was once installed, but Atolia has made a new agreement with the owners allowing for temporary installation of equipment, and removal when the job is done. Royalties are 10% to 25% depending on grade mined and market value of tungsten. Pierce Walker, who was in charge for Fegles, made the deal with Atolia, and will remain in charge as superintendent. Hugh Coke is general manager for Atolia operations, but will not be in residence at Tem Piute. The mill is to be re-vamped to recover zinc, although I doubt if there is enough present to be of much value. It is planned to get a new mine foreman who knows something about mining.

Plan of development calls for sinking a winze from 4th to 5th level (125 foot interval), and then to raise the main shaft to the 3rd level. Also, cross cuts are to be run in the upper part of the mine, and the 300 level will be extended beneath the Burdick shaft.

The price paid for the property is confidential information; so is my conclusion that Walker, and probably the Bureau of Mines, pulled a fast one on Fegles in disposing of the property for less than the value of the physical assets. Frederick spent quite a lot of time explaining to me the maps of the deposit, maps that obviously had been made either by me or by Wyant. Why do we ever have to release anything--the Bureau does the job very nicely for us!

DML

UNION CARBIDE

UNION CARBIDE EXPLORATION CORPORATION

751 RYLAND STREET, RENO, NEVADA 89502 • 702-323-0663

June 3, 1969

NOTED

JUN 6 1969

Dwight M. Lemmon
Assistant Chief Geologist
Engineering Geology

Mr. Dwight M. Lemmon
ACG, Engineering Geology
Room 4216, GSA Bldg.
Washington, D. C. 20242

Dear Dwight:

I want to express my deep appreciation and many thanks to you for the four film transparencies of the Tempiute Tungsten Deposit Map which were received today. This map and the Geologic Map (1" = 1000') of 1944 with your additions have proved to be invaluable to us.

On every occasion that we have field checked, we have found an excellent and complete mapping job had been performed.

Several interesting aspects of the deposit have developed with our deep drilling that might be of interest to you. Thus far, we have drilled 18 holes to a maximum depth of 2,000 feet. The deepest probe of the granite-tactite contact was 1,250 feet below the lowest mine level (600) or at an elevation of 4,995 feet. It appears that, with depth, scheelite mineralization in the Moody tactite zone is disappearing. At the south end of the workings, mineralization is completely missing and only the Grubstake tactite above the band of hornfels is mineralized.

At the north end, the deepest hole found hornfels on the granite contact and no Grubstake tactite above. Using the data from your map of 1944, with the overturned beds, indicates that we can expect this situation. However, we are presently trying to get deeper holes to see if tactite is present below where limestone should again be in contact with the granite. We are in the process of drilling the first of three deeper holes and, therefore, may have some answers in a couple of months.

If it isn't too much trouble, I would like to impose upon you again for a film transparency of the Geologic Map with your additions of 1944 which is at a scale of 1" = 1000 feet. Both our copies are now badly soiled from both age and use.

I hope that you can stop by Tempiute for a visit sometime soon. We have an adequate trailer camp to accommodate visitors and should be drilling for another two months. Thanks again for the films.

Sincerely yours,

P. E. Galli
District Geologist

PEG:rs

cc. ... copy ... Commodity File ... to Hobbs ...
6/11/69

has a pressure-tight closure. The Pyrex tube is then also inserted into the Teflon tube, and the pressure seal is closed. This unit, which has a thermocouple well similar to that of cold seal and Tuttle bombs, is next placed in a horizontal preheated furnace and heated to the temperature of the experiment. Teflon softens on heating but readily withstands the internal pressure to 200°C under these conditions. When the temperature of the experiment has been reached the liquids are mixed by exerting pressure on the Teflon tube, by means of a specially constructed pair of pliers with jaws, to the point where the Pyrex tube shatters. The reaction that immediately takes place is recorded by the thermocouple, which shows a rapid increase in temperature of as much as 5°C. Thereafter the temperature drops back over the next 10 minutes or so to that recorded before the liquids were mixed. The Teflon tubes are kept in the furnace at temperature from 1 to 100 hours, depending on the temperature of the experiment after mixing of the liquids, to produce well crystallized materials. The products are filtered, washed, and studied by means of X-ray diffraction patterns and in polished sections.

Pyrrhotite from Tem Piute, Nevada

Peter R. Buseck

The composition of hexagonal pyrrhotite when in equilibrium with pyrite has found considerable use as a geological thermometer. Efforts to apply the thermometer to pyrrhotite-pyrite assemblages from the Tem Piute district encountered difficulties because at this locality the pyrrhotite is monoclinic. Arnold and Reichen (1962) suggested that the thermometer may be valid even for such assemblages and that the composition of monoclinic pyrrhotite can be determined by the standard X-ray method if the specimen is first inverted to the hexagonal form by heating in vacuo.

The tungsten-copper deposits at Tem Piute, Lincoln County, Nevada, occur in a skarn aureole surrounding a small granodiorite stock. One of the mines, the Free Tunnel, was studied in detail because of its rather complex and varied ore assemblages. All the metallic minerals occur in a diopside, andradite skarn, which separates the barren intrusion from unmineralized limestone and, locally, hornfels.

The metallic minerals occur as disseminations or small lenses, veining being extremely minor. With the exception of pyrite, chalcopyrite, and scheelite, all of which occur throughout the aureole, the minerals are roughly thermally zoned. In the "inner," formerly hotter, portions of the aureole, in approximately paragenetic sequence are molybdenite, pyrrhotite, magnetite, and marcasite. Near the limestone in the "outer," formerly cooler, parts, are sphalerite, galena, galenobismutite, cosalite, and native bismuth. Except for sphalerite these minerals are sparse.

Pyrrhotite was one of the first metallic minerals to form, and, as such, it was deposited during the earliest, hottest stages of the mineralization period. It is most prominent along the granodiorite-skarn contact but occurs in decreasing amounts farther from the granodiorite. The pyrrhotite is commonly associated with and generally surrounds euhedral crystals of pyrite, thereby indicating its later origin. In an attempt to determine its temperatures of formation all available pyrrhotite was sampled and examined in the laboratory.

Arnold (1962) demonstrated that the d_{102} spacing of hexagonal pyrrhotite is a function of its composition. The composition is dependent on the temperature of formation provided that the pyrrhotite formed in equilibrium with pyrite and that it did not reequilibrate with decreasing temperatures. Most of the Tem Piute pyrrhotite was sampled within 1 mm of pyrite, and all such samples have similar d_{102} values. It is therefore assumed

that these pyrrhotites formed in equilibrium with pyrite. Pyrrhotites that did not form close to pyrite have different compositions from those in contact with it. This would presumably not be so had all the pyrrhotite reequilibrated as temperatures fell during cooling.

In the inversion of monoclinic pyrrhotite to the hexagonal form the time and temperature allowed for annealing are critical; with too long an annealing period or too high a temperature the pyrrhotite reequilibrates, and with too short an annealing time or too low a temperature it does not invert. To determine the optimum time and temperature for annealing, natural pyrrhotite was finely ground under acetone and concentrated magnetically; replicate runs prepared from this material were heated in evacuated silica glass tubes.

Runs were annealed for 0.1 hour at different temperatures. At 700°C and 555°C the pyrrhotite-pyrite reaction is sufficiently rapid for the samples to have reequilibrated. Two runs heated at 346° and one at 455°C inverted but did not have time to reequilibrate. They indicate the same composition within the limits of error of the method. A sample heated at 300°C did not invert in 0.1 hour but did in 1½ months. Likewise, one at 260°C did not invert within 1½ months but did within 1 year. Clearly the temperature of the hexagonal-monoclinic transition lies below 260°C, but at the same time the reaction is too slow for quick annealing at temperatures below 300°C. As the samples inverted rapidly but did not reequilibrate in 0.1 hour at 346°C the other Tem Piute specimens were annealed under these conditions.

Several pyrrhotites were sampled from specimens containing no pyrite. In specimens that contained appreciable pyrite the pyrrhotite was extracted with a dentist's drill kept in contact with pyrite at all times so that no pyrrhotite was collected farther than 1 mm from pyrite.

Table 22 lists the results of X-ray measurements on a number of Tem Piute pyrrhotites, all of which were originally monoclinic. Numbers 3 and 4 are from the same sample; they provide almost identical results. Likewise, all the pyrrhotite samples that were adjacent to pyrite have very similar d_{102} values and, had they been hexagonal when collected, would indicate temperatures between 455° and 510°C. Those that were not in contact with pyrite have consistently larger d_{102} values and, had they also been originally hexagonal, would correspond to minimum temperatures between 390° and 450°C. Although very reasonable for contact metasomatic deposits such as Tem Piute, these temperatures must be regarded as tentative. At present it is not

TABLE 22. Average $2\theta^{(102)}$ and Corresponding $d_{(102)}$ of Tem Piute Pyrrhotite

Sample	$\overline{2\theta}_{(102)}$	$s_{\overline{2\theta}}$*	$d_{(102)}$	Comments
1	44.03_6	0.0041	2.0563 ± 0.0002	
2	43.96_6	0.0097	2.0594 ± 0.0004	
3	44.00_2	0.0033	2.0578 ± 0.0002	
4	44.01_7	0.0053	2.0572 ± 0.0002	
5	43.95_1	0.0044	2.0601 ± 0.0002	
6	43.90_0	0.0109	2.0623 ± 0.0005	Pyrite absent
7	43.87_1	0.0067	2.0636 ± 0.0003	Pyrite absent
8	44.01_1	0.0046	2.0574 ± 0.0002	
9	43.93_9	0.0082	2.0606 ± 0.0004	Pyrite absent
10	43.88_2	0.0042	2.0631 ± 0.0002	Pyrite absent
11	43.95_1	0.0053	2.0601 ± 0.0002	

* Standard error of eight or more successive oscillations.

clear that the relations between hexagonal and monoclinic pyrrhotite are such that measurements on inverted monoclinic material yield sound estimates of temperatures of formation.

STONY METEORITES

P. Ramdohr[9] and G. Kullerud

During this past year more than a hundred stony meteorites have been studied in polished sections in addition to those described in last year's report. The following opaque and semiopaque minerals have been identified: Minerals containing elemental iron include α iron (kamacite) with variable Ni content, Fe-Ni solid solutions (taenite) with the structure of γ iron, and intergrowths of the α and γ phases, plessite. Cohenite (Fe_3C) occurs only in a few stony meteorites and in small amounts. Schreibersite (Fe_3P) is widely distributed in small amounts. A new mineral, which by synthesis was found to have the composition $(Ni,Fe)_2S$ and which we refer to as the Henderson phase, was observed in three meteorites. Graphite (C) occurs in about one-tenth of the specimens. Native copper (Cu) is commonly observed, but in trace amounts. Native gold was observed in only one specimen. Troilite (FeS) is present in all specimens examined and is frequently the most abundant opaque mineral. Chalcopyrrhotite, (Fe, Cu, Ni, Zn)S, a cubic high-temperature solid solution, was observed in about one-third of the specimens. Valleriite occurs as a disintegration product of chalcopyrrhotite and as an exsolution product of pentlandite. Pentlandite, $(Fe,Ni)_9S_8$, is present in about one-fourth of the meteorites examined. Oldhamite, (Ca, Fe, Mn)S, is limited to meteorites that are highly reduced or that have a high sulfur content. A new (Fe, Mg, Mn, Ca)S phase similar to oldhamite but with much higher reflectivity is rather common. Alabandite, MnS, was not observed. A new mineral with a hexagonal layer structure and containing Fe-C-S was observed in 10 per cent of the meteorites. Daubréelite, $FeCr_2S_4$, is also present in about 10 per cent of the specimens. Sphalerite, ZnS, occurs in trace amounts only. Chalcopyrite, $CuFeS_2$, was observed in a few meteorites, and pyrite, FeS_2, was identified only once.

Besides these minerals a number of new ones were observed in small amounts and mostly in single meteorites. These phases are referred to by the letters A through L. For most of them the compositions are partly or completely unknown although their major constituents can often be deduced from the mineral assemblages with which they are associated. Mineral A is strongly anisotropic and has a dark yellow-green color. It almost invariably occurs as lenses or lamellae in daubréelite and only rarely is found independent of troilite. Its optical properties indicate that it has a pseudohexagonal orthorhombic symmetry, and it may be a transformation product of daubréelite. Mineral B occurs interlayered with mineral A and appears to have formed from it, not directly from daubréelite, with which it is also closely associated. This mineral may be a terrestrial alteration product, although the neighboring minerals, some of which are very susceptible to weathering, show no sign of alteration.

Mineral C is olive-brown, weakly reflecting, and apparently isotropic. It is commonly, but not always, associated with daubréelite. Mineral D is colorless and transparent with high refractive index. It replaces ilmenite and chromite and is always associated with chromite. Mineral E is dark brown and occurs with troilite. It is relatively soft, is isotropic,

[9] University of Heidelberg.

fig. 8
176
Index 32

EXPLANATION

- solution cavities
- ta tactite
- 0.5% + of WO_3
- 0.5% - of WO_3
- marble
- pho hornfels, platy
- b basalt
- gr granite
- qtz quartz
- contact, dashed where not accurately known
- projected contact
- fault, showing dip, dashed where concealed
- projected fault
- 50° strike and dip of bedding

bottom, station, top } shaft

section 1
section 2
section 3
section 4
section 5
section 6
section 7

5000 E
5200 E
5400 E
5600 E
7000 N
7200 N
7400 N
7600 N

(6260')
(6240')

Level No. 2, Lincoln Mine
Elevation 6260 feet

Level No. 2, Lincoln Mine
Elevation 6240 feet

2 LEVELS (6260'), (6240')

LINCOLN MINE

Tem Piute, Lincoln County, Nevada

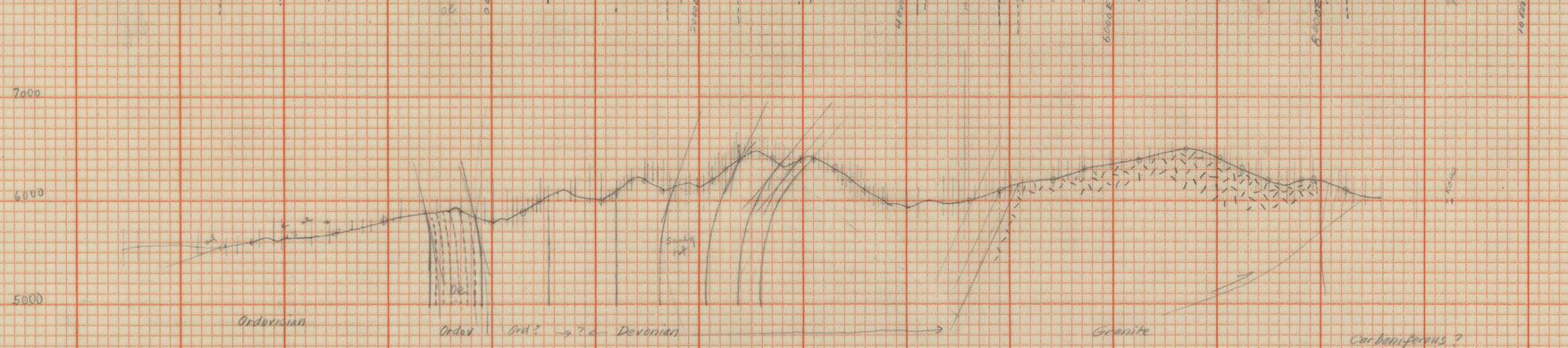
scale in feet :
0 40 80 120 160 200

August 1943

Mapped by D.G. Wyant

U. S. Department of Interior
Geological Survey

4790 0029

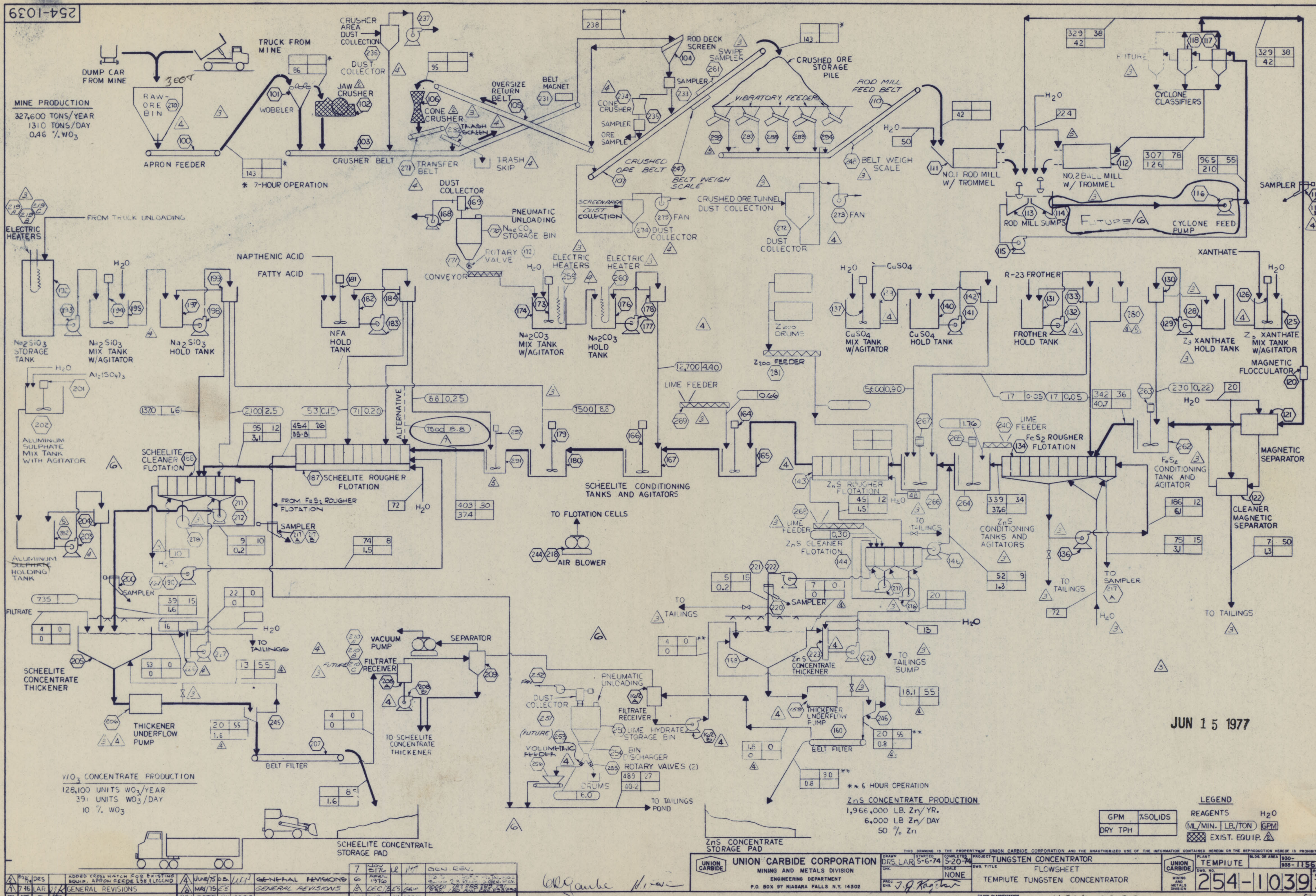


TEM PIUTE, NEVADA

SECTION 9400 N.

