



CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

The following file is part of the G. M. Colvocoresses Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

(COPY)

DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING
FAIR GROUNDS
PHOENIX, ARIZONA

HERSHEY & WHITE
Consulting Engineers
Crocker Bldg. - San Francisco

GEOLOGICAL REPORT ON

RESOLUTION MINE

BY OSCAR H. HERSHEY

San Francisco, Calif.
February 16, 1932.

Dr. Henry D. Lloyd:
364 I.W.Hellman Bldg.,
Los Angeles, California.

Dear Sir:

During the past nine days I have made a geological study of the Resolution (formerly known as Sheeptanks) mine in Yuma County, Arizona. The first day was spent with the manager, Mr. Ben R. Binns, in a reconnaissance of the mine workings and a portion of the surface to learn the problems and plan the work. During the next day and half the underground workings of the Resolution mine were studied in detail. Five and one half days were then given to mapping an area about 3500 x 4000 feet on a scale of 100 feet to the inch, using a base-map prepared by the engineering department. Mr. Jack Binns assisted me in the field work, and displayed an unusual acquaintance with the gold and silver contents and other features of the property now being developed by the Anozira Mining & Milling Company. My trip also coincided with a visit by the managing director, Mr. Edwin W. Mills, to whom I am indebted for general information in conjunction with that also given me by Mr. Ben R. Binns. The last day was spent by Mr. Binns and me in a visit to the recent strike at Santa Claus and a reconnaissance thence back to the Black Eagle mine.

To assure rapid reproduction I colored my field map and turned it over to the engineering department at the mine and I have been assured that a copy will reach you at about the same time as this report. If I undertook to describe every detail I would have a book and I believe you will get a more lucid picture of the geology of the property if I will confine my report largely to the discussion of the broader features of the map. Mr. Mills and I agreed that without access to complete assay maps I cannot make a tonnage estimate of the developed ore and this will be strictly a geological report. I may remark, however, that I have gained a very favorable impression of the property as a mining proposition.

The names I am applying to the rocks are such as one will use temporarily on a field study and are subject to some modification. I understand that Professor William Rand has collected an extensive suite of specimens which he is now working up by thin-sectioning and microscopic study, and he will give us the correct names for the formations. In the meantime the general character of the formations and structural relations are made clear by the map.

In the map I have used colors for eleven distinct features. They range in age from the youngest at the top to the oldest at the bottom. Thus the oldest formation seen by me is a white rhyolite of apparent general massive structure though there are traces of flow structure in places. I have no idea how thick it is, nor what is under it. But at one stage it had a comparatively flat surface and there flowed over this surface more basic lava that consolidated as the extrusive andesite. This was originally of a gray color, but now it weathers to a deep reddish brown. It is characterized by feldspar phenocrysts of two kinds, one lath-shaped and the other more nearly cubical. Near the bottom of the extrusive andesite the phenocrysts seem to be smaller than higher and Professor Rand will probably tell us whether this represents a separate, relatively thin sheet or merely the chilled border of a thick flow. At any rate, a thin gouge seam was developed in the andesite

about 40 to 50 feet above the floor. At a somewhat higher level there are lenses of what I have mapped as a limestone bed because it constitutes a sort of marker in the rocks. From its mode of weathering it is evidently rich in calcite, stained dark gray by manganese oxide, and in many places it is seamed with quartz and carries a little gold and silver, although not in commercial quantities. I must admit that similar material in a less definite form occurs at various places in the andesite areas and is evidently secondary in nature and not a true limestone.

The scenery is now set for the important event. At some place, the discovery of which was the chief problem assigned to me by Mr. Binns, hot mineral-bearing solution came up through the rhyolite in one or more fissures and in a certain area traveled in a general way along the rhyolite-andesite contact and formed the Resolution vein. The little gouge seam mentioned above as being 40 to 50 feet above the contact had a damming effect on the solution and caused the strongest vein action immediately under it. Thus the top of the Resolution vein is relatively even, but the bottom is very uneven, because the vein extends down from 1 to 40 feet into the andesite that underlies the gouge seam. Within the vein the andesite was practically completely replaced by silica. Much of the quartz is fine in grain and white in color. The Resolution vein is also rich in a pale yellowish, fine-grained quartz which may contain adularia. What I should say is that such appearing quartz in Tertiary volcanic rocks usually contains adularia as proved by the microscope. Also, such veins are frequently rich in gold.

Another gangue mineral present in the Resolution vein is barite. I could not determine whether it is younger or older than the quartz. Some portions of the quartz are pseudomorph after some bladed or cleavable mineral, which in most ~~mineral~~ veins of this class was calcite. Professor Rand will doubtless clear up all problems regarding the paragenesis of the vein. An unusual feature is a large amount of manganese oxide which Mr. Binns says is chiefly pyrolusite. This is secondary in origin and it is a puzzle as to what was the original manganese mineral. All portions of the vein are thoroughly oxidized. I have three guesses as to the primary manganese mineral, namely, rhodochrosite, rhodonite and mannosiderite. Perhaps Professor Rand by a study of the cavities, can determine which mineral was present.

There seems to be some difference in the distribution of the gold and silver. The richest gold ore has considerable limonite in irregular cavities. The gold may ~~mineral~~ be seen in grains in this limonite and also embedded in the solid quartz in the vicinity. I would like to think that the limonite was derived from pyrite, but again I am reminded of the possibility of the former presence of manganosiderite. That mineral would account for the large quantities of iron and manganese oxides in the vein. The silver is said to go more with the manganese oxide. That may mean that the silver is largely secondary in its present distribution and has migrated with the manganese mineral.

Shipments of ore and assays indicate the invariable presence of small quantities of lead and copper. Presumably they were derived from galena and chalcopyrite. The only galena seen in what I have mapped as the Lead vein, in the andesite above the Resolution vein horizon. It has been developed along a small fault fissure and is relatively rich in visible barite. I have been told that the original work on the Sheep Tanks mine was done on this small vein and yielded lead-silver ore. The discovery of the gold ore in the property is quite recent in time. The lead vein is distinct from the Resolution vein. The galena in the latter may have been quite fine in grain.

In fact, I may go so far as to suggest that this vein has unusual characters and its sulphides may have been in part rather rare combinations of lead, copper and other metals. I believe Mr. Mills told me that a complete chemical analysis of the ore is being made. Between it and what Professor Rand can see through the microscope we may get a clue to the original minerals. If not, we must wait till we have developed the Black Eagle vein down into the unoxidized zone.

