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

Westec CORPORATION

Preliminary Geologic Report
on the
Red Rover Property

Maricopa County, Arizona

PRELIMINARY GEOLOGIC REPORT

on the

RED ROVER PROPERTY

MARICOPA COUNTY, ARIZONA

by

Erik Bruner - Geologist

WESTEC CORPORATION

April 27, 1967

E. B.

TABLE OF CONTENTS

E. B.

ILLUSTRATIONS

E. B.

SUMMARY and RECOMMENDATIONS

The Red Rover property is located in the Magazine mining district of Arizona, near the Yavapai-Maricopa County line. It is approximately 32 miles northeast of Phoenix and about 13.5 miles north of the small community of Cave Creek.

The property was located in 1882 and the original group of claims consisted of 19 patented and 35 unpatented lode claims. Fifteen patented claims of this original group are now owned by Lawrence M. Tozier and are leased from him by H. P. McNeill and Westec Corporation.

The Red Rover property has had a history of small, poorly guided operations, mainly concerned with mining only high-grade portions of the deposit. The value of recorded production from the property is approximately $778,734 at present metal prices. Unrecorded production would probably bring this total to over $1,000,000. It is doubtful if over 20,000 tons of ore have been produced.

The property is located in the mountain province of Arizona. Elevations range from 4,000 to 5285 feet in the vicinity of the deposit. The topography is generally moderate and the climate is semi-arid. Vegetation is sparse to moderate.

Geologically, the Cave Creek area consists mainly of Precambrian schists and intrusive rocks capped by Quaternary-Tertiary basalt flows which cover approximately one half the area of interest. Schists in the area would probably all correlate with the Precambrian Yavapai series. Intrusive rocks vary in composition from granite and related rhyolite porphyry to diabase. The majority of the intrusive rocks in the area are estimated to be Precambrian in age, however, one small mass of Laramide granite is exposed just north of Cave Creek.

Block faulting and subsequent tilting of the blocks seems to be the most prominent structural feature in the area. The district is located just west of a set of steep normal faults which curve to the south from the Verde Valley.

The Red Rover deposit is located at the possible fault contact of two types of schist of

E.B.

the Yavapai series. The schist forming the hanging wall of the fault has been almost completely replaced by jasperoid, which forms a pipe-like mass with a plunge of 45° to 50° to the north. The jasperoid is the host rock for all the significant copper-silver mineralization in this deposit. Both jasperoid replacement and mineralization took place after the intrusion of a north dipping tongue of rhyolite porphyry, which now forms the main hanging wall of the deposit. Both rhyolite porphyry and jasperoid have been intruded by a number of post mineral diabase dikes.

There are at least six different types and associations of mineralization of probably two different ages in the Cave Creek district. The majority of the deposits are in schist, and are generally associated with some type of igneous rock.

Mineralization at the Red Rover deposit is contained mostly within the jasperoid pipe. Oreshoots are situated along either the footwall or hanging wall of diabase dikes at the intersection of N60°W trending fractures. The deposit has a mixed zone of oxide and secondary copper and silver minerals extending to about the 700 level. Portions of this zone have been very rich, and it has been the source of most of the ore produced. Little is known about the nature and extent of the primary zone, however, the surface gossan indicates that it should be approximately 1,000 feet long and 400 feet thick. Mineralization will probably consist of moderate grade disseminated zones and higher grade veins scattered almost at random throughout the jasperoid mass.

Based on the overall showing of mineralization of the Cave Creek district and the rather extensive showing of mineralization and leached zones at the Red Rover property, I feel that an exploration program in this area would be well warranted. A general exploration program for the Cave Creek district should be of a reconnaissance nature, and should include mapping and geochemical and geophysical methods. A detailed exploration program at the Red Rover property should include mapping, sampling and geophysical methods. A program of diamond drilling as outlined in the main body of this report will be necessary to explore the zone of primary mineralization at the Red Rover, and to ascertain if the deposit can be profitably mined by using modern, large-scale methods.

Erik Bruner

Geologist - Westec Corp.

INTRODUCTION

This report was prepared at the request of Mr. H. H. Leigh, Vice President of Westec Corporation. It represents a general description of the Cave Creek area, and a more specific description of the Red Rover property.

No attempt was made to correlate the rocks in the Cave Creek area with those located in other parts of Arizona, other than in a very general way. No petrographic work was done on any of the rocks described in this report, and thus names given them should be regarded as field classifications only. Color descriptions conform to those given in the "Rock-Color Chart," prepared by the Rock-Color Chart Committee of the National Research Council.

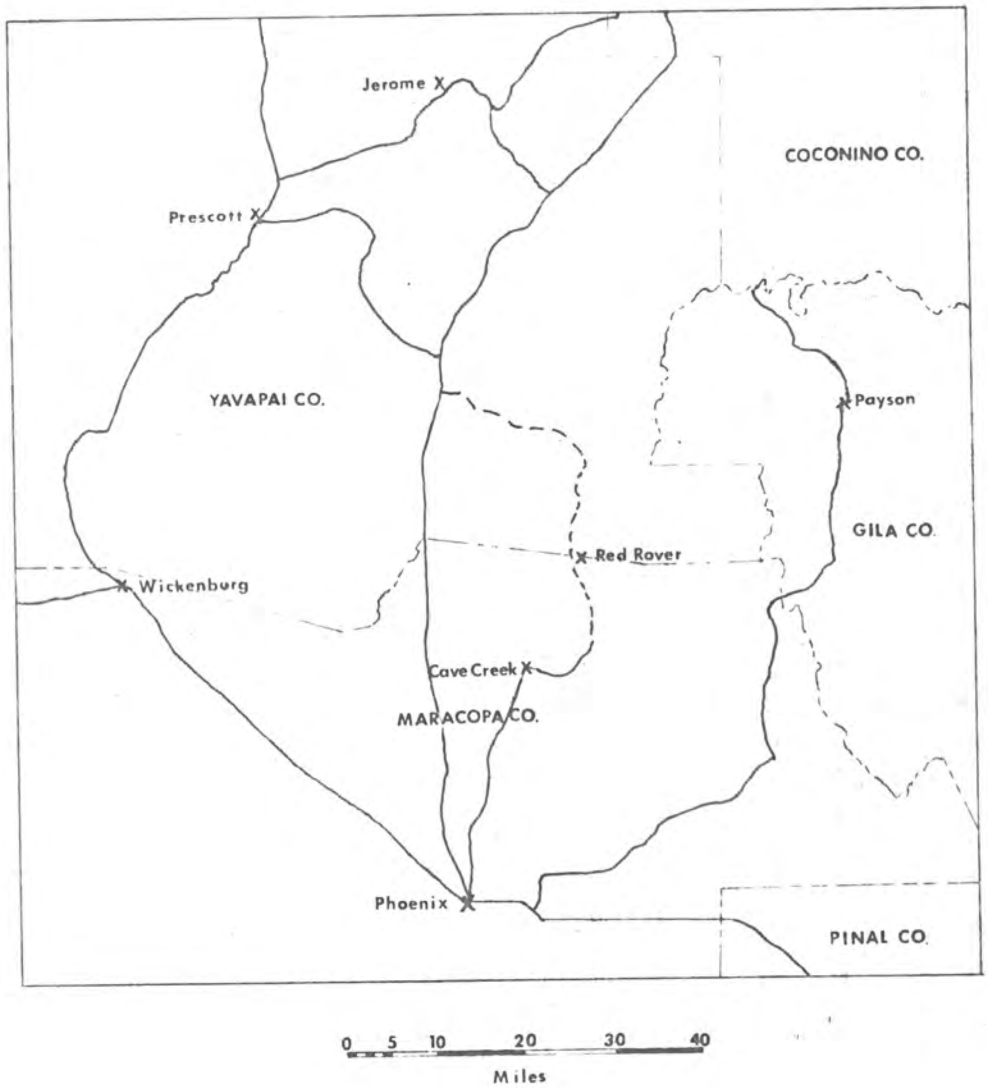
LOCATION AND OWNERSHIP

The Red Rover property is located in the Magazine mining district of Arizona, close to the Maricopa-Yavapai County line. The main workings are in the unsurveyed Section 36, T.8N., R. 5 E: S.R. B.M. The property is approximately 32 miles northeast of Phoenix and can be reached by driving north from Cave Creek, Arizona, 15 miles along Seven Springs road, turning right at an intersection marked "Red Rover Mine," and following a rough, dirt road for a little over four miles. Seven miles of the Seven Springs road is paved and the remainder is gravel.

The area is shown on U. S. Geol. Survey, Cave Creek and Turrent Peak 30 minute quadrangles and the newer, New River Mesa and Humboldt Mountain 7.5 minute quadranges. The Cave Creek and Turrent Peak quadrangles have been cut out and put together to make plate 1 of this report.

The original Red Rover group of claims consisted of 19 patented and 35 unpatented lode claims. Fifteen patented claims of this original group are now owned by Mr. Lawrence M. Tozier of Cave Creek and cover approximately 290 acres. These claims have been leased from Mr. Tozier by Mr. H. P. McNeill and in turn subleased from him by Westec Corporation.

FIGURE 1



WESTEC CORP.

LOCATION MAP – RED ROVER PROPERTY

4-27-'67 EWB

HISTORY

While there is evidence of Spanish workings at the Red Rover, probably in the early 1800's, the claims were formally located in 1882 and have been sporadically worked up to the present.

The original holder of the claims was the Red Rover Copper Company with Dr. D. W. Craig as President. Apparently the first ore produced was very rich with one 20 ton car load netting $41,000. Arizona Bureau of Mines Bulletin 140 lists production from 1882 to 1917 as having a total value of $200,000.

At some time between 1917 and 1935, B. A. Gillespie of Phoenix purchased the Red Rover Claims. E. M. Moores and various other lesees worked the mine prior to 1939.

From 1939 to 1941 Gillespie worked the mine and shipped 1621 tons of ore and concentrates to the Magma Smelter at ~~Surprise~~ Superior, Arizona. During this time, both sulfides and oxides were run through the mill on the property with rather poor results. Last reported work on the property by Gillespie was in 1947.

The property was bought from the Gillespie interest prior to 1964 and subdivided. L. M. Tozier purchased the best of the claims and leased them to H. P. McNeill in May, 1965. Prior to this time, and up to the present, McNeill has shipped a combination of ore from underground, sorted stope gob, and dump material to the I.C.C. Smelter at Miami, Arizona.

In October, 1965, Westec subleased the Tozier claims from McNeill and began a program of re-opening the 360 foot incline shaft, mapping, sampling, and <u>some</u> diamond drilling. The shaft has been reopened to the 300 level where water was encountered. Diamond drilling of short holes proved to be inconclusive, due to the highly leached nature of the rock in the upper portion of the oxide zone. Westec suspended operations at the Red Rover in December, 1966, as the crew was needed to reopen the company's Orphan Mine at Grand Canyon.

Productive history of the Red Rover has been marked by small, unorganized operations confined to high grade pockets of ore in the oxide zone and a few oreshoots in the secondary and primary

History (Cont'd):

zones. There has never been a concerted effort to map the mine, and it is doubtful if any geologic or engineering practice was ever used there. Work below the water table in the secondary or primary zones was hindered by usually inadequate pumping facilities. Also, general inaccessability of the mine probably kept it from having any steady production.

PRODUCTION

Listed below is a tabulation of recorded production from the Red Rover Property. At today's metal prices the total value would be approximately $778,734. Unrecorded production would probably bring this total to over $1,000,000. While there is no accurate record of tonnage produced, it is doubtful if it has been over 20,000 tons.

Operator	Year	Silver in Ozs.	Copper in Pounds
Red Rover Copper Co.	1882-1917	106,519 (?)	800,000
Moores & Picket	1934-1935	34,947	145,665
Gillespie	1939	30,638	109,445
"	1940	30,427	124,045
"	1941	11,392	56,508
H. P. McNeill	1964	4,533	17,493
"	1965	5,773	20,738
"	1966	1,937	7,631
TOTAL	1882-1966	226,166	1,281,525

GEOGRAPHY

The Red Rover property is located in the mountain province of Arizona. Elevations range from 4,000 feet to 5285 feet at Rover Peak, the prominant topographic feature in the area (plate 1). Topography is generally moderate. About six miles west of the Rover, there are a number of broad, basalt capped mesas. Seven miles east of the property is the broad valley of the Verde River.