1" = 1000'

DMK 10-6-44


254-1039
DUMP CAR FROM MINE
TRUCK FROM MINE
MINE PRODUCTION
327,600 TONS/YEAR
1310 TONS/DAY
0.46 % WO3
RAW-ORE BIN
APRON FEEDER
* 7-HOUR OPERATION
WOBBLER
JAW CRUSHER
CRUSHER AREA DUST COLLECTION
DUST COLLECTOR
CRUSHER BELT
CONE CRUSHER
TRASH SCREEN
OVERSIZE RETURN BELT
TRANSFER BELT
TRASH SKIP
BELT MAGNET
ROD DECK SCREEN
SWIPE SAMPLER
SAMPLER
CONE CRUSHER
ORE SAMPLE
CRUSHED ORE BELT
BELT WEIGH SCALE
CRUSHED ORE STORAGE PILE
VIBRATORY FEEDERS
ROD MILL FEED BELT
SCREEN AREA DUST COLLECTION
CRUSHED ORE TUNNEL DUST COLLECTION
FAN
DUST COLLECTOR
NO.1 ROD MILL W/ TROMMEL
NO.2 BALL MILL W/ TROMMEL
ROD MILL SUMPS
CYCLONE FEED PUMP
CYCLONE CLASSIFIERS
FUTURE
SAMPLER
ELECTRIC HEATERS
FROM TRUCK UNLOADING
Na2SiO3 STORAGE TANK
Na2SiO3 MIX TANK W/AGITATOR
Na2SiO3 HOLD TANK
NAPTHENIC ACID
FATTY ACID
NFA HOLD TANK
DUST COLLECTOR
PNEUMATIC UNLOADING
Na2CO3 STORAGE BIN
ROTARY VALVE
CONVEYOR
ELECTRIC HEATERS
ELECTRIC HEATER
Na2CO3 MIX TANK W/AGITATOR
Na2CO3 HOLD TANK
Z200 DRUMS
Z200 FEEDER
LIME FEEDER
CuSO4 MIX TANK W/AGITATOR
CuSO4 HOLD TANK
R-23 FROTHER
FROTHER HOLD TANK
XANTHATE
Z3 XANTHATE HOLD TANK
Z3 XANTHATE MIX TANK W/AGITATOR
MAGNETIC FLOCCULATOR
MAGNETIC SEPARATOR
ALUMINUM SULPHATE MIX TANK WITH AGITATOR
ALUMINUM SULPHATE HOLDING TANK
ALTERNATIVE
SCHEELITE CLEANER FLOTATION
SCHEELITE ROUGHER FLOTATION
FROM FeS2 ROUGHER FLOTATION
SAMPLER
SCHEELITE CONDITIONING TANKS AND AGITATORS
TO FLOTATION CELLS
AIR BLOWER
ZnS ROUGHER FLOTATION
LIME FEEDER
FeS2 ROUGHER FLOTATION
FeS2 CONDITIONING TANK AND AGITATOR
ZnS CONDITIONING TANKS AND AGITATORS
CLEANER MAGNETIC SEPARATOR
ZnS CLEANER FLOTATION
TO TAILINGS
TO SAMPLER
FILTRATE
SCHEELITE CONCENTRATE THICKENER
THICKENER UNDERFLOW PUMP
VACUUM PUMP
SEPARATOR
FILTRATE RECEIVER
TO SCHEELITE CONCENTRATE THICKENER
BELT FILTER
WO3 CONCENTRATE PRODUCTION
128,100 UNITS WO3/YEAR
391 UNITS WO3/DAY
10 % WO3
SCHEELITE CONCENTRATE STORAGE PAD
DUST COLLECTOR
PNEUMATIC UNLOADING
FILTRATE RECEIVER
LIME HYDRATE STORAGE BIN
BIN DISCHARGER
ROTARY VALVES (2)
VOLUMETRIC FEEDER
DRUMS
TO TAILINGS POND
ZnS CONCENTRATE THICKENER
TO TAILINGS SUMP
THICKENER UNDERFLOW PUMP
BELT FILTER
** 6 HOUR OPERATION
ZnS CONCENTRATE PRODUCTION
1,966,000 LB. Zn/YR.
6,000 LB Zn/DAY
50 % Zn
ZnS CONCENTRATE STORAGE PAD
JUN 15 1977
LEGEND
GPM | %SOLIDS
DRY TPH
REAGENTS
ML/MIN. | LB./TON
H2O GPM
EXIST. EQUIP.
UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
ENGINEERING DEPARTMENT
P.O. BOX 97 NIAGARA FALLS N.Y. 14302
PROJECT TUNGSTEN CONCENTRATOR
DWG. TITLE FLOWSHEET
TEMPIUTE TUNGSTEN CONCENTRATOR
DRAWN DRS. LAR
STARTED 5-6-74
COMPLETED 5-20-74
SCALE NONE
PLANT TEMPIUTE
254-1039
REV. 7
GENERAL REVISIONS
ADDED CROSS HATCH FOR EXISTING EQUIP. APRON FEEDER 238 LEGEND
4790 0029

254-1051

NOTE (1): SEE DWG. NO. 254-1402 FOR CRUSHER & EA LUB. AND HYDRAULIC SYSTEM PIPING & DETAILS AND INSTRUMENTATION

AREA #1

AREA #2

DUMP CAR FROM MINE

TRUCK FROM MINE

CRUSHER AREA DUST COLLECTION

TO ATMOS.

(237) FAN FOR CRUSHER AREA DUST COLLECTOR

(236) AREA DUST COLLECTOR

RAW ORE BIN (270)

(279) HYDRAULIC CYLINDERS

QUADRANT GATE

HYDRAULIC PUMP UNIT FOR QUADRANT GATE (SEE NOTE 1)

(100B) APRON FEEDER LUB. SYSTEM (FARVAL GREASE) (SEE NOTE 1)

(103) ORE APRON FEEDER WITH DRIP BELT

(101) WOBBLER FEEDER

(102A) JAW CRUSHER LUB SYSTEM (OIL) (SEE NOTE 1)

(102) JAW CRUSHER

TRASH HOPPER

(103) CRUSHER BELT CONVEYOR

TO 105 MOTOR

(106A) CONE CRUSHER HYDRAULIC PUMP UNIT FOR CRUSHER CONE ADJUSTMENT (SEE NOTE 1)

(106) CONE CRUSHER

(106B) CONE CRUSHER LUB SYSTEM (OIL) (SEE NOTE 1)

(271) TRANSFER BELT CONVEYOR

(232) TRASH SCREEN

BELT MAGNET (231)

SCRAP METAL HOPPER

TRASH HOPPER

OVERSIZE RETURN BELT (105)

TO 105 MOTOR

(104) ROD DECK SCREEN

ROD DECK SCREEN LUB. SYSTEM (104A) (SEE NOTE 1)

(233) CRUSHED ORE SAMPLER (FUTURE)

(234) SAMPLE CONE CRUSHER (FUTURE)

CONE CRUSHER LUB SYSTEM (OIL) (SEE NOTE 1)

FINE ORE SAMPLER (FUTURE) (235)

ORE SAMPLE

TO ATMOS.

(275) FAN FOR SCREEN AREA DUST COLLECTOR

SCREEN AREA DUST COLLECTION

(274) AREA DUST COLLECTOR

CRUSHED ORE BELT (107)

TO 107 MOTOR

SCALE (247)

SAMPLE (516)

CRUSHED ORE STORAGE PILE

FOR CONTINUATION SEE DWG 254-1052

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
100	ORE APRON FEEDER	254-1076
100B	APRON FEEDER GREASE LUB.	254-1076
101	WOBBLER FEEDER (USED)	254-1076
102	JAW CRUSHER (USED)	254-1075
102A	JAW CRUSHER LUB. OIL	254-1074
103	CRUSHER BELT CONVEYOR	254-1074
104	ROD DECK SCREEN	254-1085
104A	SCREEN GREASE LUB.	254-1085
105	OVERSIZE RETURN BELT	254-1085
106	CONE CRUSHER (USED)	254-1075
106A	HYDRAULIC PUMP CONE LIFT	254-1075
106B	CONE CRUSHER OIL LUB.	254-1074
107	CRUSHED ORE BELT	254-1085
231	BELT MAGNET	254-1074
232	TRASH SCREEN	254-1074
233	CRUSHED ORE SAMPLER (FUTURE)	254-1085
234	CONE CRUSHER (FUTURE)	254-1085
234A	SAMPLE CONE CRUSHER OIL LUB. (FUTURE)	254-1085
235	FINE ORE SAMPLER (FUTURE)	254-1085
236	DUST COLLECTOR FOR CRUSHER AREA	254-1074
237	FAN FOR CRUSHER AREA DUST COLLECTOR	254-1074
247	BELT WEIGH SCALE CRUSHED ORE	254-1085
261	BELT SWIPE SAMPLER	254-1296
270	RAW ORE BIN	254-1077
271	TRANSFER BELT CONVEYOR	254-1074
274	DUST COLLECTOR FOR SCREEN AREA	254-1085
276	FAN FOR SCREEN AREA DUST COLLECTOR	254-1085
279	QUADRANT GATE & HYD. PUMP UNIT	254-1076

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION
500-1E	CURRENT TRANSFORMER
500-11	AMMETER
505-SSL	SPEED SWITCH
506-Pdi	PRESSURE INDICATOR
506-PdSH	D.P. SWITCH
506-PdAH	ANNUNCIATOR
507-HSS	ROPE PULL SWITCH
508-1E	CURRENT TRANSFORMER
508-11	AMMETER
509-SSL	SPEED SWITCH
510-HSS	ROPE PULL SWITCH
511-1E	CURRENT TRANSFORMER
511A-11	AMMETER
511B-11	AMMETER
512-HSS	ROPE PULL SWITCH
513-SSL	SPEED SWITCH
514-SSL	SPEED SWITCH
515-ST	MAG. SPEED TRANSMITTER
515-WE	BELT SCALE
515-WQIT	INTEGRATING TRANSMITTER
515A-WR	TICKET PRINTER
515B-WR	CHART RECORDER
516-HSS	ROPE PULL SWITCH

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	INSTALLATION NUMBER
CONT'D		
517-Pdi	PRESSURE INDICATOR	254-1501
517-PdSH	D.P. SWITCH	254-1501
517-PdAH	ANNUNCIATOR	254-1377
595-HS	MANUAL HYDRAULIC SWITCH	
595-FCV	SOLENOID VALVE	254-1396
261-TR	INTERVAL TIMER	254-1088
261-LS	LIMIT SWITCH	254-1088

LEGEND

- ⊖ INSTRUMENT MOUNTED IN CRUSHER CONTROL PANEL
- ○ INSTRUMENT MOUNTED LOCAL TO EQUIPMENT
- ◯ INSTRUMENT IS SHOWN ELSEWHERE IN MORE DETAIL AND IS SHOWN HERE FOR INFORMATION ONLY.

JUN 15 1977

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DRAWING 254-1052 TO 254-1056

REV.	DATE	BY	APP'S	
4	NOV 6/76	LAR	[illegible]	REMOVED 515WQ1
3	3/76	LAR	[illegible]	REMOVED 261LS & 261TR
2	APR 2/76	LAR	[illegible]	GENERAL REVISION
1	DEC 19/75	J.C.	GEN	GENERAL REVISION
5	DEC 4-76	DRS	GEN	ADDED LINE NUMBERS TO PIPING

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN M.E.C. NOV. 74 | STARTED | COMPLETED AUG-75 | SCALE | PROJECT TUNGSTEN CONCENTRATOR

DWG TITLE MECHANICAL & INSTRUMENT FLOW DIAGRAM CRUSHING FACILITY SHEET 1 OF 6

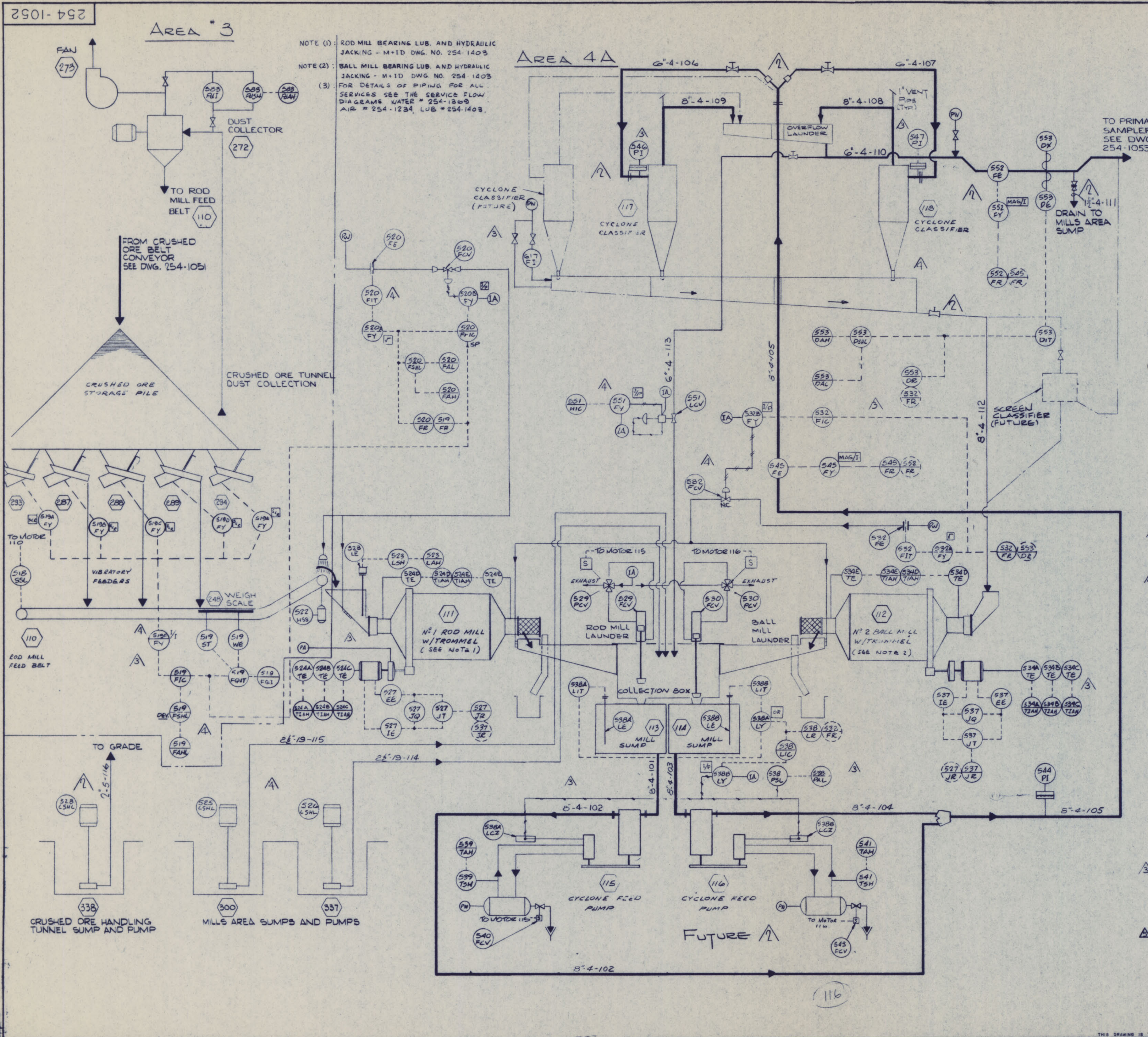
PLANT TEMPIUTE | BLDG OR AREA 1&2 | 930-936-1156

DWG. NO. 254-1051 | REV. NO. 5

FILING CLASSIFICATION FLOW SHEET

ACRES DWG No. 3902-C-1051

4790 0029



LEGEND

- INSTRUMENT MOUNTED IN MILL CONTROL PANEL.
- INSTRUMENT MOUNTED IN BACK OF MILL PANEL.
- INSTRUMENT MOUNTED LOCAL TO EQUIPMENT
- INSTRUMENT SHOWN ELSEWHERE AS WELL.

