

U. S. Geological Survey
Ely, Nevada
September 29, 1943

Supplementary Memorandum

TUNGSTEN IN THE BAY STATE SILVER MINE

Newark Mining District, White Pine County, Nevada

by

M. R. Klepper

Abstract

At the Bay State Silver mine in the Newark Mining District of White Pine County, Nevada, scheelite is irregularly distributed within stockworks of quartz in limestone. Abe Laird, Hadley Bramel and Frank Hoagland hold a lease on the property. During the last year they have produced about 1350 units of WO_3 .

The quartz stockworks are associated with steeply dipping, silver-bearing quartz veins. These stockworks occur locally in limestone adjacent to the veins and elsewhere irregularly cap the veins. Scheelite is disseminated through the stockworks, and fairly large blocks may average 0.25% WO_3 . Higher grade zones, in part controlled by bedding, occur within the lower grade bodies.

It is almost impossible to estimate the reserve of high-grade ore in advance of mining because of its irregular distribution within the stockworks. Reserves of 1.5-2.0% WO_3 ore are estimated to total 70 tons measured, 280 tons indicated and 900 tons inferred. It is not likely that a much larger tonnage of ore of this grade will be developed. However, the writer believes that 2000 or 3000 tons of 0.75% WO_3 ore are reasonably assured, and that possibly a substantially larger tonnage of this grade may occur.

Location

The Bay State Silver mine is on the east slope of the Diamond Range, near the western border of White Pine County, Nevada. The property consists of three patented mining claims, the Chihuahua, the Buckeye State and the Lincoln, located in the SW $\frac{1}{4}$ of Sec. 5, the NE $\frac{1}{4}$ of Sec. 8, and the NW $\frac{1}{4}$ of S_ec. 9, T. 19 N., R. 55 E., M. D. M. From Eureka the property is reached by driving east for 13 miles on the graveled Newark Pass road, then north for four miles on the Newark Valley road, and then west for one mile into Mining Canyon. The last half mile of the Mining Canyon road is passable, but difficult. The property may also be reached by turning north on to the Newark Valley road from U. S. Highway 50, nineteen miles east of Eureka, then driving north to the Mining Canyon intersection.

History and Ownership

The property was owned and operated in the 1870's by the Bay State Silver Mining Co. In the early 1900's, the Newark Silver Mining Co. acquired control and built a mill at the mouth of Mining Canyon. This mill was destroyed by fire several years ago. In 1932, the claims were purchased at a tax sale by Swick and Robinson of Eureka, and since then have been worked sporadically by lessees. Total value of silver (including a little lead) produced is reported to be about \$250,000.

A. R. Laird of Eureka and Frank Hoagland of Kimberly obtained a lease and option in 1941, and during the next summer Laird discovered scheelite on the dumps and in the old silver workings. In August 1942, the lessees gave an option to Hadley R. Bramel of Ely, later making him an equal partner in the lease. During the spring of 1943, Laird, Hoagland and Bramel subleased the Lincoln claim to Rube Nicolay of Ely.

D. M. Lemmon of the Survey examined the property in September 1942 and submitted a memorandum. During September 1943, the writer and P. Joralemon spent 11 days mapping the geology of the surface and of accessible mine workings, giving special attention to the occurrence of scheelite.

Workings and Equipment

The Chihuahua and Buckeye State are contiguous claims and lie respectively on the north and south sides of steep-walled Mining Canyon. (See plate 1). The Chihuahua is developed by the 875'-long Chihuahua adit driven north along a steeply dipping silver-bearing vein from near the bottom of the canyon, by interconnected drifts and crosscuts at elevations between 80' and 120' above the Chihuahua adit, and by numerous stopes, raises and winzes. The lessees are mining scheelite ore from the southern part of the upper workings. The Buckeye State is developed by two partly caved shafts, a caved adit, and by open cuts. Stopes between the caved adit and the surface continue beyond the southern limit of plate 1. No scheelite has been found on the Buckeye State claim.

Extensive workings are said to extend north and south from the 200' station of the 400' shaft at the southwest corner of the Chihuahua claim. These workings are partly accessible with the aid of ropes. The writer did not attempt to explore these workings, as the dumps from them did not contain scheelite.

On the Lincoln claim, two steeply dipping splits of a silver vein are developed by three short adits with stopes, and by several open cuts. Mr. Nicolay is driving an adit in scheelite ore which occurs in a 6' wide limestone bed near its intersection with the steeply dipping fissures.