Main drainage in the area is Cave Creek, which runs north-south about a mile west of the Red Rover. There are three main canyons trending N45E which drain the Red Rover area and empty into Cave Creek. Generally, the creeks run only in rainy seasons but are fed year round by numerous small springs in the district.

Climate in the area is semi-arid, probably only averaging 15 inches per year of precipitation. Temperatures range from freezing to around 75°F. in the winter and from 60°F. to 95°F. in the summer. Vegetation is sparse to moderate and consists mainly of juniper trees, scrub oak, and several varieties of cacti.

Rock exposures are generally excellent and mapping is not difficult; however, much of the area is overlain by Quaternary basalt flows which mask the Precambrian lithology and structure.

E.B.

GEOLOGY

Previous Work And Publications

The first and only published description of the Cave Creek area and Red Rover mine was by Alfred Strong Lewis (1920, p. 713-716). A copy of this paper is located in the Appendix of this report. Lewis' report gives a good description of the general geology and mineralization of the whole district.

Harry E. Jones surveyed the underground workings of the Red Rover on a scale of 1 inch = 50 feet in 1927. This map is accurate for the amount of work done up to that time; however, there has been considerable production and development work on the 800 and 900 levels since this map was made. A copy of the map (plate 3) is located in the pocket of this report.

In 1935, Charles H. Dunning made a private report on the Red Rover. A copy of his report is located in the Appendix of this report. Dunning gives a description of the workings on the lower levels and speculates on the depth of the zone of secondary enrichment. No maps accompanied his report.

In 1959, Harrison Schmitt made a rather brief private report on the Red Rover but did not spend enough time there to draw any helpful conclusions. A copy of his report is also located in the Appendix.

The writer first examined the Red Rover property on July 13, 1965. Several samples were taken during this one day examination and the results were generally encouraging. Two weeks were spent at the property in August, 1965, surveying and topographically mapping the surface over the main workings on a scale of 1 inch = 40 feet. Several later visits were made to the property and the (where) then accessable workings were surveyed and geologically mapped on a scale of 1 inch = 20 feet. The latest period spent at the property was from March 14 to March 26, 1967. Surface mapping of geology in more detail was made on a one-half scale reduction of the previously mentioned topographic map, and a potential drilling site was chosen. A total of 22 samples were taken at the Red Rover and from mineralization in the surrounding area. Sixteen of these samples were from various gossanous areas and several different rock types which were taken for geochemical analysis.

E.B.

REGIONAL GEOLOGY

The area consists mainly of Precambrian schists and intrusive rocks capped by Quaternary-Tertiary basalt and agglomerate. The shists are of a very diverse origin, but would probably all correlate with the Yavapai series. Foliation in the shists is moderate to well developed and has an average strike of N 45° E. The shists have been intruded by a number of large igneous bodies ranging in composition from granite and related rhyolite porphyry to diabase. In the vicinity of the Red Rover, the diabase has intruded rhyolite porphyry at numerous locations and is probably the youngest intrusive in the district. None of the intrusive masses noted show any evidence of strong shearing or metamorphism.

Nine miles south of the Red Rover property is a large granite mass which is coarse grained and porphyritic. Much of this granite is covered by Quaternary alluvium but it doubtless underlies an area of over 400 square miles. Four miles northeast of Cave Creek there is a small mass of medium grained, reddish granite which has an outcrop area of approximately three quarters of a square mile. This granite has been given Laramide age by the Arizona Bureau of Mines (1957).

Quaternary-Tertiary basalt flows and agglomerate cover approximately one half of the area of interest. The flows are typically gray to black in color and dense to vesicular in texture.

Structurally, block faulting and subsequent tilting of the blocks seems to be the most prominant feature in the area. Much of this deformation took place later than the spreading of the basalt flows,as many of the basal contacts have moderate to steep dips now. The area is located just west of a set of steep to vertical normal faults which curve to the south from the Verde Valley proper. This set of faults, which includes the Verde fault itself, is considered by Schmitt (1966 p. 23) as being part of the Wasatch-Jerome orogen.

LOCAL GEOLOGY

The Red Rover deposit is located at the probable fault contact of two types of shist of the Precambrian Yavapai series (plate 2). This contact formed the locus of large scale replacement of the schist on the hanging wall of the fault by jasperoid. The

Local Geology (Cont'd):

jasperoid now forms a pipe-like mass with a plunge of 45°-50° to the north. This jasperoid is the host rock for all significant copper and silver mineralization at the Red Rover. Both the jasperoid replacement of the schist and the subsequent mineralization of the jasperoid took place after the intrusion of a north dipping tongue of rhyolite porphyry, which now forms the main hanging wall of the deposit. The rhyolite porphyry and the mineralized jasperoid were then intruded by a number of generally northeast tranding diabase dikes.

Precambrian Rocks

Yavapai Series

Two shists of Precambrian age are in probably fault contact at the Red Rover property. The schist forming the foot wall of the fault, and of the mineral deposit itself, is here designated as the foot wall schist. The schist forming the hanging wall, is of sedimentary origin and strongly resembles a redbed deposit as described by Dunbar and Rodgers (1957, p. 209-218), and is thus here designated as redbed schist. No attempt has been made to correlate these shists with any previously described group of the Yavapai series, and they are only assumed to be part of the Yavapai series due to their geographic location.

Foot Wall Schist

The foot wall schist could be more properly described as a sericite phyllite. It outcrops in the south portion of the map area (plate 2) and, more extensively, to the south and southwest of the map area. It is moderately well foliated, striking N50°-70°E and dipping around 60° to the northwest. Outcrops of the phyllite vary in color from a predominantly grayish purple (5P4/2) to a moderate orange pink (10R7/4) in bleached areas. Numerous veinlets and stringers of pinkish gray (5YR8/1) to dusky red (5R3/4) jasper cut outcrops of the rock at various angles. Also present are a few stringers of dark yellowish orange (10YR6/6) limonite of uncertain derivation.

A hand lens inspection shows the rock to be composed of approximately equal amounts of grayish purple (5P4/2) sericite, which has a pearly lustre, and

Foot Wall Schist (Cont'd):

pinkish gray (5YR8/1) quartz,as grains and stringers elongated parallel to the foliation. Generally the quartz stringers and grains are from 1-2 mm wide and are from 2-25 mm long. The combination of quartz grains and stringers with sericite gives the rock a characteristically wavy or crinkled appearance.

Redbed Schist

The slightly metamorphosed sediments which form a belt between the intrusive rhyolite porphyry and foot wall schist in the center of the map area (plate 2) are poorly foliated, with strike and dip of the foliation being about N 15°-25°E and 70°-75°SE. The schist is composed of alternating beds of siltstone and poorly sorted sandstone with included conglomerate lenses. Outcrops are generally moderate red (5R5/4) in color but are bleached to a pale red purple (5RP6/2) when in contact with the rhyolite porphyry.

Hand lens examination shows the rock to vary from a dense, hard, grayish purple (5P4/2) hornfels to a medium grained, poorly sorted, moderate red (5R5/4) to grayish red (10R4/2) sandstone. The sandstone is composed mainly of .5 to 1 mm quartz grains with smaller amounts of .5 mm white feldspar fragments and a greenish mineral, possibly epidote. Also included in the sandstone are rounded rock fragments from 2 mm up to 1 cm in diameter. Portions of the redbed shist are limey,and give vigorous reaction to acid. Foliation is made apparent by flattening and parallelism of the mineral grains.

Jasperoid

Jasperoid forms two main crescent shaped masses on the surface of the Red Rover,and represents partial to complete replacement of the redbed schist. The two separate masses of jasperoid shown on Plate 2 doubtless join at depth, as there is no evidence of unaltered or unreplaced redbed schist in the adit (plates 3 and 4). On the surface and to the deepest accessible levels above the present water table, the jasperoid forms either in combination with a white talcy schist or as dense, fractured masses in areas of more extreme replacement.

The jasperoid is generally yellowish gray (5Y8/1) to light-greenish gray (5GY8/1), limonite stained, cryptocrystalline quartz. Specimens from the dump containing primary sulfide mineralization are generally greenish gray (5G8/1) in color and have a strongly brecciated appearance, with angular, light greenish gray (5GY8/1) fragments of cryptocrystalline quartz cemented by a combination of dark gray cryptocrystalline quartz and greenish black (5GY2/1) chlorite.

Present in, and associated with the jasperoid, are two zones fine grained calcite, as lenses and breccia fragments, which strongly resemble limestone. The fragments are rounded to angular, pinkish gray (5YR8/1) to light bluish gray (5B7/1) in color and range from 1/4 inch up to about 6 inches in diameter. The fragments are set in a matrix of jasperoid in the eastern outcrop (plate 2), or as fragments and lenses in a shear zone in redbed shist in the western outcrop. The calcite may either be the result of hydrothermal activity, or be altered limestone or limey lenses that were present in the original redbed schist.

Generally, areas or zones of massive jasperoid are in contact with either the foot wall or hanging wall of diabase dikes, and seem to represent areas of the most intense hydrothermal activity. Other areas show gradations from massive jasperoid to a combination of jasperoid stringers in a white, talcy schist. The talcy schist is generally well foliated and contains numerous, rounded, 1-2 mm grains of quartz. The attitude of foliation of the talcy schist is usually parallel to that of the redbed schist and thus probably represents an alteration product partway between redbed schist and jasperoid.

Surface outcrops of the jasperoid cover an area of over 177,000 square feet in the vicinity of the main workings of the Red Rover property, and scattered outcrops of jasperoid with associated copper mineralization occur over 1,000 feet to the east of the main workings, along the fault between the redbed schist and the foot wall schist.

Distinction must be made, however, between jasperoid and jasper, which seems to represent a much more general phase of hydrothermal alteration in the Red Rover area as well as in many other areas in the district. The jasper is abundant in the foot wall schist and forms several large, silicified outcrops southwest of the map area. It generally ranges in color from pinkish gray (5YR8/1), to dusky red (5R3/4), and is much more dense in appearance than the jasperoid. Generally, the pinkish gray jasper is confined to zones or veins along N40°W fractures, or in the case of the large, silicified outcrops, forms as numerous veinlets cutting the rock at any angle. Dusky red jasper with associated specularite forms as small veinlets and pods cutting the main mass of the rock at no preferred orintation, and seems to be mainly concentrated along the contact of the rhyolite porphyry. In many instances, the intruded rock has been replaced by jasper in great enough quantity to mask foliation.

Intrusive Rocks

Rhyolite Porphyry

A north dipping tongue of rhyolite porphyry intrudes the redbed schist near the Red Rover main workings, and only a small portion of it is shown on plate 2. This tongue extends to the north for about 2900 feet and to the west for about 600 feet past the map area, where it is covered by Cenozoic basalt. This western tongue is part of the main mass of rhyolite porphyry which comprises the ridge including Rover Peak shown on plate I.

The rhyolite porphyry is the oldest non-foliated intrusive in the area. Outcrops are generally bold, and show well developed jointing. Color on weathered surfaces ranges from moderate red (5R4/6) to light red (5R6/6). The rock is quite resistant to weathering and forms the most prominant topographic features in the area.

Hand lens examination shows the rock to be composed of about 15% subhedral, white, 2-6 mm long, plagioclase phenocrysts in a moderate red (5R5/4) microcrystalline groundmass. Most of the plagioclase phenocrysts are kaolinized, but the groundmass appears fresh and unaltered. Texture of the groundmass varys from one in which no crystals at all may be seen by the hand lens, to one where phenocrysts of 2-3 mm quartz grains may be seen. Also present is a greenish mineral, possibly epidote. Occasionally a very slightly developed crystal of orthoclase is visible. No mica or mafic minerals were noted.

Present in some outcrops of the rhyolite porphyry are small, 1-2 mm, miarolitic cavities now partially filled with limonite. Limonite stain is also present in some portions of the rock.

E.B.

Rhyolite Porphyry (Cont'd):

Near contacts with other rocks in the area the rhyolite is bleached to a yellowish gray (5Y8/1). The plagioclase phenocrysts are strongly kaolinized, and only an occasional quartz grain may be seen in the groundmass. Limonite is common as general staining, cavity filling, and most pronounced as coatings along joints.

Some samples were taken from the general mass of the rhyolite porphyry which have the same general light red (5R6/6) color as the rest of the rock, except that phenocrysts, which comprise about 20-25% of the rock mass, are euhedral, grayish orange pink (5R7/4), 3-8 mm long crystals of orthoclase. The phenocrysts are generally in a microcrystalline groundmass in which no minerals are visible with a hand lens. While the two rock types are very likely closely related, not enough time was spent to determine their relationship.

