(254) Item 119

4840 0119

REPORT ON THE

MIZPAH EXTENSION MINE

TONOPAH, NEVADA

SPURR & COX INC.
165 BROADWAY NEW YORK

SPURR & COX
INCORPORATED
CONSULTING SPECIALISTS IN MINING
165 BROADWAY, NEW YORK
CABLE: SPURCOX CODE: BEDFORD McNEILL

REPORT ON MIZPAH EXTENSION MINE TONOPAH, NEVADA

SUMMARY

The Mizpah Extension Mine workings at present consist of a shaft a little over 975 feet in depth and an aggregate of some 1400 feet of cross-cuts and drifts. So far development work has shown but three of the Tertiary igneous rock formations characteristic of the Tonopah District, these, in the probable order of their age, are the Midway or "Calcitic" Andesite, the Tonopah Rhyolite, and the Oddie Rhyolite. All of these formations are of more recent origin than the main ore bearing veins of the Tonopah District--that is the veins of what are termed the 1st and 2nd Periods.

Quartz vein material belonging to the 3rd period, which is closely connected with the intrusion of the Tonopah rhyolite, is present in abundance. This massive quartz, which is associated with considerable iron pyrite, carries values up to $8.00 to $12.00 in spots, but in the main is practically barren and is probably of no economic importance.

Shear zones and fracture lines are fairly abundant in all of the formations. Small faults of a few inches to 2 or 3 feet are also not uncommon. The strongest fault noted is one exposed in the southeast workings on the 500-foot level and termed the "Mizpah Extension Fault". The exact throw of this fault is not known but is at least 10 or 12 feet and is sufficient to bring the

overlying Oddie Rhyolite down opposite the Tonopah Rhyolite and associated quartz vein. This fault may be found to represent one of a series of somewhat parallel slip leads comprising the "Belmont Fault" of the Belmont Mine which has a throw of several hundred feet. Owing to the erratic distribution of the intrusive rock formations of the district, to the great irregularity in contacts between formations and to the complications likely to arise as a result of faulting, nothing can be predicted with certainty regarding what will occur in the undeveloped area to the southeast of the present workings which it is desired to explore.

The nearest known occurrence of Mizpah trachyte, the main ore bearing formation of the Tonopah District occurs on neighboring properties at 800 to 1000 feet distant. The general trend of this Mizpah trachyte body, provided it continues should take it into Mizpah Extension ground. However whether the Mizpah trachyte is cut off by more recent igneous intrusions or by faults, or whether it will be productive if it does continue into Mizpah Extension ground cannot be foretold from the existing development work in the Tonopah District, and can only be definitely decided by exploration work. The advisability of postponing active development work and an outline of where it is best to do exploration work if such is undertaken, are discussed at the end of this report under the heading, "General Conclusions".

TABLE OF CONTENTS

SPURR & COX
INCORPORATED
CONSULTING SPECIALISTS IN MINING
165 BROADWAY, NEW YORK
CABLE: SPURCOX CODE: BEDFORD McNEILL

MIZPAH EXTENSION MINE, TONOPAH, NEVADA

LOCATION

The Mizpah Extension Mine is located in the sag between Mount Oddie and Ararat Mountain about one mile northeasterly of the town of Tonopah.

The Mizpah Extension shaft is situated some 1500 feet N 53 E of the summit of Mt. Oddie and about 1367 feet N 6° W of the new "Belmont Shaft" of the Tonopah-Belmont Mining Co.

EXTENT

The property embraces the following claims--Gold Finch, Gold pheasant, Quail, Humming Bird, Black Hawk, Chicken, Owl, Crow, Wren and Blue Jay and the fractional claims Eagle, Black Bird and Sparrow.

DEVELOPMENT

The present development work consists of a shaft over 970 feet deep and an aggregate of some 1400 feet of cross-cuts and drifts chiefly confined to the 485 and 800 foot levels.