However, the above speculations have little connection with the purpose of my work which was to help to find more ore. If you will now glance at the map you will note that the central portion is characterized by great complexity and the border portions of relative simplicity. The red strips that mark the outcrops of the Resolution vein are also confined to this central portion. A nearly straight line may be drawn from the most south-easterly outcrop at a little tunnel on the south line of Resolution No.1 claim, on a course about N.25 de. E. magnetic, via the powder house, guest house and thence on to the north line of Red Top No.1 claim that will very closely mark the original east limit of the Resolution vein. In fact there are two places along this line the vein can actually be seen pinching out. For the western limit we will take a point at the western end of the lens-shaped outcrop near the southeast corner of the Resolution claim, go thence to the western end of the outcrop about 150 feet east of the north end of the Lead vein, and thence on a course about N.10 deg. W. magnetic to the Black Eagle vein. All the area thus delimited was once underlaid by the Resolution vein. At the south end it was confined within 400 feet. At the north end it may have been about 1500 feet wide. The distance from south to north is about 2600 feet. Roughly, the vein underlaid about 2,500,000 square feet. Whether it extended further north and south will be discussed later.

So far as we can at present see this vein had a relatively thick section which was much nearer the western limit than the eastern limit. The thick section was also characterized by a thin sheet of unusually rich ore which laid a few feet below the top. This was partly stoped in the Resolution tunnel and yielded, if I remember rightly, 900 or 1000 tons that went \$60.00 and better per ton except one carload that went about \$45.00 per ton. One can pick spots that will yield a startling pan prospects and high assays. This is the "sweetener" in an ore channel 20 to 40 feet thick. This thick channel has a course nearly due north magnetic and developing more of it is one of the chief lines of work before Mr. Binns. East of the deep channel there is a sort of wide wing in which the vein is mostly 4 to 7 feet thick, thinning to 2 feet and then pinching out.

The andesite under the Resolution vein has been considerably altered and quartz-seamed and carries low gold and silver values. For this reason I have mapped it with an orange to indicate light mineralization. In places it extends beyond the vein proper. I am far from convinced that thorough sampling would not show that where there is no thick cover the Resolution vein and this underlying altered andesite could be cheaply mined with bench blasting and a steam shovel at a profit if the cost of milling will not be prohibitive. There are places near the bottom of the altered andesite where a group of very small, very rich quartz seams make ore. On the 200-foot level a relatively small orebody has been developed in a position that seems to me to be in the rhyolite immediately under the contact. In fact, silicification and quartz-seaming can be seen to extend a short distance down into the rhyolite at many places. Thus it may be said that shoots of ore occur near the rhyolite-andesite contact but are not continuous enough to warrant mapping as a separate vein horizon.

The andesite over the Resolution vein was more or less altered and may carry small quantities of gold and silver. In fact, over the thick channel

near the south outcrop on the Resolution claim the alteration has been so severe that I have mapped an area separate as "Silicified Andesite". Soon after one passes the limits of the Resolution vein and underlying mineralized ground to east and west the andesite becomes barren-appearing and of a uniform reddish brown color, which constitutes another evidence of the limitation of the vein action.

Since the Resolution vein was formed as a "bed vein" lying nearly flat and related to the rhyolite-andesite contact, a number of things of a destructive nature have happened to it. First it was tilted northward and out by various faults. Most of these faults are of small displacement and it seems to me it would unnecessarily burden this report if I were to discuss them in detail. Their nature can be figured out from the map and they are quite well known to Mr. Binns. But the Major fault, so named by Mr. Binns, with a northward dip of 55 deg. to 60 deg. has dropped the vein down on the north about 120 feet. This makes a strip 100 feet or a little more wide that is not underlaid by ore except such as has been dragged along the Major fault.

Erosion has cut into and removed part of the original vein. Thus the yellow (rhyolite) areas have practically no ore, erosion having removed it. I say practically because there may be a few small bodies of low grade ore along the contact with the orange areas. In the orange areas the Resolution vein has been removed by erosion, but they have possibilities for low-grade ore and some small shoots of good grade ore. Where the gray (andesite) areas are bordered by the red outcrops (except the above mentioned strip north of the apex of the Major fault) you can count on ore under the gray. Thus the main body of ore near the top of the ridge south of the Major fault may be said roughly to have about 100,000 square feet. The body lying north of the Major fault and south of a group of east-west faults, that occur about 100 feet south of the north portal of the main tunnel may have an area of about 150,000 square feet.

Between the Major fault and a fault that passes by the north end of the Lead vein there is an unusual complication. The block seems to have been tilted steeply toward the south-east. This causes the group of quartz seams that often occur near the rhyolite-andesite contact to outcrop as a steep vein and I have so labeled them. We have too much orange in that block and probably there is some ore in the east angle of it but if so it is buried under a dump and I thought it safer to map with orange only. Quite a large fragment of ore has been dragged down between the top strands of the Major fault. In fact, I think that fault zone will stand a good deal of investigation for dragged ore.

In the group of faults about 100 feet south of the north portal of the main tunnel there is one that raises the formations on the north. But passing by the portal of the tunnel there is an east-west fault that dips northward about 45 deg. and has thrown down the andesite on the north. Between the two faults mentioned the thick ore channel has been removed by erosion, though thinner ore must remain east of the tunnel.

North of the fault that passes the north portal of the main tunnel is the next important block deserving development. Mr. Binns and I have selected a point for a diamond drill hole at the north end of the bed-rock exposure that follows the gully back of the boarding house. There is another rock exposure at the feet of the dump farther east where a hole could be drilled. Drilling could also be done near the patch of limestone mapped. Otherwise coarse debris will have to be removed to get at the bedrock. However, Mr. Binns understands my idea and will do the drilling to best advantage. Mr. Mills endorsed drilling this block. There is a chance in this block for as large a tonnage as has yet

been developed, provided the average thickness of the vein does not decrease northward.

Another stage of volcanic activity began in the district. At first it blew holes in the older rocks and filled them with debris. In some the debris is quite angular, in others it has been churned up enough to be partly rounded. A curious feature is that the material was never moved far. Thus in the rhyolite areas the fragments are chiefly rhyolite and I have mapped it as a rhyolite breccia, with an ochre yellow color. In the andesite areas the fragments are chiefly andesite and I have used olive green to map andesite breccia. Some of these breccia bodies are over 1000 feet long and up to 600 feet wide. Fortunately they occur mostly on the borders of the area in which the Resolution vein occurred, but two of them encroached on the vein and have fragments of vein quartz in them. One locality is north of the powder house and the other down the main gulch. They prove that these breccia bodies are post-mineral and no ore need be looked for in the olive green areas. Some narrow fissures in the Resolution mine are filled with debris and are post-mineral.