Diabase

Two types of diabase are present in the general area. One, a "normal" diabase, is located part way up the hill north of the vertical shaft in the vicinity of the proposed drill site shown on plate 4. Here it forms a dike-like mass about 1600 feet long and 350 feet wide, trending N50°E. Another much smaller mass of this type of diabase is located about 1300 feet east of the map area, in the wash followed by the road.

The other type of diabase is fine grained, but it doubtless derived from larger masses of normal diabase. The fine grained diabase forms numerous dikes which have intruded both jasperoid and rhyolite porphyry (plate 2). The trend of these dikes is generally N20°-40°E and the dip is usually 45°-50°NW. Contacts of the dikes are extremely irregular, however, and projecting them for any distance is difficult.

Outcrops of the normal diabase are generally subdued, as the rock weathers readily into soil and typically spherical boulders. Weathered surfaces of this diabase range in color from very pale orange (10Y/R8/2) to pale yellowish orange (10Y/R8/6). Fresh surfaces of the rock are generally a dark greenish gray (10GY4/1).

Diabase (Cont'd):

Within the diabase masses there are areas which are almost completely altered to light olive (10Y5/4) epidote and glassy to milky quartz in the form of veinlets and crystals.

Hand lens inspection shows the rock to be medium grained, varing from 1 mm near contacts to 4 mm near the center of the mass. The larger grained diabase has a pronounced diabasic texture and is composed of around 70% plagioclase, 17% to 19% augite, and 1% to 3% magnetite in 1 mm euhedral crystals. Pyrite is present in 1 mm cubes, but is rare.

Outcrops of the fine grained diabase are more resistant to erosion than the normal diabase. Generally, this diabase is a dusky yellowish brown (10YR2/2) on weathered surfaces and joint and fracture surfaces, with the inner portion of the rock being a moderate yellowish brown and, in places, a dark reddish brown (10R3/4). Color of the fine grained diabase, from the dump of the vertical shaft and in some of the deeper accessible workings, is a uniform dark greenish gray (5GY4/1).

Individual minerals of the fine grained diabase are unrecognizable with a hand lens except for epidote, which forms as fracture filling. No evidence of sulfide mineralization in the diabase itself has been noted.

Age of the diabase and its relationship with the mineralization at the Red Rover property is open to question. Oreshoots form along both foot wall and hanging wall contacts of the diabase, but always in jasperoid. In the few rare instances where limonite gossan was noted within the diabase dikes, it was always in association with jasperoid, and likely represents pods or masses of previously mineralized jasperoid that were engulfed by the intruding diabase.

The close association between diabase and mineralized jasperoid is hard to explain without assuming that the diabase is really pre-ore and acted as a barrier or guide for ascending hydrothermal solutions; except that the masses of fine grained diabase in the southwestern portion of the map area are in a zone of only slightly altered redbed schist with no associated jasperoid or mineralization. It is possible that the diabase could have intruded along previously mineralized northeast trending fractures in the main jasperoid mass, and that the association between diabase and mineralization is merely fortuitous. This problem needs more study, especially in the deeper levels which have not been so highly altered and leached as those near the surface.

E.R.

Structure

The jasperoid mass at the Red Rover deposit has been the focus of intense fracturing along certain directions. This is not so obvious on the surface as it is underground, where many of the accessible workings have been mapped in detail. Generally, the faults present show little notable displacement. No extended account concerning any special structural feature will be given here, but only a summary of the more important fracture sets.

Results of the earliest Precambrian deformation in the Red Rover area are shown in the foliation of the schists of the Yavapai series. The attitude of the foliation of the foot wall schist is conformable with that of the district, as shown on Lewis' map (1920, p. 714). The attitude of the foliation of the redbed schist is anomalous to this trend, however. Since the two types of schist differ both in lithology and attitude of foliation, they are almost certainly separated by a fault. The surface trace of this fault is not obvious and is marked only generally on plate 2. The trend of this foot wall fault is N75°E dipping 45°-50°NW.

A much more obvious direction of fracturing and faulting strikes N40°E and dips 45°-50°NW. The drifts of the upper levels of the mine follow a mineralized fault with a well defined gouge zone along this trend. Most of the diabase dikes follow this attitude and were probably all emplaced along pre-existing faults or fractures of the N40°E. trend.

Perhaps the second most important direction of fracturing and faulting is the N50°-60°W trend, with dips of vertical to 60°NE. At the majority of intersections between this direction and the N40°E direction, there are either stopes in massive jasperoid, stains of copper oxide mineralization, and/or large gossanous areas indicative of former sulfide mineralization.

A N10°-20°E, steeply southeast dipping fracture direction generally parallels the foliation of the redbed schist. This trend does not seem to have much bearing on mineralization, although Dunning mentions a vein on the 700 level, in his report, that strikes N20°E and dips 70°SE (?). The two zones containing the limestone or calcite lenses and breccia are also parallel to this direction.

A N30°-40°W direction of fracturing is prominent in the foot wall schist, where the fractures are usually filled with jasper. This trend does not seem to have much importance in the mine area, however.

ORE MINERALIZATION

REGIONAL

There are at least six different types and associations of mineralization of probably two different ages in the Cave Creek area. The majority of the deposits are in schist of the Precambrian Yavapai series, and are generally in association with some type of igneous rock. The following is a short summary of each different type of mineralization:

Gold, Silver, Lead, Copper Veins

This mineral assemblage is contained in usually narrow quartz veins in silvery, sericite schist, close to the contact of the coarse grained Precambrian granite. This type of mineralization is quite typical of Precambrian deposits in the central part of Arizona, especially in the Bradshaw Mountains. It is doubtful if any of these veins would be of economic interest.

Tungsten Veins with Gold, Copper, Flourite and Minor Molybdenum

This mineral assemblage is described by Wilson (1941) in a deposit located five miles north of Cave Creek. The principal mineral is ferberite with auriferous pyrite, chalcopyrite, flourite, and minor molybdenite. Ore shoots are two to three feet wide and are located at fracture intersections. The deposit is associated with a granite. Very likely the age of this mineralization is Laramide, as the flourite-molybdenite combination is quite rare in Precambrian deposits in Arizona. Since I did not examine this property I cannot give any qualification as to its size or potential.

Gold and Copper in Massive Pyrite

Only one deposit of this type, the Blue Bird, was noted. Its location is shown on plate I. The deposit is essentially a replacement in schist, and consists of narrow pods of massive, fine grained pyrite with minor chalcopyrite in a 10 to 15 foot wide zone in sericite schist. The mineralized zone is conformable to the foliation of the schist, and strikes N80°E with vertical dip. Evidence of the massive pyrite mineralization appears along the zone for about 50 feet. A sample of the massive pyrite from the dump of a 50 foot deep shaft assayed; Au=.48 oz/T, Ag=.40 oz/T, and Cu=1.05%.

While this deposit itself seems quite small, it represents one of the most productive types of Precambrian mineral deposits in Arizona, and should be given more time and study.

Disseminated Copper in Diorite

This type of deposit occurs at Cramm Mountain, shown on plate 1, and consists of small blebs of copper pitch, chalcocite, and malachite stain in a dark green, fine grained hornblende diorite (?). This rock has quite a different appearance from the usual fine grained diabase of this area, and weathers to a more reddish brown. The disseminated copper mineralization seems to be concentrated along a wide shear zone. Chalcopyrite is reported to be the primary mineral exposed in a lower adit, but the back end of this level was filled with water at the time of my visit.

Cramm Mountain forms part of what could be called the "copper zone" of this district. It extends southwest of Cramm Mountain to, and beyond the Red Rover to the northeast, and is about three miles wide. It is an area that should be extensively prospected by anyone interested in the district.

Chalcopyrite-Pyrite Veins in Quartzite

This type of deposit is located on the east side of Rover Peak part way down the mountain, and is about one mile northeast of the main workings of the Red Rover property. It consists of chalcopyrite and pyrite with associated specularite in a gangue of calcite. There are several veins of this type, ranging from 6 inches to 1.5 feet wide, in a 20 foot wide zone of jasperized quartzite and metamorphosed siltstone. Strike of this zone is N36°W and general dip is 80°SW. The quartzite host rock is unde formed and shows good bedding, striking N75°W and dipping 18°NE. Possibly the quartzite is either underformed Mazatzal or one of the quartzites of the upper Precambrian Apache group.

LOCAL

Mineralization at the Red Rover property consists of a combination of oxide, secondary, and primary copper and silver minerals in a gangue of jasperoid, and minor calcite, ankerite, and possibly siderite. Pyrite is very minor, and as yet, no lead or zinc minerals have been noted.

Minerals in the oxide zone consist of malachite, azurite, chrysocolla, cuprite, and cerargyrite. Generally, these minerals occur as stains and fracture fillings in jasperoid, and as impregnations in talcy schist. Limonite is abundant in the oxide zone, and is usually moderate brown (5YR3/4) to grayish brown (5YR3/2). It occurs both as massive, pulverulent zones in jasperoid, generally at fracture intersections or in veins, and as indigenous cavity filling in the jasperoid, usually as disseminated haloes around zones of more massive limonite. There is very little transported limonite present in gossanous areas, indicating that the original pyrite content was low.

Minerals of the secondary zone, or zones, include chalcocite, very rare unreplaced chalcopyrite and probably argentite in combination with chalcocite. The chalcocite ranges from sooty black to steely gray

Primary zone minerals (noted in samples from the dump of the vertical shaft) include bornite, tetrahedrite-tennantite, chalcopyrite, possibly chalcocite, and very minor pyrite. No lead or zinc minerals have yet been noted, and a composite spectograph of primary mineralization shows no zinc present and only .3% lead.

There is no clear cut distinction between the oxide zone and secondary zone at the Red Rover deposit. Dunning mentions a combination of leached zones and chalcocite on the 700 level, with the amount of chalcocite increasing in a winze below the level. The combination of leached zones, zones of oxide minerals, and small pods of chalcocite seems to extend from near the surface to at least the 700 level. One pod of chalcocite in the "Bridal Chamber" stope was only about 90 feet below the surface. A three foot chip sample of the best looking material assayed 100 oz/T silver and 9.6% copper.

Zones of primarily oxide minerals seem to be in areas which were once highly mineralized, and which had enough carbonate left in the jasperoid and talcy schist to bring a portion of the copper out of solution. Silver, of course, is mainly dependent on halide ions to precipitate it in the oxide zone, and thus this type of mineralization generally averages less than 5% copper but from 10 to 15 oz/T silver.

Perhaps the combination of mixed secondary and oxide minerals at the same elevation is due to a fluctuating water table in this area, or to a certain odd set of geochemical factors. Fault gouge and the diabase dikes have acted as traps for descending supergene solutions in many places in the mixed oxide-secondary zone.

On the surface and in the upper workings, there are extensively leached areas in jasperoid, which contain abundant, indigenous, pulverulent, moderate brown to grayish brown limonite. Very dusky red (5R2/6) specularitic limonite is present in some of these areas but only in small amounts. Nine samples, of both limonite and jasperoid containing limonite, were taken for geochemical analysis in order to ascertain if the limonite was derived from copper minerals. Results ranged from 4 ppm to 120 ppm silver and from 128 ppm to 3290 ppm copper. None of the samples contained any visible silver or copper minerals. Sample locations are shown on plates 1 and 2, and are described under the section on sampling. These numerous gossanous areas indicate that primary copper mineralization was much more widespread and extensive in the main jasperoid mass than is indicated by stoped areas in the oxide zone.

Little is known about the nature of primary mineralization at the Red Rover. E. M. Moores Jr. (written communication) indicates mining primary ore on the 800 level from a vein 6 to 10 feet wide, assaying 4% copper and 11 oz/T silver, but does not state the minerology. Jones' map (plate 3) shows areas marked only as "ore" on the lower levels and shows a 3'13" vein of bornite on the 500 level. From description of workings on the lower levels and from a study of Jones' map, it is very doubtful if workings in the primary zone disclose the size or average grade of primary mineralization at the Red Rover, as indicated by gossanous areas on the surface.

