

WAR MINERALS REPORT*

Report of the Bureau of Mines to Secretary of the Interior, Harold L. Ickes

U.S. MINE
THE GOLD HILL MINE
TOOELE COUNTY, UTAH

Arsenic - Lead - Zinc

The Gold Hill mine is situated in the Clifton mining district, Tooele County, Utah. Gold Hill, the nearest settlement, is 1/2 mile north of the property and 56 miles southeast of Henderson, Utah, a station on the main line of the Western Pacific railroad.

The mine is owned by the United States Smelting, Refining, and Mining Company, and operated by this company under an agreement with the Metals Reserve Company. The urgent need of arsenic for War Department uses prompted opening the mine in 1943. The property is the only one in the western United States which is primarily a producer of arsenic. Approximately 100,000 tons of ore assaying 25 percent arsenic has been produced from the property and treated in smelters near Salt Lake City. Present ore reserves are sufficient for mining until February 1945, at a rate of 6,000 to 7,000 tons of ore per month. The mine will be forced to suspend operations on this date if additional ore reserves are not found.

The ores at the Gold Hill mine occur as replacement deposits in a roof pendant of the Ochre Mountain limestone. The pendant is enclosed by quartz monzonite, which has intruded the Ochre Mountain limestone and other sedimentary

* The War Minerals Reports of the Bureau of Mines are issued by the United States Department of the Interior to give official expression to the conclusions reached on various investigations relating to domestic minerals. These reports are based upon the field work of the Bureau of Mines and upon data made available to the Department from other sources. The primary purpose of these reports is to provide essential information to the war agencies of the United States Government and to assist owners and operators of mining properties in the production of minerals vital to the prosecution of the war.

rocks in the area.

The Bureau of Mines after examining the Gold Hill mine concludes that;

1. The ores at the property occur in a north-south zone in limestone.
2. Arsenic ores occur near the south end of the zone, and lead-zinc-silver ores at the north end of the zone.
3. Present ore reserves will permit production of arsenic ore from the property until February 1945.
4. Additional reserves of arsenic ore and also lead-zinc-silver ore may be found in faulted segments of the Oehre Mountain limestone near the 200-foot level.
5. Diamond drilling exploration appears to be the most feasible method for searching for additional ore reserves.
6. A diamond drilling program at the Gold Hill mine estimated at a cost of \$5,000 is warranted, to search for additional arsenic ores urgently needed by the War Department.
7. The proposed exploratory work should be done immediately to take advantage of company facilities, and to prove reserves before present reserves are exhausted.

Introduction

The Gold Hill mine, owned by the United States Smelting, Refining, and Mining Company of Salt Lake City, Utah, was examined in November 1944 by an engineer^{1/} of the Bureau of Mines accompanied by Mr. Leland A. Walker, manager of mines for the company. The purpose of the examination was to determine from underground and surface reconnaissance if approximately 1,000 feet of diamond drilling was justified in order to prove additional tonnages of arsenic and lead-zinc-silver ores.

^{1/} James A. Marsh, District Engineer.

History

The property of the Gold Hill mine of the United States Smelting, Refining, and Mining Company consists of 13 patented claims, which were obtained in 1924 by lease and bond agreements with J. J. Gerster and Graveli Chemical Company. Early development work was done on the Last Dollar claim by Mr. Gerster, and a small shipment of copper ore is reported to have been made. Arsenopyrite was discovered in commercial quantities during 1923. After the consolidation of the claims, the company continued the development work on the Last Dollar claim and adjacent claims. During the years 1924 and 1925, the company produced 12,153 tons of ore averaging 25.84 percent arsenic. The arsenic produced was used primarily as an insecticide in combating the Boll weevil scourge in the cotton belt. Several hundred tons of lead-zinc-silver ore were shipped from the mine in 1925 and 1926. The property was closed in 1926 because of depressed markets, and all equipment, supplies, and buildings were sold prior to July 31, 1930.

During March 1943, the company was appointed agent for the Metals Reserve Company to mine and ship arsenic ore for the immediate use of the War Department. A new surface plant was installed at the mine and the underground workings were rehabilitated in preparation for mining. Production began in July 1943, and from this date to the end of October 1944, 87,776 wet tons of arsenic ore were shipped to the treatment plants.

Physical Features and Communications

The Gold Hill mine is situated in the Clifton mining district, Tooele County, Utah, near the north end of the Deep Creek Mountains. The elevation is approximately 5,400 feet above sea level. The area is one of medium relief, with drainage toward the Great Salt Lake Desert to the northeast. The region is arid, and the climate is typical of other sections of the Great Basin.

The mine is located approximately 1/2 mile south of Gold Hill, a settlement

with a population of 100 people. Bendover, Utah, on the Western Pacific railroad, is 56 miles northwest of Gold Hill. A recently completed mine access road, 28 miles long, connects Gold Hill with U.S. Highway 50, at a point 28 miles southwest of Bendover.

The ore is trucked to Bendover and loaded in railroad cars for shipment to the treatment plants near Salt Lake City. The mine may be operated throughout the year as the weather seldom becomes too severe for normal operations.

Labor and Living Conditions

On the date of the examination 40 men were employed at the mine. Labor has been recruited locally and also imported from other United States Smelting, Refining, and Mining Company properties. The daily wage is \$7.65 a day for both miners and packers. The ore is trucked to the railroad on a contract basis at an average rate of \$.05 per ton miles.

The company has erected a bunkhouse, mess hall, and recreational facilities for the employees at Gold Hill. Trailer houses have been brought in under a Federal housing project, to care for extra housing requirements.

Culinary water for the Gold Hill mine is supplied from a spring owned by the mining company. The spring is located approximately 7,000 feet southwest of the mine. The water is piped to a reservoir by means of a 1 1/2 inch galvanized pipe line.

Supplies and commodities may be purchased in Bendover or Salt Lake City.

Property of the United States Smelting, Refining and Mining Company

The property holdings of the company consists of 13 patented claims, 12 being in a contiguous group surrounding the mine, and 1 covering the spring development and source of culinary water. The total acreage in the mining group is 143.737 acres and in the Spring Hill Lode, 19.386 acres, or a total of 163.123 acres. The claims are located in the Clifton mining district, about 1/2 mile

south of Gold Hill and specifically in section 1, Township 8 South, Range 18 West, unsurveyed, S.L.S. & M., Tooele County, Utah.