Three men are employed at the Chihuahua and three at the Lincoln. Each operation is served by a small compressor. Pipe, track and implements necessary for a small scale operation are at the property. Ore is trucked to Ely and from there shipped to Salt Lake City by rail. Water for mine and domestic use is hauled from Water Canyon, two miles north of the mine and camp.

Production

Production of tungsten from the property is tabulated below:

<u>Date</u>	<u>Tons of Ore</u>	<u>% WO₃</u>	<u>Units of WO₃</u>	<u>Claim mined from</u>
12-29-42	15.5	6.40	98.23	Chihuahua
2-9-43	40.5	4.49	181.47	"
5-22-43	56	2.82	156.99	"
6-22-43	52.5	1.53	79.49	"
7-18-43	52	1.48	76.51	"
8-17-43	52	1.88	94.26	"
9-1-43	51.5	2.20	112.21	"
9-18-43	51	2.80	142.80	"
<u>Summer '43</u>	<u>17</u>	7.0 approx.	<u>118.</u> approx.	Lincoln
<u>Sub-total</u>	<u>388.0</u>		<u>1049.96</u>	
Ore in bins: to	50	3.0 est.	150. est.	Chihuahua
<u>be shipped 10-1.</u>	<u>50</u>	3.0 est.	<u>150.</u> est.	Lincoln
	100		300	

Total to 10-1. 488.
 $\frac{-16}{472}$

2.75 approx. av. 1350. approx.

$\frac{-98}{1252}$

Geology

The east flank of the Diamond Range in the vicinity of the Bay State mine is underlain by a thick sequence of Devonian limestone which strikes east and dips from 15° to 22° N. The sequence is made up of interlayered gray, blue and black beds varying from a few inches to more than 5' in thickness.

In the mine area the limestone is cut by a few steeply dipping, north-westerly trending fractures of small displacement. These fractures have been filled by silver-bearing quartz veins which range from a few inches to 15' in thickness. Steeply dipping, northeasterly trending fractures are exposed on

the Lincoln claim, but they are not mineralized.

The steeply dipping veins have been formed by the filling of a fracture or several closely spaced fractures with quartz and some calcite. Tetrahedrite with a little galena and argentite (?) is distributed irregularly through the quartz. Scheelite occurs locally, but not in commercial amounts. Limestone adjacent to the filled fractures is silicified. In some places silicification has been so thorough that it is difficult to distinguish between the vein filling and the replaced limestone. The veins commonly dip between 70° E. and 70° W, but in one place the west split of the Chihuahua vein dips 40° E.

At several places in the Chihuahua workings, the Chihuahua silver vein branches out into an irregular stockwork of quartz in limestone. These stockworks appear to cap the vein irregularly and discontinuously along a northwesterly dipping profile. The main stockwork exposed in the upper workings is about 150' long and may average 50' in both width and thickness. Smaller stockworks of quartz also locally penetrate the limestone adjacent to the silver veins. On the Lincoln claim, scheelite ore is confined to a quartz-impregnated limestone bed. A similar-appearing bed on the Chihuahua claim contains no scheelite.

The writer believes that the stockworks formed where mineralizing solutions spread from one or several distinct, steeply dipping fractures into fractured or brecciated zones, such as those into which the two splits of the Chihuahua feather out at the surface. The breccia zones exposed at the surface contain a little quartz and calcite, but no metallic minerals.

Mineralization in the stockworks differs from that in the main veins. Silver-bearing galena is the most abundant metallic mineral. Tetrahedrite, sphalerite and scheelite occur in smaller amounts. The galena occurs as replacement veins along certain beds and as small irregular-shaped bodies of different attitudes. (See geologic plan of upper Chihuahua workings, plate 3). Sphalerite occurs locally with the galena. Some of this lead-silver ore has been partially oxidized. Scheelite in quartz and silicified limestone occurs adjacent to, but not within, these bodies of lead-silver ore. Tetrahedrite is common in some of the scheelite ore.

Scheelite Ore Bodies

Mineralogy.—In most typical faces of ore, coarsely crystalline scheelite is irregularly imbedded in a gangue of white quartz or silicified limestone. Part of the scheelite occurs in narrow quartz seams and is very fine-grained. Calcite, although locally abundant, is generally a minor constituent of the gangue. Tetrahedrite and galena are irregularly scattered through the ore in small amounts.