A study of Arizona Precambrian copper deposits shows that, in the replacement class, the majority of the deposits are massive sulfide, with pyrite greatly predominating over the other minerals, in a gangue usually of quartz, calcite, ankerite, and rarely siderite. Only the United Verde deposit at Jerome is pipe-like, the remainder of the deposits being en echelon lenses parallel to the foliation of the Yavapai series. Also, jasperoid gangue, described as such, is rare in these deposits. Anderson and Creasy (1958, p. 111), however, describe silicification at the United Verde as being formed as a replacement earlier than sulfide mineralization, and as fine grained quartz, almost flinty in texture, and red, black, or white in color. They also describe jasper nodules as being present in the foot wall of the deposit in quartz porphyry.

It is quite possible that in depth the Red Rover deposit might turn into more of a massive sulfide type of deposit. Zoning indicates that the amount of pyrite and chalcopyrite will probably increase over bornite and tetrahedrite-tennantite in depth, and will probably occur in combination, as noted in the Blue Bird prospect five miles south of the Red Rover.

The source of the mineralizing solutions at the Red Rover deposit must have been quite deep, as neither of the intrusive rocks in the area indicate a genetic connection with mineralization. Chip samples of unaltered rhyolite porphyry taken from the top of the hill 1200 feet northwest of the main shaft contained 32 ppm copper, and chips of bleached, limonite stained rhyolite porphyry, near the contact with jasperoid, contained only 40 ppm copper. Chip samples of "normal" diabase from an outcrop 600 feet northwest of the vertical shaft contained only 54 ppm copper.

There are only two other areas close to the Red Rover deposit which show some potential as mineralized areas. First of these is about 2900 feet east of the main workings of the Red Rover. It is an area of jasperoid about 250 feet wide and 800 feet long, showing minor copper stain and abundant transported limonite. Samples of this jasperoid contained only 1 ppm silver and 94 ppm copper, however.

The other area of interest is about 1700 feet south of the main workings, and is a vein about three feet wide. Several shallow pits along the vein show malachite stain, limonite, siderite, ankerite and jasperoid. The vein is possibly 1700 feet long, but is mostly covered by basalt. Exposed portions of this vein strike N20°E and dip vertically to 75°SE. A sample of limonite from the dump of a 20 foot deep shaft on the southwest end of this vein, contained 3 ppm silver and 526 ppm copper.

SAMPLING

The following is a tabulation of samples taken for both assay and geochemical analysis from the Red Rover property, and from deposits in the surrounding area. Areas from which the samples were taken are shown on plates 1 and 2 and are shown only as sample numbers.

Sample No.	Description	Assays Au.	Ag	Cu
2601	East of Rover Peak 1.5 foot wide chip sample of vein. .5 foot mostly leached away.	.01 oz/T	.40 oz/T	2.40%
2602	Blue Bird deposit - Grab sample of massive pyrite with chalcopyrite from dump of shaft.	.48 oz/T	.40 oz/T	1.05%
2603	Blue Bird deposit - Grab sample of pyritic schist from dump of shaft.	.01 oz/T	.20 oz/T	.25%
2604	Red Rover property - Representative grab sample of dump from small shaft west of main workings, showing malachite stained schist.		10.80 oz/T	3.15%
2605	R.R. property - chips of non-mineralized jasperoid from outcrop SW of main workings, 9780N, 9430E.		8 ppm	1276 ppm.
2606	R.R. property - same location as No. 2605 - Chips of massive limonite, one foot wide.		18 ppm	1208 ppm.
2607	R.R. property - West of main workings, 9640N, 9370E, chips from 5 foot wide limonite zone.		1 ppm	72 ppm.
2608	R.R. property - chips of unaltered rhyolite porphyry, 1200 feet NW of vertical shaft.		(1 ppm	32 ppm.

Sample No.	Description	Assays Au.	Ag	Cu
2609	R.R. property - chips of "normal" diabase, 600 feet NW of vertical shaft.		(1 ppm	54 ppm
2610	R.R. property - chips of limonite and jasperoid, in adit; 9890N, 10,020E.		5 ppm	494 ppm
2611	R.R. property - chips of limonite and jasperoid from H.W. of Db. dike, in adit; 9900N, 10,025E.		4 ppm	128 ppm
2612	R.R. property - Dusky red, hematitic gossan, in adit; 9891N, 10,005E.		2 ppm	446 ppm
2613	R.R. property - chips of 4 foot wide zone of massive dusky red and moderate brown limonite; 9780N, 9570E.		120 ppm	3290ppm
2614	R.R. property - chips of bleached, limonite stained, rhyolite porphyry; 9800N, 9360E.		1 ppm	40 ppm
2615	R.R. property - chips of non-mineralized, "dead" jasperoid; 9810N, 9400E		1 ppm	44 ppm
2616	R.R. property - chips of jasperoid and limonite along road; 9884N, 9764E.		10 ppm	2430ppm
2617	R.R. property - chips of limonite from limestone breccia - jasperoid zone along road; 9830N, 10,040E.		8 ppm	426 ppm
2618	R.R. property - chips of limonite from gossan behind bunkhouse; 9890N, 10,140E.		18 ppm	2750ppm
2619	R.R. area - 2900 feet east of workings - chips of limonite stained jasperoid		1 ppm	94 ppm
2620	R.R. area - shaft, 3200 feet south of main workings, grab of limonite stained jasperoid on dump.		3 ppm	526 ppm

PROPOSED EXPLORATION

An Exploration Program, for anyone interested in the Red Rover property, should be divided into three parts. One part should be a complete reconnaissance of the Cave Creek district, and should include mapping, sampling and geophysical work. There are many scattered deposits of various minerals in the area that would very likely form a pattern when plotted and evaluated. The second part of the program should be detailed mapping of the Red Rover area, in all directions out from the outcrop of the deposit. This should include geochemical sampling, and very likely an induced potential geophysical survey. This should give a good idea as to the potential of the surrounding area before any undue interest in the district is aroused. The third part of the program should be detailed mapping, sampling, diamond drilling, and geophysical work at the Red Rover deposit itself.

Detailed geologic mapping of both the surface and accessible underground workings should be made on a scale of at least 1 inch = 40 feet. Gossanous areas should be plotted and geochemically sampled. This detailed work will reveal potential underground areas that have not yet been explored.

The oxide zone of this deposit, which probably extends to the 700 level, will likely be of little interest to anyone planning a potential medium to large scale mining program at the Red Rover deposit. Doubtless, many unexplored areas of rich secondary and oxide mineralization still exist above the 700 level, but they will be spotty and hard to follow.

I feel that the prime target at the Red Rover is the primary zone below the 700 level, which will probably also include some secondary mineralization. If conditions at depth are the same as those shown on the surface by leached zones, the potential target area will be 1,000 feet long and 400 feet thick. Mineralization will probably consist of moderate grade disseminated zones and higher grade veins scattered almost at random throughout a main jasperoid mass. There is also the previously mentioned possibility of the mineralization turning to a more massive sulfide at depth.

C.B.

A deposit of this size would be amenable to modern large scale mining methods, and would allow for an overall lower grade of mineralization than that sought by previous operators. The nature of the diabase dikes at depth will be an important dilution causing factor, which must also be considered.

Shown on plate 5 is a cross section through the vertical shaft on a 1 inch = 50 foot scale. Information came both from my surface map and Jones' map of underground workings (Plate 3). I have projected the levels shown on his map into the section, and have shown places marked "ore" as red dots. Downward projection of the outline of the jasperoid mass on the surface is generally conformable with the potentially mineralized zone at depth. It also shows some rather large gaps in development work.

I propose drilling at least thee 1200 foot plus, diamond drill holes from the location shown on Plates 1 and 5. The first hole should be vertical, and should enter the potential zone at 600 feet, and should leave it at a little over 1100 feet in depth. The next two holes should be drilled from the same location, but with one to the northeast and one to the southwest. This should show the lateral extent of the deposit at that depth. If this drilling is encouraging, more holes should be planned to intersect the potential zone at a greater depth. Also, shaft should be repaired, the water pumped out of the workings, and a program of mapping, sampling, diamond drilling, and development work should begin on the deepest level.

An induced polarization geophysical survey either before or during the preliminary drilling would also be helpful in determining the downward extention of the mineralized zone.

L.B.

WATER, POWER AND SUPPLIES

Water is present at the Red Rover property in the 360 foot incline shaft. It stands just below the 300 level, or 220 vertical feet below the collar. Judging from most of the available reports, the workings make 50 gallons of water per minute. Drinking water must be hauled to the property, and may be obtained either at Cave Creek or at Seven Springs, about seven miles by road from the property.

Power is also available at the property, where Westec has installed a D 337, Series F, diesel power plant with a capacity of 480 volts A.C. - 10KVA. The only commercial power near the property is a 350 K.V. transmission line about one mile west of the main workings.

Supplies may be obtained in Phoenix. The closest source of timber is Prescott, about 100 miles distant from the property.

E.B

PRESENT EQUIPMENT

Westec has installed a number of permanent pieces of equipment at the Red Rover property. These include the previously mentioned power plant, an electrically powered 600 cfm compressor, and a 500 foot capacity Coeur D'Alene hoist, which serves the 360 foot incline. All this equipment is presently operative, and is supplied with all the necessary switches, wiring, etc. The 360 foot incline shaft is serviced with a four inch airline and one inch water line to the 300 level. All the equipment is housed in combination plywood-corregated steel, frame buildings set on reinforced concrete slabs. A 30 foot high, steel headframe is set over the 360 foot incline. Also present is a 20 x 60 foot, recently renovated, frame building which is suitable for either an office or bunkhouse.

E.B.

REFERENCES CITED

Anderson, C. A., and Creasy, S. C., 1958, Geology and ore deposits of the Jerome area, Yavapai County, Arizona: U. S. Geol. Survey Prof. Paper 308, 185 p.

Ariz. Bureau of Mines, 1957, Geologic map of Maricopa County, Arizona: Tucson.

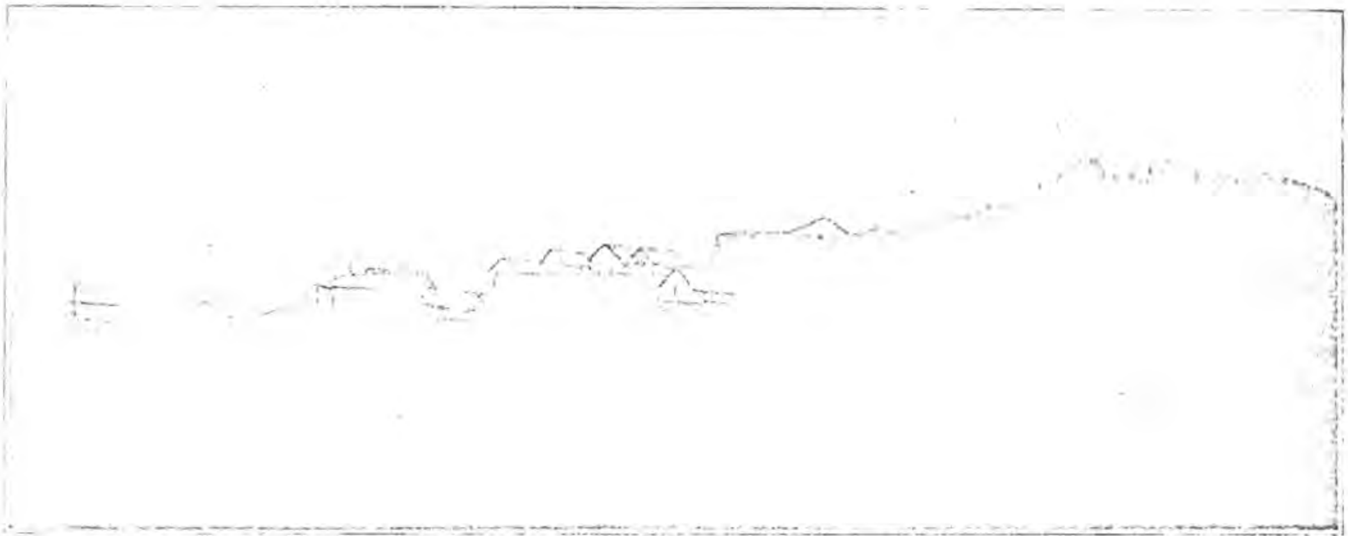
Dunbar, C. O., and Rodgers, John, 1957, Principles of Stratigraphy: New York, John Wiley & Sons, Inc., 356 p.

Lewis, A. S., 1920, Ore deposits of the Cave Creek district in Arizona: Engr. Mine Jour., v. 100, p. 713-716.