GENERAL GEOLOGY

ROCK FORMATIONS

The present mine workings show only igneous rock formations which were extruded or intruded subsequent to the time of

formation of both the First and Second Period main pay-ore veins of the Tonopah district. These formations consist of the Midway Andesite or "Calcitic Andesite" (= "Later Andesite" of Professional Paper 42 of U. S. Geol. Survey by J. E. Spurr); the "Tonopah Rhyolite" flow breccia; and the Oddie Rhyolite.

The Midway or "Calcitic" Andesite

This is the oldest rock formation so far exposed in the mine workings. What was probably a flow occurs on surface in the sag between Mt. Oddie and Ararat Mountain and in the company's shaft extends to a depth of about 280 feet from surface. This body is undoubtedly a portion of the same flow which is found in other portions of the Tonopah District and is known to be later than and to act as a "cap-rock" to the "Mizpah trachyte", "Montana breccia" and "West End Rhyolite" and to the Tonopah ore bearing first and second period veins. A second sheet of very similar andesite occurs in the shaft and extends from about 490 feet to 605 feet below the collar of the shaft. This Midway Andesite body is probably also part of the same mass which shows on the 800 foot level for a width of some 100 feet to the northeast of a point about 290 feet northeast of the shaft. The general trend of the Midway Andesite body on the 800-foot level appears to be a little west of north with a dip of 28° to 32° to the E. N. E.

At a depth of about 200 feet below surface in the shaft and also near the center of the body on the 800-foot level the Midway Andesite is practically fresh and at those points is a

dark grayish to greenish black color and shows comparatively fresh colorless feldspar and slightly altered augite crystals in a dense groundmass. The andesites near surface while massive usually have a dark brown or purplish brown or dark gray groundmass with large white altered feldspars, both bronze colored and light gray bleached biotite micas and highly altered greenish augites and possibly hornblendes. The brown coloration is probably due to iron staining resulting from the alteration of ferromagnesian minerals in the rock due to action of surface waters. The lower portion of the surface sheet and also the intrusive mass on the 800-foot level show considerable highly altered light and pinkish gray fine grained andesite without the conspicuous feldspars but with minute altered green rod-like ferromagnesian minerals, while other portions show areas with mixtures of fine and coarse-grained altered andesite which in places closely resemble a volcanic breccia or agglomerate.

The highly altered phases of the Midway Andesite show much pyrite and some calcite. Generally the altered rocks are dull yellowish gray to brownish in color but locally are greenish in color due to development of serpentine as a result of the alteration of the augite (and possibly also of the hornblende) crystals. Practically no silicification of the Midway Andesite accompanies alteration except near contacts with the Tonopah Rhyolite when the latter rock is associated with vein quartz of the 3rd period.

Tonopah Rhyolite

Two bodies of this formation occur in the mine. One

which cuts across the shaft at a depth of 485 feet below the collar, is probably to be correlated with the rhyolite occurring in the N. E. breast of the 800-foot level; the other forms the wall rocks of the shaft from a depth of 605 feet below the collar to below the 970-foot level and also forms the only rock on the 800-foot level for a distance of some 285 feet northeast of the shaft.

The typical rock appears to be a definite rhyolite flow breccia containing rather abundant angular inclusions of other rocks as well as numerous fragments of rock with a composition very similar to itself but with slightly different textures. Pumice occurring as irregular blotches or fragments with indefinite boundaries and of a white or pinkish to greenish gray tinge is very abundant in places. Faint flow banding locally developed in the groundmass and associated with pumice fragments is also characteristic. The Tonopah rhyolite has a somewhat glassy groundmass which varies from light to dark gray or from a pinkish to a greenish gray. Within this groundmass occur conspicuous quartz phenocrysts of various sizes up to 1/10 inch or more in diameter which as a rule are colorless but occasionally when the crystals are shattered are stained a characteristic garnet red color. Feldspars usually small and irregular in shape are also present but inconspicuous. These are colorless to glassy when fresh and white to pinkish when altered. Biotites and other ferromagnesian minerals are rare or absent, although a slight greenish tinge to the rock or to pumice fragments in places may be due to serpentine developed

as the result of alteration of rare ferromagnesian minerals.