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
110	ROD MILL FEED BELT	254-1300
111	NO. 1 ROD MILL	254-1314
112	NO. 2 BALL MILL	254-1314
113	MILL SUMP	254-1313
114	MILL SUMP	254-1313
115	CYCLONE FEED PUMP	254-1313
116	CYCLONE FEED PUMP	254-1313
117	CYCLONE CLASSIFIERS	254-1316
118	CYCLONE CLASSIFIERS	254-1316
248	BELT WEIGH SCALE MILL FEED	254-1302
272	CRUSHED ORE DUST COLLECTOR	254-1302
273	EXHAUST FAN FOR CRUSHED ORE DUST COLLECTOR	254-1302
287	VIBRATORY FEEDER	254-1300
288	VIBRATORY FEEDER	254-1300
289	VIBRATORY FEEDER	254-1300
293	VIBRATORY FEEDER	254-1300
294	VIBRATORY FEEDER	254-1300
300	MILL AREA SUMP AND PUMP	254-1313
337	MILL AREA SUMP AND PUMP	254-1313
338	CRUSHED ORE HANDLING TUNNEL SUMP AND PUMP	254-1300

INSTRUMENT NUMBER	INSTRUMENT NUMBER	INSTALLATION DETAIL
CONT'D.		
538-A-LCZ	POSITION PILOT	254-1448
538-A-LE	CAPACITANCE PROBE	
538-LIC	P & I CONTROLLER	254-1379
538-LR	CHART RECORDER	254-1379
538-A-LIT	CAPACITANCE TRANSMITTER	
538-A-LY	MERCURY RELAY	254-1380
538- PAL	ANNUNCIATOR	254-1380
538- PSL	PRESSURE SWITCH	
538-B-LCZ	POSITION PILOT	254-1448
538-B-LE	CAPACITANCE PROBE	
538-B-LIT	CAPACITANCE TRANSMITTER	
538-B-LY	I/P TRANSDUCER	
539-TAH	ANNUNCIATOR	254-1380
539-TSH	SWITCH	
540-FCV	SOLENOID VALVE	
541-TAH	ANNUNCIATOR	254-1380
541-TSH	TEMPERATURE SWITCH	
543-FCV	SOLENOID VALVE	
544-PI	PRESSURE GAUGE	
545-FE	MAG. FLOW TUBE	254-1383
545-FR	CHART RECORDER	254-1379
545-FY	MAG./CURRENT CONVERTER	254-1383
546-PI	PRESSURE GAUGE	
547-PI	PRESSURE GAUGE	
551-HIC	MANUAL LOADING STATION	254-1379
551-LCV	PINCH CONTROL VALVE	254-1449
552-FE	MAG. FLOW TUBE	254-1383
552-FR	CHART RECORDER	254-1379
552-FY	MAG./CURRENT CONVERTER	254-1383
553-DAH	ANNUNCIATOR	254-1380
553-DAL	ANNUNCIATOR	254-1380
553-DE	NUCLEONIC RECEIVER	254-1502
553-DIT	MV/I TRANSMITTER	254-1502
553-DR	CHART RECORDER	254-1379
553-DSHL	CURRENT SWITCH	254-1379
553-DX	NUCLEONIC SOURCE	254-1502
583-PdI	PRESSURE INDICATOR	254-1501
583-PdSH	DP SWITCH	254-1380
583-PdAH	ANNUNCIATOR	254-1379
617-FI	ROTAMETER	254-1383

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
518-SSL	SPEED SWITCH	254-1488
519A/E-FY	SCR FEEDER CONTROLS	
519F-FY	CURRENT REPEATER	
519-FAHL	ANNUNCIATOR	254-1380
519-FIC	P & I CONTROLLER	254-1379
519-FQIT	INTEGRATING TRANSMITTER	254-1379
519-FQI	INDICATING INTEGRATOR	254-1379
519-FR	CHART RECORDER	254-1379
519-FSHL	DEVIATION SWITCH	254-1379
519-ST	MAG. SPEED TRANSMITTER	254-1488
519-WE	BELT SCALE	254-1488
520-FAH	ANNUNCIATOR	254-1380
520-FAL	ANNUNCIATOR	254-1380
520-FCV	GLOBE VALVE	254-1449
520-FE	ORIFICE PLATE	254-1383
520-FR	CHART RECORDER	254-1379
520-FrIC	P & I RATIO CONTROLLER	254-1379
520-FSHL	CURRENT SWITCH	254-1379
520-FIT	DP TRANSMITTER	254-1383
520A-FY	SQ ROOT EXTRACTOR	254-1379
520B-FY	CURRENT TO PNEUMATIC CONVERTER	
522-HSS	ROPE PULL SWITCH	254-1487
523-LAH	ANNUNCIATOR	254-1380
523-LE	CAPACITANCE PROBE	
523-LSH	CAPACITANCE SWITCH	
524-A/C TE	STATOR WINDING TEMP. RTD.	254-1487
524-D/E-TE	BEARING TEMP RTD	
524-A/E-TIAH	INDICATING ANNUNCIATOR	254-1379
525 LSHL	LEVEL SWITCH	
526-LSHL	LEVEL SWITCH	
527-EE	POTENTIAL TRANSFORMER	
527-IE	CURRENT TRANSFORMER	
527-JQ	WATT-HOUR METER	
527-JR	CHART RECORDER	254-1379
527-JT	POWER TRANSDUCER	
528 LSHL	LEVEL SWITCH	
529-FCV	PISTON OPERATOR	254-1314
529-PCV	SOLENOID VALVE	254-1487
529-FCV	PISTON OPERATOR	254-1314
530 FCV	PISTON OPERATOR	254-1314
530 PCV	SOLENOID VALVE	254-1487
532-FE	ORIFICE PLATE	254-1383
532 FCV	GLOBE VALVE	254-1448
532-FR	CHART RECORDER	254-1379
532-FIT	D.P. TRANSMITTER	254-1383
532A-FY	SQ ROOT EXTRACTOR	254-1379
532B-FY	CURRENT/PNEUMATIC CONVERTER	
532-FIC	P&I INDICATING CONTROLLER	
537 IE	CURRENT TRANSFORMER	
537-EE	POTENTIAL TRANSFORMER	
537-JT	POWER TRANSDUCER	
537-JQ	WATT HOUR METER	
537-JR	CHART RECORDER	254-1379
534A/E TIAH	INDICATING ANNUNCIATOR	
534A/E-TE	STATOR WINDING TEMP RTD	
534D/E-TE	BEARING TEMP RTD	

JUN 15 1977

LINE NUMBERS

100 & 200 SERIES - SLURRY SERVICE
300 SERIES - REAGENT SERVICE
400 SERIES - PLANT AIR & INSTR. AIR
500 SERIES - AIR FLOTATION & VACUUM
600 SERIES - WATER - FIRE & SERVICE

(116)

REV.	DATE	BY	APPR	
3	7-19-76	LAR		GEN'L REV.
2	APR. 1976			PINCH VALVE ADDED, LINE SIZES REVISED, 546 & 547 PI RELOCATED, INDICATED EQUIP. 116 AS FUTURE, STAND PIPE @ O/F LAUNDER ALTERED.
1	DEC 1975	J.C.	GEW	GENERAL REVISION
5	DEC. 14-76	DRS	GEW	ADDED LINE NUMBERS TO PIPING
4	NOV 8/76	LAR		GENERAL REVISION

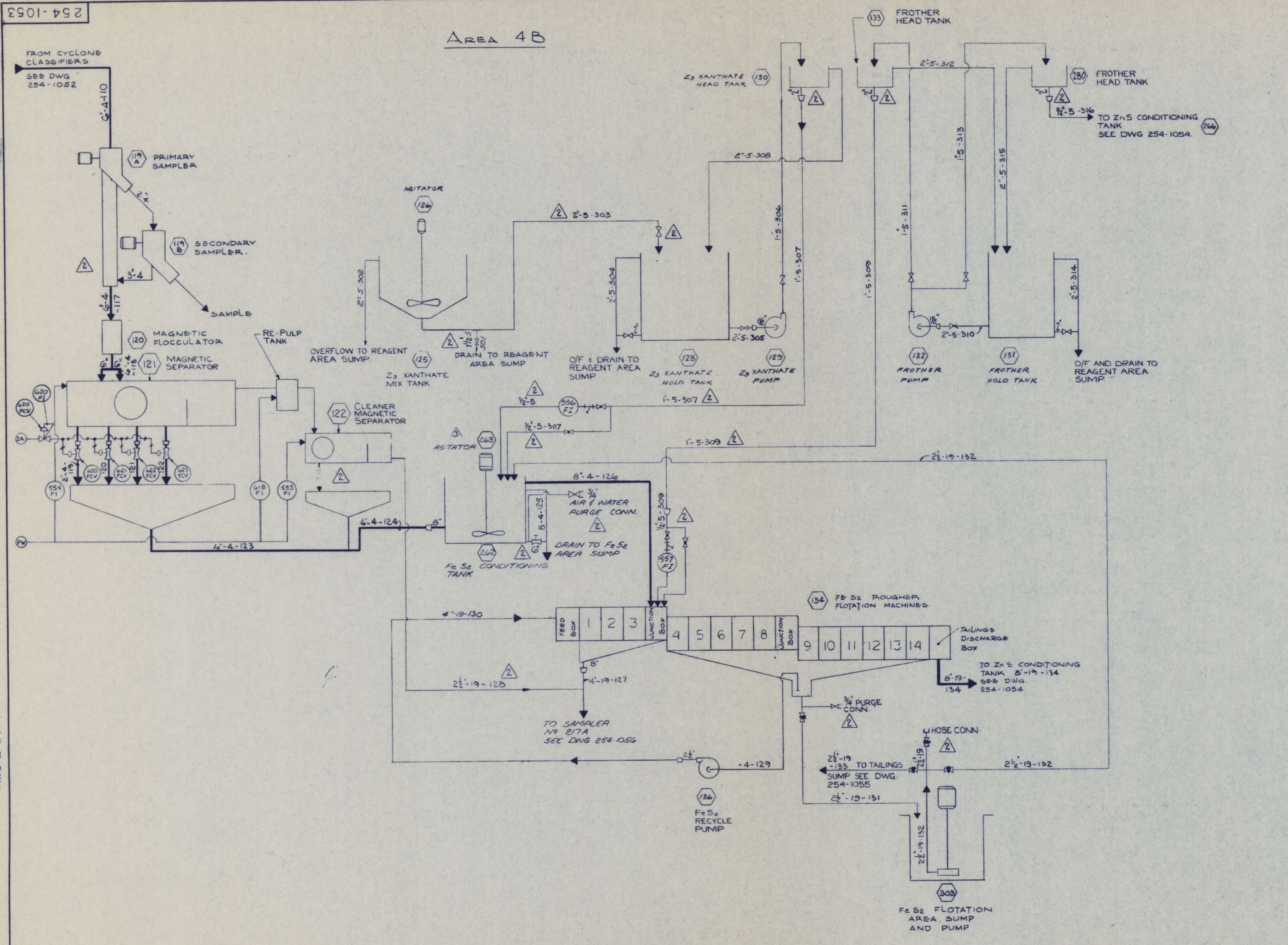
ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

STARTED: DEC. 74 | COMPLETED: AUG-75
PROJECT: TUNGSTEN CONCENTRATOR
DWG. TITLE: MECHANICAL & INSTRUMENT FLOW DIAGRAM MILLING FACILITY SHEET 2 OF 6
PLANT: TEMPIUTE | BLDG. OR AREA: 3 & 4A | 930- 936-1156
DWG. NO. 254-1052 | REV. NO. 5
FILING CLASSIFICATION: FLOW SHEET
ACRES DWG No 3902-C-1052

4790 0029

254-1053



AREA 4B
FROM CYCLONE CLASSIFIERS
SEE DWG 254-1052
6"-4-110
PRIMARY SAMPLER
SECONDARY SAMPLER.
SAMPLE
MAGNETIC FLOCCULATOR
MAGNETIC SEPARATOR
RE-PULP TANK
CLEANER MAGNETIC SEPARATOR
AGITATOR
2"-5-303
2"-5-302
OVERFLOW TO REAGENT AREA SUMP
Z3 XANTHATE MIX TANK
DRAIN TO REAGENT AREA SUMP
2"-5-304
O/F & DRAIN TO REAGENT AREA SUMP
Z3 XANTHATE HOLD TANK
Z3 XANTHATE PUMP
2"-5-305
2"-5-308
1"-5-306
1"-5-307
Z3 XANTHATE HEAD TANK
FROTHER HEAD TANK
2"-5-312
1"-5-313
2"-5-315
1"-5-311
1"-5-309
2"-5-310
2"-5-314
FROTHER HEAD TANK
1/2"-5-316
TO ZnS CONDITIONING TANK SEE DWG 254-1054.
FROTHER PUMP
FROTHER HOLD TANK
O/F AND DRAIN TO REAGENT AREA SUMP
1/2"-5
1/2"-5-307
AGITATOR
8"-4-126
3/4" AIR & WATER PURGE CONN.
8"-4-125
DRAIN TO FeS2 AREA SUMP
FeS2 CONDITIONING TANK
4"-4-124
4"-4-123
2 1/2"-19-132
FeS2 ROUGHER FLOTATION MACHINES.
4"-19-130
FEED BOX
JUNCTION BOX
TAILINGS DISCHARGE BOX
TO ZnS CONDITIONING TANK 8"-19-134 SEE DWG. 254-1054
2 1/2"-19-128
4"-19-127
TO SAMPLER N° 217A SEE DWG 254-1056
3/4" PURGE CONN.
HOSE CONN.
2 1/2"-19-133 TO TAILINGS SUMP SEE DWG. 254-1055
2 1/2"-19-131
2 1/2"-19-132
-4-129
FeS2 RECYCLE PUMP
FeS2 FLOTATION AREA SUMP AND PUMP

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
119A	PRIMARY SAMPLER (CYCLONE OVERFLOW)	254-1316
119B	SECONDARY SAMPLER (CYCLONE OVERFLOW)	254-1316
120	MAGNETIC FLOCCULATOR	254-1316
121	MAGNETIC SEPARATOR	254-1316
122	CLEANER MAGNETIC SEPARATOR	254-1316
125	Z3 XANTHATE MIX TANK	254-1283
126	Z3 XANTHATE MIX TANK AGITATOR	254-1283
128	Z3 XANTHATE HOLD TANK	254-1282
129	Z3 XANTHATE TRANSFER PUMP	254-1282
130	Z3 XANTHATE HEAD TANK	254-1284
131	FROTHER HOLD TANK	254-1282
132	FROTHER TRANSFER PUMP	254-1282
133	FROTHER HEAD TANK	254-1284
134	Fe S2 ROUGHER FLOTATION MACHINE	254-1283
136	Fe S2 RECYCLE PUMP	254-1283
262	Fe S2 CONDITIONING TANK	254-1283
263	AGITATOR FOR Fe S2 CONDITIONING TANK	254-1283
280	FROTHER HEAD TANK	254-1284
303	Fe S2 FLOTATION AREA SUMP AND PUMP	254-1282
554-FI	ROTAMETER	
555-FI	ROTAMETER	
556-FI	ROTAMETER	
557-FI	ROTAMETER	

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
3		
554-FI	ROTAMETER	254-1383
555-FI	ROTAMETER	254-1383
556-FI	ROTAMETER	254-1383
557-FI	ROTAMETER	254-1383
618-FI	ROTAMETER	254-1383
620-FCV	PINCH CONTROL VALVE	254-1500
620-PCV	PRESSURE REGULATOR	254-1500
620-PI	PRESSURE GAUGE	254-1500
621-FCV	PINCH CONTROL VALVE	254-1500
622-FCV	PINCH CONTROL VALVE	254-1500
623-FCV	PINCH CONTROL VALVE	254-1500

LEGEND

INSTRUMENT LOCATED AT FLOATION ALARM PANEL.

INSTRUMENT LOCATED INSIDE FLOTATION ALARM PANEL.

JUN 15 1977

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DRAWING 254-1051, 1052, & 254-1054 TO 1056

REV.	DATE	BY	APP'R	
3	8-4-76	LAR		REMOVED 263EAL, 263ESL
2	APR 1976			HOSE & PURGE CONN. ORFICE & LINE SIZES ADDED GATE VALVE WAS GLOBE PIPING ALTERED AT SAMPLERS
1	DEC/75	ES	GEM	GENERAL REVISION
4	DEC/14-76	DRS	GEM	ADDED LINE NUMBERS TO PIPING

ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

STARTED DEC.74 COMPLETED AUG-75
PROJECT TUNGSTEN CONCENTRATOR
DWG. TITLE MECHANICAL & INSTRUMENT FLOW DIAGRAM FeS2 FLOTATION & REAGENTS
SHEET 3 OF 6
FILING CLASSIFICATION FLOWSHEET
PLANT TEMPIUTE
BLDG. OR AREA 930-936-1156
DWG. NO. 254-1053 REV. 4
ACRES DWG N° 3902-C-1053

4790 0029

254-1054

AREA 4B

NOTE:-

ALL COMPONENTS SHOWN ON THIS SHEET WILL BE INSTALLED AT A LATER DATE, AND DO NOT FORM PART OF THIS CONTRACT.