Size and Shape.—A little scheelite is present almost everywhere in the stockworks, but concentrations of commercial grade are small. Four hundred tons of 2.5% WO_3 ore has been mined from one body in the upper Chihuahua workings. (See projection, plate 2). A few hundred tons of about the same grade are believed to remain. Four or five hundred tons of sub-commercial rock averaging between 0.5 and 0.75% WO_3 were also broken in mining the high-grade ore. The best values in this body appear to lie in two beds, about 40' apart, and along a steeply dipping, pipe-like connection between these two beds.

Three other zones that contain at least some commercial scheelite ore have been found in the Chihuahua workings. In each there is a strong suggestion that the best values are confined to one or a few beds. It does not seem likely to the writer that any of these undeveloped zones contains as large a tonnage of high-grade ore as the body now being mined.

One small lens containing 17 tons of 7% WO_3 ore was mined from the Lincoln claim. This ore appears to have lain partly within a steeply dipping split of the Lincoln silver vein and partly in a stockwork in the limestone adjacent to the vein. A bedding stockwork ore body is now being mined. It may contain a few hundred tons of 1.5% to 2.0% WO_3 ore.

Localization.—Scheelite mineralization, as far as is known, is almost entirely confined to the stockworks. Within the stockworks, the better values appear to lie along certain beds and, in a few places, along steeply dipping fracture zones. All the known bodies of scheelite ore are closely associated with bedded and irregular replacement bodies of lead-silver-zinc ore, but little or no scheelite occurs within these sulfide ore bodies.

Description of Specific Ore Bodies

Chihuahua Mine, upper workings.—The principal stockwork zone exposed in the upper workings is about 150' long, averages 40' or 50' wide and at least 30' thick. (See projection, plate 2 and plan of upper workings, plate 3). This entire block, containing between 15,000 and 20,000 tons, is believed to average 0.25% WO_3 . Within this block there are irregular bodies of higher grade ore. Four hundred tons averaging 2.5% WO_3 have already been mined by selective methods. The body from which this ore was mined begins where the west split of the Chihuahua vein passes into a stockwork and appears to be

concentrated along two beds and a connecting steeply dipping pipe. The lower bed of high-grade ore was mined from the 7157' sub-level. It is expected to continue down dip as far as the silver stope on the east split of the Chihuahua vein. (See projection, plate 2 and section A-A', plate 3). Spotty commercial ore was followed above this bed by a vertical raise, and a second gently dipping ore zone was encountered about 30' above the first. This upper ore zone is now being mined from beneath an old lead stope, as shown in Section A-A', plate 3.

Another zone that contains commercial ore occurs farther to the north where the stockwork again passes into a steeply dipping, silver-bearing fissure. The best zone is about 6' thick and appears to follow one or a few beds. It may, in fact, lie along the same bed that has been replaced by a lens of lead-silver ore 50' farther west. (See map of upper workings, plate 3).

Chihuahua Adit.--A stockwork zone is crosscut by the last 100' of the Chihuahua adit. It seems likely that here again the steeply dipping vein structure has branched out into a stockwork, although there may be some continuation of the steeply dipping structure beyond the southwest wall of the adit. The part of the stockwork mineralized with scheelite is about 75' long and 25' thick. By analogy with the stockworks in the upper workings, the width is expected to average 20' or 25'. The overall grade of the ore that has been crosscut is estimated to be 0.4 or 0.5% WO_3 , but small lenses of 2.0-3.0% WO_3 ore occur within the zone.

Lincoln Claim.--The scheelite ore body now being mined at the Lincoln claim is a bedding stockwork averaging between 5' and 6' thick. The commercial ore lies in the segment of the bed that is bounded by the two

steeply dipping silver veins shown on plate 1. Distribution of values is erratic, but 50 tons of sorted ore estimated to average 3% WO_3 have already been taken from the 40' adit driven along this bed. Fifty tons of waste rock from this operation average about 0.5% WO_3 . A few hundred tons of sorted ore may ultimately be taken from this bed. None of the other scheelite showings on the Lincoln claim appear to be of commercial size or grade.

Reserve of Scheelite Ore

Because of the very erratic and spotty distribution of scheelite within the stockwork zones, it is difficult to estimate reserve of ore with any certainty. The estimates of tonnage of high grade ore are especially apt to be in error.