In the Mizpah Extension mine while the inclusions in the Tonopah Rhyolite are abundant and conspicuous yet most of them are less than 3/4 inch in diameter although rare included boulders up to a foot or two in diameter are present. A majority of the inclusions consist of denser and more glassy phases of the same or a similar rhyolitic rock. Among the other kinds of rock inclusions are yellowish dense structureless fragments and also dense light to dark gray structureless inclusions, the latter suggesting silicified limestone. Occasional fine grained altered andesite-like inclusions, which at times show a mixture of small rod-like ferromagnesian minerals and feldspars and possibly both biotite and hornblende also occur. Some of these inclusions are undoubtedly Midway Andesite but some of them may also represent the Mizpah trachyte. Near the upper margins of both Tonopah rhyolite bodies, and especially in the east workings on the 800-foot level, are inclusions of purplish brown andesite, with conspicuous white altered feldspar phenocrysts, suggesting typical Midway Andesite. Near the upper contact of the lower body rare inclusions of a white rhyolite strongly suggesting altered Oddie Rhyolite were present.

The Upper Tonopah rhyolite body, where developed in the shaft and on the 485-foot level, is quite different from the lower normal phase, for in this locality the inclusions are not as conspicuous or abundant as in the lower body and the mass in places resembles to some extent certain phases of the Oddie Rhyolite--the main characteristics are a dull gray color and the inconspicuous and comparatively rare angular quartz crystals and small incon-

spicuous feldspars. Occasional small angular fragments of a dark gray to black shale-like rock, usually highly pyritized, are present. Areas containing white soft chalk-like, probably pumice inclusions and also dense structureless gray fragments are locally developed in the upper body. Above and to the northeast of the Midway Andesite on the 800-foot level the rhyolite body, which probably corresponds to the upper body in the shaft, is a rhyolite with the normal flow breccia characteristics of the Tonopah Rhyolite of the lower levels. Both the upper and lower bodies are characterized by minute quartz stringers cutting the mass erratically. These quartz stringers at times are associated with iron oxide which gives the stringers a characteristic dull reddish brown color.

Oddie Rhyolite

White to light gray typical Oddie Rhyolite occurs in the shaft between points 280 and 435 feet below the collar. A very highly altered white kaolinized rhyolite, probably Oddie Rhyolite, also occurs in a very small exposure in the breast of the east cross-cut from the shaft on the 500-foot (485') level on the hanging wall side of the N 50 E striking Mizpah Extension Fault.

This rock is a pure white to very light gray rock with scattered quartz and feldspar (both orthoclase and plagioclase) and occasional biotite phenocrysts. Although locally fresh the rock in general is rather highly altered throughout and consists of a bleached appearing rather porous chalk-white matrix with quartz crystals showing only in spots while the biotites and feldspars

are either bleached and altered to kaolin and sericite or are dissolved out completely and represented only by small cavities which gives the rather massive rock a porous texture. Some of the gray phases are probably a result of local silicification subsequent to intrusion. At the 400-foot shaft station there are a series of more glassy streaks showing flow banding which in general strike about N 5° W and dip 19° east. Near the contact of the Oddie Rhyolite angular inclusions, both small and large, of the overlying Midway Andesite are abundant, which shows that the Oddie Rhyolite is the younger rock.

OCCURRENCE OF FORMATIONS IN THE SHAFT

The following sequence of formations was noted in the shaft. In a number of instances the contacts were rolling or very irregular and the strikes and dips given are the averages as nearly as could be determined under the conditions resulting from irregularities, movement along contacts and poor exposures due to the tight lagging of the shaft except where the lagging was removed at particular points to allow of inspection.