Description of the Deposits

The prevailing country rocks in the vicinity of the Gold Hill mine are of igneous and sedimentary origin. See figs. 3, 4, 5, and 6. The sedimentary rocks consist of the Ochre Mountain limestone, the Manning Canyon formation, and the Oquirrh formation all of Carboniferous age^{2/}. The sedimentary rocks have been intruded by a mass of quartz monzonite, and the sediments remain as roof pendants enclosed by the quartz monzonite. The Ochre Mountain limestone is composed chiefly of massively bedded limestone with a thin bed of shale toward the bottom of the formation. The Manning Canyon formation, consisting of black shale and dark colored quartzite lies stratigraphically above the Ochre Mountain limestone. The Oquirrh formation, lying above the Manning Canyon formation is composed essentially of thin bedded limestone and quartzite. The sedimentary rocks vary in strike from north-south to N 30° W, and dip 55° to the east. The average strike of the beds within the ore body is N 18° W.

The ores at the Gold Hill mine occur as replacement deposits in the upper 175 feet of the Ochre Mountain limestone roof pendant. The walls of the ore body are not well defined except where quartz monzonite or post-mineral faulting limits the ore. On the N level arsenic and lead-zinc-silver sulfide ores extend for more than 300 feet along the strike of the limestone beds. Most of the production has been derived from the south end of the ore zone, where the arsenic content of the sulfide ore is greater than at the north end. The lead, zinc, and silver content of the ore is greater toward the north end of the ore zone.

^{2/} Nolan, T.S., The Gold Hill Mining District, Utah U.S.G.S. B.P. 177, 1935

The Ochre Mountain limestone is slightly more than 200 feet thick where exposed by the H level crosscut. The entire section of the limestone has been affected by contact metamorphic solutions resulting from the intrusion of the quartz monzonite. Typical contact minerals occur along the contact of the Ochre Mountain limestone and quartz monzonite, a short distance east of the H. level portal. Weak copper mineralization is also present along this contact. It appears that the origin of the arsenic-lead-zinc mineralization is related to the intrusion of the quartz monzonite.

A strong normal fault striking near east-west and dipping south, and exposed south of the portal of the main adit, has faulted the Oquirrh formation across the Ochre Mountain limestone-Manning Canyon formation contact. This fault is exposed in the most southerly workings of the H level, where it terminates the beds of the Ochre Mountain limestone. The fault passes over the back of the main slope at a near right angle to the strike of the ore zone. It is not clear whether this fault is a pre-mineral or post-mineral fault, but the magnitude of the movement prevents any small-scale exploration to the south of present workings and on the hanging wall side of the fault.

A second fault of probable normal movement, is exposed on the 200-foot level in the northeast crosscut, north of the shaft. This fault strikes N 50° W, dips 57° to the southwest, and cuts the massive sulfide ore body. The limestone in the footwall of the fault is garnetized and highly silicified, and probably represents a metamorphosed section of the Ochre Mountain limestone. The dip slip on this fault is assumed to be approximately 135 feet as shown in the section, fig. 5.

A third prominent fault cuts the beds near the end of the most easterly workings on the 200-foot level, and separates the sedimentary rocks from the main mass of the quartz monzonite occurring east of the mine. The fault strikes

N 50° W and dips 40° to the southwest. The footwall is quartz monzonite. The movement on the fault appears to have been normal, and if this is true, exploration in the footwall will only disclose quartz monzonite. Quartz monzonite also forms the footwall of the fault at the surface, indicating that the faulted section of the limestone has been removed by erosion.

Mine workings

The mine has been developed by the main adit, H level, with approximately 1,000 feet of drifts and crosscuts; the 100 foot level, 14 feet vertically above the H level; and the 200-foot level, 106 feet vertically below the H level. This level consists of approximately 450 feet of drifting and crosscutting. The 3 levels are connected by an inclined winze. A 100-foot shaft connects the 100-foot level with the surface.

The Ores

There are two classes of ore occurring in the main ore zone at the mine, arsenic ore and lead-zinc-silver ore containing arsenic. The arsenic ore is found at the south end of the zone and the lead-zinc-silver ore at the north end. The primary arsenic ore consists of arsenopyrite, associated with minor quantities of pyrite, sphalerite, chalcopyrite, jamesonite, and pyrrhotite, and abundant fine-grained quartz. Near the surface this ore has been oxidized and consists chiefly of massive green scorodite associated with fine-grained quartz. The primary lead-zinc-silver ore, as exposed on the 200-foot level consists essentially of galena, jamesonite, sphalerite, pyrite, chalcopyrite, arsenopyrite, associated with quartz and calcite. The oxidized lead-zinc-silver ore occurring on the H level contains jarosite, cerusite, and scorodite.

Ore Reserves

The United States Smelting, Refining, and Mining Company engineers estimated that ore reserves remaining in the mine at the date of the examination were

12,000 to 15,000 tons of ore assaying 20 to 23 percent arsenic.

Equipment

The mine plant at the property consists of a Diesel driven compressor of 1,800 cubic feet capacity, air driven hoists, air drills and smaller equipment to maintain a daily production rate of 200 tons of ore.

Plans for Company Operations

The mining company plans to continue mining arsenic ores for production of arsenic for the War Department, until reserves are exhausted. Present reserves will enable the company to mine ores until February 1945. If additional ore reserves are indicated by the proposed diamond drilling program the mine will continue operation.

Exploration Proposed by the Bureau of Mines

The sulfide ore body exposed in the northeast crosscut on the 200-foot level north of the shaft, has been truncated by a fault of probable normal movement. It appears that this fault is post-mineral, and if this is true, the faulted segment may be found with a minimum of diamond drilling. Additional ore may also occur along the strike and dip of the ore zone on the hanging wall side of the fault.

It is proposed that 7 holes ranging in depth from 75 to 150 feet, and totalling approximately 1,000 feet, be drilled from the 200-foot level to search for possible segments of the sulfide ore body, and to explore the ore zone along the strike and dip. The proposed hole locations are as follows:

Hole 1 Coordinates 5302N, 5250E
 Bearing S67°E
 Inclination Minus 10°
 Depth 135 feet

This hole will be drilled to explore the ore zone along the dip.

Hole 2 Coordinates 5401N, 5337E
 Bearing N83°E
 Inclination plus 30°
 Depth 75 feet

If hole 1 is successful hole 2 will be drilled to cut the ore zone along the strike.