Schmitt, H. A., 1966, The porphyry copper deposits in their regional setting in Geology of the porphyry copper deposits - Southwestern North America: Tucson, University of Arizona Press, p. 17-33.

Wilson, E. D., 1941, Tungsten deposits of Arizona: Arizona Bur. Mines Bull. 148, 54 p.

E. B.



CAMP AT RED ROVER MINE, CAVE CREEK DISTRICT

Ore Deposits of Cave Creek District, in Arizona

Geology of Area Twenty-eight Miles North of Phoenix Described—Only Deposit Developed of Present Importance That of Red Rover Mine—Characteristics of Principal Type of Outcrops Discussed

BY ALFRED STRONG LEWIS

Written for Engineering and Mining Journal

WITHIN the last two years I have made several professional trips to the Cave Creek mining district, in Maricopa County, Ariz., for Eastern clients holding mining interests therein. In passing over and through the district, and in connection with my examination of certain specific properties, I was greatly impressed by the appearance of the general surface conditions, and therefore determined to make a careful examination, with the purpose of preparing a geological map of the district. This article is based on such survey and examination.

First I made a thorough search of all possible sources for information relating to the district, but found nothing except that its northeast corner was included in the quadrangle covered by the Bradshaw folio of the U. S. Geological Survey. Careful study was made of the Government geological maps and other data relating to the developed districts both north and south of the Cave Creek district, in which the same surface conditions are disclosed as I found to exist in the latter.

MAPPING THE DISTRICT

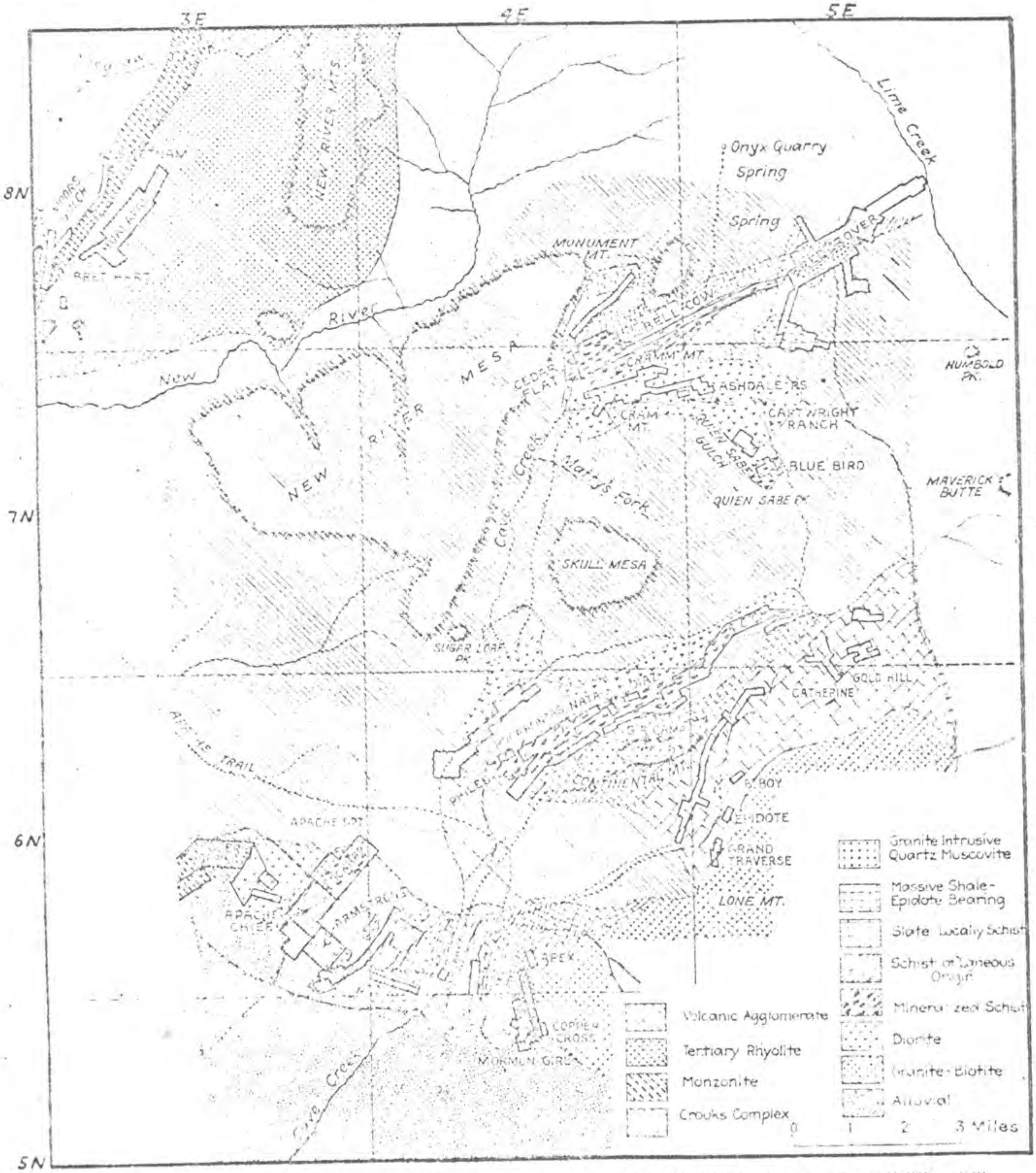
Having completed the study of the adjoining territory I proceeded to examine the Cave Creek district about July 1, 1919, and by Oct. 1, 1919, I had gone over all of the country which had exposures of the older pre-Cambrian formation. I found large areas within the district to be covered by volcanic agglomerate, which was not mineralized and was therefore of no economic importance. These areas I simply sketched in and did not attempt to differentiate. The final results of my work are embodied in the geological map on page 714.

The Cave Creek district is twenty-eight miles due north of Phoenix, Ariz. The road leading out of Phoenix is paved for the first eight miles and from that point passes through the Paradise Valley with slight grades. The elevation of the district varies from 2,100 ft. in the lowest part of the basin to a maximum of 5,000 ft. at the higher peaks. The main outlet for the drainage of the entire district is Cave Creek, which has an average fall of 200 ft. to the mile. At its headwaters near the Red Rover mine it has an elevation of about 4,000 ft. and twenty miles from here it emerges into the desert at an elevation of 2,000 ft.

EVIDENCES OF GREAT EROSION APPARENT

Following up Cave Creek, a rim of low mountains is first encountered through which the stream has cut its course. The rim forms the southern boundary of the district. These mountains are abruptly covered at the base of their southern slope by the alluvial material of Paradise Valley. At the foot of the northern slope they are covered by volcanic agglomerate, which covers a basin-like area about three miles wide, feathering out to the east, but widening to the west. High ridges and mesas then succeed one another for several miles. Cave Creek has cut a deep gorge in this part of its course. The ridges and mesas finally give place to open country with an average elevation of about 3,500 ft. and the creek branches out into numerous small washes and ravines. Erosion has been very great, as evidenced by the great depth of the fill in Paradise and Salt River valleys. These hills, which now stand out alone and disconnected, were once part of an enormous mountain system extending from the interior of Mexico diagonally across Arizona and continuing through Nevada. Many thousand of feet have been torn from this mountain system by powerful forces of nature operating through millions of years. This material has been washed down into the great chasms at their feet. The chasms have been filled and leveled into broad valleys of great agricultural activity, and the once lofty peaks have been dwarfed and diminished into low hills of insignificant size. These tremendous destructive natural agencies have finally exposed at the surface mineralized zones which were originally conceived at profound depth.

The geological ages represented in the district by agglomerate, are for the most part in their original position and are non-mineral bearing as far as known. The Paleozoic beds elsewhere developed in Arizona are entirely absent here. Rocks of igneous origin, however, represent volcanic activity in many geologic periods.



RECONNAISSANCE MAP OF AREAL GEOLOGY OF CAVE CREEK MINING DISTRICT, MARICOPA COUNTY, ARIZ.

sedimentary deposits are confined to the oldest and the youngest of all exposures in Arizona. The pre-Cambrian sediments, which have been highly altered, metamorphosed, folded and finally compressed into shales, slates, and schists, are mineral bearing, but the Tertiary (or Quaternary) deposits, composed of volcanic

Granites of Algonkian age are present; siliceous porphyries originally bedded in pre-Cambrian oceanic sediments, and now forming nearly vertical zones of schist; later granite intrusions in the schists diagonal to its strike; greenstone bedded with the schists and diorites in large marginal masses as well as small and large dikes irregularly intruded into the schist; and narrow granite prophyry dikes developed for miles in length and running with the strike of the schists, some highly sericitized, some highly siliceous.[1] At certain points as many as six of these dikes running remarkably parallel and spaced from 300 to 600 ft. apart are exposed.

Upon the southeastern margin of the districts is exposed a coarse-grained biotite granite batholith which covers an area of about 2,000 square miles. The granite weathers into peculiar shaped boulders which have almost the identical appearance of the boulder batholith granite exposures of Butte, Mont. The batholith, if of post-Paleozoic age, may have doomed and broken up the Paleozoic beds, rendering them easy prey to the erosive action of the Verde and Salt rivers. Deformation is evidenced by highly contorted rocks in many localities, as well as the change in the strike of the schist zones. There is a remarkable persistency in this strike. The normal strike seems to be N 32° E, and the deformed strike in almost all cases in N 60° E.

Quartz Lenses and Stringers Prominent in Schist

At certain points the schists contain large and small lenses, stringers, and bands of jasper and quartz. Some of these lenses are prominently developed. They are usually from 10 to 50 ft. wide and from 200 to 500 ft. long. They do not occur in straight lines, but are offset in a somewhat regular manner and occur in the softer, more highly sericitized and bleached zones of schist and usually in proximity to the acid-porphyry dikes. Throughout these mineralized zones are distributed many small outcroppings of copper, silver, and gold minerals.

The exposures in the Cave Creek district are similar to those found at the surface in the proven districts of Arizona. An examination of the ore outcrops throughout the district discloses clearly the fact that, in the main, the gold, copper, and silver have been leached, leaving occasional shoots or kidneys of ore which have escaped leaching by reasons of some topographical or other conditions unfavorable to leaching. Such residual oreshoots are found to carry values in gold, silver, and copper running from $10 to $60 per ton.

Red Rover Deposit Only One of Importance to Date

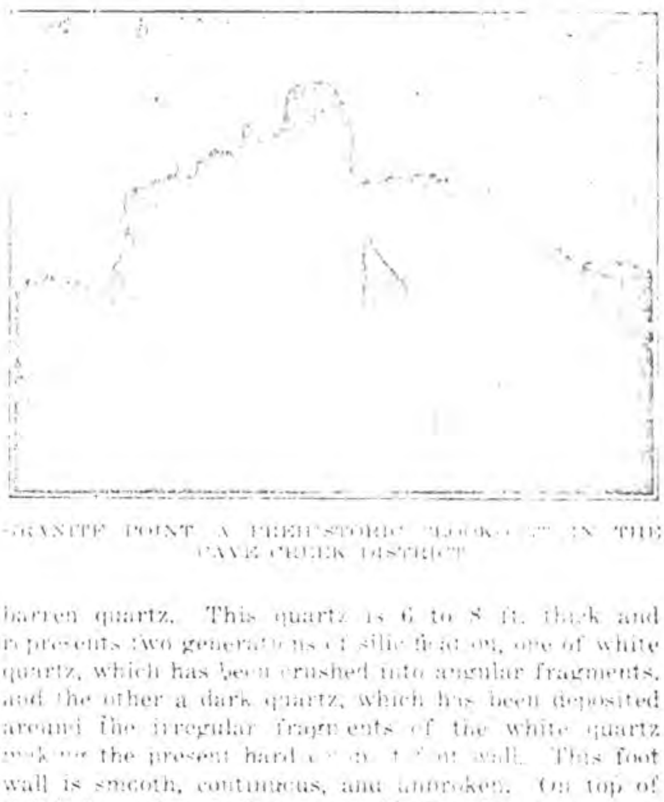
There is only one property in the district which has done sufficient development work to uncover anything worthy of the term "ore deposit." This property, known as the Red Rover mine, is in the schist zone. The deposit at the surface is in an irregular inclined series and shows copper carbonates carrying as high as 2,000 oz. of silver per ton. The ore occurs as lenses in the schist and has been developed so far to a depth of 500 ft. A very interesting occurrence is to be seen in the shaft which passes through about 30 ft. of schist impregnated with native copper in the form of thin scales, bright and wonderfully distinct until tarnished by exposure to the air. The principal deposit opened up on the 300- and 500-ft. level shows masses 3 to 4 ft. wide, of copper glance carrying 400 to 700 oz. silver per ton. The other properties in the district have nothing but outcrops to recommend them.