The Midway Andesite occurs as a dull dark brown or gray to purplish brown massive rock with conspicuous large white altered feldspar crystals down to a depth of about 125 feet where a highly altered fine grained phase of the same rock comes in which shows numerous pinkish red-like altered crystals. Below this point, except on the east wall near 195 and 200 foot levels where practically fresh gray to greenish black coarsely crystalline andesite shows, the andesite rock mass consists of a mixture of

fine grained and coarse grained andesite which in places assumes the nature of a volcanic breccia or agglomerate. A medium grained but highly altered and softened andesite occurs near the base of the formation adjacent to the contact with the Oddie rhyolite which is located at a depth of about 280 feet. This contact shows evidence of being an intrusive contact of Oddie rhyolite into the Midway andesite. This contact in general strikes about N 30° W and dips irregularly from 25° to 45° to the northeast. Very little clay gouge or other evidence of movement along the contact exists. Numerous angular fragments and masses of Midway andesite occur in the Oddie rhyolite near the contact but are entirely lacking below. From the upper contact to just below the 400 foot level the rhyolite is comparatively massive although rather porous in texture. From a few feet below the 400 foot level to a depth of 435 feet where quartz vein material is encountered, the Oddie rhyolite is highly altered, and in places is highly crushed and associated with considerable clay gouge as a result of movement. It is probable that the "Mizpah Extension fault" crosses the shaft at this point but if so it has flattened in dip from 50° to only 33° to the southeast. A 3rd period quartz vein zone from 15 to 20 feet in thickness occurs just below the Oddie rhyolite and consists of streaks of massive quartz or of a series of irregular quartz stringers scattered through Tonopah Rhyolite.

The contact between the soft crushed Oddie rhyolite and the quartz strikes about N 25° E and dips 33° S. E. The contact between the quartz and mottled gray Tonopah Rhyolite in massive

form below, strikes roughly N 15° W and dips 15 to 20° eastward. The upper body of Tonopah Rhyolite from 455 feet to just below the station at the 485 foot level does not have the typical flow breccia characteristic of the lower main mass and further is conspicuous for the smallness and in places the scarcity of its angular quartz and feldspar phenocrysts. (See description of Tonopah Rhyolite).

Quartz vein material also characterizes the upper Tonopah Rhyolite body near its contact with Midway Andesite below, at 490 to 500-foot level where quartz stringers and irregular masses of vein quartz of the 3rd period are scattered through the rhyolite for a thickness of 10 feet or so. Midway or "Calcitic Andesite" which comes in at a depth of about 500 feet below the collar is comparatively soft and highly altered at the contact with the quartz and upper Tonopah Rhyolite body which strikes about N 65° W and dips 35° N. E. The altered andesite shows but little silicification except in spots and only rare small quartz stringers near the contact. The altered andesite near the contact is highly pyritized and also streaked with green due to serpentine resulting from the alteration of the ferromagnesian minerals. Between the 600-foot station and the lower contact at 7 or 8 feet below the 600-foot station the andesite is rather soft and highly altered with occasional small quartz stringers cutting it. A 3" to 10" quartz seam occurs at the immediate contact associated with 1 to 2 feet of moist dark gray clay gouge and crushed rock which appears to strike about N 30° E and to dip 42° to 45° eastward.

The Tonopah Rhyolite flow breccia which comes in below the Midway andesite at a depth of 608 feet below the collar continues to form the wall rocks of the shaft to below the 970-foot level which is the limit of the present workings. Near the upper contact of the Lower Tonopah Rhyolite Mass with the overlying Midway Andesite the Tonopah rhyolite is considerably crushed and altered and soft due probably to movement along and near the contact. In depth the rock is the typical massive but fractured comparatively fresh rhyolite flow breccia.