It seems probable that the stockworks in the Chihuahua mine contain 20,000 tons of rock averaging 0.25% WO_3 . Of this, 5,000 tons may average 0.5% and 2,500 tons may average 0.75% WO_3 . Of ore that can be shipped, that containing 1.5% WO_3 or better, 50 tons are measured, 250 tons indicated, and 700 tons inferred.

On the Lincoln claim 20 tons of 2.0% WO_3 ore are measured, 30 tons are indicated, and 200 tons are inferred.

One thousand tons of dump rock on these two claims are estimated to average 0.5% WO_3 . From this, one or two hundred tons of 2.0% ore could probably be sorted.

The lessees have recently considered erecting a small mill at the property. To the writer this seems to be a hazardous undertaking in view of the uncertain, but probably rather small, reserve of mill grade ore (as a guess, 2500 tons averaging 0.75% WO_3), and in view of the silver-lead-

zinc impurity, which can probably be separated from the scheelite only by selective flotation. It would probably be better for the operators to continue to mine selectively only the high-grade parts of the mineralized stockworks.

Suggested Exploration.--The writer believes that it would be worthwhile for the lessees to drill with long steel into the walls and faces in the mineralized parts of the stockworks and into the floor and roof of the gently inclined lead stopes. This exploration might disclose small unknown lenses of high-grade ore. Furthermore, it will give a more reliable basis for the estimation of tonnage of mill grade ore.

SHAFT COLLAR



EXPLANATION

VERTICAL PROJECTION

PLAN

- LOCATED WORKINGS ON STEEPLY DIPPING SILVER VEINS
- APPROXIMATE POSITION WORKINGS ON STEEPLY DIPPING SILVER VEINS
- LOCATED WORKINGS IN STOCKWORKS AND LEAD STOPES
- APPROXIMATE POSITION WORKINGS IN STOCKWORKS AND LEAD STOPES
- SCHEELITE MINERALIZATION; CONCENTRATION OF DOTS SHOWS APPROXIMATE GRADE IN RANGE BETWEEN 0.1 - 5.0 % WO₃
- ROCK FILL

- CHIHUAHUA ADIT
- UPPER CHIHUAHUA WORKINGS
- MAIN UPPER WORKINGS; EL. BETWEEN 7160' AND 7185'
- SUB-LEVELS; EL. BETWEEN 7140' AND 7160'
- TUNGSTEN STOPE; EL. BETWEEN 7187' AND 7193'
- LEAD AND SILVER STOPES
- FIVE FOOT CONTOUR ON FLOOR OF WORKINGS
- FIVE FOOT VERTICAL CHANGE OF ELEVATION

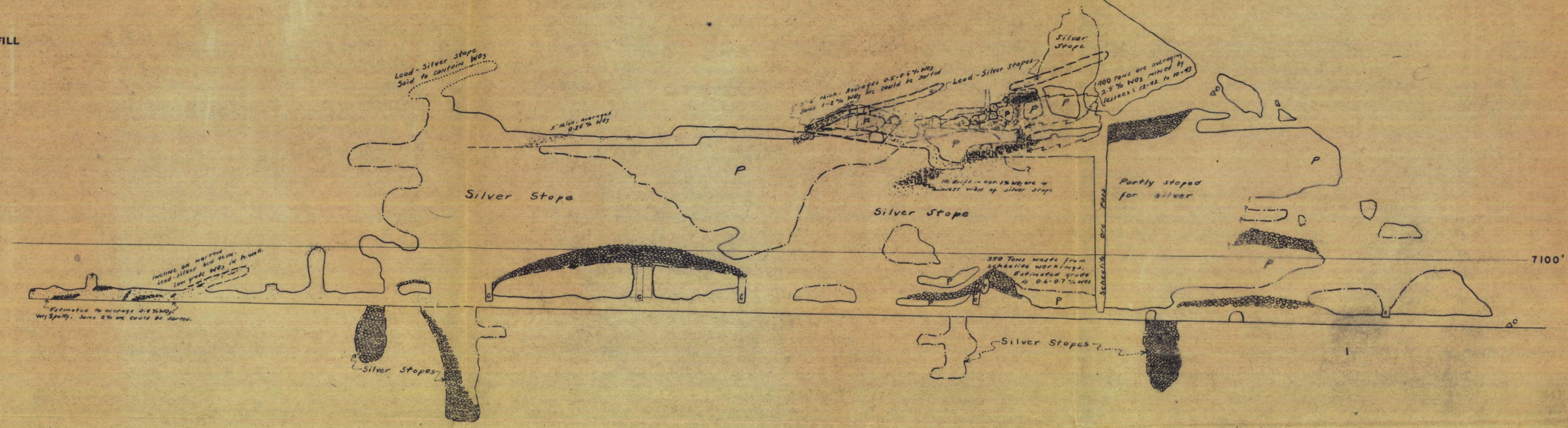
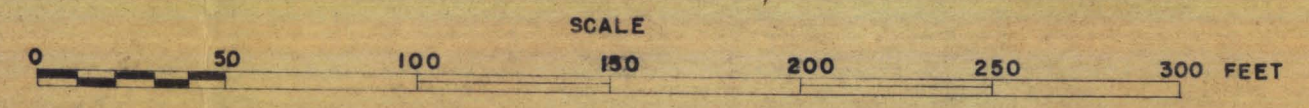
PLAN AND VERTICAL LONGITUDINAL PROJECTION