FeS_2 FLOTATION DISCHARGE SHALL BE CONNECTED DIRECTLY TO THE SCHEELITE CONDITIONING TANK USING 8"ø CLASS 19 PIPE.

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
137	AGITATOR FOR Cu SO4 MIX TANK	254-1283
138	Cu SO4 MIX TANK	254-1283
140	Cu SO4 HOLD TANK	254-1282
141	Cu SO4 TRANSFER PUMP	254-1282
142	Cu SO4 HEAD TANK	254-1284
143	Zn S ROUGHER FLOTATION MACHINES	254-1283
144	Zn S CLEANER FLOTATION MACHINES	254-1282
146	Zn S TAILS RECYCLE PUMP	254-1282
158	ZnS CONCENTRATE THICKENER	254-1310
159	ZnS THICKENER UNDER FLOW PUMP	254-1310
160	ZnS CONCENTRATE BELT FILTER	254-1283
220	ZnS CONCENTRATE SAMPLER	254-1284
221	ZnS CONCENTRATE PUMP	254-1282
222	ZnS CONCENTRATE PUMP	254-1282
223	ZnS THICKENER STAND PIPE	254-1310
224	ZnS THICKENER OVERFLOW PUMP	254-1310
240	LIME HYDRATE FEEDER	254-1283
246	ZnS FILTER HEAD TANK	254-1283
264	ZnS CONDITIONING TANK	254-1283
265	ZnS CONDITIONING TANK AGITATOR	254-1283
266	ZnS CONDITIONING TANK	254-1283
267	ZnS CONDITIONING TANK AGITATOR	254-1283
268	LIME FEEDER	254-1282
276	ZnS RECYCLE PUMP	254-1282
277	ZnS RECYCLE PUMP	254-1282
281	Z-200 FEEDER	254-1283
304	ZnS FLOTATION AREA SUMP AND PUMP	254-1282
340	ZnS CONCENTRATE THICKENER AREA SUMP AND PUMP	254-1310

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
558-FI	ROTAMETER	254-1383
559-FI	ROTAMETER	254-1383
561-WAH	ANNUNCIATOR	254-1472
561-WSH	TORQUE SWITCH	254-1444
562-FIC	CONSTANT DIFF. RELAY	254-1502
562-LCV	GLOBE VALVE	254-1413
562-LE	BUBBLER TUBE	254-1502
562-LIC	PRESSURE CONTROLLER	254-1502

JUN 15 1977

LEGEND

- (—) INSTRUMENT LOCATED AT FLOTATION ALARM PANEL.
- (---) INSTRUMENT LOCATED INSIDE FLOTATION ALARM PANEL.

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DRAWING 254-1051 TO 254-1053 & 254-1055 & 1056

REV.	DATE	BY	APPR	
3	8&6	LAR	[illegible]	GEN'L REV.
2	APR. 1976			LINE SIZES ALTERED HOSE CONN. (EQUIP Nº 280 ADDED GATE VALVE WAS GLOBE
1	3&8 75	E.B.	GEW	GENERAL REVISION
4	DEC. 14-76	DRS	GEW	ADDED LINE NUMBERS TO PIPING

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN — STARTED NOV 74 — COMPLETED AUG 75
PROJECT TUNGSTEN CONCENTRATOR
DWG TITLE MECHANICAL & INSTRUMENT FLOW DIAGRAM ZnS FLOTATION & REAGENTS SHEET 4 OF 6
FILING CLASSIFICATION FLOWSHEET
PLANT TEMPIUTE — BLDG. OR AREA 930-936-1156
DWG. NO. 254-1054 — REV. NO. 4
ACRES DWG Nº 3902-C-1054

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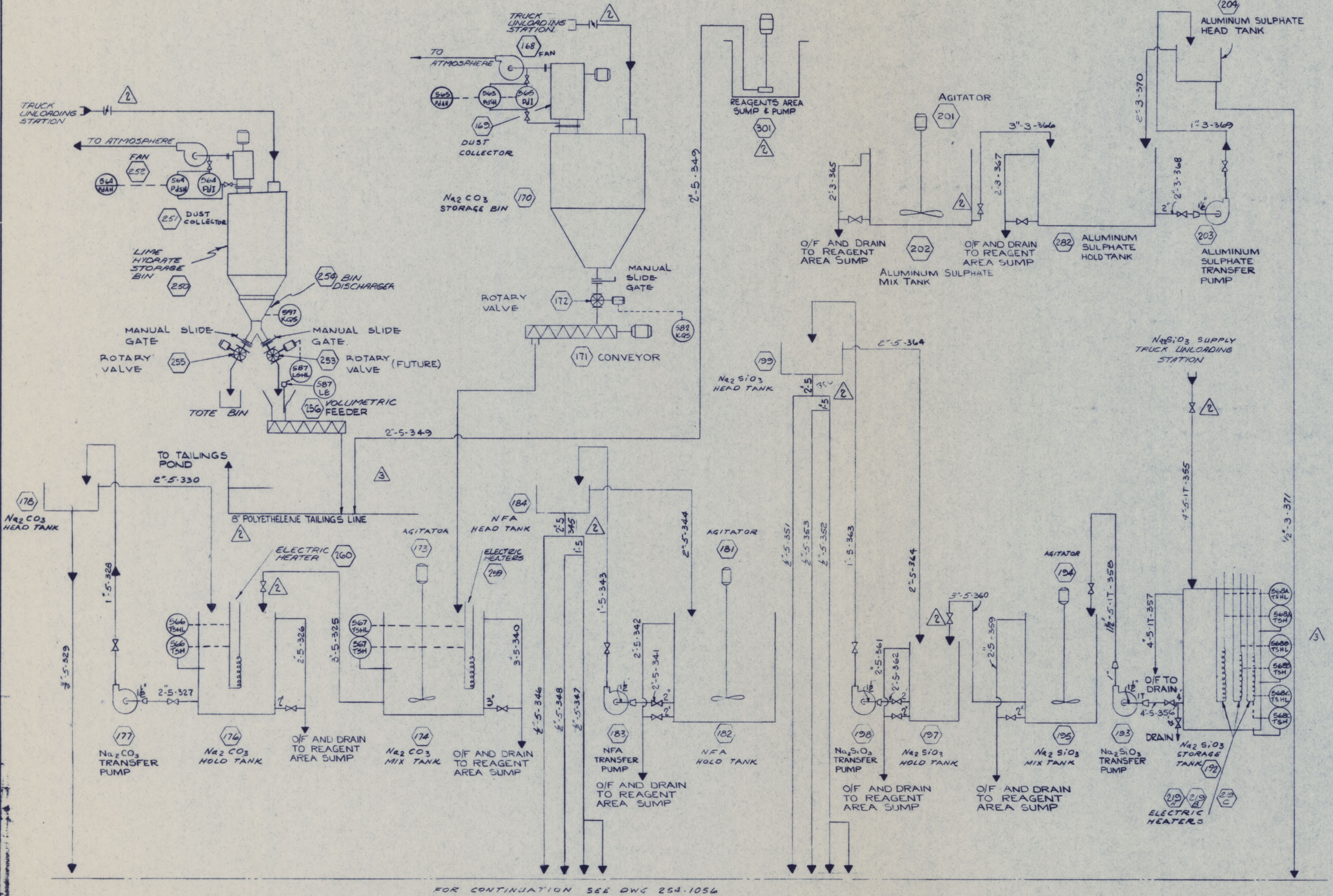
4790 0029

254-1055

AREA 4B



TRUCK UNLOADING STATION
TO ATMOSPHERE
FAN 252
564 PdAH
564 PdSH
564 PdI
251 DUST COLLECTOR
LIME HYDRATE STORAGE BIN 250
254 BIN DISCHARGER
597 KQS
MANUAL SLIDE GATE
MANUAL SLIDE GATE
ROTARY VALVE 255
253 ROTARY VALVE (FUTURE)
587 LSHL
587 LE
256 VOLUMETRIC FEEDER
TOTE BIN
TRUCK UNLOADING STATION
168 FAN
TO ATMOSPHERE
565 PdAH
565 PdSH
565 PdI
169 DUST COLLECTOR
Na_2CO_3 STORAGE BIN 170
MANUAL SLIDE GATE
ROTARY VALVE 172
582 KQS
171 CONVEYOR
REAGENTS AREA SUMP & PUMP 301
AGITATOR 201
3"-3-366
2"-3-365
2"-3-367
O/F AND DRAIN TO REAGENT AREA SUMP
202 ALUMINUM SULPHATE MIX TANK
O/F AND DRAIN TO REAGENT AREA SUMP
282 ALUMINUM SULPHATE HOLD TANK
204 ALUMINUM SULPHATE HEAD TANK
2"-3-370
1"-3-369
2"-3-368
203 ALUMINUM SULPHATE TRANSFER PUMP
2"-5-349
TO TAILINGS POND
2"-5-330
178 Na_2CO_3 HEAD TANK
8" POLYETHELENE TAILINGS LINE
ELECTRIC HEATER 260
566 TSHL
566 TSH
1"-5-328
2"-5-329
2"-5-327
2"-5-326
3"-5-325
AGITATOR 173
ELECTRIC HEATERS 259
567 TSHL
567 TSH
3"-5-340
177 Na_2CO_3 TRANSFER PUMP
176 Na_2CO_3 HOLD TANK
O/F AND DRAIN TO REAGENT AREA SUMP
174 Na_2CO_3 MIX TANK
O/F AND DRAIN TO REAGENT AREA SUMP
184 NFA HEAD TANK
2"-5-346
2"-5-348
2"-5-347
1"-5-343
2"-5-342
2"-5-341
2"-5-344
AGITATOR 181
183 NFA TRANSFER PUMP
182 NFA HOLD TANK
O/F AND DRAIN TO REAGENT AREA SUMP
199 Na_2SiO_3 HEAD TANK
2"-5-364
2"-5-351
2"-5-363
2"-5-352
1"-5-343
2"-5-361
2"-5-362
2"-5-364
3"-5-360
2"-5-359
AGITATOR 194
1½"-5-IT-358
1½"-5-IT-357
4"-5-IT-355
½"-3-371
Na_2SiO_3 SUPPLY TRUCK UNLOADING STATION
O/F TO DRAIN
4"-5-356
DRAIN
198 Na_2SiO_3 TRANSFER PUMP
197 Na_2SiO_3 HOLD TANK
O/F AND DRAIN TO REAGENT AREA SUMP
195 Na_2SiO_3 MIX TANK
O/F AND DRAIN TO REAGENT AREA SUMP
193 Na_2SiO_3 TRANSFER PUMP
Na_2SiO_3 STORAGE TANK 192
219A 219B 219C ELECTRIC HEATERS
568A TSHL
568A TSH
568B TSHL
568B TSH
568C TSHL
568C TSH
FOR CONTINUATION SEE DWG 254-1056

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
168	Na_2CO_3 FAN	254-1303
169	Na_2CO_3 DUST COLLECTOR	254-1303
170	Na_2CO_3 STORAGE BIN	254-1303
171	Na_2CO_3 SCREW CONVEYOR	254-1303
172	Na_2CO_3 ROTARY VALVE	254-1303
173	Na_2CO_3 MIX TANK AGITATOR	254-1283
174	Na_2CO_3 MIX TANKS	254-1283
176	Na_2CO_3 HOLD TANK	254-1282
177	Na_2CO_3 TRANSFER PUMP	254-1282
178	Na_2CO_3 HEAD TANK	254-1284
181	NFA HOLD TANK AGITATOR	254-1282
182	NFA HOLD TANK	254-1282
183	NFA TRANSFER PUMP	254-1283
184	NFA HEAD TANK	254-1284
192	Na_2SiO_3 STORAGE TANK	254-1303
193	Na_2SiO_3 TRANSFER PUMP	254-1303
194	Na_2SiO_3 MIX TANK AGITATOR	254-1283
195	Na_2SiO_3 MIX TANK	254-1283
197	Na_2SiO_3 HOLD TANK	254-1282
198	Na_2SiO_3 TRANSFER PUMP	254-1282
199	Na_2SiO_3 HEAD TANK	254-1284
201	ALUMINUM SULPHATE AGITATOR	254-1283
202	ALUMINUM SULPHATE MIX TANK	254-1283
203	ALUMINUM SULPHATE PUMP	254-1282
204	ALUMINUM SULPHATE HEAD TANK	254-1284
213	TAILINGS SUMP	254-1303
219A	Na_2SiO_3 TANK HEATER	254-1303
219B	Na_2SiO_3 TANK HEATER	254-1303
219C	Na_2SiO_3 TANK HEATER	254-1303
250	LIME HYDRATE STORAGE BIN	254-1303
251	DUST COLLECTOR FOR LINE HYDRATE STORAGE BIN	254-1303
252	EXHAUST FAN FOR LIME DUST COLLECTOR	254-1303
253	LIME ROTARY VALVE (FUTURE)	254-1303
254	LIME BIN DISCHARGER	254-1303
255	LIME ROTARY VALVE	254-1303
256	LIME VULUMETRIC FEEDER	254-1303
259	TANK HEATER Na_2CO_3 MIX TANK	254-1283
260	TANK HEATER Na_2CO_3 HOLD TANK	254-1282
282	ALUMINUM SULPHATE HOLD TANK	254-1282

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
564-PdI	D.P. INDICATOR	254-1501
564-PdSH	D.P. SWITCH	254-1501
564-PdAH	ANNUNCIATOR	254-1380
565-PdI	D.P. INDICATOR	254-1501
565-PdSH	D.P. SWITCH	254-1501
565-PdAH	ANNUNCIATOR	254-1380
566-TSHL	THERMOSTAT	254-1442
566-TSH	TEMPERATURE SWITCH	254-1442
567-TSHL	THERMOSTAT	254-1442
567-TSH	TEMPERATURE SWITCH	254-1442
568-A-TSHL	THERMOSTAT	254-1443
568-A-TSH	TEMPERATURE SWITCH	254-1443
568-B-TSHL	THERMOSTAT	254-1443
568-B-TSH	TEMPERATURE SWITCH	254-1443
568-C-TSHL	THERMOSTAT	254-1443
568-C-TSH	TEMPERATURE SWITCH	254-1443
582-KQS	THIMED SWITCH	254-1442
587-LE	CAPACITANCE PROBE	254-1502
587-LSHL	CAPACITANCE SWITCH	254-1502
597-KQS	TIMED SWITCH	254-1443

LEGEND

- INSTRUMENT MOUNTED IN MILL CONTROL PANEL.
- INSTRUMENT MOUNTED LOCAL TO EQUIPMENT.

JUN 15 1977

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DRAWING 254-1051 TO 1054 & 254-1056

REV.	DATE	BY	APP'R	
3	8-16-76	LAR		GEN'L REV.
2	APR 1976			VALVES, TAILINGS LINE, SUMP PUMP 301, AND LINE SIZES ADDED GATE VALVES WERE GLOBES.
1	DEC. 75	E.S.	GAW	GENERAL REVISION
4	DEC 14/76	DRS	GEW	ADDED LINE NUMBERS TO PIPING

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN: TED | STARTED: DEC 74 | COMPLETED: AUG-75 | SCALE:
PROJECT: TUNGSTEN CONCENTRATOR
DWG. TITLE: MECHANICAL & INSTRUMENT FLOW DIAGRAM SCHEELITE (WO_3) REAGENTS SHEET 5 OF 6
PLANT: TEMPIUTE | BLDG. OR AREA: 930-936-1156
DWG. NO. 254-1055 | REV. NO. 4
FILING CLASSIFICATION: FLOWSHEET
ACRES DWG. Nº 3902-C-1055

4790 0029

254-1056

AREA 4B

FROM NFA HEAD TANK SEE DWG 254-1055

FROM Na_2SiO_3 HEAD TANK SEE DWG 254-1055

FROM ALUMINIUM SULPHATE HEAD TANK SEE DWG. 254-1055

FROM Na_2CO_3 HEAD TANK DWG. No. 254-1055

LIME FEEDER (218)

(164) AGITATOR

(166) AGITATOR

(179) AGITATOR

(230) AGITATOR

SCHEELITE (WO_3) CONDITIONING TANKS

JUNCTION BOX

SCHEELITE ROUGHER FLOTATION MACHINE (187)

TAILINGS DISCHARGE BOX

SCHEELITE CLEANER FLOTATION MACHINE (188)

FROM FeS_2 ROUGHER FLOTATION MACHINE No 134 SEE DWG. 254-1053

PRIMARY SAMPLER (217A)

SECONDARY SAMPLER (217B)

SAMPLE

TO TAILINGS SUMP SEE DWG 254-1055

PUMP (212)

PUMP (211)

RECYCLE PUMP (278)

SAMPLER (200)

HOSE CONN.

TO SAMPLER (217)

SCHEELITE AREA SUMP AND FLOTATION PUMP (302)

(208 B) FROM SCHEELITE FILTRATE PUMP SEE DWG 254-1330

PW

PUMP (190)

PUMP (161)

AIR & WATER PURGE CONN.

DRAIN

STAND PIPE (226)

TO TAILINGS

PUMP (227)

SCHEELITE FILTER HEAD TANK (245)

DRIP PAN FLUSHING

DRIP PAN

BELT FILTER (207)

THICKENER UNDERFLOW PUMP (206)

SCHEELITE CONCENTRATE THICKENER (205)

SCHEELITE CONCENTRATE THICKENER AREA SUMP & PUMP (339)

TO SCHEELITE FILTRATE RECEIVER SEE DWG 254-1330

SCHEELITE CONCENTRATE STORAGE PAD

LEGEND

- INSTRUMENT LOCATED AT FLOTATION ALARM PANEL.
- INSTRUMENT LOCATED INSIDE FLOTATION ALARM PANEL.