THE VEINS

The quartz veins so far developed in the mine belong entirely to the 3rd period low grade to barren type of Tonopah veins, which so far as known in the district are confined to the Midway Andesite, the Tonopah Rhyolite and the Oddie Rhyolite.

The 3rd period quartz in this mine occurs as mottled white, and light and dark gray masses or veinlets showing a mixture of colorless to translucent light and dark colored quartzes occasionally showing irregular banding. In other places the dark quartz has the appearance of fragments within the light quartz and again the white quartz appears to occur as fragments within the dark quartz, these fragments however have ill-defined boundaries. A small amount of pyrite or arsenopyrite usually occurs disseminated through the quartz but in places the pyrite becomes very abundant. Picked samples of the quartz high in pyrite content are said to have yielded assay values as high as $12.00 chiefly in gold values although a little silver was present.

The main mass of the quartz however is barren or too low grade to mine.

In the Mizpah Extension workings the quartz veins vary greatly in width and occur either entirely within the Tonopah Rhyolite near the borders of the intrusions, along the contacts between the Tonopah rhyolite and the Oddie rhyolite and the Midway Andesite or to a much less extent as small veins cutting the Midway Andesite and possibly the Oddie Rhyolite.

The quartz masses occurring either within or along the contacts of the upper body of Tonopah Rhyolite are very large, the body at the contact with the overlying Oddie Rhyolite attaining a thickness of from 12 to 20 feet while near the contact with the underlying Midway Andesite the quartz veinlets and masses are scattered through a zone of Tonopah Rhyolite some 8 to 10 feet in thickness.

On the 485-foot level the quartz near the contact of the upper Tonopah Rhyolite body and the Oddie Rhyolite has been cross-cut for a width of 50 feet or more. This great width however is due to a width of only 12 to 15 or 20 feet of quartz which dips easterly at an angle of only about 12°.

Near the present breast of the 970-foot cross-cut a flatly dipping quartz stringer 1" to 10" wide came in and ran somewhat parallel to the cross-cut dipping flatly but irregularly to the northwest. This stringer showed considerable pyrite in places but carried only low values.

The veins so far exposed all seem to have been formed subsequent to the intrusion of the Tonopah Rhyolite and are closely

associated with and probably owe their formation to the intrusion of this rock.

FAULTING

Evidence of rock movements and faulting such as characterizes the whole Tonopah District, also occurs in the Mizpah Extension mine. The fault line which shows the most evidence of displacement is the one termed the "Mizpah Extension fault". This fault which occurs along the northeast side of the 485-foot level workings strikes N 50° E and on the level shows a dip of about 50° to the southeast. The dip of this fault plane should cause it to intersect the shaft at about 365 feet below the collar. The only place a fault appears to cut the shaft is in a belt some 20 feet or more wide near the lower contact of the Oddie Rhyolite just below the 400-foot level, where the Rhyolite is highly crushed and seams of clay gouge occur within it. However if this point is where the Mizpah Extension fault cuts the shaft the fault has flattened going upward and the average dip is only about 34° to the southeast.

The Mizpah Extension fault is a normal fault which has resulted in a downthrow of the hanging or southeast wall so that the Oddie Rhyolite is brought down opposite the large quartz vein occurring in the upper portion of the Tonopah Rhyolite mass. While the throw of this particular fault slip is as yet undetermined owing to lack of development southeast of the fault, yet the displacement along this particular slip lead is probably not great although it is known to be at least more than 10 or 12

feet. However the Mizpah Extension fault may prove to be only one of a series of somewhat parallel slip leads, corresponding to the slips of the extension of the "Belmont Fault" of the Belmont Mine, which have a very large aggregate displacement downward to the southeast.

In addition to the Mizpah Extension Fault there are a great many minor slips, accompanied by a few inches to 2 or 3 feet displacements, which cause offsets in the various formations and also in the veins.