OF WORKINGS ON CHIHUAHUA CLAIM

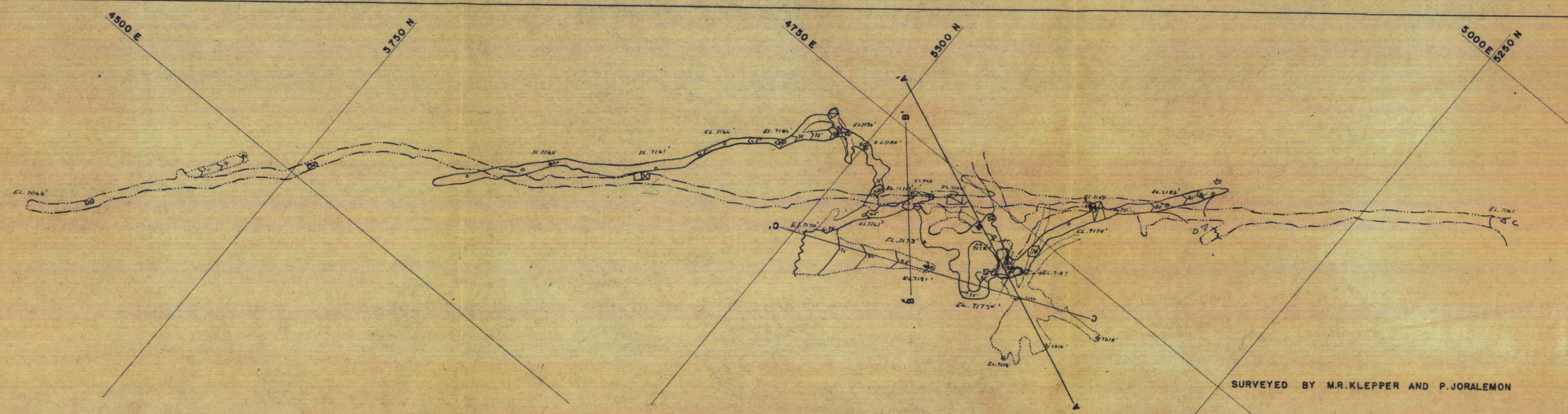
BAY STATE SILVER MINE

NEWARK MINING DISTRICT, WHITE PINE COUNTY, NEVADA

U.S. GEOLOGICAL SURVEY SEPTEMBER 1943



VERTICAL PROJECTION



PLAN

SURVEYED BY M.R. KLEPPER AND P. JORALEMON

GEOLOGIC PLANS AND SECTIONS
OF WORKINGS ON CHIHUAHUA CLAIM

BAY STATE SILVER MINE

NEWARK MINING DISTRICT, WHITE PINE COUNTY, NEVADA

U.S. GEOLOGICAL SURVEY

SEPTEMBER 1943

SCALE
0 50 100 150 200 FEET

EXPLANATION

LIMESTONE; MOSTLY SILICIFIED IN VICINITY
OF VEINS

SILVER-BEARING QUARTZ