Hole 3 Coordinates 5294S, 5241E
Bearing N33°E
Inclination plus 3°
Depth 80 feet

Hole 3 will be drilled to cut the extension of the fault and also to ascertain if ore exists in the hanging wall of the fault, to the north of present workings.

Hole 4 Coordinates 5261S, 5320E
Bearing N25°W
Inclination plus 3°
Depth 125 feet

Hole 5 Coordinates 5261S, 5320E
Bearing N36°E
Inclination plus 30°
Depth 180 feet

Holes 4 and 5 will be drilled from the same location to ascertain if ore exists along the strike of the ore zone in the footwall of the fault cutting the zone. Hole 5 will cut the Ochre Mountain limestone in the hanging wall of the fault which separates this formation from the quartz monzonite near the east end of the 200-foot level.

Hole 6 Coordinates 5276S, 5400E
Bearing N65°E
Inclination plus 45°
Depth 150 feet

Hole 7 Coordinates 5276 S, 5400E
Bearing S77°E
Inclination plus 36°
Depth 120 feet

Holes 6 and 7 will be drilled to explore the Ochre Mountain limestone in the hanging wall of the fault which separates this formation from the quartz monzonite near the east end of the 200-foot level.

The 7 holes as proposed total 865 feet. It is recommended that an appropriation sufficient to permit drilling a total of 1,000 feet be made,

for additional footage may be warranted depending upon the results of the planned holes. The cost of the drilling is estimated as follows:

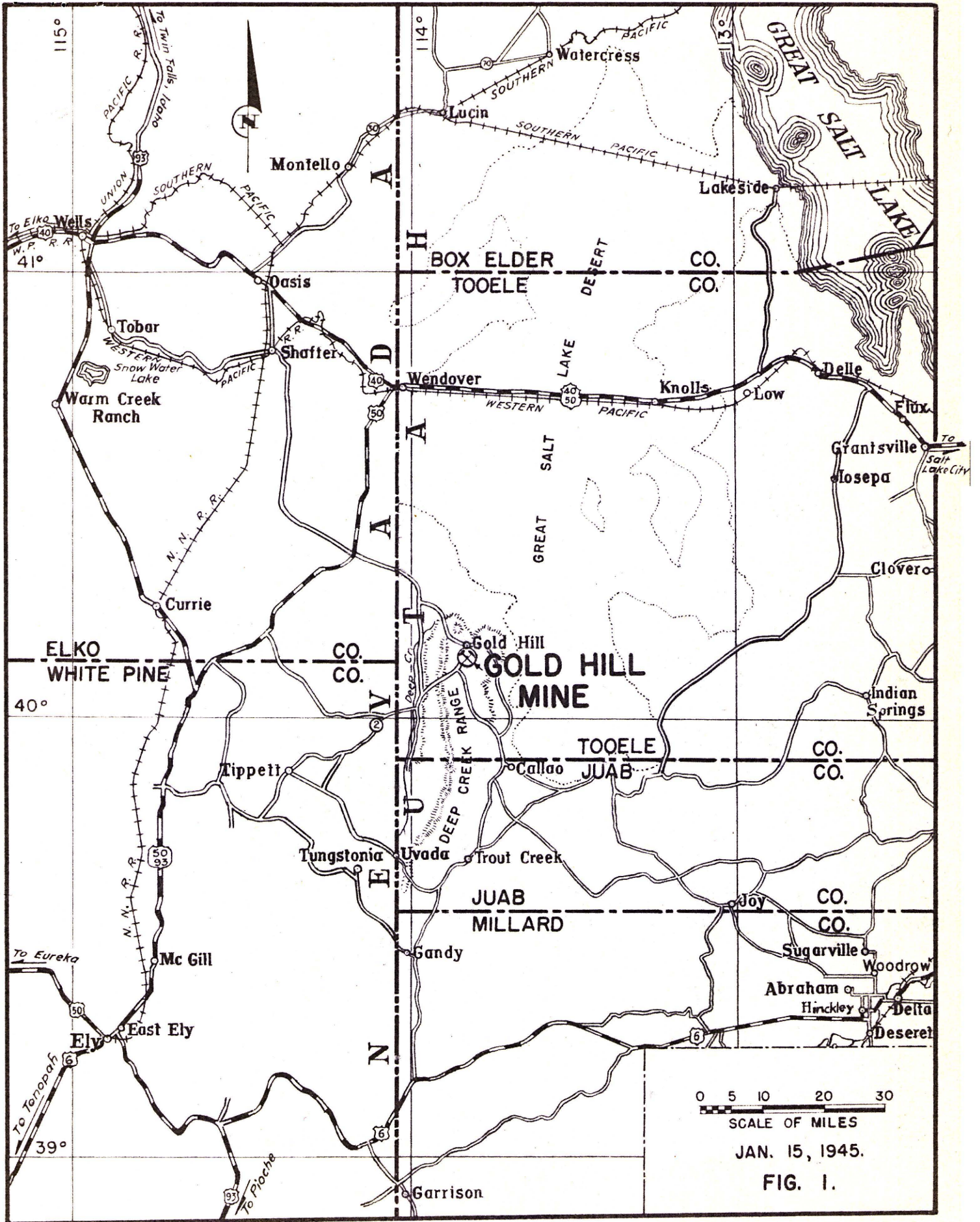
1,000 feet of drilling @ \$4.00 per foot	\$4,000
Supervision, sampling, and travel -----	<u>1,000</u>
	\$5,000

It is estimated that the exploratory work will require two months for completion.