It has been stated many times in recent mining literature that the mines of the future must be found by the application of geological deduction based upon surface and other data available. It therefore seems proper to describe the general characteristics of the principal types of outcrops exposed in this district. For convenient description the district can be divided into three zones.

Copper Carbonates Frequent Along Batholith Contact

The first zone is from one mile to two miles wide and borders the northwestern contact of the granite batholith. It is composed of highly metamorphosed banded shales. Blocky epidote rock is extensively developed in this zone, and in places there are ledges composed of epidote, quartz, and dolomite intimately mixed. This zone gives place to slates along its western margin. Copper carbonates carrying several dollars per ton in gold and silver outcrop at many points within this zone, always in association with quartz or epidote.

The Mormon Girl deposit, in this zone, is formed in contact with and just above an inclined foot wall of



GRANITE POINT, A PREHISTORIC "LOOKOUT" IN THE CAVE CREEK DISTRICT

barren quartz. This quartz is 6 to 8 ft. thick and represents two generations of silicification, one of white quartz, which has been crushed into angular fragments, and the other a dark quartz, which has been deposited around the irregular fragments of the white quartz making the present hard, smooth foot wall. This foot wall is smooth, continuous, and unbroken. On top of it has been deposited copper-gold-silver-bearing quartz of an average value of $40 per ton and from 1 to 5 ft. thick. A few hundred feet below this the ore disappears.

Little Copper in Second Zone

The second zone begins at the edge or border of the slates and extends to the contact of diorite and igneous complex. It is several miles wide and is all schist. Within this belt is a narrow, highly mineralized area that is exposed for about fifteen miles and is 600 to 1,200 ft. wide. It consists of highly altered soft sericitized schist in places highly twisted and contorted. In coloring it ranges from pearly white through the various shades of yellow and occasionally is deep red. In

[1] The [illegible] on the accompanying [illegible] "Mineralized Schist" and [illegible] the latter formation, shown in the northwest [illegible] of the formation so named by the U. S. Geological Survey in the Folio of the Bradshaw [illegible]

other places, it is bleached or gray and full of innumerable quartz stringers. Very little copper is in evidence in the outcrops, but several location cuts exposed copper stain a few feet beneath the surface.

Elsewhere in this area many huge silicified outcrops occur, showing jasper and siliceous hematite. In connection with these there are innumerable outcroppings of carbonate, oxide, and some sulphide of copper occurring in patches or irregular impregnations.

The third zone lies along the contact of the schist and the diorite and other igneous intrusions and is the western part of the mineralized section of the district. There are several brecciated siliceous zones, from 50 to 300 ft. wide and of undetermined extent, which contain ore averaging \$2 to \$5 in gold per ton. Ore averaging as high as \$12 per ton has been taken from narrower enriched channels within the main low-grade orebodies.

In the diorite there are many outcrops showing strong shearing action. In these zones impregnations of copper carbonates are common. One of these at a depth of 225 ft. was crosscut for 30 ft., showing chalcopyrite and bornite disseminated in a hard greenish diorite which carried 1 to 3 per cent copper.

Phoenix, Arizona

March 25, 1935

Mr. B. A. Gillespie
Phoenix, Arizona

Dear Sir:

As per your request, I have made an examination of the Red Rover Mine and beg to submit herewith a report on conditions as I found them.

PURPOSE OF REPORT:

This report is not written so much to present a picture of the property to those unfamiliar with it, as to present opinions on which further procedure can be based, to those already familiar with the mine.

CLAIMS AND LOCATION:

The Red Rover Mine consists of (19 and 35 unpatented) patented mining claims located at the northern boundary of Maricopa County, Arizona. It is 54 miles north from Phoenix, Arizona, the nearest present railroad point, and is reached by the Cave Creek and Camp Creek Road from Phoenix. Title is held by the Red Rover Mining Company.

GEOLOGY:

The Red Rover orebodies are a series of replacements in Yavapai Schist. It is beyond the scope of this report to present any lengthy or detailed description of those rocks classed under the general heading of Yavapai Schist, but a brief description or definition is necessary.

The Yavapai Schist Formation comprises a series of pre-Cambrian sediments and igneous rocks, which have been compressed, folded, metmorphosed and altered into schists and metmorphosed rocks of various typesand phases.

The planes of schistosity are now nearly vertical, with steep dips to the west of the western side of the anticline fold, and to the east on the eastern side. Their general strike is northeast-southwest, and their thickness has been calculated to be between 4,000 and 6,000 feet. The various phases of the schist require some study and description, as the chemical and mechanical makeup of one phase, as compared to another, often makes the one phase more receptive to mineralizing replacement.

The series contains many phases. A light colored silver phyllite or sericite schist is the more normal phase, but graduations occur through fedlspathic phases to mica schists, homeblende schists and amphibolites, to very basic diabasic phases. Bends of quartzite and conglomerate occur also in the series. The sericiltic phase has been classed as originally sedimentary. The feldspathic, and also the diabasic were probably originally ingeneous rocks. The hornblendic or amphibolitic phases are of doubtful origin. They may represent complete re-chystallization of silicious ferro-magnesium limestone, or they may be equally well drived from basic igneous rocks. The series also contains quartzite "dikes" standing with schistosity, but originally sandstone beds. Conglomerate beds, now standing almost vertical, occur occasionally in the series. These beds, contain rounded and watern worn particles of pre-existant formations, and are a considerable proof of the original sedimentary character of much of this series.

At the Red Rover itself many of the phases of schist occur, most of them altered and silicified beyond recognition. It has been the opinion of some examining engineers that the mineralization of the Red Rover was in an altered limestone bed, inferring that such limestone was a dediment laid down on top of the schist, would be of shallow thickness, and could not hold important primary or secondarily enriched orebodies. This is a natural and easily made mis-assumption for an engineer who is not broadly experienced with Yavapai Schist in its various types and phases. I believe I can state positively, that this formation, often mistaken for a limestone, while it may have been a limestone bed before the action causing schistosity, is merely a phase of Yavapai Schist. It has been subject to the same folding and compression common to the schist formation, and will maintain its continuity to a considerable depth. Chemically, it has almost completely silicified, and now contains only one or two percent lime.

I have observed this identical character in other locations in the schist belt, where it is structurally impossible for it to be anything else but a phase of Yavapai Schist. Further development of the Red Rover will show the same structural relationship.

The Red Rover development shows a very complex confusion of dikes, faults, and original phase variations, impossible to untangle until there has been considerably more development. Many dikes occur both pre-mineral and post-mineral, the latter probably mostly representing the conduits of extrusive flows, which subsequently covered the district. There was much faulting, both before and after mineralization, although there are no known post-mineral faults that have resulted in great displacements.

The Dike-fault complex has a very confusing effect on any attempt to locate the trend of the orebodies, especially in the upper zones. In the first place, we have the phase variations of the original schist, with the fact that some phases were more susceptible to mineralizing replacement than others. Then we have faults displacing these phases but which also opened channels for primary mineralizing solutions and we also have pre-mineral dikes, more impervious than the susceptible schist, which acted as dams to the primary solutions. Finally, we have faults displacing to some slight extent the ore as primarily formed.

The entire process was repeated during the secondary period. The faults and some of the dikes formed channels for the decending solutions, causing localization of secondary precipitation. Others formed dams, blocking off portions of the ore to leaching action, and leaving isolate remnants of ore, such as found on the upper levels.

It can be readily seen that the situation is so complex that extensive development will be required before it can be worked out in detail.

Important orebodies have been formed as replacement in the Yavapai Schist, such as those at Jerome. Other orebodies of this type have proven to be small and disappointing. To make extensive bodies of commercial ore we should look for evidence of a strong and extensive general mineralization; evidence that such mineralization contained copper, at least in localizations; evidence of a mineralization intrusive probably of the acid type, monzonite, ryolite, or quartz prophyry; evidence of extensive leaching with its consequent secondarily enriched zone; evidence of residual values in gold or silver, evidence of some formation to confine the mineralization.

All these factors are proven in the surface and underground showings at the Red Rover. A cross cut tunnel near the surface, and upper levels, show one area alone, over 100 feet wide, extensively mineralized and leached, with strong gossans and with residual values in copper and silver, often high grade. On the 700 level an acid dike occurs which I believe to be a tongue of a mineralizing intrusive. These are numerous rhyolite dikes in the vicinity. Leaching has been exceptionally extensive, even to the 700 level, and the more imprevious dikes may easily cause a concentration of the mineralization.

DEVELOPMENT:

While there has been considerable development at the Red Rover as measured in feet, it has been nowhere near commensurate with the work required to outline orebodies, in a formation of this sort, or even to discover the many orebodies that may exist in the extensive favorable formation. The main shaft is 860 feet dep with levels on the 860, 700, 500, k300 and 200. Three hundred feet to the south is an old incline shaft on the ore 360 feet deep. The two shafts are connected through drifts and stopes at about the three hundred level. In the vicinity of the old incline shaft there is a strong surfact cropping of copper-silver ore that has been worked to a considerable extent, probably 200 cars of high grade copper-silver ore that has been mined and shipped. This zone is over 100 feet wide, strikes northeast-southwest and dips about 45% to the west. It is also cut by a southeast cross cut from the 500 level of the main shaft. The high grade ore occurs in irregular small bodies, and consists of remnants and enriched spots, as mentioned above.

A tunnel from the surface about 300 feet long, in the vicinity of the old shaft, reaches a maximum depth of about 100 feet. This tunnel is across the formation and shows an excellent cross cut of surface conditions. There are strong gossan showings of the copper type, extensively leached areas, dikes and faults, and remnants of high-grade ore.

The following samples were taken from the surface dumps: #4 Sample from old dump working, not an average of the dump, but not specimen pieces: Copper 9.07%, Silver 22.8 oz; Gold trace. #5 Specimen from dump, apparently rich silver ore; Copper 9.40%; Silver 146.8 oz; Gold .01 oz. #6 Specimen from dup, of typical well-placed schist oxidized: Copper 12.22%; Silver 18.8 oz.; Gold trace.

In the main shaft a south cross cut on the 500 level encounters the ore zone. It is still extensively leached and mining has been confined to the remnants as in the surface workings. A cross cut to the north has not proceeded far enough to encounter any known ore formation.

On the 700 level there is little work to the south, under the dip of the known ore zone, but a cross cut has been run about 250 feet to the north. This encountered what is apparently a different orebody. This ore-body strikes north 20 degrees east, with the schist, but dips about 70 degrees to the east. The mineralization is about 100 feet wide and consists of leached areas and secondarily enriched spots containing chalcocite. Apparently, the cross cut is very close to the top of the secondary zone. A 30 ft. winze in the center of this formation, with a cross cut at the bottom was full of water, but the report is that there is a great improvement in the values during that 300 feet, with chalcocite more permanency showing in the cross cut at the bottom. The following samples were taken near this location: Areas of copper stained material near the floor of the cross cut west of the winze; Copper 2.31%; Silver 3.5 oz; Gold trace. Streaks of ore showing chalcocite about 5 feet wide in roof of the winze; Copper 11.25%; Silver 17.5 oz.; Gold trace.

On the 860 level a cross cut was run to cut the ore as shown on the 700 level. The formation here is an entirely different phase of the schist--much more basic. The ore was never encountered. It could hardly be expected to be encountered with the work done, even if the ore merely maintains its normal strike and dip, and there should be some displacement by post-mineralizing faulting, which is probable, there would be even less likelihood of encountering this ore without further work.

A raise has been started from the 860 level to connect with the winze from the 700. This will have to show the contact with the ore at some point, and will give valuable information on its trend.

In general, there has been a tendency to step faulting north and east, which could easily account for some displacement. There has been no work to the south on the 860 level.

GENERAL DISCUSSION:

Some of the questions of natural interest to those interested in the property might be enumerated as follows:

(1) Is the orebody cut on the 300 and 500 level, and which connects with the surface workings, the same as the orebody cut on the 700.

(2) What has happened to the orebody on the 700 that it was not cut on the 860 level?

(3) At what depth can a condarily enriched zone be expected and how extensive will it be?

(4) What evidence is there that still further ore zones will be encountered?