The next important event was the injection of the intrusive andesite that I have mapped with a green color. That is an appropriate color for the andesite has had the poisonous effect of intruding and destroying the Resolution vein in an extensive area. I would like to prefer the mineralization to this intrusion of andesite but it clearly cuts the breccia deposits, the extrusive andesite and the vein. Yet there are places where the intrusive andesite has been bleached by hot water action and lightly mineralized. Except for a fresher appearance one cannot microscopically distinguish the intrusive andesite from the extrusive andesite, having the same two kinds of feldspar phenocrysts, yet between them occurred the formation of the Resolution vein, the faulting and the explosions that formed the breccia bodies.

Debris-covering makes some uncertainty about the exact position on the northwest of the border of the Boarding House block of ore, but if about as mapped there is a chance in that block for more than 400 feet length of main channel.

Nearby on the north there is an outcrop of 150 feet length of the Resolution vein. It is rather thin, but as it occurs in a large inclusion in the intrusive andesite it might have been floated from its original position. A better appearing remnant occurs about 450 feet further north. This runs north about 225 feet and then gets smashed in a breccia body. Fragments of vein occur elsewhere in this breccia and it is said that at times high-grade float has been found down the gulch. It may have come out of this breccia, or it may have come from near the top of the ridge where recently some high grade ore was found and was being prospected during my visit. It occurs in a couple of small inclusions in the intrusive andesite mass and merely indicates the presence of a high-grade seam in the Resolution vein in this vicinity. I am not disposed at present to recommend prospecting in the immediate future in this central area that is badly cut up by intrusive andesite and breccia bodies as no great tonnage is possible from it. The map will suggest several relatively small areas digging around in which would probably produce some ore, but the time and money will be better spent on the Black Eagle claim on the north of the intruded area.

Just over the ridge from the specimen diggings described above, there is a short segment of the Resolution vein. It is cut off on the north by a small fault that dips northward 55 deg. Presuming that this is a normal fault it has thrown the vein down out of sight and it cannot outcrop on the south side of the ridge because it is buried by the intrusive andesite. The entire ridge

north and northwest from here to the Black Eagle workings is andesite so highly altered that so far as appearance is concerned it might belong under the Resolution horizon. On the other hand it may be a body of highly silicified andesite over the Resolution horizon like that mapped over the deep channel on the south side of the ridge south of the camp. It is too thick to belong under the Resolution horizon and the little fault discussed above aids in giving me a belief that the Resolution vein lies in this ridge and may be very good, if the silicification over it is any criterion. The puzzling feature is that on the Red Top No.1 claim there seems to come out from under the silicified andesite a very light colored hard siliceous rock that has much to suggest altered rhyolite. If it is that formation the Resolution vein is absent in this region. I am not quite certain of the nature of this "Highly Siliceous Area" and I have failed to color it. Professor Rand may tell us whether it was made from rhyolite or andesite.

However, further west, as already stated, I am fairly convinced that the Resolution horizon is well below the surface and may have a large block of ore. My present impression is that the best way to test the possibilities is by continuing work on the Black Eagle vein.

The Black Eagle tunnel follows a fault gouge which dips northward about 40 deg. It is very rich in manganese oxide. The ore is said to consist of this gouge and varying widths of rock on either side of it. In mapping the gouge apex across the ridge Mr. Jack Binns pointed out a zone of breccia on the hanging wall side as ore. Going down the hill toward the northwest the gouge seemed to me to pass out of the more solid vein matter. In fact, I suspect that this gouge represents post-mineral thrust faulting of small displacement and the ore along the gouge is dragged ore. Recently a strong vein has been found at the foot of the hill on the northwest and a prospective shaft is being sunk on it beside the road. Some question remains as to the course of this vein but I have incorporated in the map by best guess which is that it is a segment of the Black Eagle vein whose true strike is a little south of west and dip northward 60 deg. or 65 deg.

I must now introduce a new formation into the picture. It is an intrusive rock of fine grain of a light gray, lilac or pink color, and appears acid except that it has many small plates of brown biolite and a few needles of some very dark colored ferromagnesian mineral. In advance of Professor Radd's decision as to the proper name to apply to it, I am mapping it with pale blue as the said intrusive. It forms the large mountain west of the camp, but does no harm there as it does not reach the Resolution vein. On the north, however, it practically puts a limit to our prospecting territory. In that direction it is largely buried under the Upper Volcanic Series which consists mainly of tuff overlaid by basalt lava. This upper series in place laps across the acid intrusive on to the older rocks but there are enough exposures of the said intrusive to make it practically certain that it is continuous along a line trending about S 60 deg. E. from the Black Eagle claim, though somewhat sinuous in detail. In general, the contact with the older rocks dips northward 45 deg. to 60 deg. That this said intrusive extends deep and cuts off everything that has a less dip than the contact is beyond question. It represents an intermediate stage of volcanic activity. Further east there are glassy lavas that may be the extrusive phase of this upwelling of lava.

I have one more formation in my legend. It is a dike that begins several hundred feet south of the south portal of the main tunnel and runs eastward about 1200 feet. It is porphyritic like an andesite but seems

somewhat more acid and so I am temporarily designating it feldspar porphyry. So far it seems to have played no part in the economic geology of the camp.

I now have a strong suspicion that the source of the solution that formed the Resolution vein was a series of steep fissures that occur in an east-west belt near the line along which the acid intrusive and the Upper Volcanic Series put a north limit to your operations. A group of small gold bearing seams occur in the extrusive andesite on the Backbone No.2 claim. One of the strongest I have mapped as a vein that dips southward 50 deg. to 60 deg. Cutting the Black Eagle vein there is a very steep cross vein traceable 300 feet on a course slightly east of north magnetic. Further east there is an obscure remnant of vein matter. On the N.T.F. and Red Top No.1 claims I have mapped for 200 feet as a weak vein a sheeted zone that dips northward 50 deg. and has some mineralization. The acid intrusive cuts ~~off~~ it off at both ends. In the highly siliceous area, near the section corner on the Red Top No.1 claim there is an Allison shaft. On my first visit gold seemed to be distributed irregularly through a considerable mass of siliceous material and I failed to map a vein. Later Mr. Binns told me that the gold is chiefly confined to a zone 6 to 8 feet thick that is bordered by gouge seams that strike east-west and dip north 55 deg. to 70 deg. Some specimens may be found with gold embedded in hard ~~granite~~ fine-grained quartz.