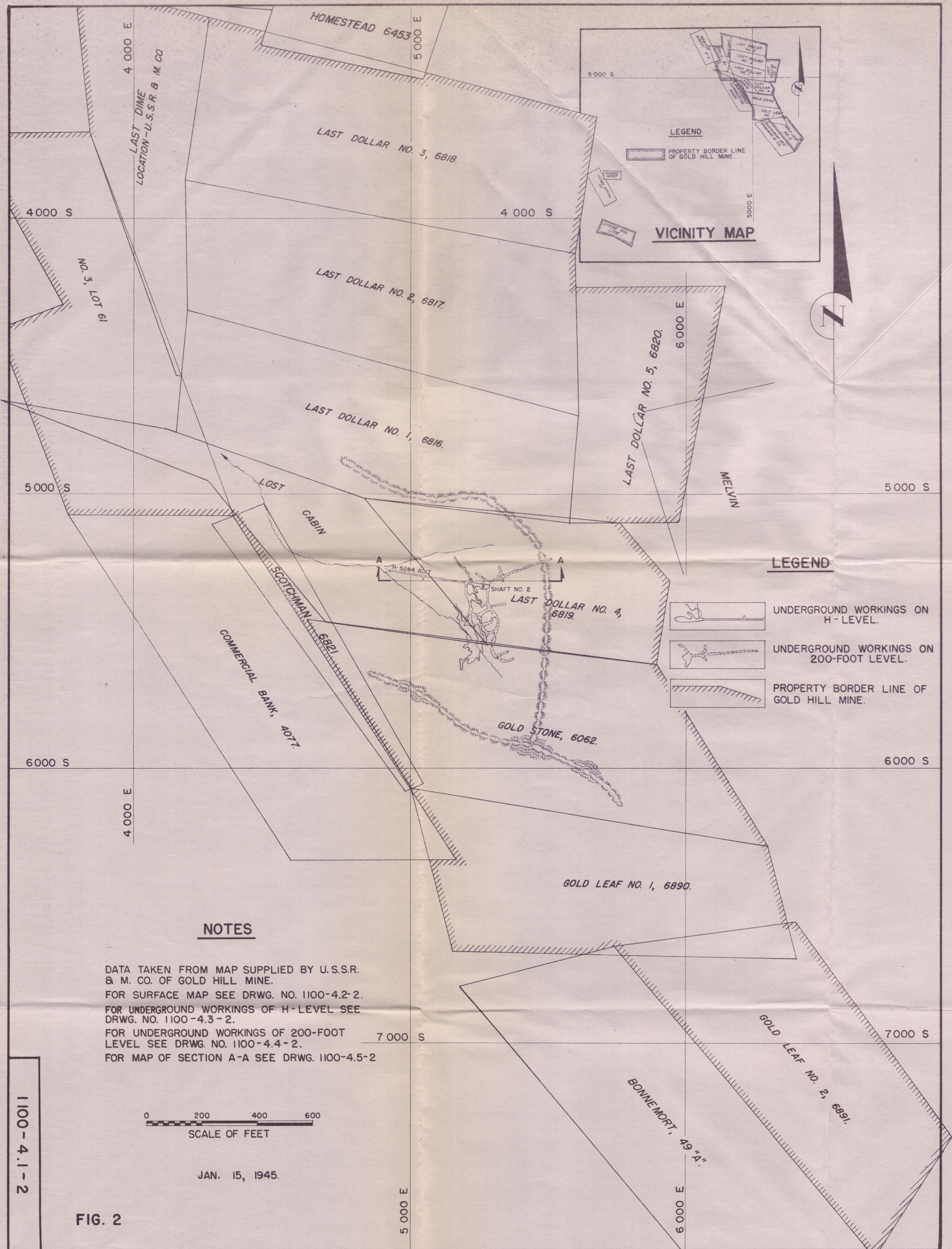
Conclusions

After examining the Gold Hill mine, the Bureau of Mines concludes that:

1. The ores at the property occur in a north-south zone in limestone.
2. Arsenic ores occur near the south end of the zone, and lead-zinc-silver ores near the north end of the zone.
3. Present ore reserves will permit production of arsenic ore from the property until February 1945.
4. Additional reserves of arsenic ore and also lead-zinc-silver ores may be found in faulted segments of the Ochre Mountain limestone near the 200-foot level.
5. Diamond drilling exploration appears to be the most feasible method for searching for additional ore at the property.
6. A diamond drilling program, estimated at a cost of \$5,000, is warranted, to search for additional arsenic ores urgently needed by the War Department.
7. The proposed exploratory work should be done immediately to take advantage of company facilities, and to prove reserves before present reserves are exhausted.



Vicinity Map of Gold Hill Mine, Tooele County, Utah.



1100-4.1-2

NOTES

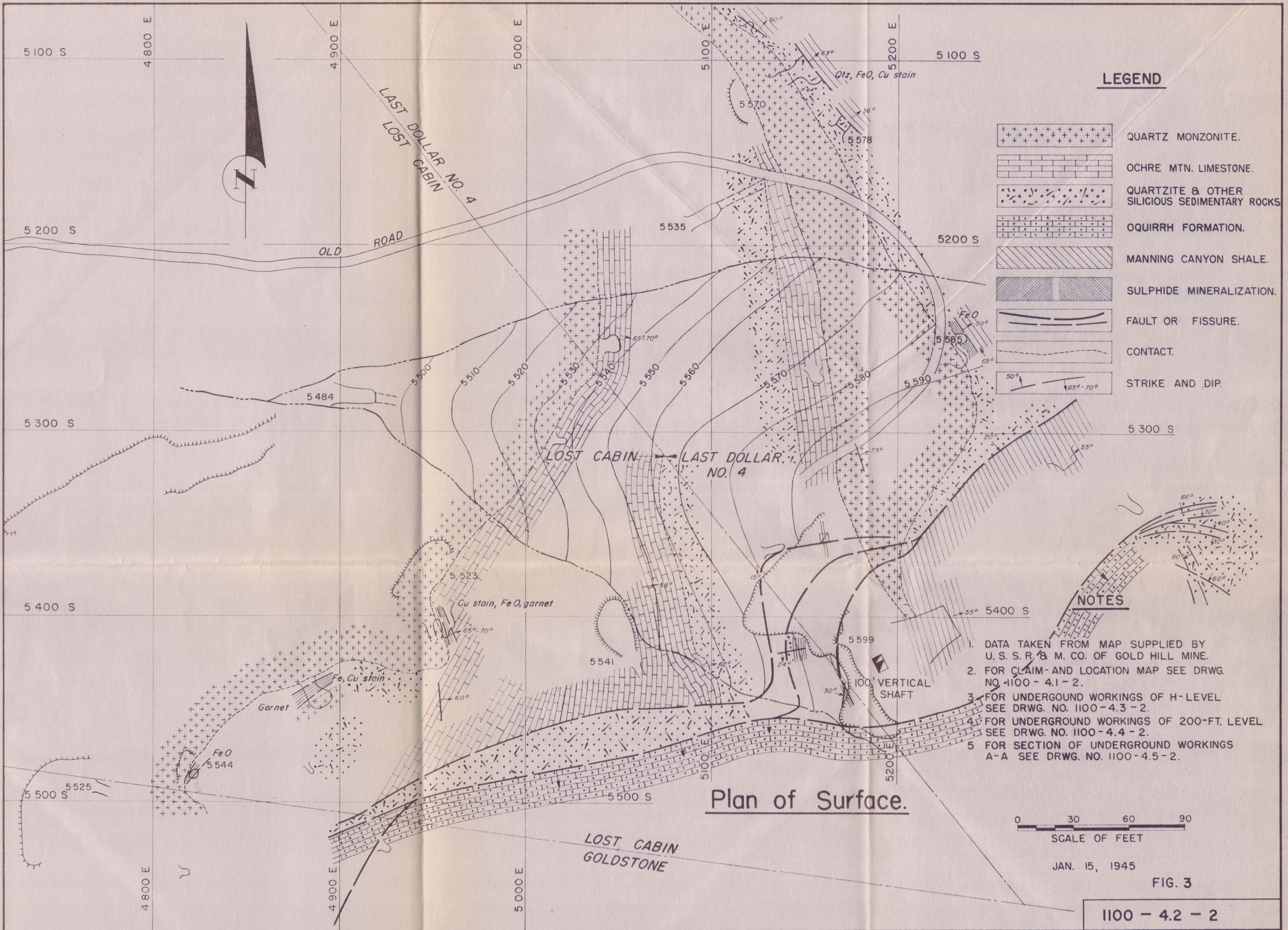
DATA TAKEN FROM MAP SUPPLIED BY U.S.S.R. & M. CO. OF GOLD HILL MINE.
 FOR SURFACE MAP SEE DRWG. NO. 1100-4.2-2.
 FOR UNDERGROUND WORKINGS OF H-LEVEL SEE DRWG. NO. 1100-4.3-2.
 FOR UNDERGROUND WORKINGS OF 200-FOOT LEVEL SEE DRWG. NO. 1100-4.4-2.
 FOR MAP OF SECTION A-A SEE DRWG. 1100-4.5-2