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
161	SCHEELITE CLEANER TAILS TRANSFER PUMP	254-1282
164	AGITATOR FOR WO_3 CONDITIONING TANK	254-1283
165	SCHEELITE WO_3 CONDITIONING TANK	254-1283
166	AGITATOR FOR WO_3 CONDITIONING TANK	254-1283
167	SCHEELITE WO_3 CONDITIONING TANK	254-1283
179	AGITATOR FOR WO_3 CONDITIONING TANK	254-1283
180	SCHEELITE WO_3 CONDITIONING TANK	254-1283
187	WO_3 ROUGHER FLOTATION MACHINE	254-1283
188	WO_3 CLEANER FLOTATION MACHINE	254-1282
190	SCHEELITE CLEANER TAILS TRANSFER PUMP	254-1282
200	WO_3 CONCENTRATE SAMPLER	254-1284
205	WO_3 CONCENTRATE THICKENER	254-1310
206	WO_3 THICKENER UNDER-FLOW PUMP	254-1310
207	WO_3 CONCENTRATE BELT FILTER	254-1283
211	WO_3 CONCENTRATE TRANSFER PUMP	254-1282
212	WO_3 CONCENTRATE TRANSFER PUMP	254-1282
217A	TAILINGS SAMPLER (PRIMARY)	254-1282
217B	TAILINGS SAMPLER (SECONDARY)	254-1282
226	WO_3 THICKENER OVER-FLOW STAND PIPE	254-1310
227	WO_3 THICKENER OVER-FLOW PUMP	254-1310
245	SCHEELITE FILTER HEAD TANK	254-1283
269	LIME FEEDER	254-1283
278	WO_3 RECYCLE PUMP	254-1283
291	SCHEELITE WO_3 CONDITIONING TANK	254-1282
292	AGITATOR FOR WO_3 CONDITIONING TANK	254-1282
302	SCHEELITE FLOTATION AREA SUMP AND PUMP	254-1282
339	SCHEELITE CONCENTRATE THICKENER AREA SUMP AND PUMP	254-1310

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
570-FI	ROTAMETER	254-1383
571-FI	ROTAMETER	254-1383
572-FI	ROTAMETER	254-1383
573-FI	ROTAMETER	254-1383
574-FI	ROTAMETER	254-1383
575-FI	ROTAMETER	254-1383
576-FI	ROTAMETER	254-1383
577-FI	ROTAMETER	254-1383
578-FI	ROTAMETER	254-1383
580-WAH	ANNUNCIATOR	254-1472
580-WSH	TORQUE SWITCH	254-1444
581-FIC	CONSTANT DIFF. RELAY	254-1502
581-LCV	GLOBE VALVE	254-1419
581-LE	BUBBLE TUBE	254-1502
581-LIC	PRESSURE CONTROLLER	254-1502

JUN 15 1977

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH DRAWING 254-1051 TO 254-1055

REV.	DATE	BY	APP'R	
3	9/6/76	LAE		GEN'L REV'S
2	APR. 1976			FLUSH CONN AT 188 AND LINE SIZES ADDED. PIPING AT 160 & 190 AND LINE SIZES ALTERED.
1	DEC 75	E.S	GEW	GENERAL REVISION
4	DEC 14-76	DRS	GEW	ADDED LINE NUMBERS TO PIPING

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION MINING AND METALS DIVISION TECHNOLOGY DEPARTMENT P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN LAE STARTED DEC 74 COMPLETED AUG 75 SCALE

PROJECT TUNGSTEN CONCENTRATOR

DWG. TITLE MECHANICAL & INSTRUMENT FLOW DIAGRAM SCHEELITE (WO_3) FLOTATION SHEET 6 OF 6

PLANT TEMPIUTE BLDG. OR AREA 330-350-15

DWG. NO. 254-1056 REV. NO. 4

FILING CLASSIFICATION FLOWSHEET

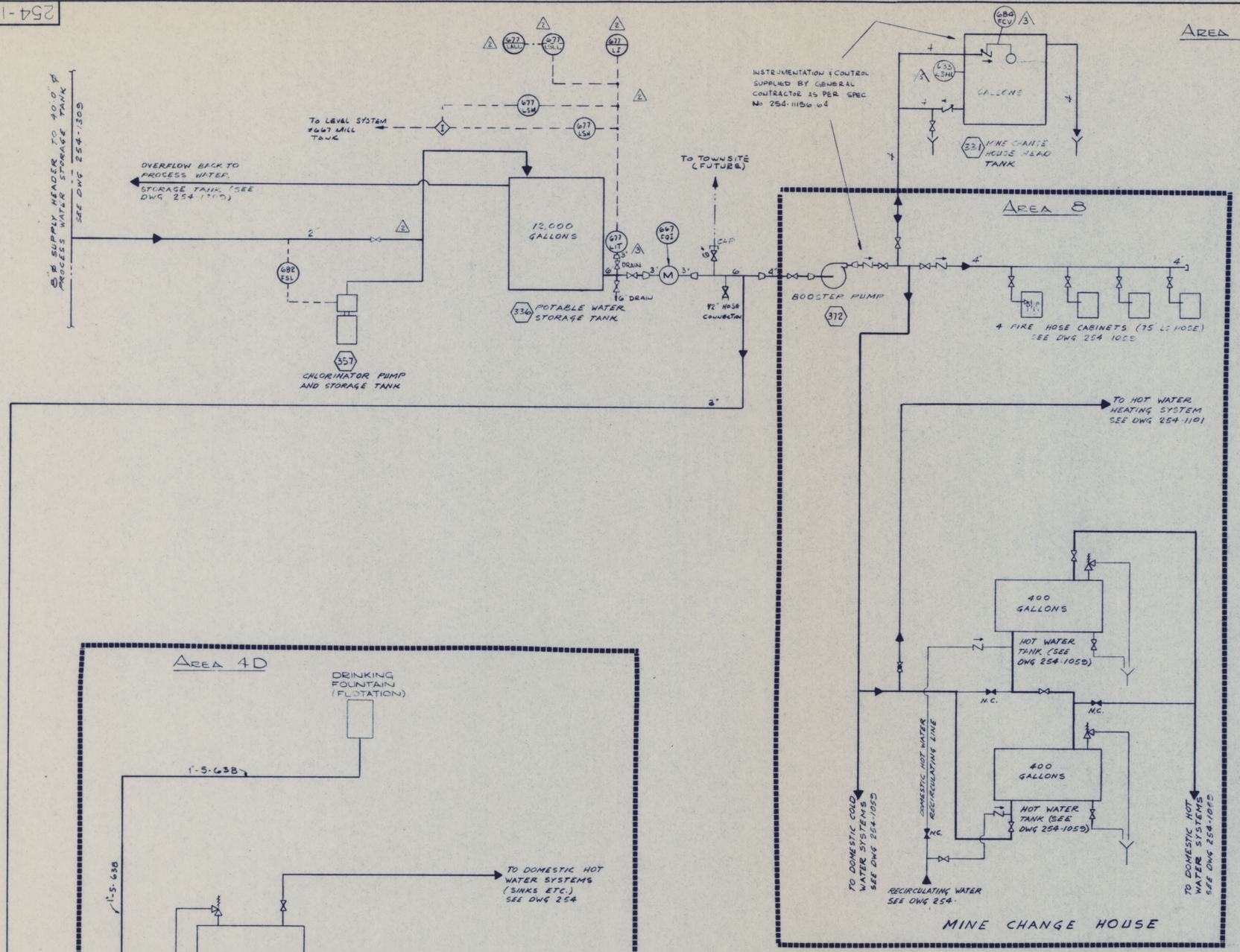
ACRES DWG. No 3902-E-1056

254-1233

AREA 11

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
331	MINE CHANGE HOUSE HEAD TANK	254-1069
336	POTABLE WATER STORAGE TANK	254-1069
357	CHLORINATOR PUMP AND STORAGE TANK	254-1069
372	MINE CHANGE HOUSE BOOSTER PUMP	254-1475

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	INSTALLATION DETAIL
633-LSHL	BW PROBE LEVEL SWITCH	
667-FQI	WATER METER	254-1069
677-LALL	ANNUNCIATOR	254-1380
677-LI	LEVEL GAUGE	254-1379
677-LIT	D.P. TRANSMITTER	254-1445
677-LSH	CURRENT SWITCH	254-1471
677-LSLL	CURRENT SWITCH	254-1380
677-LSL	CURRENT SWITCH	254-1471
682-FSL	VANE FLOW SWITCH	254-1383
684-FCV	4" FLOAT VALVE	



PRESSURE CONDITIONS
UPSTREAM SIDE OF POTABLE WATER STORAGE TANK Nº 336 - SEE SPECIFICATIONS.
DOWNSTREAM SIDE OF POTABLE WATER STORAGE TANK Nº 336 - DESIGN = 60 P.S.I.G.
TEST = 100 P.S.I.G

JUN 15 1977

LEGEND:

- GATE VALVE
- GLOBE VALVE
- CHECK VALVE
- VALVE - NORMALLY CLOSED (N.C.)
- PRESSURE RELIEF VALVE
- (331) EQUIPMENT NUMBER
- INSTRUMENT LOCATED IN MILL CONTROL PANEL
- INSTRUMENT LOCATED INSIDE MILL CONTROL PANEL
- INSTRUMENT LOCATED AT EQUIPMENT

SEE REFERENCE DWG Nº 254-11666.

REV.	DATE	BY	APP'R	
4	DEC 14-76	DRS	GEW	ADDED LINE NUMBERS TO PIPING
3	4/28/76	LAR	RM	GEN'L REV'S.
2	APR 76			REMOVED 677/LCV & 677B/LI
1	DEC 1975	DR	GEW	GENERAL REVISION

5 MAY 1976 Added 633 LSHL

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN T.G. Smith STARTED JUNE 13-75
CHK.
PROJ. ENG. W.C. Lains
COMPLETED
SCALE NONE

PROJECT TUNGSTEN CONCENTRATOR
DWG. TITLE POTABLE WATER SYSTEM FLOW DIAGRAM

UNION CARBIDE MINING AND METALS DIVISION

PLANT TEMPIUTE
BLDG. OR AREA 930 - 936 - 1156
DWG. NO. 254-1233
REV. NO. 5

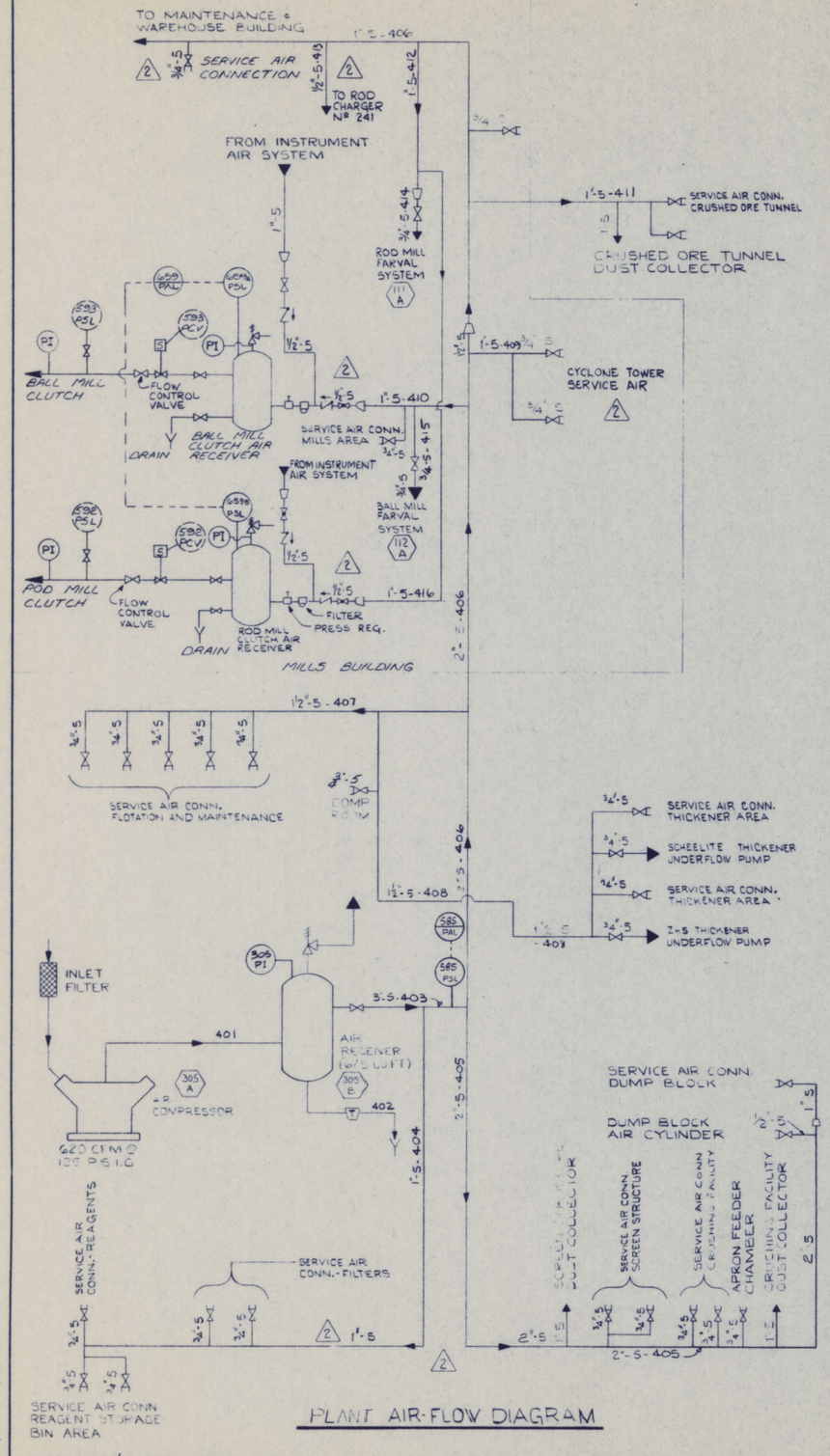
FILING CLASSIFICATION FLOWSHEET

ACRES DWG NO 3902-C-1233

4790 0029

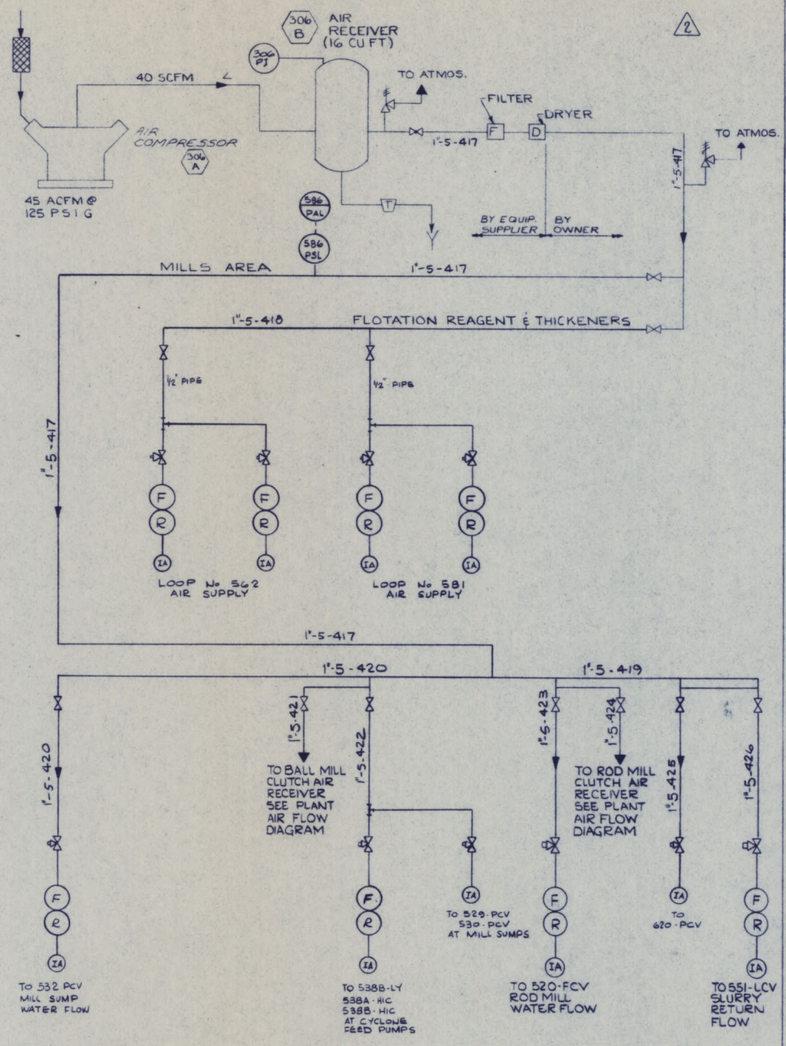
Printed by Rapids Bridge Graphics Niagara Falls, N.Y.