(5) What further development work is advised in order to prove the maximum amount of ore with the minimum expenditure?

In answer to Question #1, I believe there are two different orebodies, or at least separate ore lenses, possibly in the same general mineral zone. The known ore on the 500 does not line up with the known ore on the 700 and they dip in opposite directions. While faulting might account for the difference, its more probable that they are separate orebodies.

In answer to Question #2, if the orebody cut on the 700 does not extend very far to the south, and actually had its apparent dip of 70 degrees to the east, it would hardly be cut by the present work on the 860. Such work should be underneath it and would require an easterly cross cut to cut it. Some fault displacement may have also increased this distance.

I would expect the top of the secondary zone to be quite uneven because of the channelling caused by the dikes and faults. The ore in the vicinity of the winze on the 700 is beginning to show chalcocite and evidence of secondary enrichment. It also shows oxidation and leaching. Another 50 to 75 feet in depth there should encounter the real secondary zone. This zone should be of an unusual thickness because of the great thickness of the leached and partly-leached zone above, and the fact that there has been a large amount of erosion, which has kept fairly even pace with the leaching action.

As to the evidence of further ore zones, there is a very large amount of very favorable territory. The section is generally extensively mineralized, and further zones should be encountered with sufficient development.

DEVELOPMENT ADVISED:

The raise being run from the 860 to connect with the ore shown in the winze from the 700 is an important piece of work. It should be completed first and will give valuable information as to the downward trend of the ore. I would also advise three flat diamont drill holes from the face of the 860 to prospect the territy ahead, and to both sides ahead. The exact course of these holes can be determined better after the work on the 860 level is properly mapped.

Another piece of development advisable would be a drift from the 860 station, 200 feet on a course south 65 degrees west. From this point flat diamond drill holes should be run on each side at right angles to the drift. This would give valuable information as to the relative position of the two probable orebodies.

MINING FACILITIES:

While the property is rather inaccessably located, if a large mine is proven, this difficulty can be largely eliminated. It is possible to drive a two mile cross-cut tunnel from Lime Creek, near the Verde River, cutting the Red Rover at 1,800 feet depth, and giving an easier outlet down the valley of the Verde to Ft. McDowell and Mesa. Such a tunnel would cross cut the general trend of the schists, and would be most interesting from a prospecting point of view.

The present mine workings make out 50 gallons of water per minute. More extensive development will probably double this. There is thus no scarcity of water at the mine itself for all operation. Under present conditions ore is hauled and loaded on cars at Phoenix for $4.00 per ton.

The property is equipped with all equipment necessary to carry on an extensive line of development. The shaft is in good shape, and such development does not present any special difficulties.

CONCLUSION:

In conclusion, it is my opinion that the Red Rover warrants extensive development with a view to opening up a rich secondary zone, and below that, and extensive primary zone of moderate-grade commercial ore.

Respectfully submitted,

(Signed) Charles H. Dunning
Mining Engineer

HARRISON ASHLEY SCHMITT
Consulting Mining Geologist
Cottage Sanatorium Road
Silver City, New Mexico

January 9, 1959

Mr. B. G. Gillespie
66 North Country Club Drive
Phoenix, Arizona

Subject: Red Rover Mine, Maricopa County, Arizona.
Metals: Cu and AG

The Red Rover Mine is approximately 50 miles north-northeast from Phoenix, Arizona, in the Tonto National Forest a few miles west of the Verde River Canyon. The mine is said to have been opened up around 1880.

Moore and Pickett in 1929 are said to have shipped about 5060 tons of ore. The grade of this is not available to me. The Magna smelter records show that the Gillespie Land and Cattle Company shipped 1621 tons of ore and concentrates the average assay of which was 44.60 oz. Ag, .0196 oz. Au and 8.9% Cu. During 1934-35 1830 tons of ore were received at the smelter from this mine that assayed 22.11 oz. Ag and 2.497% Cu. These above shipments total 8511 tons.

The best ore is said to have assayed 10-22% Cu and 80 oz. Ag with extremes up to 30% Cu and 300 oz. Ag.

There are said to be 4-5000 ft. of workings. Some diamond drilling has been done. The Gillespie stope off the 500 level is reported to be 200 ft. long, 150 ft. high and four to six ft. wide. The Moore stope, between the 300 and 500 ft. levels, is reported to be 60-80 ft. long, 10-40 ft. wide and is on a 45 degree dip. This stope, it is said, produced 105 railroad cars of which the best ore assayed 18-22% Cu and 80 oz. Ag. This would bring the recorded production to about 14,300 tons.

The ore minerals include chrysocolla, malachite, cuprite, chalcocite and chalcopyrite. Bornite and tetrahedrite have been reported. Chalcocite appears to have been the chief copper mineral of most of the ore mined to date. The gangue includes silicification, jasperoid, minor quartz and some carbonate which is said to include dolomite, ankerite and siderite.

The walls are largely schist derived from quartzite, shale and limestone. The strike of the schistosity averages about northeast and the dip is northwest. The ore appears to be localized by complex, strong fissuring. The main glory hole, which is about 20 ft. in diameter, is at the intersection of a cross-fracture with the schistosity. This stope is said to extend down to the 500 level.

The mineralization is presumably from "epithermal" type. This type is characterized by high-grade ore with jasperoid gangue, etc. The primary ore presumably contained the ore minerals chalcopyrite and tetrahedrite.

The repair and unwatering of the shaft would incur a heavy expenditure. There is said to be some fair-grade ore buried under one of the dumps. Possibly some lesser would be interested in working on this. In the meantime, a preliminary mapping and study of the surface in the mine area might indicate places suitable for prospecting that were previously overlooked.

The red jasper breceia area to the east of the mine does not appear to represent the outcrop of valuable metal bearing veins. Their true origin, however, is obscure to me. This iron oxide found in cracks in the red jasperoid is specularite, not limenite or gossenous material. The latter would be significant; the specularite is not.

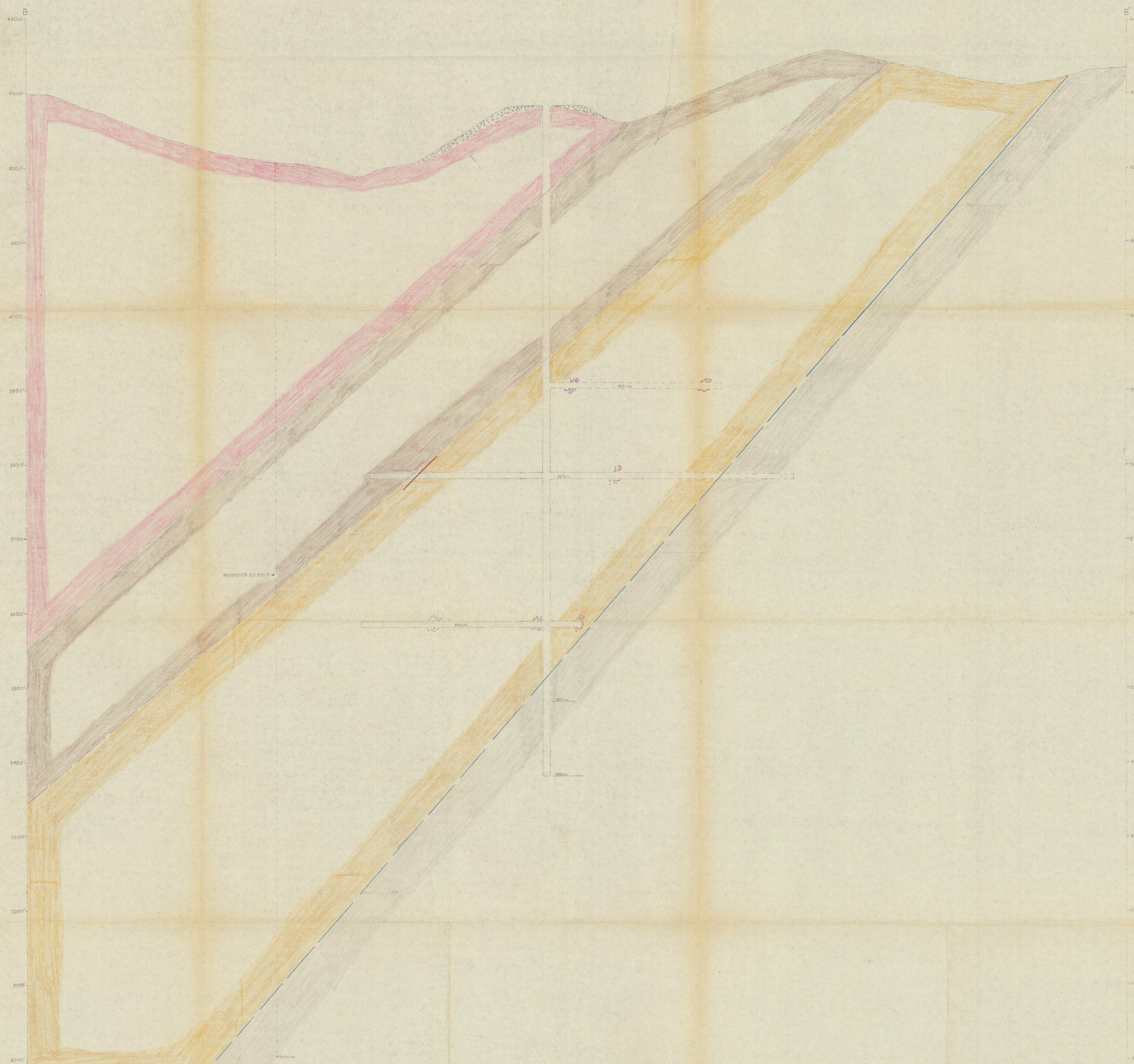
I think the mine area proper deserves more time and study than I was able to give it. Mapping is needed. It may be of interest to someone as an exploration gamble. I've seen extensive exploration work done on mines that looked a lot worse than this one does.

(Signed) HARRISON ASHLEY SCHMITT

HAS:ehs


10,100 N
10,000 N
9900 N
9800 N
9700 N
9600 N
9400 E
9500 E
9600 E
9700 E
Westec Corp.
Red Rover Mine
70 Level
Scale: 1" = 20'
by E.W.B.
5-10-66

PLATE 5



EXPLANATION

DIABASE
JASPEROID
RHYOLITE PORPHYRY
REDBED SCHIST
FOOTWALL SCHIST

SYMBOLS

MINERALIZATION
CONTACT
FAULT OR FRACTURE

PLATE 5

WESTEC CORPORATION

RED ROVER PROPERTY

SECTION B - B'