0 200 400 600
 SCALE OF FEET

JAN. 15, 1945.

FIG. 2

Claim and Location Map of Gold Hill Mine, Tooele County, Utah.



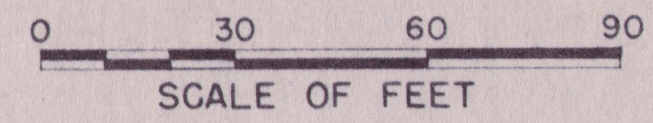
LEGEND

- QUARTZ MONZONITE.
- OCHRE MTN. LIMESTONE.
- QUARTZITE & OTHER SILICIOUS SEDIMENTARY ROCKS.
- QUIRRH FORMATION.
- MANNING CANYON SHALE.
- SULPHIDE MINERALIZATION.
- FAULT OR FISSURE.
- CONTACT.
- STRIKE AND DIP.

NOTES

1. DATA TAKEN FROM MAP SUPPLIED BY U. S. S. R. & M. CO. OF GOLD HILL MINE.
2. FOR CLAIM- AND LOCATION MAP SEE DRWG. NO. 1100 - 4.1 - 2.
3. FOR UNDERGROUND WORKINGS OF H-LEVEL SEE DRWG. NO. 1100 - 4.3 - 2.
4. FOR UNDERGROUND WORKINGS OF 200-FT. LEVEL SEE DRWG. NO. 1100 - 4.4 - 2.
5. FOR SECTION OF UNDERGROUND WORKINGS A-A SEE DRWG. NO. 1100 - 4.5 - 2.

Plan of Surface.



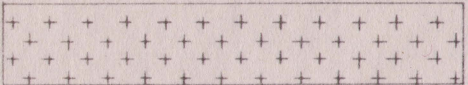
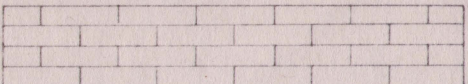
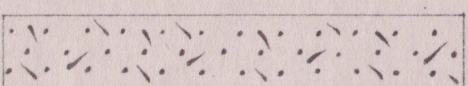
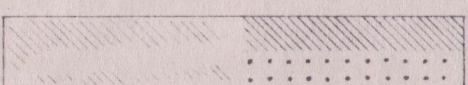
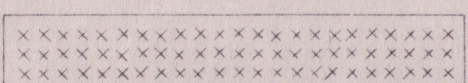
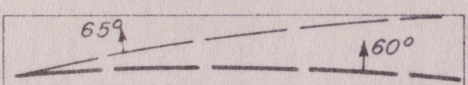
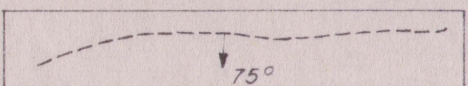
JAN. 15, 1945

FIG. 3

1100 - 4.2 - 2

Surface Map of Gold Hill Mine, Tooele County, Utah.