At the Santa Claus recent strike there is a vein which strikes east-west and dips north 35 deg. to 45 deg. It has some pale yellowish quartz and bears the same relation to the rhyolite-andesite content as does the Resolution ~~shaft~~ vein. At one place under the vein proper gold occurs in thin plates in cracks in the andesite and this is what has attracted attention to the strike. The occurrence is probably secondary and limited in extent, but the vein may be strong enough and rich enough to warrant development. A representative of the Newmont company is in charge of the work and a prospect shaft is being contemplated. If the shaft is put down along the vein with a northward inclination of 35 deg. or 45 deg. and a drift driven along the vein an ore shoot may be found.

The vein strikes toward the Resolution mine but goes under vesicular basalt within several hundred feet. Thence for a long distance west on the course of the vein there is a detrital slope to and into the Allison group. Somewhat to the south is a low range of rhyolite hills in which Mr. Allison has several fissures that dip northward 60 deg. to 75 deg. Seams of fine grained quartz along them have a little gold and in one out on the Hot Day claim Mr. Allison gets specimens with fine grains of gold embedded in quartz. There are traces of oxidized pyrite. The locality is much intruded by andesite.

A little farther west the Upper Series tuff laps across onto the red andesite. The latter shows little evidence of mineralization except in one small area on your company's claims where we saw float and vein outcrops near the acid intrusive. Along this belt from the Black Eagle to the Hot Day and Santa Claus localities, if the acid intrusive had not cut away much of the vein system and the Upper Volcanic Series largely buried the remainder of it I am convinced we would find an important group of fissures coming up through the rhyolite and forming the feeders to the bed-veins at the Resolution horizon. Not that I think that little fissure zones like the Hot Day and Red Top made the Resolution prebody, but a strong vein like the Black Eagle, either that vein or another further north that has been completely destroyed by the acid intrusive. The best we can do is to test the hypothesis that the Black Eagle was the vein that fed the Resolution horizon at your camp. I advised Mr. Binns to continue sinking the prospect shaft beside the

road until a wall is found. When the andesite-rhyolite contact is reached the Resolution vein may be found. If so it can then be driven upon eastward and developed in the important block that I am expecting under the Black Eagle claim. If in a hurry Mr. Binns can go to the foot of the ~~Mine~~ ~~and~~ ~~the~~ ~~andesite~~ ~~outcrop~~ on the north and bore a series of holes down to the Resolution horizon, but even if found the place from which to develop it will be this new shaft by the road.

I have heard something about a proposed deep shaft. There is nothing in the structure to warrant such shaft anywhere south of the Black Eagle vein. But if that vein will go into rhyolite in a strong condition and is not cut off prematurely by the acid intrusive, a deep shaft to develop it will be in order. That can be planned after the prospect shaft has shown the facts at that locality.

I did not go far south of the Resolution ridge but it appears that the Rhyolite-andesite contact goes down again in that direction. The Resolution channel probably becomes very narrow and has suffered severely from an extensive breccia body so I do not have much confidence in prospecting in that direction.

One thing that impressed me during my visit was the recency of some of the discoveries of ore that have been made. The property has not been thoroughly prospected. Even some of the isolated Resolution outcrops that I have mapped may prove better ore than we know them to be. The values are spotted in the vein and the rich spots may easily be missed in sampling an outcrop. Some day when the main bodies have been mined out, all the little remnants will be gophered out and milled and the mine will die hard. For the present, however, I recommend that work be concentrated to the Boarding House Block and the Black Eagle claim.

Respectfully submitted,

(Sgd) Oscar H. Hershey

Ira B. Joralemon,

SHEEP TANK MINE
YUMA COUNTY ARIZONA

DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING
FAIR GROUNDS
PHOENIX, ARIZONA

Property and Location: The Sheep Tanks Mine and adjoining property held under option by C. M. d'Autremont are located in northern Yuma County, Arizona. The Camp is 30 miles by rough road south of Vicksburg, on the Santa Fe Railroad, and about 35 miles north of the Southern Pacific cutoff from Yuma to Phoenix.

The claims lie in the rugged Sheep Tanks Mountains, in the heart of the Arizona desert. The hills rise 200 to 400 feet above the fairly gently sloping canyons. Roads can easily be built up these canyons, making all parts of the property readily accessible.

All supplies must be hauled to the camp, which consists of four tents. The nearest water is in a well 7 miles away. The topography indicates a good chance of finding water enough for a small mill by drilling above a lava ridge that extends almost across the valley about a mile and a half east of camp.

Geology: The Sheep Tanks Mountains are formed chiefly of a series of volcanic rocks, generally andesitic, with rhyolite beds. There are two main divisions of the andesite. The Lower Andesite is rather light colored, with a few green beds. It is made up of fairly well crystallized lava flows, varying from white rhyolite to dark green andesite. The top beds of this series are stained bright red by iron oxide, due to oxidation of pyrite. This Lower Andesite is barren as far as is known.

The Upper Andesite consists of volcanic breccia flows with a total thickness of at least 150 feet. It is more silicious and harder than the Lower Andesite, and so caps many of the hills. Usually this breccia is stained on the surface by manganese, giving the formation a black color that distinguishes it from the lower flows. All of the ore developed in the district is in the bottom 50 or 75 feet of this Upper Andesite.

South of the property, forming the crest of the Sheep Tanks Mountains, is a mass of light colored trachytic material which is probably intrusive. The andesitic beds dip away from it on all sides. The trachyte is apparently the cause of the Sheep Tanks uplift.

Surrounding this mass of older volcanic rocks are hills of

the recent basalt that covers much of the surrounding desert.

While the general structure of the mountains is a dome sloping away from the trachyte intrusion, there are many irregularities. Most important of these is an anticline, with an axis North 55 degrees East, pitching gently to the northeast. This anticline shows in the Upper Andesite capping the hills southwest and northeast of the camp. Between these hills most of the Upper Andesite has been eroded, leaving small blocks dropped by faulting 50 to 200 feet below their normal position. Northwest and southeast of this anticline the Upper Andesite caps most of the hills, but is badly faulted and crushed.

The geological sketch map shows the large outcrops of Upper Andesite.

Mineralization: The most important mineralization thus far discovered is on the crest of the anticline described above. In the block southwest of the camp, the lower 50 feet of the Upper Andesite breccia flows have been extensively replaced by quartz, with much iron oxide stain. A portion of this material carries enough gold to make ore. This block in which the ore occurs is cut off on the southwest by a fault, near the trachyte intrusion. On the other three sides the Upper Andesite is eroded away. This block in which the ore occurs is about 500 feet square. Mineralization is strongest near the crest of the fold, becoming weaker down the sides. On the northwest side the Upper Andesite is eroded away before mineralization ends, so ore is exposed on the surface. On the southeast the formation continues for several hundred feet beyond the probable ore, but with very slight mineralization.