254-1234



PLANT AIR-FLOW DIAGRAM

AREA 4



INSTRUMENT AIR - FLOW DIAGRAM

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
305A	PLANT AIR COMPRESSOR	254-1306
305B	PLANT AIR RECEIVER	254-1306
306A	INSTRUMENT AIR COMPRESSOR	254-1306
306B	INSTRUMENT AIR RECEIVER	254-1306

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	INSTALATION DETAIL
305-PI	PRESSURE GAUGE	
306-PI	PRESSURE GAUGE	
585-PAL	ANNUNCIATOR	254-1380
585-PSL	PRESSURE SWITCH	254-1466
586-PAL	ANNUNCIATOR	254-1380
586-PSL	PRESSURE SWITCH	254-1466
582-PCV	SOLENOID VALVE	254-1487
2 582-PSL	PRESSURE SWITCH	254-1501
583-PCV	SOLENOID VALVE	254-1487
2 593-PSL	PRESSURE SWITCH	254-1501
659-PAL	ANNUNCIATOR	254-1380
659A-PSL	PRESSURE SWITCH	254-1487
659B-PSL	PRESSURE SWITCH	254-1487

LEGEND

- INSTRUMENT LOCATED AT MILL CONTROL PANEL.
- INSTRUMENT LOCATED INSIDE MILL CONTROL PANEL.
- INSTRUMENT LOCATED LOCAL TO EQUIPMENT.
- INSTRUMENT SHOWN ELSEWHERE AND IS SHOWN HERE FOR PIPING CLARITY
- F R — FILTER REGULATOR
- 3-WAY BALL VALVE - VENT PORT PLUGGED

JUN 5 1977

NOTE:-
DESIGN PRESSURE = 125 P.S.I.G.
TEST PRESSURE = 200 P.S.I.G.

REV.	DATE	BY	APPR	
3	DEC 28/76	DRS	GEM	ADDED LINE NUMBERS TO PIPING
2	APR 14/76			LINE SIZES ADDED, INSTR. AIR DISTRIBUTION AND PIPING AT MILLS CLUTCH AIR RECEIVER'S ALTERED
1	5/8	DR	[illegible]	GENERAL REVISION

ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

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P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN J.S. STARTED MAR 75 COMPLETED JAN 76
CHK. [illegible]
PROJ. ENG. W.C. Fales
SCALE NONE

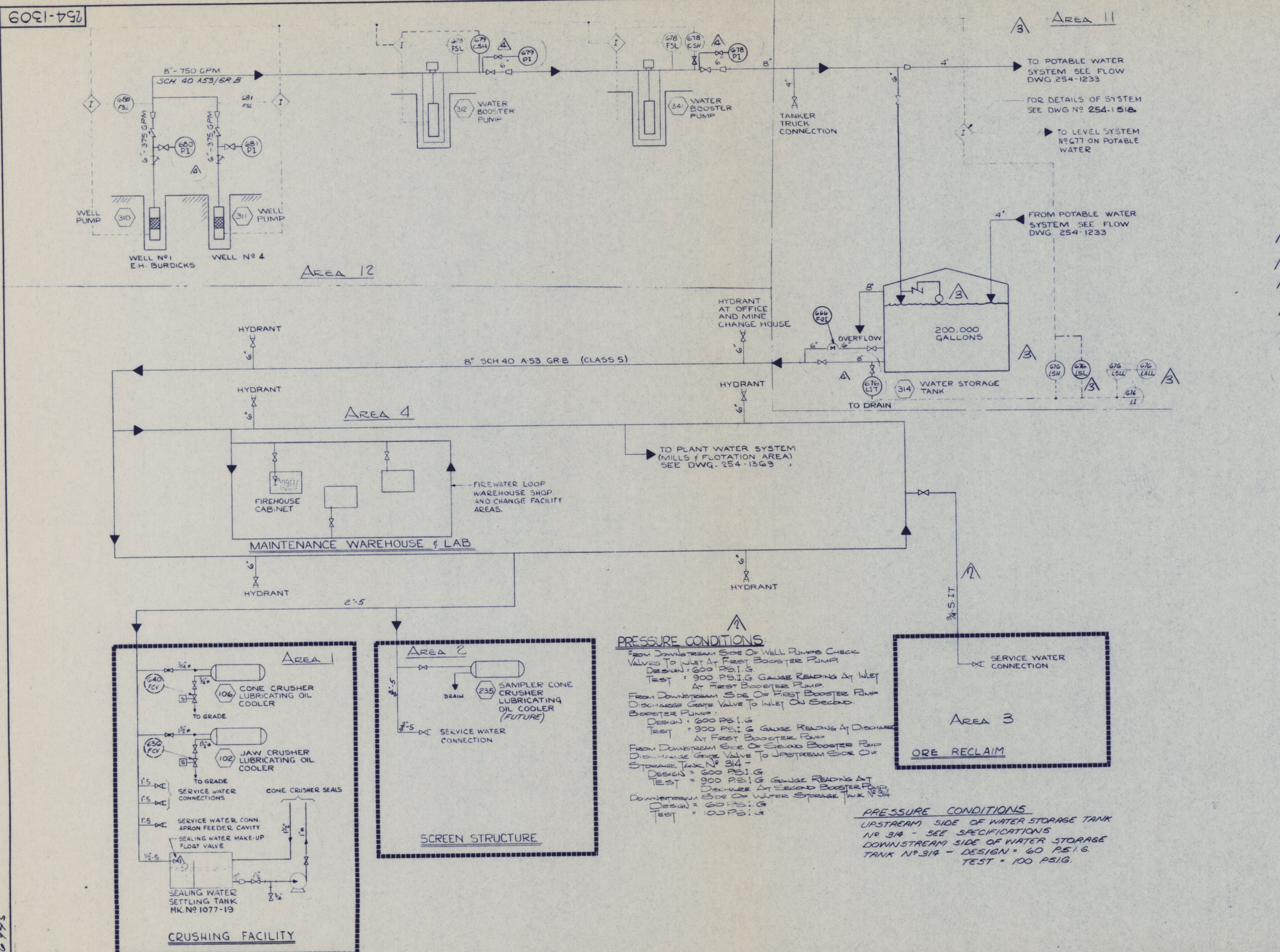
PROJECT TUNGSTEN CONCENTRATOR
DWG TITLE PLANT & INSTRUMENT AIR FLOW DIAGRAM

UNION CARBIDE MINING AND METALS DIVISION
PLANT TEMPIUTE NEVADA | BLDG. OR AREA 4 | 930-936-1156
DWG. NO. 2 5 4 - 1 2 3 4 | REV. NO. 3

FILING CLASSIFICATION FLOW SHEET

ACRES DWG Nº 3902-C-1234 ECN

4790 0029



254-1309
AREA 11
AREA 12
8"-750 GPM
SCH 40 A53/GR.B
680 FSL
681 FSL
6"-375 GPM
680 PI
681 PI
WELL PUMP 310
311 WELL PUMP
WELL Nº 1
E.H. BURDICKS
WELL Nº 4
679 FSL
679 CSH
679 PI
312 WATER BOOSTER PUMP
678 FSL
678 CSH
678 PI
341 WATER BOOSTER PUMP
TO POTABLE WATER SYSTEM SEE FLOW DWG 254-1233
FOR DETAILS OF SYSTEM SEE DWG Nº 254-1518
TO LEVEL SYSTEM Nº 677 ON POTABLE WATER
TANKER TRUCK CONNECTION
FROM POTABLE WATER SYSTEM SEE FLOW DWG 254-1233
HYDRANT AT OFFICE AND MINE CHANGE HOUSE
666 FQI
OVERFLOW
200,000 GALLONS
676 LIT
314 WATER STORAGE TANK
TO DRAIN
676 LSH
676 LSL
676 LSLL
676 LALL
676 LI
HYDRANT
8" SCH 40 A53 GR.B (CLASS 5)
AREA 4
TO PLANT WATER SYSTEM (MILLS & FLOTATION AREA) SEE DWG. 254-1369
FIREHOUSE CABINET
FIREWATER LOOP WAREHOUSE SHOP AND CHANGE FACILITY AREAS.
MAINTENANCE WAREHOUSE & LAB
2"-S
AREA 1
640 FCV
106 CONE CRUSHER LUBRICATING OIL COOLER
TO GRADE
636 FCV
102 JAW CRUSHER LUBRICATING OIL COOLER
SERVICE WATER CONNECTIONS
CONE CRUSHER SEALS
SERVICE WATER CONN. APRON FEEDER CAVITY
SEALING WATER MAKE-UP FLOAT VALVE
SEALING WATER SETTLING TANK MK. Nº 1077-19
CRUSHING FACILITY
AREA 2
DRAIN
235 SAMPLER CONE CRUSHER LUBRICATING OIL COOLER (FUTURE)
SERVICE WATER CONNECTION
SCREEN STRUCTURE
3/4"-S. IT
SERVICE WATER CONNECTION
AREA 3
ORE RECLAIM

PRESSURE CONDITIONS:
From Downstream Side Of Well Pumps Check Valves To Inlet At First Booster Pump.
Design : 600 P.S.I.G.
Test : 900 P.S.I.G. Gauge Reading At Inlet At First Booster Pump.
From Downstream Side Of First Booster Pump Discharge Gate Valve To Inlet On Second Booster Pump.
Design : 600 P.S.I.G
Test : 900 P.S.I.G Gauge Reading At Discharge At First Booster Pump
From Downstream Side Of Second Booster Pump Discharge Gate Valve To Upstream Side Of Storage Tank Nº 314 -
Design = 600 P.S.I.G
Test = 900 P.S.I.G Gauge Reading At Discharge At Second Booster Pump.
Downstream Side Of Water Storage Tank Nº 314
Design = 60 P.S.I.G
Test = 100 P.S.I.G

PRESSURE CONDITIONS
UPSTREAM SIDE OF WATER STORAGE TANK Nº 314 - SEE SPECIFICATIONS
DOWNSTREAM SIDE OF WATER STORAGE TANK Nº 314 - DESIGN = 60 P.S.I.G.
TEST = 100 P.S.I.G.

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
102	CONE CRUSHER LUBE-OIL COOLER	254-1074
106	JAW CRUSHER LUBE-OIL COOLER	254-1074
235	SAMPLE CONE CRUSHER LUBE-OIL COOLER	254-1085
310	WELL PUMP	254-1231
311	WELL PUMP	254-1231
312	WATER BOOSTER PUMP	254-1231
313	WATER BOOSTER PUMP	254-1231
314	WATER STORAGE TANK	254-1069
341	WATER BOOSTER PUMP	254-1231
342	WATER BOOSTER PUMP	254-1231

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
636-FCV	SOLENOID VALVE	254-1394
640-FCV	SOLENOID VALVE	254-1394
666-FQI	WATER METER	254-1069
676-LALL	ANNUNCIATOR	254-1380
676-LI	LEVEL GAUGE	254-1379
676-LIT	D.P. TRANSMITTER	254-1445
676-LSH	CURRENT SWITCH	254-1471
676-LSLL	CURRENT SWITCH	254-1380
676-LSL	CURRENT SWITCH	254-1471
678-FSL 678-CSH 678-PI	VANE FLOW SWITCH CONDUCTIVITY SWITCH PRESSURE GAUGE	254-1383
679-FSL 679-CSH 679-PI	VANE FLOW SWITCH CONDUCTIVITY SWITCH PRESSURE GAUGE	254-1383
680-FSL 680-PI	VANE FLOW SWITCH PRESSURE GAUGE	254-1383
681-FSL 681-PI	VANE FLOW SWITCH PRESSURE GAUGE	254-1383
683-FCV	FLOAT VALVE	

LEGEND

- INSTRUMENT LOCATED AT MILL CONTROL PANEL.
- INSTRUMENT LOCATED INSIDE MILL CONTROL PANEL.
- INSTRUMENT LOCATED LOCAL TO EQUIPMENT.
- INSTRUMENT SHOWN ELSEWHERE IN MORE DETAIL AND IS SHOWN HERE FOR INFORMATION ONLY

SEE REFERENCE DRAWING 254-1166.

JUN 15 1977

946 94's

REV.	DATE	BY	APP'R	
4	11/4/76	LAR	RH	GEN'L REVS.
3	11/4/76	AB	RH	ADDED FLOAT SWITCH & VALVE IN WATER STOR. TANK
2	APR 1976			PRESSURE CONDITIONS REVISED. SUPPLY TO ORE RECLAIM REVISED.
1	JAN '76	CHR	GSV	GENERAL REVISION

ACRES AMERICAN INCORPORATED BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

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DRAWN: CHR | STARTED: JUNE/75 | COMPLETED: JAN. 76 | SCALE: NONE

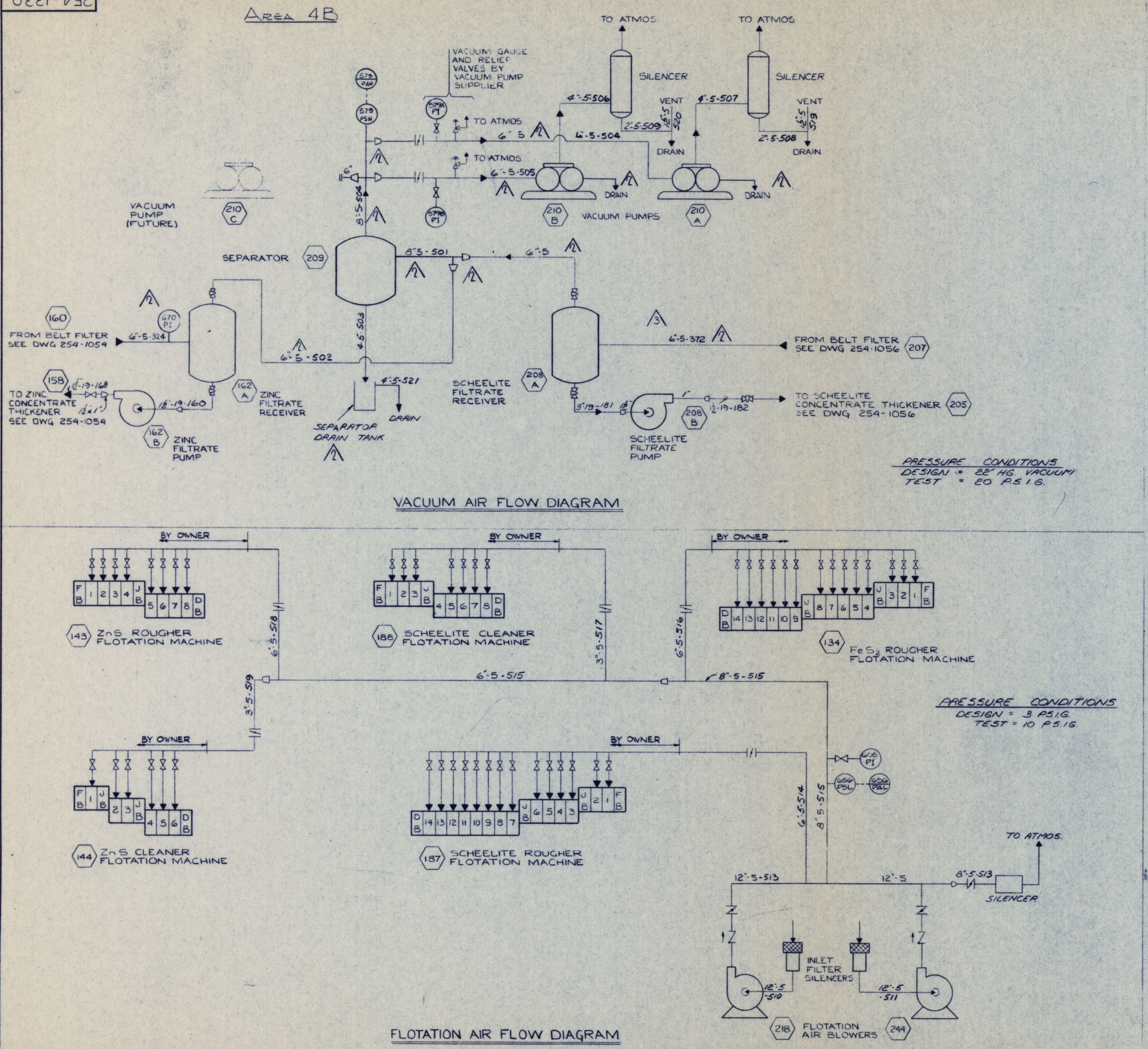
PROJECT: TUNGSTEN CONCENTRATOR
DWG. TITLE: PLANT WATER SYSTEM (BURIED) FLOW DIAGRAM
FILING CLASSIFICATION: FLOW SHEET

PLANT: TEMPIUTE | BLDG. OR AREA: 930-936-1156
DWG. NO. 254-1309 | REV. NO. 4

ACRES DWG. Nº 3902-C-1309

4790 0029

254-1330



EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
134	FeS_2 ROUGHER FLOTATION MACHINE	254-1283
143	ZnS ROUGHER FLOTATION MACHINE	254-1283
144	ZnS CLEANER FLOTATION MACHINE	254-1282
162A	ZINC FILTRATE RECEIVER	254-1283
162B	ZINC FILTRATE PUMP	254-1283
187	SCHEELITE ROUGHER FLOTATION MACHINE	254-1283
188	SCHEELITE CLEANER FLOTATION MACHINE	254-1282
208A	SCHEELITE FILTRATE RECEIVER	254-1283
208B	SCHEELITE FILTRATE PUMP	254-1283
209	SEPARATOR	254-1284
210A	VACUUM PUMP	254-1306
210B	VACUUM PUMP	254-1306
218	FLOTATION AIR BLOWER	254-1306
244	FLOTATION AIR BLOWER	254-1306

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	
579-PAH	ANNUNCIATOR	254-1380
579-PSH	PRESSURE SWITCH	254-1501
579A-PI	VACUUM GAUGE	254-1501
579B-PI	VACUUM GAUGE	254-1501
655-PI	PRESSURE GAUGE	254-1380
656-PAL	ANNUNCIATOR	254-1380
656-PSL	PRESSURE SWITCH	254-1501
670-PI	PRESSURE GAUGE	254-1501
671-PI	PRESSURE GAUGE	254-1501

LEGEND

⊖ INSTRUMENT LOCATED AT MILL CONTROL PANEL.