GENERAL CONCLUSIONS

Detailed geologic mapping shows that none of the earlier ore bearing formations such as the Mizpah trachyte, the Glassy trachyte, or the West End Rhyolite occur in the Mizpah Extension mine workings at present. On account of this fact all development work in the mine must be based mainly upon knowledge of geological phenomena occurring on other properties within the Tonopah District.

Owing to the great irregularity of the contacts of the erratically distributed intrusive masses of the various Tonopah rock formations and also to the very irregular strikes and dips of the various veins and faults of the district, it is impossible for anyone to predict with certainty conditions which are likely to exist even a short distance away.

The cross-out on the 970-foot level is headed for what is in reality an entirely unexplored area, for the nearest mine workings in productive ground are 800 to 1000 feet distant.

It is true that the area lies in the extension of the strike of the known blocks of Mizpah trachyte but so many factors such as irregular intrusions of igneous rock and numerous faults with extensive displacements are likely to come in to alter conditions that no one can predict what will be encountered in the new area. Accordingly the most conservative plan to follow would be to let the neighboring properties, which are developing ground in ore, do the exploration work of the unexplored ground adjacent to the Mizpah Extension ground. This wait should not be very long owing to the active development campaign of the properties in question. The Mizpah Extension shaft could be sunk a couple of hundred feet while awaiting developments.

In the writer's opinion the cross-cut which is being driven to the S 50° E from the shaft on the 970-foot level is at a horizon which is too high to allow of much development work even if the ore bearing Mizpah trachyte formation should be encountered. If no development work had been done on the 970-foot level, the writer would have advised sinking the shaft possibly 200 feet deeper before starting to cross-cut. However since the cross-cut is in over 250 feet, and provided it is decided to go ahead with the drifting, it is probably best to continue the cross-cut in the same direction until the Belmont Mizpah Extension side line is encountered. If the cross-cut does not pass through the Tonopah rhyolite into Mizpah trachyte before the Belmont boundary is encountered, the upper contact of the Tonopah Rhyolite, if near by, will undoubtedly then be encountered most quickly by changing the direction of the cross-cut and drifting N 85° E parallel to

the boundary line. The nearest occurrence of Mizpah trachyte shows this ore bearing formation lying above the Tonopah rhyolite and below the Midway Andesite. Accordingly in driving the southeast cross-cut on the 970-foot level, if the Tonopah rhyolite contact is passed through and Midway Andesite instead of Mizpah trachyte is encountered it would indicate that the cross-cut has been run at a horizon which is too high. In this case it would be useless to continue the cross-cut at the 970-foot level further. If this condition developed it would probably be most economical to sink a working winze from the breast of the 970-foot cross-cut for 200 feet and then continue the cross-cut at this lower level.

On the Mizpah Extension 800-foot level the contact between the lower Tonopah Rhyolite body and the Midway Andesite, which is the one along which the Mizpah trachyte occurs on adjacent properties, has a strike of about N 3° W and a dip of 29° to the east. This contact to the southward however probably swings around to the westward in order to join a similar north-south contact exposed at about the same elevation some 500 or 600 feet northeast of the Desert Queen shaft of the Belmont Mine.

Among the faults which are likely to come in and affect the location of the formations and veins is the "Mizpah Extension fault" lead shown on the southeast side of the 500-foot level workings. This lead is possibly to be correlated as one of a series of more or less parallel and interlacing slip leads which make up what is called the "Belmont Fault" which in the Belmont Mine has a throw downward to the southeastward of several hundred

feet.

The fact that practically all northeast and northwest striking faults tend to throw the formations downward on the east side throughout the whole Tonopah District, points toward the general conclusion that in the area to be prospected southeast of the Hiaplah Extension shaft the ore-bearing formations should be expected to be best developed at even greater depth than in the present workings of other mines of the district.

Respectfully submitted:

SPURR & COX (INC.)

by ORIGINAL SIGNED GEORGE H. GARREY

New York, March 10, 1911.