In the portion of the same anticline crossing the hill northeast of camp there is considerable silicification and iron staining of the lower part of the Upper Andesite. Two short tunnels are said to have cut only very lean material. More work may find ore. The structure continues for 500 feet northeast, and residual patches of silicified breccia extend on northeast for 600 additional feet to the center of the East Pass No. 1 Claim. In an erosional remnant of Upper Andesite on this claim, in line with the main anticline, Mr. Allison, the owner, has found a little rich gold ore.

There is surface mineralization of the Upper Andesite in several of the blocks northwest and southeast of the main anticline. On the Black Eagle Claim a 4-foot vertical quartz vein is said to assay \$10.00 in gold. Further prospecting may find small orebodies

in these blocks.

Development and Orebody: Save for shallow cuts and tunnels, the only development in the Sheep Tanks property is in the southwest block of the main anticline, in the southeast end of the Resolution Claim. About 480 feet of drifting and cross cutting has been done in the main tunnel, and 200 additional feet in the lower East Tunnel.

The Main Tunnel workings have partly developed a gold ore-body on the crest of the main anticlinal fold. The ore consists of crushed, silicified andesite breccia, with much limonite, and minute quantities of galena and oxidized lead minerals. Most of the gold is free, and can frequently be seen as specks or crystals in the quartz. In addition to the gold, the ore carries from 1 to 15 ounces of silver per ton. Gold values are very irregular varying in a few feet from \$2.00 to \$90.00 per ton.

Not enough work has been done to determine the shape, size or average grade of the ore. The Main Tunnel runs southwest a little south of the crest of the fold, and due to the northeast pitch, gradually gets deeper in the beds. At 165 feet length the ore passes up out of the back of the tunnel. Many samplings by reliable engineers indicate that the 165 feet in ore averages about \$25.00 per ton in gold and silver.

A general sample for treatment tests, made up by combining ore from channels taken every 10 feet throughout the developed orebody, averaged \$20.67 in gold and 11.35 ounces, or \$6.47, in silver. The orebearing bed outcrops 150 feet southwest of the last exposure in the tunnel, and is so thoroughly mineralized that it seems reasonably certain that ore will continue to this point.

The east and west crosscuts run across the crest of the anticline for a total width of 100 feet. For a few feet in the bottom of the west crosscut the lower, lean beds appear. The rest of the crosscuts developed ore averaging about \$20.00 in gold and silver, with ore in the east face and in the top of the west face.

The east tunnel is 140 feet east of the Main Tunnel and 60 feet deeper. It is slightly lower in the bedding than the ore in the Main Tunnel. It found no ore save for a streak at the portal. It is probably too far down the east limb of the fold to get ore, in addition to being too deep.

Two short tunnels 120 feet west of the Main Tunnel, found good looking silicified breccia carrying a few dollars in gold.

They are at the west edge of the ore.

Three hundred feet still further west a third short tunnel followed a streak of galena and lead carbonate with fair silver and gold values.

The Main Tunnel has proved the orebody to be 165 feet long by 100 feet wide. Surface outcrops and shorter tunnels and pits make it likely that the ore is 400 feet long by at least 200 feet wide.

The thickness of the ore is not developed. The greatest thickness actually proven at one point is 14 feet, while winzes or drillholes prove 12 feet thickness at 6 or 8 other points. Vertical sections show that the orebearing breccia bed that outcrops at the portal of the Main Tunnel forms the surface over most of the ore. It is covered by higher, barren beds only in the northeastern and southwestern parts of the area. The bottom of the ore, 165 feet from the portal of the tunnel, is 35 feet deeper in the bedding and 35 feet from the surface. All of the intervening beds are ore in the tunnel, and in 6-foot drill holes above it, save for one barren drill hole. There seems to be an excellent chance that the 35 feet of breccia from the bottom of the ore in the tunnel to the surface will all be of commercial grade, save for thin coating of secondary calcite and lean material in the top 3 or 4 feet. Rich ore breaks through this lean surface material at several points.

Ore Estimate: The developed orebody at the Main Tunnel is 165 feet long, 100 feet wide, and 12 feet thick. The developed tonnage is 13,200 tons averaging about \$25.00 per ton in gold and silver.

It is reasonably certain that there will be many times this amount of ore in the main orebody. The thickness will probably average 25 feet. The length is likely to be 400 feet and the width 200 feet. The amount of fairly probable ore is therefore 130,000 tons. The grade of this ore is uncertain, but will probably be from \$15.00 to \$20.00 per ton.

The portion of the anticline northeast of camp, and the other fault blocks of Upper Andesite may furnish additional tonnage.

Mining and Treatment: The orebody is not sufficiently developed to make it possible to plan the mining. If, as seems likely, ore comes to the surface, with a thickness of 35 feet at the center, tapering toward the edges, it can be mined in an open cut from a track around the nose of the anticline. Stripping would then be necessary in

only two places, and the mining cost should be under \$1.00 per ton. If the ore is thinner, and capped by 10 to 20 feet of barren breccia, it can best be mined in open stopes, leaving pillars that can be robbed at the end of mining. In this case the cost of mining would be \$1.50 to \$2.00 depending on the regularity of the ore.

The best site for a mill is on an even slope on the Dark Horse No. 2 Claim, 1500 feet from the main orebody. Ore could be taken to this site very cheaply by a gravity rope tramway.

The method of treatment must be determined by tests. As the ore is thoroughly oxidized, cyaniding by percolation should give a good recovery. But it is possible that amalgamation followed by flotation may give a better silver recovery, and so be advisable.

Ore could be shipped to the Magma smelter for a total cost of about \$12.50 per ton for mining, hauling, freight, and smelting. This is so much more than any possible cost of milling that it would be extremely wasteful except in the case of rich bunches.

Recommended Procedure: The following procedure is recommended:-

1. Raise to the surface from the Main Tunnel, to determine the thickness of the ore. The first raise should be 215 feet from the portal, where a raise has already been started. This will add 50 feet to the developed length as well as proving the thickness. It should be followed by raises or drill holes up spaced 50 feet apart. Downward drill holes would be less satisfactory, as values in the brecciated ground might either be concentrated or lost in cracks.
2. Drill for water above the reef a mile and a half east of camp. If no water is found here, drill other likely places.
3. Have thorough metallurgical tests made on the average sample taken at the time of the examination on which this report is based.
4. From the results of this work, the detailed plan of mining and treatment can be made.