○ INSTRUMENT MOUNTED LOCAL TO EQUIPMENT.

JUN 15 1977

REV.	DATE	BY	APP'R	
3	AUG 13/76	LAR		REMOVED 671PI
2	APR 1976			GENERAL REVISION 670 & 671 PI RELOCATED
1		E.S.	GBW	GENERAL REVISION
4	DEC 4/76	DRS		ADDED LINE NUMBER TO PIPING

ACRES AMERICAN INCORPORATED, BUFFALO, NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN: CER — STARTED: JULY/75 — COMPLETED: AUG/75 — SCALE: NONE

PROJECT: TUNGSTEN CONCENTRATOR

DWG. TITLE: VACUUM AND FLOTATION AIR FLOW DIAGRAM

PLANT: TEMPIUTE — BLDG. OR AREA: 930 – 936-1136

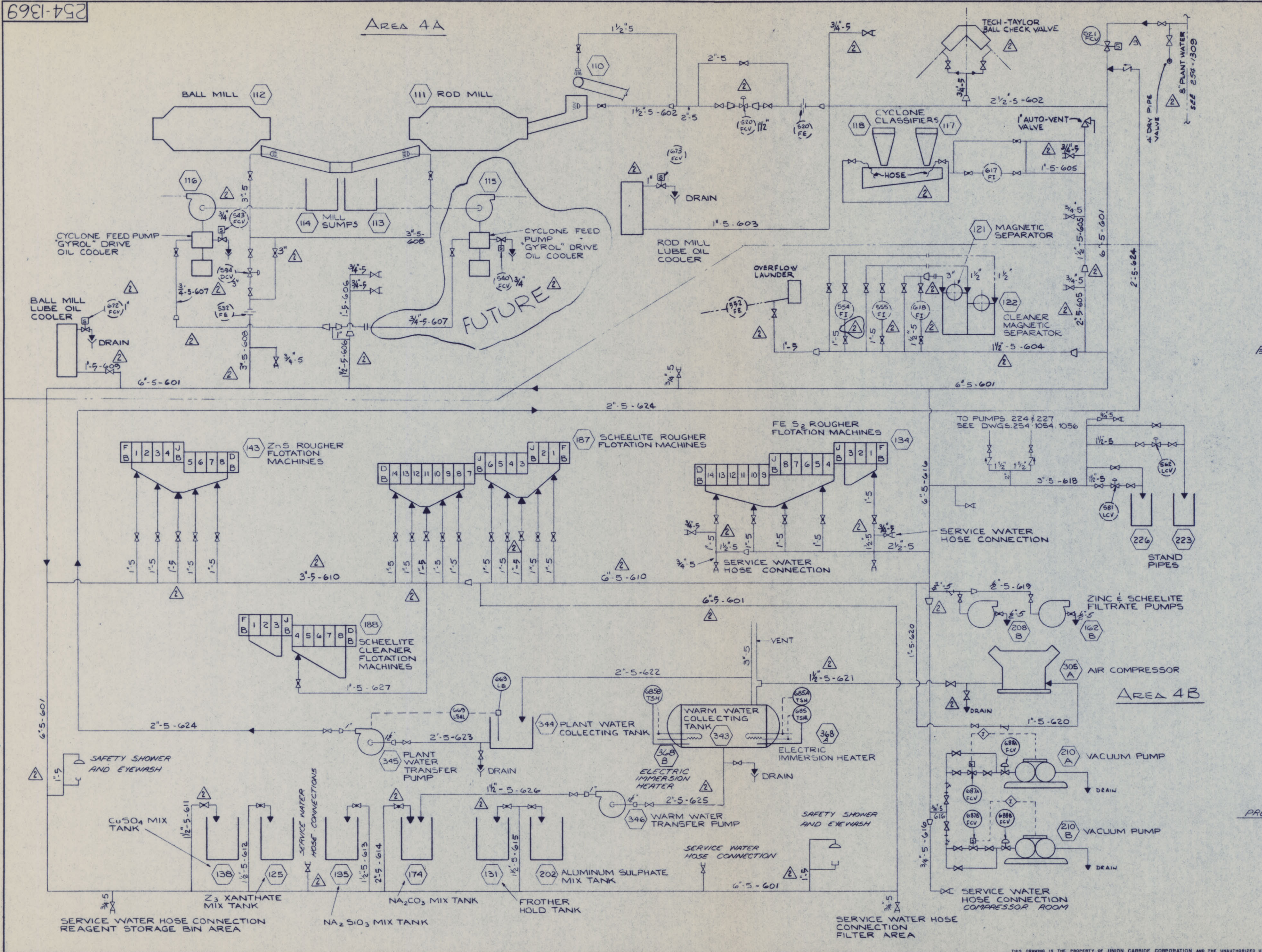
DWG. NO. 2 5 4 - 1 3 3 0 — REV. NO. 4

FILING CLASSIFICATION: FLOW SHEET

ACRES DWG Nº 3902-C-1330

4790 0029

254-1369



AREA 4A
BALL MILL 112
111 ROD MILL
110
TECH-TAYLOR BALL CHECK VALVE
CYCLONE CLASSIFIERS 118 117
1" AUTO-VENT VALVE
MILL SUMPS 114 113
116
115
CYCLONE FEED PUMP "GYROL" DRIVE OIL COOLER
CYCLONE FEED PUMP "GYROL" DRIVE OIL COOLER
FUTURE
BALL MILL LUBE OIL COOLER
DRAIN
ROD MILL LUBE OIL COOLER
OVERFLOW LAUNDER
121 MAGNETIC SEPARATOR
122 CLEANER MAGNETIC SEPARATOR
HOSE
4" DRY PIPE VALVE
8" PLANT WATER SEE 254-1309
143 ZnS ROUGHER FLOTATION MACHINES
187 SCHEELITE ROUGHER FLOTATION MACHINES
FE S2 ROUGHER FLOTATION MACHINES 134
TO PUMPS 224 & 227 SEE DWGS. 254-1084, 1056
SERVICE WATER HOSE CONNECTION
SERVICE WATER HOSE CONNECTION
226 223 STAND PIPES
188 SCHEELITE CLEANER FLOTATION MACHINES
ZINC & SCHEELITE FILTRATE PUMPS 208 B 162 B
305 A AIR COMPRESSOR
AREA 4B
VENT
344 PLANT WATER COLLECTING TANK
345 PLANT WATER TRANSFER PUMP
WARM WATER COLLECTING TANK 343
368 B ELECTRIC IMMERSION HEATER
368 ELECTRIC IMMERSION HEATER
346 WARM WATER TRANSFER PUMP
210 A VACUUM PUMP
210 B VACUUM PUMP
DRAIN
SAFETY SHOWER AND EYEWASH
SAFETY SHOWER AND EYEWASH
CuSO4 MIX TANK 138
125 Z3 XANTHATE MIX TANK
SERVICE WATER HOSE CONNECTIONS
195 NA2 SiO3 MIX TANK
174 NA2CO3 MIX TANK
131 FROTHER HOLD TANK
202 ALUMINUM SULPHATE MIX TANK
SERVICE WATER HOSE CONNECTION
SERVICE WATER HOSE CONNECTION REAGENT STORAGE BIN AREA
SERVICE WATER HOSE CONNECTION FILTER AREA
SERVICE WATER HOSE CONNECTION COMPRESSOR ROOM
6"-5-601
2"-5-624
3"-5-610
6"-5-610
2"-5-622
1½"-5-621
2"-5-623
1½"-5-626
2"-5-625
1"-5-620
1"-5-627
2½"-5-602
1½"-5-602
1"-5-603
1½"-5-604
1"-5-605
3"-5-618
2"-5-619

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
110	ROD MILL FEED CONVEYOR	254-1297
111	ROD MILL	254-1314
112	BALL MILL	254-1314
113	MILL SUMP	254-1313
114	MILL SUMP	254-1313
115	CYCLONE FEED PUMP	254-1313
116	CYCLONE FEED PUMP	254-1313
117	CYCLONE CLASSIFIER	254-1316
118	CYCLONE CLASSIFIER	254-1316
121	MAGNETIC SEPARATOR	254-1316
122	CLEANER MAGNETIC SEPARATOR	254-1316
125	Z3 XANTHATE MIX TANK	254-1283
131	FROTHER HOLD TANK	254-1282
134	FE S2 ROUGHER FLOTATION MACHINES	254-1283
138	$CuSO_4$ MIX TANK	254-1283
143	ZNS ROUGHER FLOTATION MACHINES	254-1283
162B	ZINC FILTRATE PUMP	254-1283
174	NA_2CO_3 MIX TANK	254-1283
187	SCHEELITE ROUGHER FLOTATION MACHINES	254-1283
188	SCHEELITE CLEANER FLOATATION	254-1282
195	$NA_2S_1O_3$ MIX TANK	254-1283
202	ALUMINUM SULPHATE MIX TANK	254-1283
208B	SCHEELITE FILTRATE PUMP	254-1283
210A	VACUUM PUMP	254-1306
210B	VACUUM PUMP	254-1306
223	STAND PIPE	254-1310
226	STAND PIPE	254-1310
305A	AIR COMPRESSOR	254-1306
343	WARM WATER COLLECTING TANK	254-1282
344	PLANT WATER COLLECTING TANK	254-1282
345	PLANT WATER TRANSFERPUMP	254-1282
346	WARM WATER TRANSFER PUMP	254-1282
368A	ELECTRIC TANK HEATER	254-1282
368B	ELECTRIC TANK HEATER	254-1282
520-FCV	GLOBE VALVE	254-1449
520-FE	ORIFACE PLATE	254-1383
532-FE	ORIFACE PLATE	254-1383
540-FCV	SOLENOID VALVE	254-1487
543-FCV	SOLENOID VALVE	254-1487
552 FE		
554-FI	ROTAMETER	254-1383
555-FI	ROTAMETER	254-1383
562-LCV	GLOBE VALVE	254-1413
581-LCV	GLOBE VALVE	254-1413
594-DCV	GLOBE VALVE	254-1448
617-FI	ROTAMETER	254-1383
618-FI	ROTAMETER	254-1383
669-LE	CAPACITANCE PROBE	254-1502
669-LSHL	CAPACITANCE SWITCH	254-1502
672-FCV	SOLENOID VALVE	254-1487
673-FCV	SOLENOID VALVE	254-1487
685A-TSH	TEMPERATURE SWITCH	254-1442
685B-TSH	TEMPERATURE SWITCH	254-1442
685-TSHL	THERMOSTAT	254-1442
687A-FCV	SOLENOID VALVE	
687B-FCV	SOLENOID VALVE	
688A-FCV	CONTROL VALVE	254-1307
688B-FCV	CONTROL VALVE	254-1307

( ) INDICATES INSTRUMENT SHOWN ELSEWHERE AND IS SHOWN HERE FOR PIPING CLARITY

JUN 15 1977

PRESSURE CONDITIONS
DESIGN = 60 P.S.I.G
TEST = 100 P.S.I.G

REV.	DATE	BY	APP'R	
4	DEC 14-76	DRS		ADDED LINE NUMBERS TO PIPING
3		LAR		GEN. REVISION
2	4-17-76	ACRES	GEW	GENERAL REVISION
1		E.S.	GEW	GENERAL REVISION

ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

UNION CARBIDE CORPORATION
METALS DIVISION
TECHNOLOGY DEPARTMENT — ENGINEERING
P.O. BOX 97 NIAGARA FALLS, N.Y. 14302

DRAWN: D.R. STARTED: OCT/75 COMPLETED: JAN/76 SCALE: NONE

PROJECT: TUNGSTEN CONCENTRATOR
DWG. TITLE: PLANT WATER SYSTEM (MILLS AND FLOTATION AREA) FLOW DIAGRAM

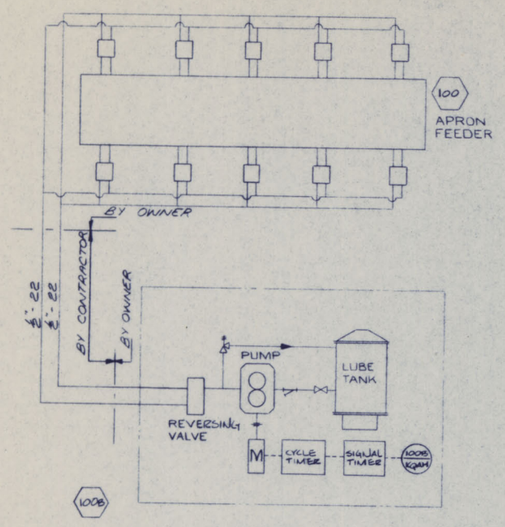
PLANT: TEMPIUTE BLDG. OR AREA: 4A & 4B 930-936-1156
UNION CARBIDE METALS DIVISION
DWG. NO. 254-1369 REV. NO. 4

FILING CLASSIFICATION FLOWSHEET

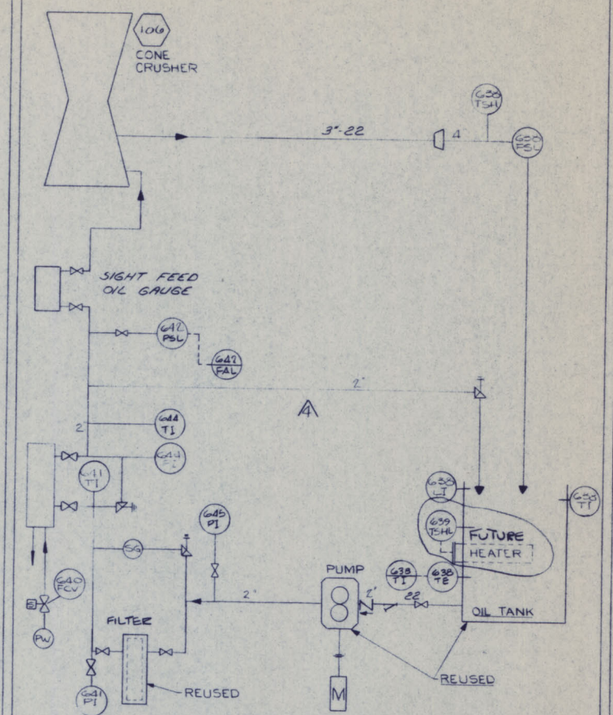
ACRES DWG Nº: 3902-C-1369

4790 0029

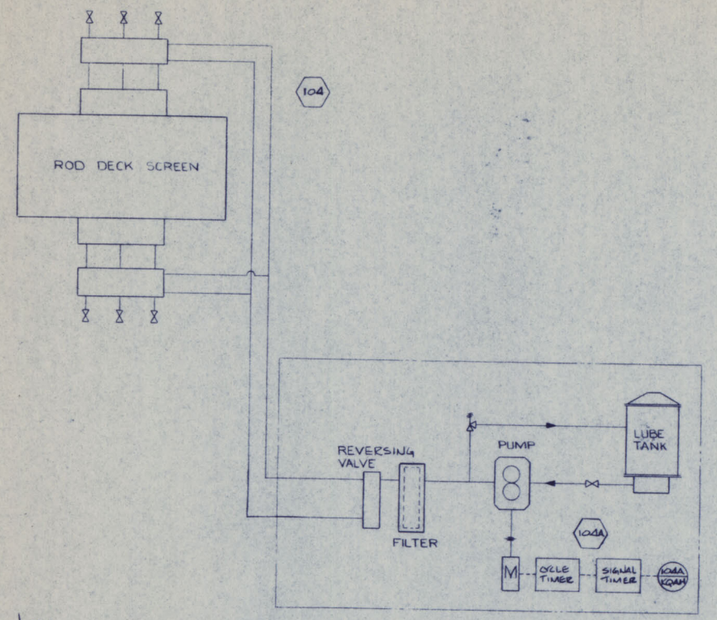
254-1402



APRON FEEDER LUBRICATING SYSTEM 100B



CONE CRUSHER LUBRICATING SYSTEM 106B

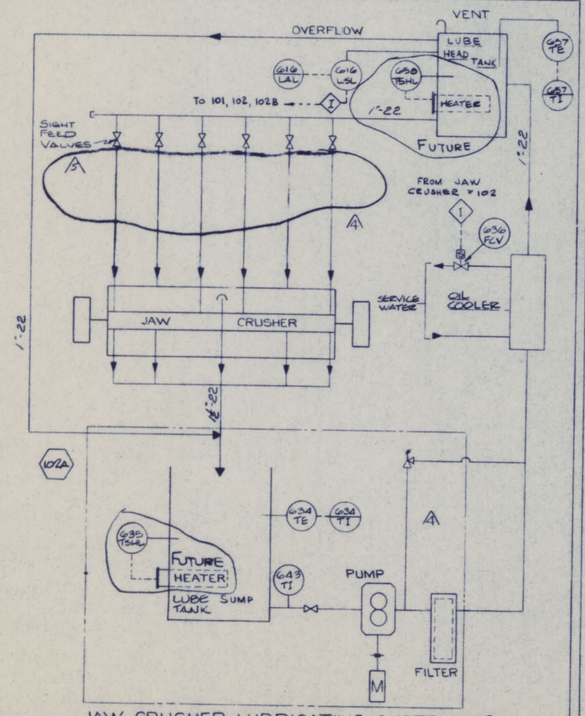


NOTE
THIS DIAGRAM IS SUBJECT TO CONFIRMATION ON RECEIPT OF MANUFACTURERS DRAWINGS

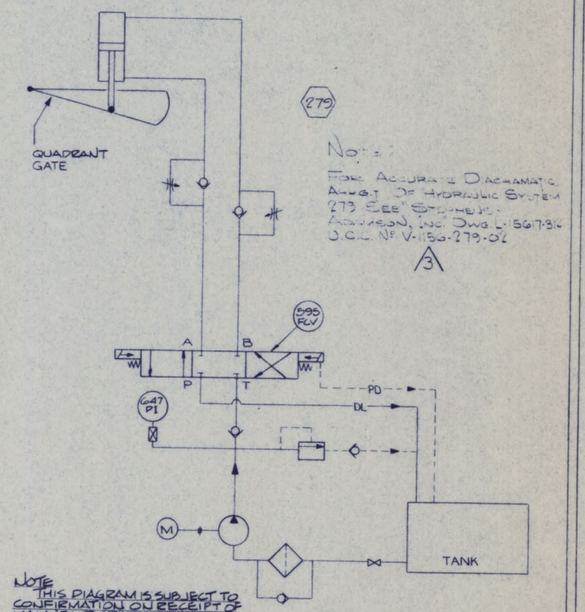
ROD DECK SCREEN LUBRICATING SYSTEM 104A

EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
100	ORE APRON FEEDER	254-1076
100B	ORE APRON FEEDER - LUBRICATING UNIT	254-1076
102	JAW CRUSHER	254-1075
102A	JAW CRUSHER - LUBRICATING UNIT	254-1074
104	ROD DECK SCREEN	254-1085
104A	ROD DECK SCREEN - LUBRICATING UNIT	254-1085
106	CONE CRUSHER	254-1075
106A	CONE CRUSHER HYDRAULIC - ADJUSTING UNIT	254-1075
106B	CONE CRUSHER - LUBRICATING UNIT	254-1074
279	QUADRANT GATE AND HYDRAULIC UNIT	254-1076