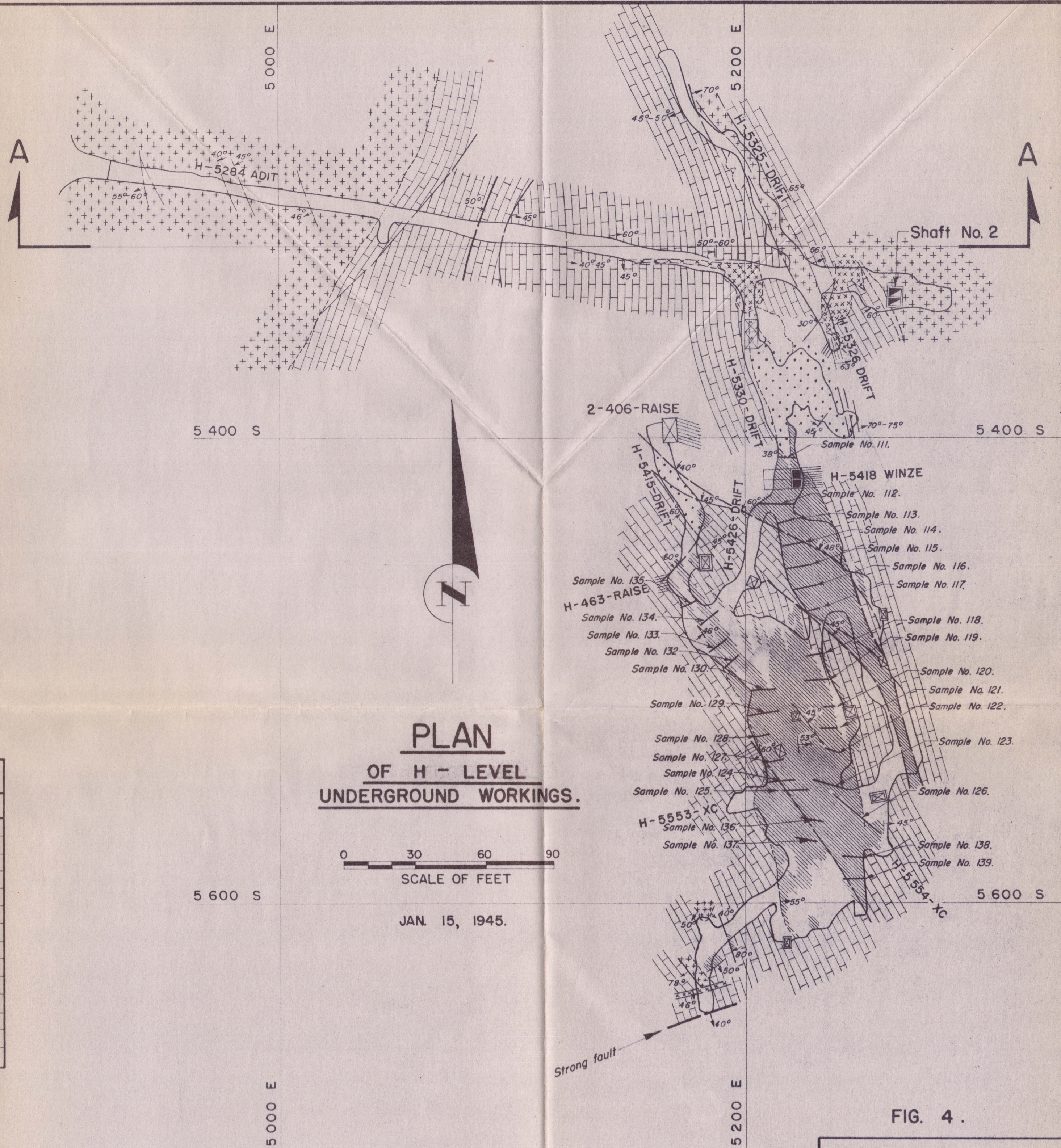
LEGEND

-  QUARTZ MONZONITE.
-  OCHRE MTN. LIMESTONE.
-  QUARTZITE AND OTHER SILICIOUS SEDIMENTARY ROCKS.
-  SULPHIDE ORE. OXIDIZED ORE.
-  QUARTZ PORPHYRY.
-  FAULT AND FISSURE WITH STRIKE AND DIP.
-  CONTACT WITH STRIKE AND DIP.

NOTES

1. DATA TAKEN FROM MAP SUPPLIED BY U. S. S. R. & M. CO. OF GOLD HILL MINE.
2. FOR CLAIM- AND LOCATION MAP SEE DRWG. NO. 1100-4.1-2.
3. FOR SURFACE MAP SEE DRWG. NO. 1100-4.2-2
4. FOR UNDERGROUND WORKINGS OF 200-FT. LEVEL SEE DRWG. NO. 1100-4.4-2
5. FOR SECTION OF UNDERGROUND WORKINGS A-A SEE DRWG. NO. 1100-4.5-2.

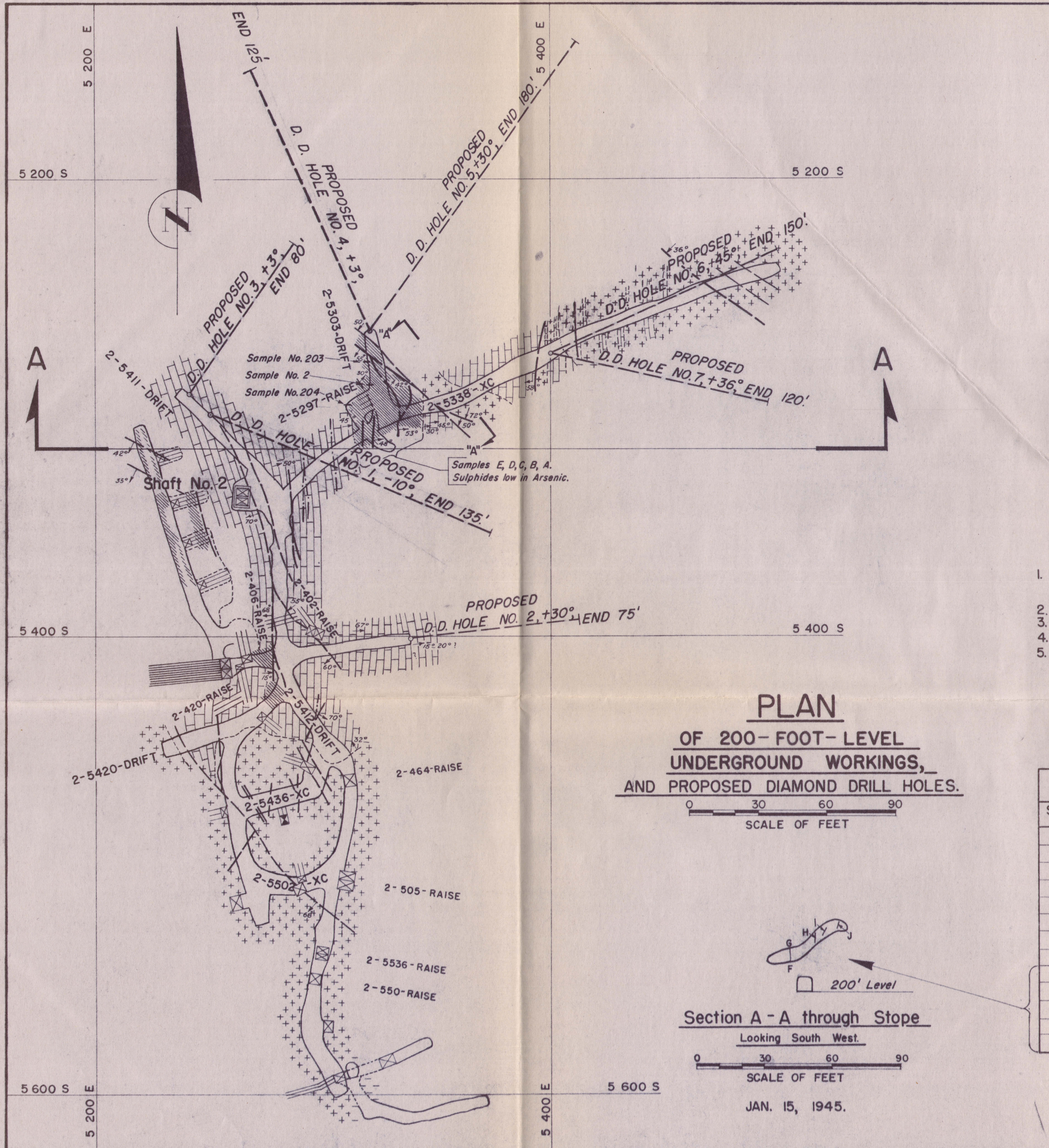
ASSAYS ON H-LEVEL							
SAMPLE NO.	WIDTH FEET	As, %	S, %	SAMPLE NO.	WIDTH FEET	As, %	S, %
111	5.25	27.31	14.2	125	7.2	21.44	10.3
112	14.7	26.9	12.9	126	16.0	34.45	15.6
113	5.7	26.55	12.8	127	5.2	20.32	9.0
114	8.6	28.46	11.9	128	3.9	27.34	11.4
115	7.1	26.52	11.9	129	9.3	22.90	8.9
116	7.2	25.73	10.9	130	7.0	28.41	11.7
117	3.9	14.93	9.2	132	4.0	23.22	12.2
118	6.4	34.74	15.4	133	9.3	27.44	12.2
119	9.4	28.09	13.3	134	8.1	23.40	8.9
120	2.2	25.73	14.5	135	6.4	24.30	9.9
121	5.3	33.12	14.2	136	4.8	25.14	12.0
122	7.2	33.47	16.3	137	6.0	18.03	10.3
123	9.7	24.91	13.3	138	7.7	36.40	16.1
124	8.1	16.93	9.5	139	7.2	22.75	17.3