Conclusion: At the worst the Sheep Tanks is a little rich mine that will yield a profit of \$200,000, exclusive of purchase price, by mining and shipping the better ore.

It seems almost certain that the mine is far better than this, and that it will justify a 50 to 100 ton mill. A profit of \$500,000 can be expected with much confidence, and several times this amount can reasonably be hoped for.

(Signed) Ira B. Joralemon

San Francisco, California
December 15, 1928

SHEEP TANKS MINE

(note by G. M. Colvocoresses - November 1937)

This mine was opened or reopened in 1932 by Ed Mills who had the financial backing of Dr. Lloyd part owner of the Chicago Tribune. The active operations ceased in 1935 after Lloyd and associates had lost about \$450,000. The mill and mine equipment were sold but Mills then personally purchased the claims and has since been trying to resume operations having repeatedly applied for loans to the R.F.C. whose engineers have turned down the applications.

The mine is located some 20 miles by road south of Vicksburg, Arizona near the Kofa Mountains.

The deposit is formed in a flat vein 15' to 20' in width lying between hanging and foot walls of andesite. The ore in the vein occurs in shoots carrying a high percentage of manganese with which are found substantial values in gold and silver. The treatment presents a difficult problem and flotation, cyanide and a combination method successively failed to recover any substantial percentage of the silver. A great deal of money was spent in an effort to secure an adequate water supply and many wells were sunk with indifferent success.

The mine was well equipped and the mill was designed to treat 150 tons per day.

The total output from 32 to 35 has been given me as 15000 tons of ore with average value of \$15.00 per ton in gold and silver but the recovered values in concentrates were only about \$10.00 per ton.

The values in the vein decrease with depth and a recent sampling by a reliable engineer gave the average value of the remaining reserves at \$8.00 per ton.

In view of the location, grade of ore, shortage of water, and metallurgical difficulties it does not appear that any resumption of operations is likely to prove profitable.

SHEEP TANKS MINE

(note by G. M. Colvocoresses - November 1937)

This mine was opened or reopened in 1932 by Ed Mills who had the financial backing of Dr. Lloyd part owner of the Chicago Tribune. The active operations ceased in 1935 after Lloyd and associates had lost about \$450,000. The mill and mine equipment were sold but Mills then personally purchased the claims and has since been trying to resume operations having repeatedly applied for loans to the R.F.C. whose engineers have turned down the applications.

The mine is located some 20 miles by road south of Vicksburg, Arizona near the Kofa Mountains.

The deposit is formed in a flat vein 15' to 20' in width lying between hanging and foot walls of andesite. The ore in the vein occurs in shoots carrying a high percentage of manganese with which are found substantial values in gold and silver. The treatment presents a difficult problem and flotation, cyanide and a combination method successively failed to recover any substantial percentage of the silver. A great deal of money was spent in an effort to secure an adequate water supply and many wells were sunk with indifferent success.

The mine was well equipped and the mill was designed to treat 150 tons per day.

The total output from 32 to 35 has been given me as 15000 tons of ore with average value of \$15.00 per ton in gold and silver but the recovered values in concentrates were only about \$10.00 per ton.

The values in the vein decrease with depth and a recent sampling by a reliable engineer gave the average value of the remaining reserves at \$8.00 per ton.

In view of the location, grade of ore, shortage of water, and metallurgical difficulties it does not appear that any resumption of operations is likely to prove profitable.

SHEEP TANKS MINE

February 15, 1934

S

Talk with Cooper

Mine is located some distance from ~~Wickenburg~~ ^{Smith's} on Parker Cut Off. Principal owner is Dr. Lloyd of Rhode Island who spends his winters in Arcadia (Phoenix). *Lloyd is part owner of the Chicago Tribune.*

Owners claim 400,000 tons of ore blocked out containing good values in gold and silver and high percentage of Mn. Until recently the manager was Ed Mills and the metallurgist Thompson of S. F.

The tonnage & real value of the ore seems to be uncertain.

A mill was built with the idea of recovering and selling the Mn. and separating the Ag from it but this did not work and more recently the flow sheet was changed over to straight cyanide and mill is now working by that method.

(It would seem that the consumption of KCN must be very high and the losses in Ag heavy.)

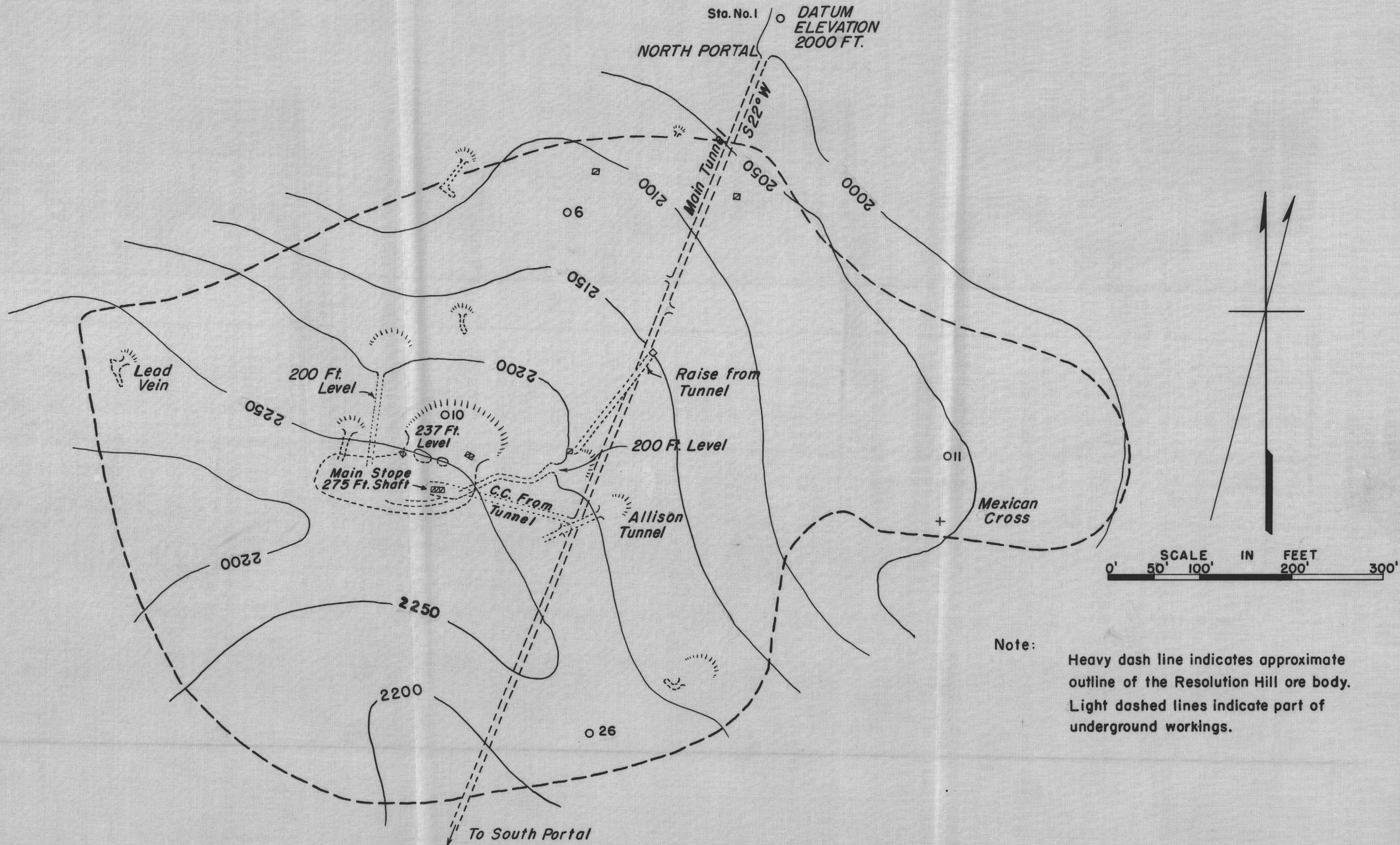
It might be possible to revise the flow sheet so as to make a bulk flotation concentrate containing the gold and silver (there is also some lead) and ship this to a smelter.