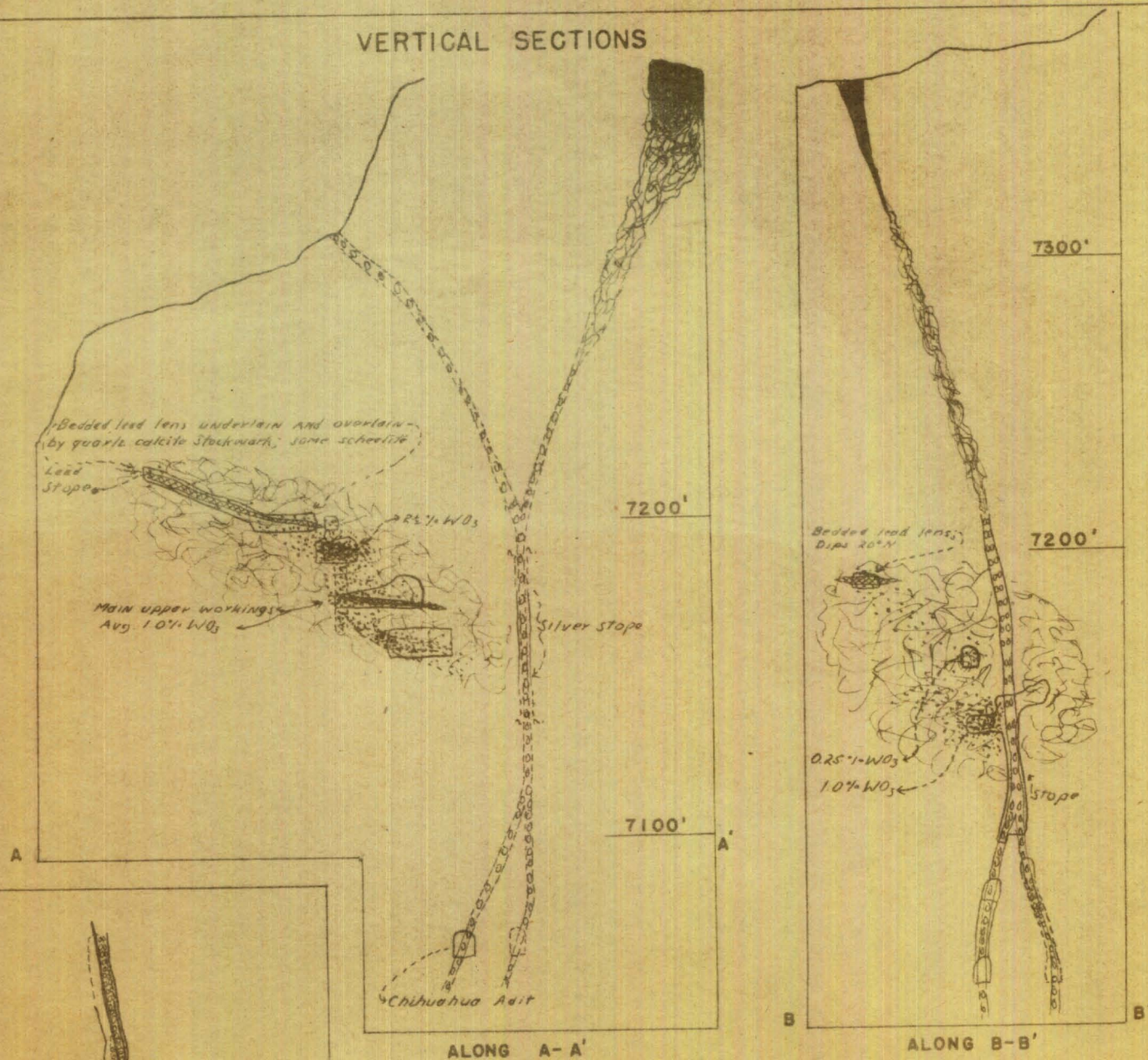
SHEARED OR BRECCIATED VEIN OR LIMESTONE;
DISPLACEMENT PROBABLY SLIGHT

STOCKWORK OF QUARTZ IN LIMESTONE

SCHEELITE MINERALIZATION; CONCENTRATION OF
DOTS SHOWS ESTIMATED GRADE IN RANGE
BETWEEN 0.1 AND 5.0% WO_3 REPLACEMENT BODIES OF GALENA IN
LIMESTONE

GEOLOGY BY M.R. KLEPPER AND P. JORALEMON

VERTICAL SECTIONS



ALONG A-A'

ALONG B-B'

C

C'

ALONG C-C'

CHIHUAHUA ADIT
EL. 7061'MAIN UPPER WORKINGS
EL. 7160'-7185'SUB-LEVELS
EL. 7140'-7160'UPPER TUNGSTEN STOPE 5400 N
EL. 7187'-7193'

GEOLOGIC PLANS