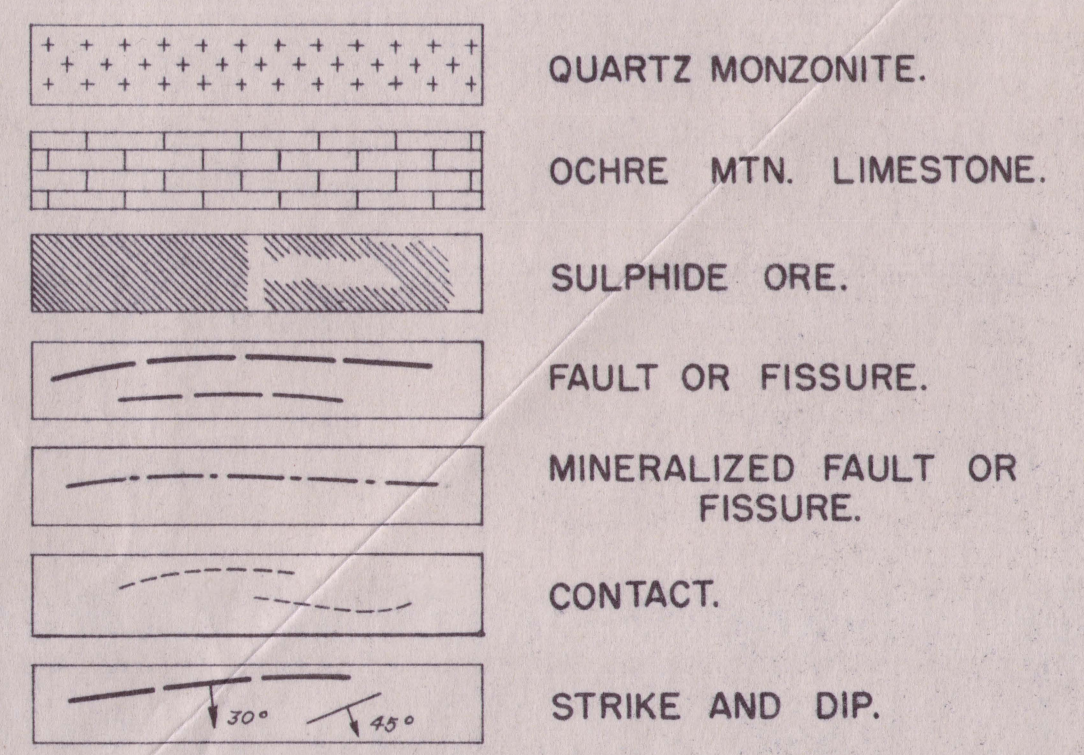
**PLAN
OF H-LEVEL
UNDERGROUND WORKINGS.**

FIG. 4.

1100 - 4.3 - 2



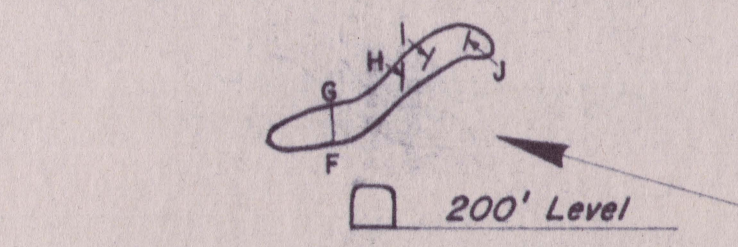
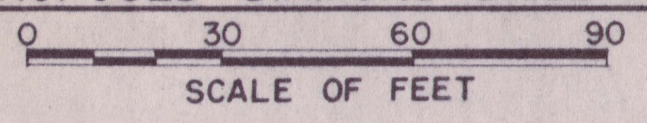
LEGEND



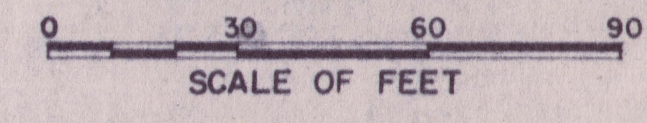
NOTES

1. DATA TAKEN FROM MAP SUPPLIED BY U.S.S.R. & M. CO. OF GOLD HILL MINE.
2. FOR CLAIM AND LOCATION MAP SEE DRWG. NO. 1100-4.1-2.
3. FOR SURFACE MAP SEE DRWG. NO. 1100-4.2-2.
4. FOR MAP OF SECTION A - A SEE DRWG. NO. 1100-4.5-2.
5. FOR UNDERGROUND WORKINGS OF H-LEVEL SEE DRWG. NO. 1100-4.3-2.