Lloyd knows nothing of mining or metallurgy but is not inclined to take or pay for any advice.

E. L. Stenger is now Supt. of this property.

Aug 23rd. 1935

Lloyd is there, has spent \$60,000 & gotten back \$155,000 from shipments of bullion. Has now sold the entire property with excellent cyanide plant to U. S. Machinery Co., 1800 - 20th St. Sacramento, Cal, represented by Paul F. Smith now stopping at Adams Hotel, Phoenix who promised to send me a list of the machinery & equip. which might be very suitable for ^(our) _{business}

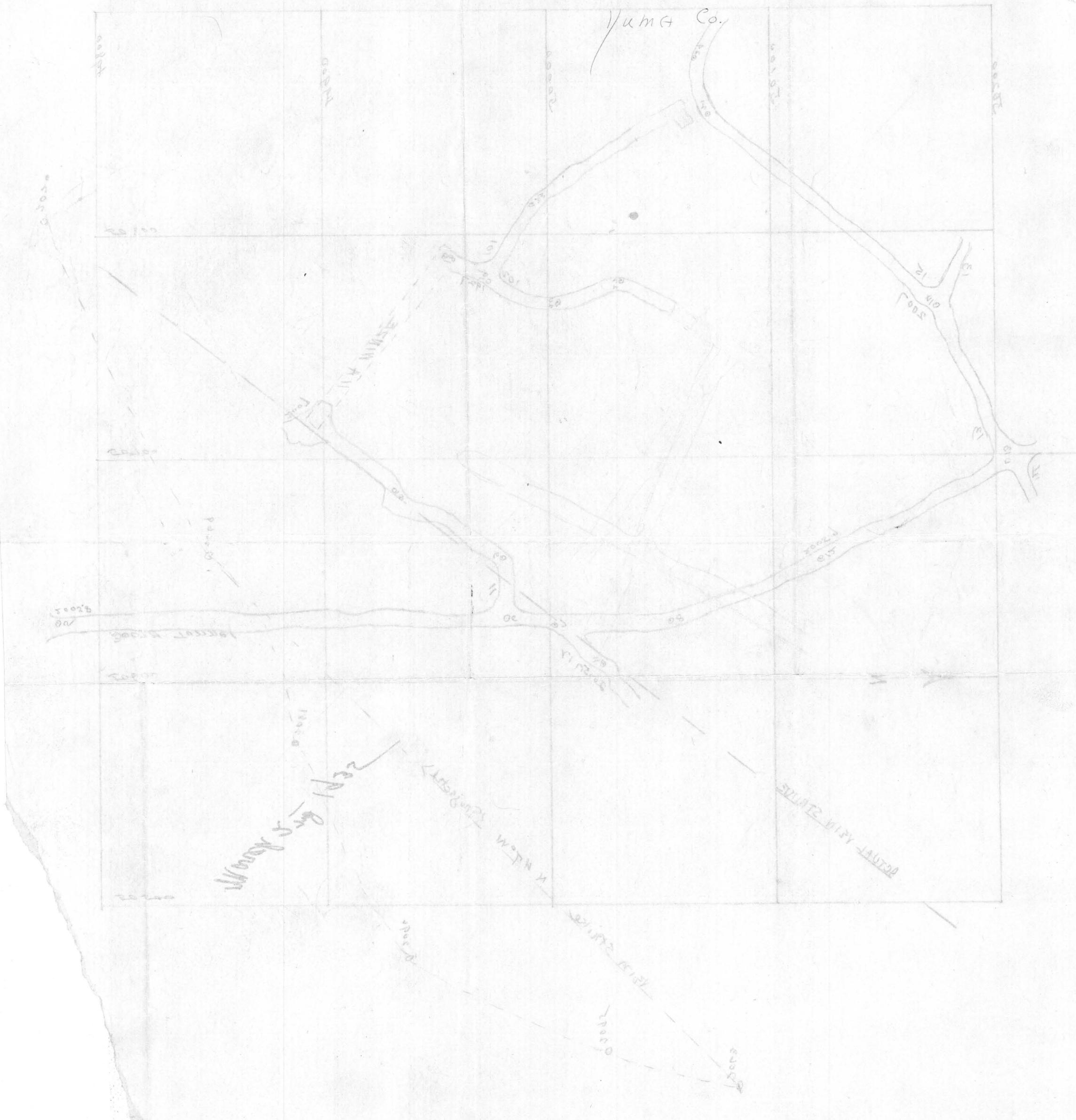


Note: Heavy dash line indicates approximate outline of the Resolution Hill ore body. Light dashed lines indicate part of underground workings.

SHEEP TANKS MINE—YUMA COUNTY, ARIZONA

Sheep Tanks Mine

Yuma Co.