INSTRUMENT NUMBER	INSTRUMENT DESCRIPTION	INSTALLATION DETAIL
1008-KQAH	ANNUNCIATOR	254-1377
1048-KQAH	ANNUNCIATOR	254-1377
595-FCV	SOLENOID VALVE	254-1396
616-LAL	ANNUNCIATOR	254-1377
616-LSL	LEVEL SWITCH	
628-PSL	PRESSURE SWITCH	254-1501
634-TE	THERMOCOUPLE	254-1502
634-TI	INDICATOR	254-1377
634-TSHL	THERMOSTAT	254-1394
636-FCV	SOLENOID VALVE	254-1396
638-TE	THERMOCOUPLE	254-1502
638-TI	INDICATOR	254-1377
638-TSHL	THERMOSTAT	254-1394
640-FCV	SOLENOID VALVE	254-1394
641-PI	PRESSURE GAUGE	
642-FAL	ANNUNCIATOR	254-1377
642-FSL	FLOW SWITCH	254-1394
643-TI	THERMOMETER	254-1502
644-TI	THERMOMETER	254-1502
645-PI	PRESSURE GAUGE	254-1501
646-PI	PRESSURE GAUGE	254-1501
647-PI	PRESSURE GAUGE	254-1075
648-PI	PRESSURE GAUGE	254-1075
657 TE	THERMOCOUPLE	254-1502
657 TI	INDICATOR	254-1377
658TSHL	THERMOSTAT	254-1396



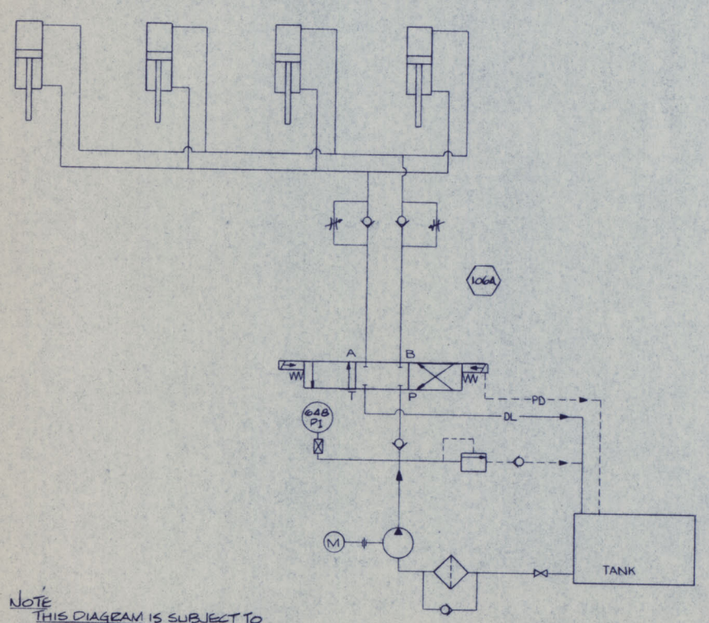
JAW CRUSHER LUBRICATING SYSTEM 102A



NOTE
FOR ACCURATE DIAGRAMATIC ARRGT OF HYDRAULIC SYSTEM 279 SEE "STEPHENS ADAMSON, INC. DWG. L-56731-C D.C.C. NO V-150-279-02"

NOTE
THIS DIAGRAM IS SUBJECT TO CONFIRMATION ON RECEIPT OF MANUFACTURERS DRAWINGS

QUADRANT GATE HYDRAULIC SYSTEM 279



NOTE
THIS DIAGRAM IS SUBJECT TO CONFIRMATION ON RECEIPT OF MANUFACTURERS DRAWINGS

CONE CRUSHER HYDRAULIC SYSTEM 106A

JUN 5 1977

PRESSURE CONDITIONS
SEE U.C.C. PIPING STANDARDS CLASS EE DWG. No 935-0022

REV.	DATE	BY	APPR	
4	OCT 20/76	LAR	[illegible]	REVISED JAW CRUSHING & CONE CRUSHER LUBRICATING SYSTEMS
3	APR 1976			NOTE ADDED
2	MAR 26	LAR		REMOVED G34TT, G38TT, G57TT
1	JAN 76	DHB	GRW	GENERAL REVISION
5	MAY 1977		RTS	REVISED PS FROM JAW CRUSHER

ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN	STARTED	COMPLETED	PROJECT
DHR	SEPT/75	JAN. 76	TUNGSTEN CONCENTRATOR
CHK.		SCALE	DWG TITLE
MH		NONE	CRUSHING AND MILLING FACILITY HYDRAULIC AND LUBRICATION SYSTEM FLOW DIAGRAM SHT. 1 OF 2
PROJ ENG.			
WC Paris			

UNION CARBIDE MINING AND METALS DIVISION

PLANT	BLDG. OR AREA
TEMPIUTE	930-936-1156

DWG. NO. 254-1402 REV. NO. 5

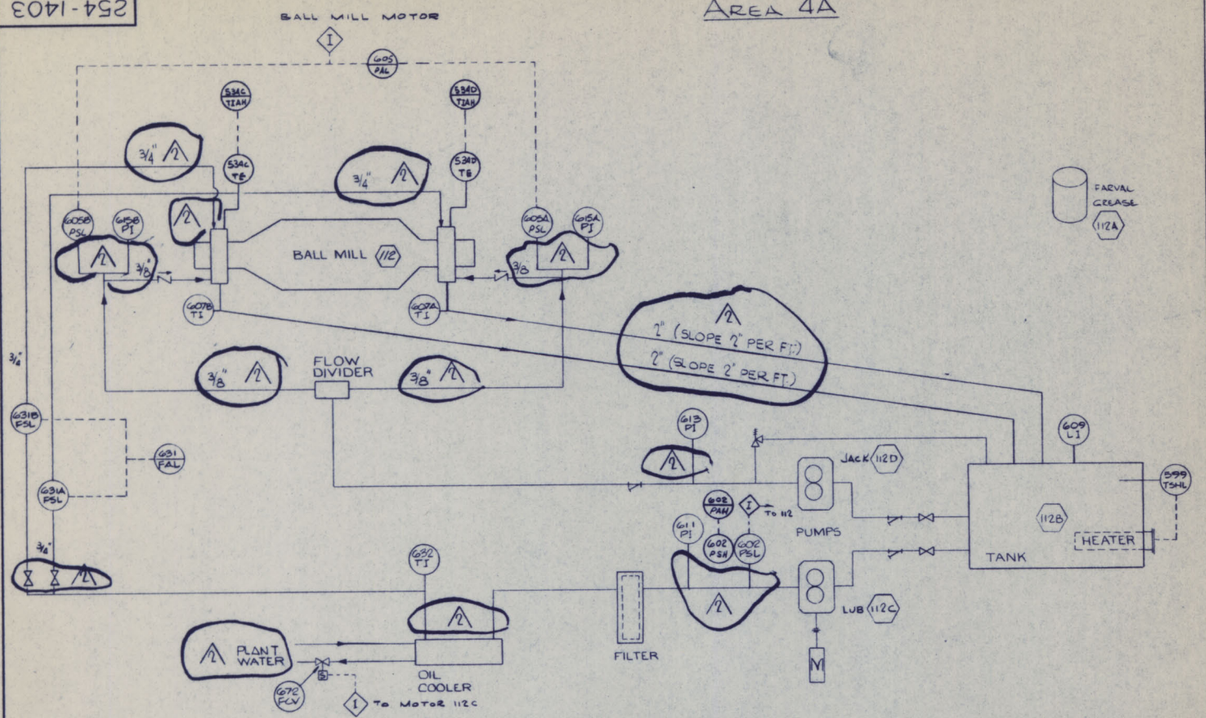
FILING CLASSIFICATION FLOW SHEET

ACRES DWG NO 3902-C-1402

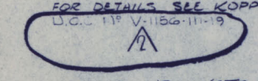
4790 0029

254-1403

AREA 4A



OIL LUBRICATION SYSTEM FOR BALL MILL 112

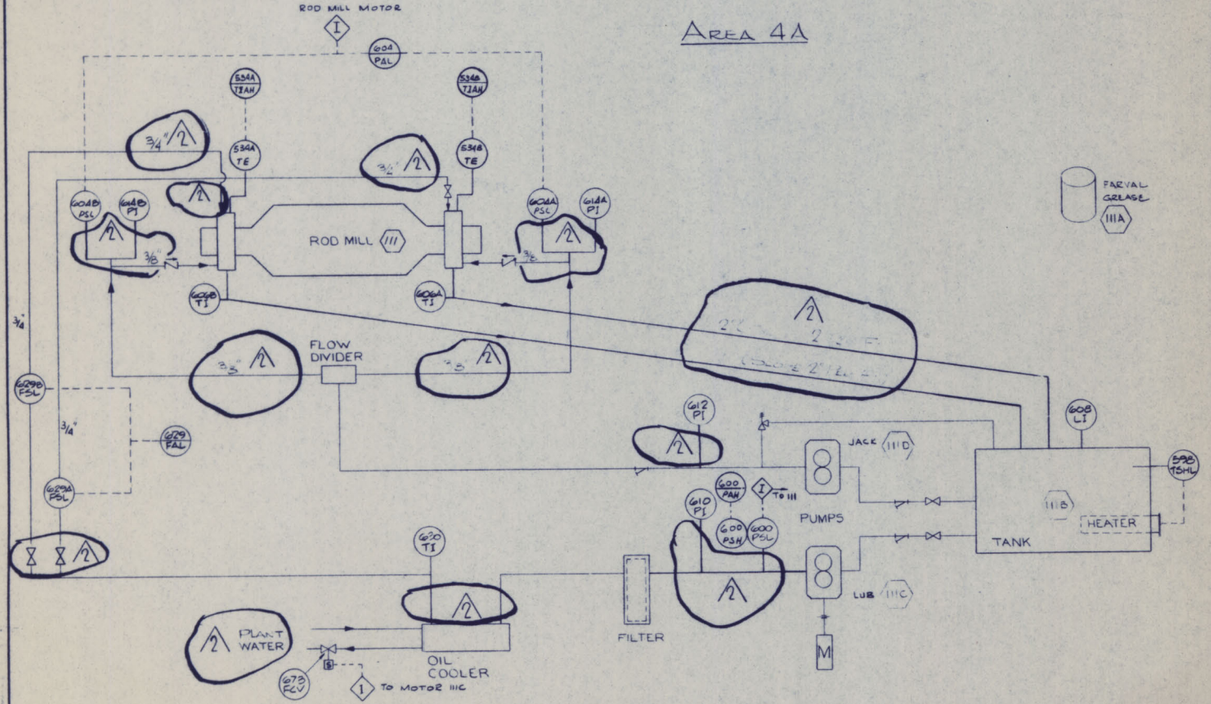


GREASE LUB SYSTEM FOR BALL MILL

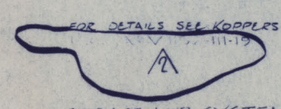
EQUIPMENT NUMBER	EQUIPMENT DESCRIPTION	INSTALLATION DETAIL
111	ROD MILL	254-1314
111A	FARVAL GREASE PUMP	254-1490
111B	LUBE-TANK AND HEATER	254-1490
111C	LUBE-PUMP	254-1490
111D	JACKING PUMP	254-1490
112	BALL MILL	254-1314
112A	FARVAL GREASE PUMP	254-1491
112B	LUBE-TANK AND HEATER	254-1491
112C	LUBE-PUMP	254-1491
112D	JACKING PUMP	254-1491

INSTRUMENT NUMBER		
534A-TE	BEARING TEMP. RTD.	254-1487
534A-TIAH	INDICATING ANNUNCIATOR	254-1379
534B-TE	BEARING TEMP. RTD.	254-1487
534B-TIAH	INDICATING ANNUNCIATOR	254-1379
534C-TE	BEARING TEMP. RTD.	254-1487
534C-TIAH	INDICATING ANNUNCIATOR	254-1379
534D-TE	BEARING TEMP. RTD.	254-1487
534D-TIAH	INDICATING ANNUNCIATOR	254-1379
598-TSHL	BEARING OIL THERMOSTAT	254-1487
599-TSHL	BEARING OIL THERMOSTAT	254-1487
600-PAH	ANNUNCIATOR	254-1380
600-PSH	PRESSURE SWITCH	254-1487
600-PSL	PRESSURE SWITCH	254-1487
602-PAH	ANNUNCIATOR	254-1380
602-PSH	PRESSURE SWITCH	254-1487
602-PSL	PRESSURE SWITCH	254-1487
604-PAL	ANNUNCIATOR	254-1380
604A-PSL	PRESSURE SWITCH	254-1487
604B-PSL	PRESSURE SWITCH	254-1487
605-PAL	ANNUNCIATOR	254-1380
605A-PSL	PRESSURE SWITCH	254-1487
605B-PSL	PRESSURE SWITCH	254-1487
606A-TI	THERMOMETER	254-1490
606B-TI	THERMOMETER	254-1490
607A-TI	THERMOMETER	254-1491
607B-TI	THERMOMETER	254-1491
608-LI	LEVEL GAUGE	254-1490
609-LI	LEVEL GAUGE	254-1491
610-PI	PRESSURE GAUGE	254-1490
611-PI	PRESSURE GAUGE	254-1491
612-PI	PRESSURE GAUGE	254-1490
613-PI	PRESSURE GAUGE	254-1491
614A-PI	PRESSURE GAUGE	254-1490
614B-PI	PRESSURE GAUGE	254-1490
615A-PI	PRESSURE GAUGE	254-1491
615B-PI	PRESSURE GAUGE	254-1491
629-FAL	ANNUNCIATOR	254-1380
629A-FSL	FLOW SWITCH	254-1487
629B-FSL	FLOW SWITCH	254-1487
630-TI	THERMOMETER	254-1502
631-FAL	ANNUNCIATOR	254-1380
631A-FSL	FLOW SWITCH	254-1487
631B-FSL	FLOW SWITCH	254-1487
632-TI	THERMOMETER	254-1502
672-FCV	SOLENOID VALVE	254-1487
673-FCV	SOLENOID VALVE	254-1487

AREA 4A



OIL LUBRICATION SYSTEM FOR ROD MILL 111



GREASE LUB SYSTEM FOR ROD MILL

JUN 15 1977

PRESSURE CONDITIONS
SEE U.C.C. PIPING STANDARDS
CLASS EE DWG. Nº 935-0022

REV.	DATE	BY	APP'R	
2	APR 1976	ACRES	GEN	LINE SIZES ADDED, VALVES DESIGNATIONS A. REVISED
1	JAN 1976	DR	GEN	GENERAL REVISION

ACRES AMERICAN INCORPORATED
BUFFALO NEW YORK

UNION CARBIDE CORPORATION
MINING AND METALS DIVISION
TECHNOLOGY DEPARTMENT
P.O. BOX 579 NIAGARA FALLS, N.Y. 14302

DRAWN	STARTED	COMPLETED
DR	SEPT/75	JAN. 76
CHK.		SCALE NONE
PROJ. ENG.		

PROJECT TUNGSTEN CONCENTRATOR
DWG. TITLE CRUSHING AND MILLING FACILITY
HYDRAULIC AND LUBRICATION SYSTEMS
FLOW DIAGRAM SHT 2 OF 2

UNION CARBIDE MINING AND METALS DIVISION
PLANT TEMPIUTE
BLDG. OR AREA 930-936-1156
DWG. NO. 254-1403
REV. NO. 2

FILING CLASSIFICATION FLOWSHEET
ACRES DWG Nº 3902-C-1403

4790 0029