**PLAN
OF 200-FOOT-LEVEL
UNDERGROUND WORKINGS,
AND PROPOSED DIAMOND DRILL HOLES.**



**Section A - A through Stope
Looking South West.**

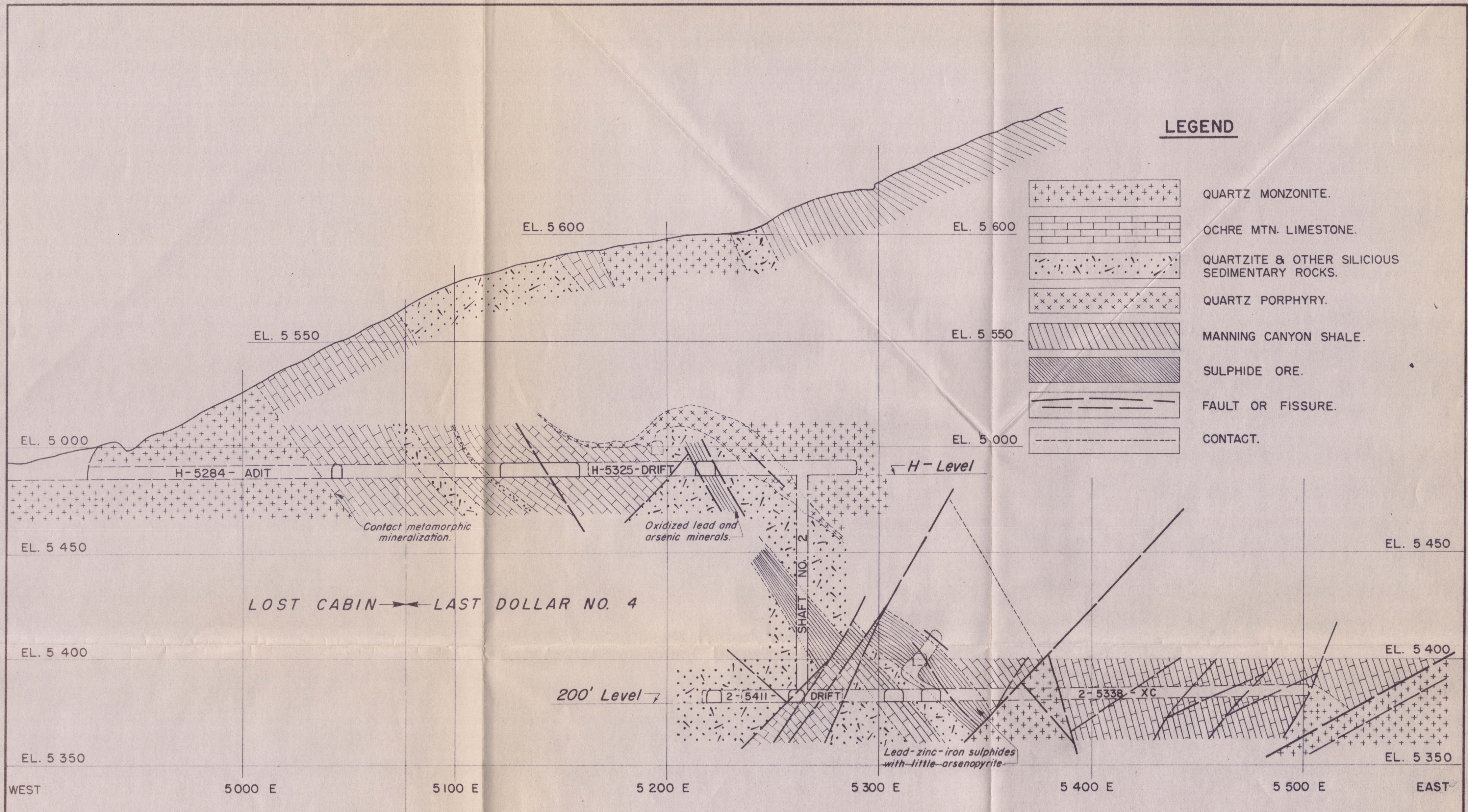


JAN. 15, 1945.

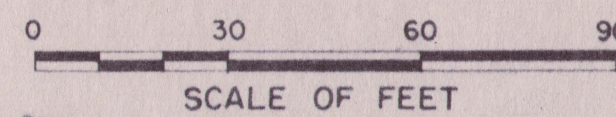
Assays on 200-Foot Level							
SAMPLE NO.	WIDTH FEET	Au,oz.	Ag,oz.	Pb,%	Zn,%	As,%	S,%
2	6.5	0.02	4.9	2.5	4.6	7.32	22.9
203	5.8	0.015	2.9	3.0	2.4	10.27	24.1
204	4.8	0.02	4.5	4.6	8.6	2.92	39.4
A	5.0	0.015	1.9	2.2	4.9	3.69	20.0
B	3.0	0.02	7.6	8.8	14.8	1.76	31.5
C	5.0	0.02	9.2	4.7	12.5	2.92	36.6
D	5.0	0.02	6.4	2.2	4.9	3.41	37.9
E	5.0	0.025	7.0	2.8	4.0	8.41	32.4
F	5.0	0.015	2.7	3.8	5.0	2.04	39.9
G	2.0	0.015	3.5	-	-	1.40	19.9
H	4.8	0.01	3.0	1.0	3.4	3.69	28.9
I	5.0	0.01	3.6	1.3	1.9	0.77	31.4
J	4.5	0.01	0.2	-	-	0.28	12.1

FIG. 5.

1100 - 4.4 - 2



Section A - A



JAN. 15, 1945.

NOTES

1. DATA TAKEN FROM MAP SUPPLIED BY U. S. S. R. & M. CO. OF GOLD HILL MINE.
2. FOR CLAIM - AND LOCATION MAP SEE DRWG. NO. 1100-4.1-2.
3. FOR SURFACE MAP SEE DRWG. NO. 1100-4.2-2.
4. FOR UNDERGROUND WORKINGS OF H-LEVEL SEE DRWG. NO. 1100-4.3-2.
5. FOR UNDERGROUND WORKINGS OF 200 LEVEL SEE DRWG. NO. 1100-4.4-2.

FIG. 6.

1100 - 4.5 - 2

Section of Underground Workings at H-Level & 200-Level of Gold Hill Mine, Tooele County, Utah.