SECTION 49-350 N

ANDESITE

LEVEL 2237

2200

2170
(CALLISON)

ANDESITE

RHYOLITE

2000-TR-1

ANDESITE

ANDESITE

3

5

6

ANDESITE

RHYOLITE

ANDESITE

RHYOLITE

ANDESITE

ANDESITE

4

ANDESITE

ANDESITE

RHYOLITE

ANDESITE

RHYOLITE

2000-1

SHEEPTANKS CONS. MINES
YUMA CO. ARIZONA.
RESOLUTION MINE

SECTION PLANE — 50-000 E —
" " — 49-825 E —
" " — 49-800 E —
ORE ZONE SHADED.

SCALE 1" = 40' JUNE - 1932

BRECCIA

RHYOLITE

RHYOLITE

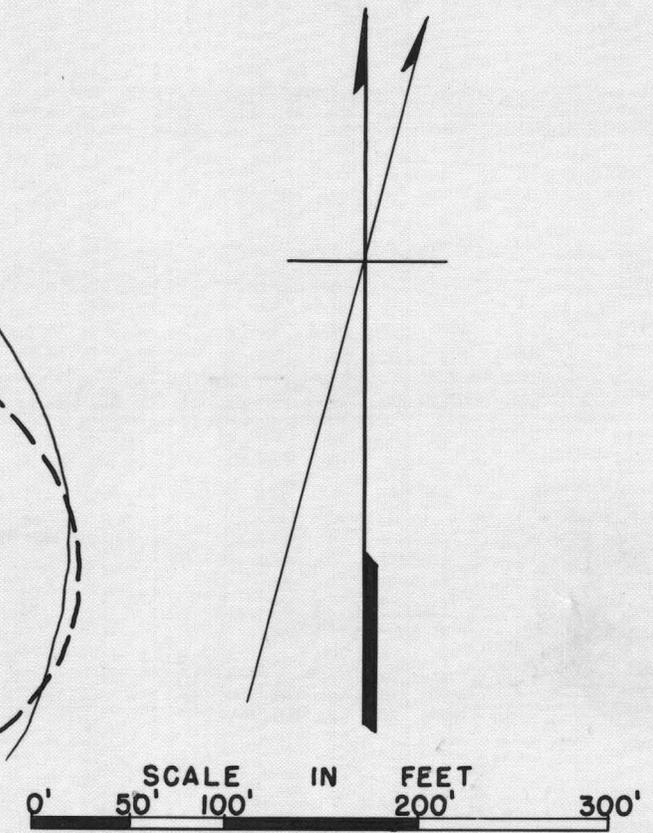
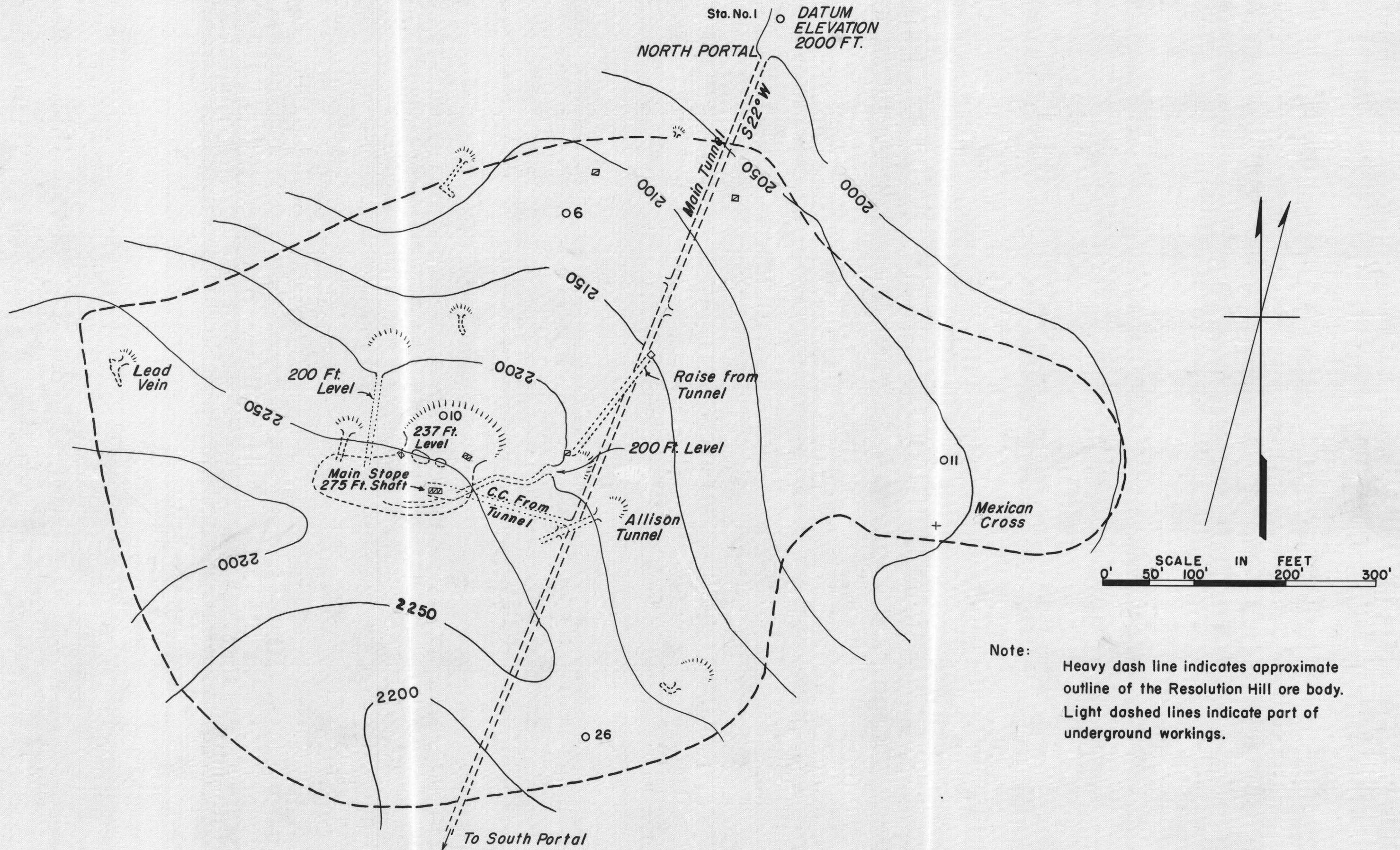
ANDESITE

1

RHYOLITE

ANDESITE

ANDESITE



Note: Heavy dash line indicates approximate outline of the Resolution Hill ore body. Light dashed lines indicate part of underground workings.

SHEEP TANKS MINE—YUMA COUNTY, ARIZONA

File

EDWIN WALTER MILLS* reports on

Metallurgical Tests of Sheep Tanks Ore