THROUGH VERTICAL SHAFT

4-27-67 EWB

PLATE 4

EXPLANATION

DIABASE
JASPEROID
RHYOLITE PORPHYRY
REDBED SCHIST
FOOTWALL SCHIST

SYMBOLS

MINERALIZATION
LIMONITE GOSSAN
CONTACT
FAULT OR FRACTURE

PLATE 4

WESTEC CORPORATION

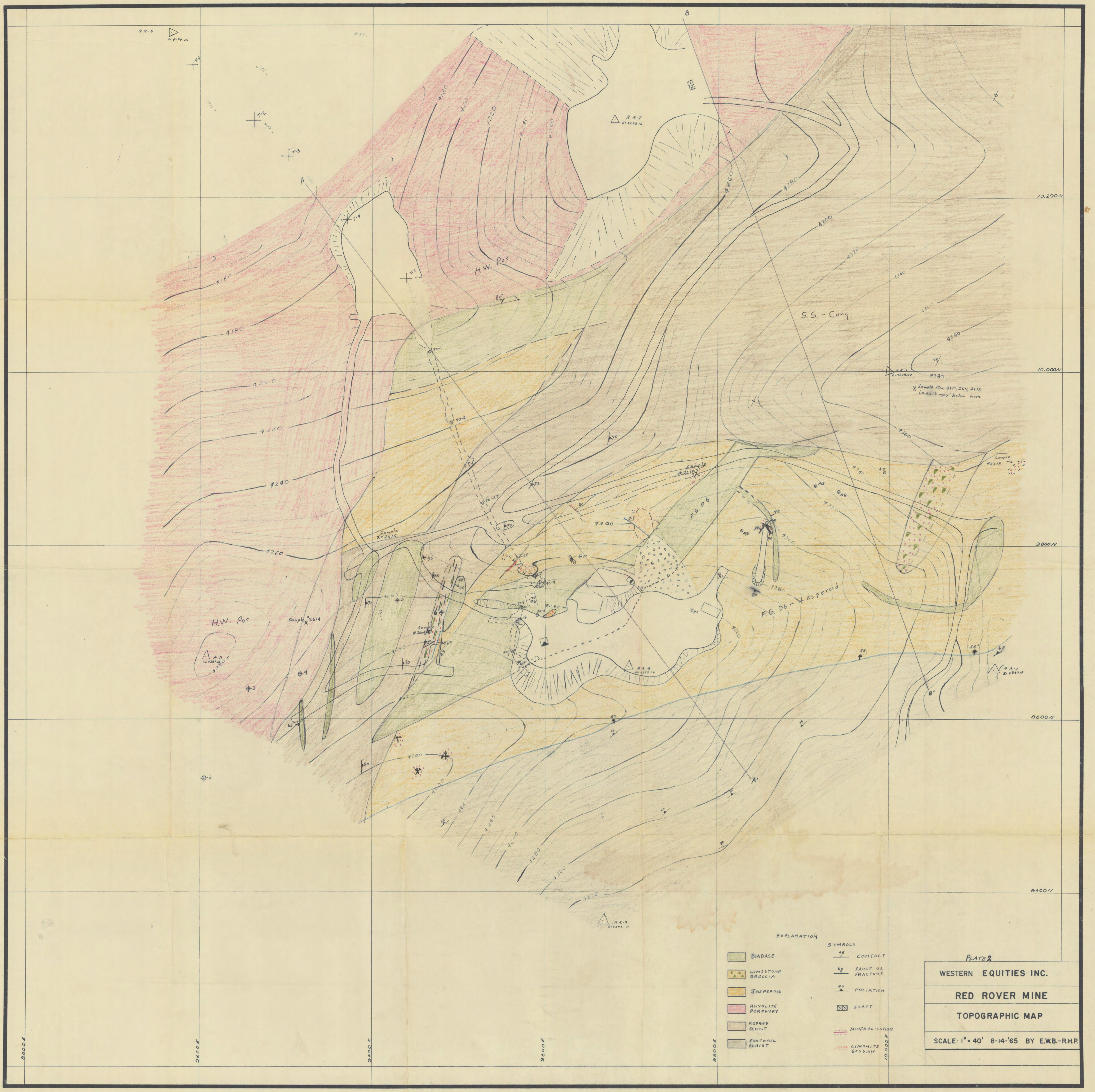
RED ROVER PROPERTY

SECTION A - A'

THROUGH 360 FOOT INCLINE

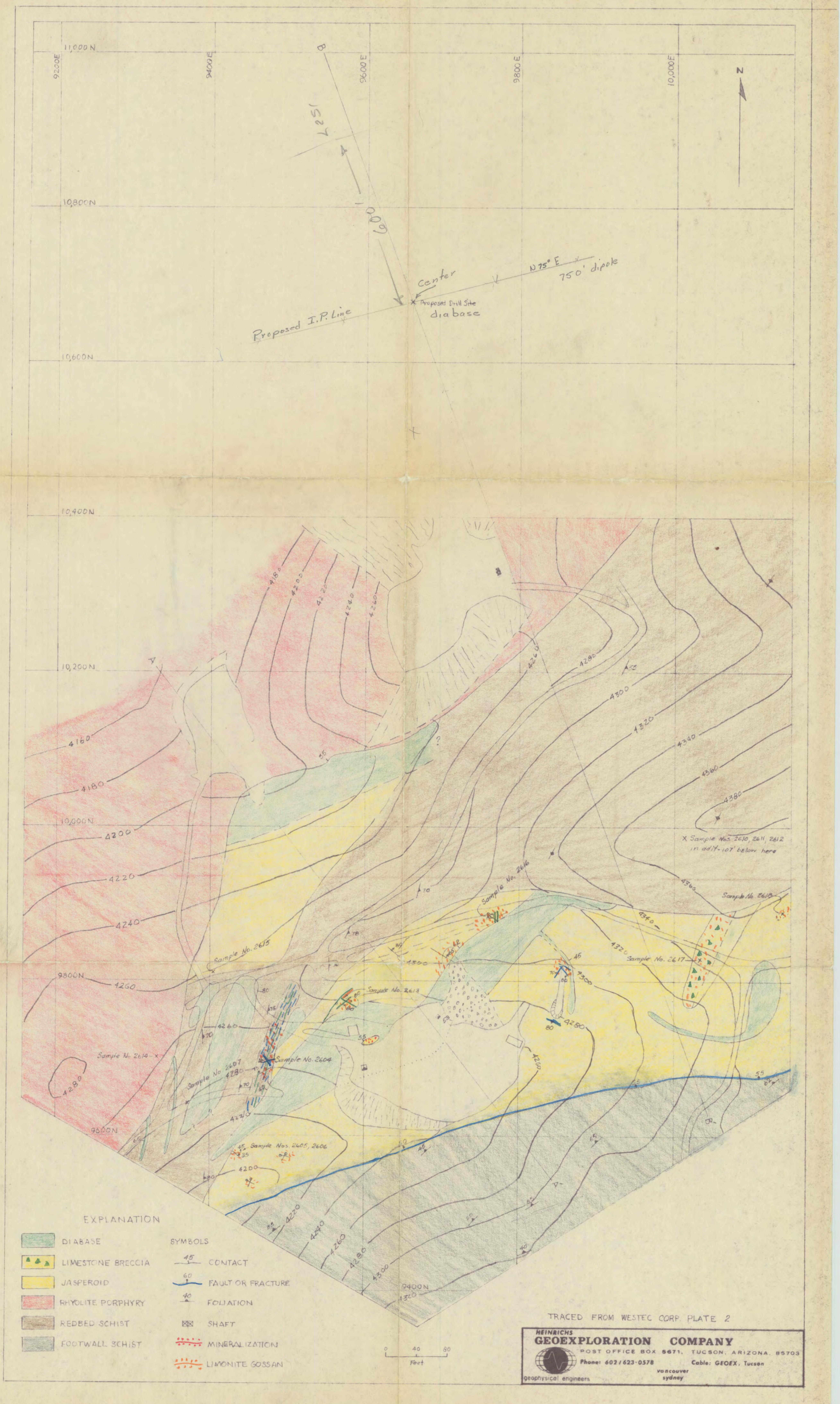
4-27-67

EWB

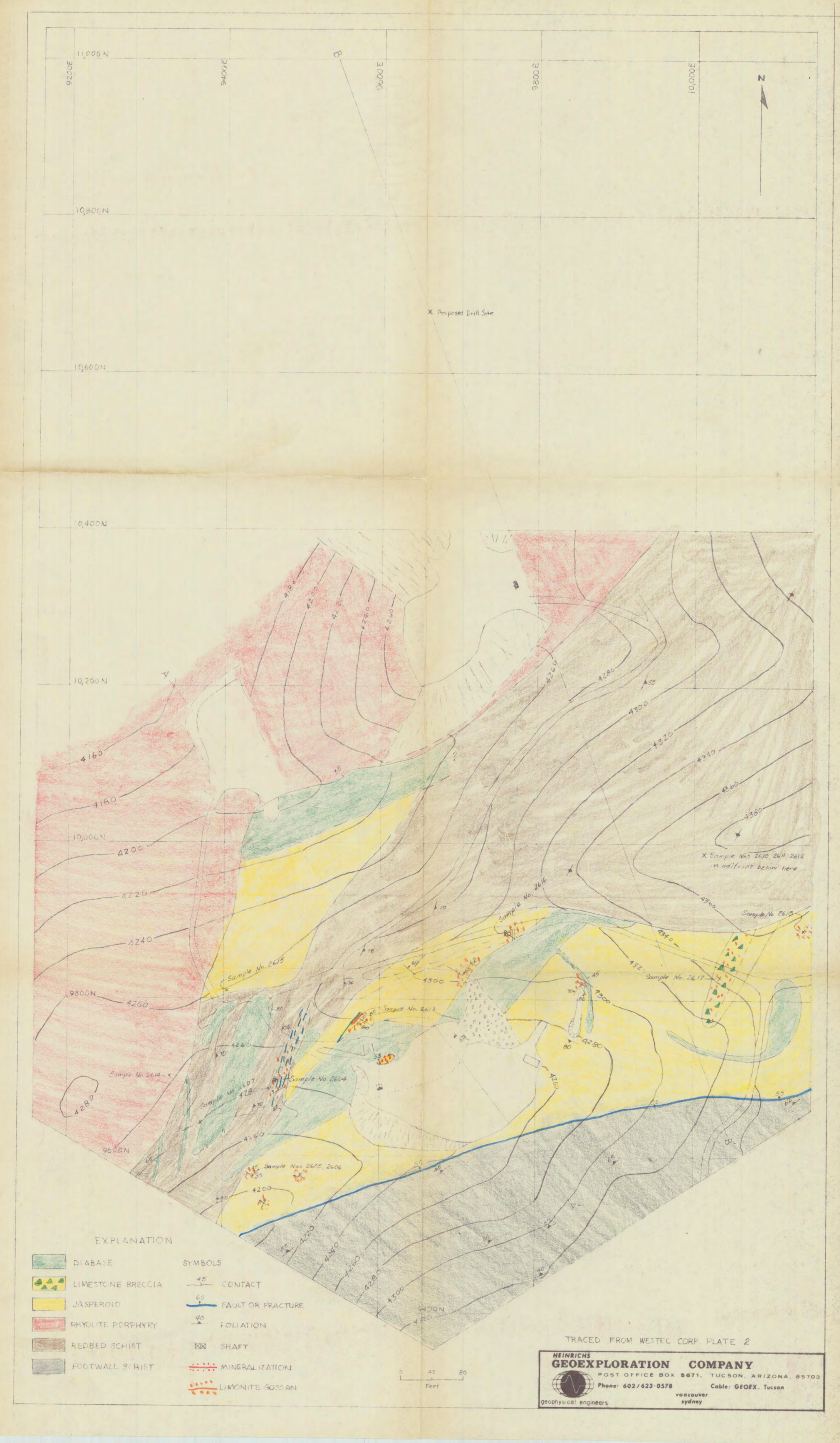


H.W. Por
S.S. - Cong.
F.G. Db
F.G. Db - Jasperoid
10,200N
10,000N
9800N
9600N
9400N
9200E
9400E
9600E
9800E
10,000E
EXPLANATION
DIABASE
LIMESTONE BRECCIA
JASPEROID
RHYOLITE PORPHYRY
REDBED SCHIST
FOOTWALL SCHIST
SYMBOLS
CONTACT
FAULT OR FRACTURE
FOLIATION
SHAFT
MINERALIZATION
LIMONITE GOSSAN
PLATE 2
WESTERN EQUITIES INC.
RED ROVER MINE
TOPOGRAPHIC MAP
SCALE: 1" = 40' 8-14-'65 BY E.W.B.-R.H.P.


Red Rover Mine
Generalized Composite of Mine Workings - From Harry E. Jones - 1927
Scale 1" = 50'
PLATE 3
LEGEND
Tunnel Lev
50 FT "
60 "
180 "
200 "
240 "
300 FT. LEV
360 "
380 "
500 "
700 "
850 "
MAIN SHAFT
BL No 3
TUNNEL PORTAL PT
ADIT
COLLAR INCLINE
SURF. T.L. No 1
DUMP PT.
PROPOSED 75' RAISE & 160' DRIFTS & X-CUTS
PROPOSED 70' SHAFT & 100' DRIFTS & X-CUTS
GOOD OXIDIZED ORE ON SURFACE
700 ORE IN BACK
BORNITE
ORE
N



11,000 N
10,800 N
10,600 N
10,400 N
10,200 N
10,000 N
9800 N
9600 N
9400 N
9200 E
9400 E
9600 E
9800 E
10,000 E
N
B
A
1527
600
Center
N 75° E
750' dipole
Proposed I.P. Line
Proposed Drill Site
diabase
Sample Nos. 2610, 2611, 2612 in adit - 107' below here
Sample No. 2616
Sample No. 2618
Sample No. 2615
Sample No. 2617
Sample No. 2613
Sample No. 2614
Sample No. 2607
Sample No. 2604
Sample Nos. 2605, 2606
EXPLANATION
DIABASE
LIMESTONE BRECCIA
JASPEROID
RHYOLITE PORPHYRY
REDBED SCHIST
FOOTWALL SCHIST
SYMBOLS
CONTACT
FAULT OR FRACTURE
FOLIATION
SHAFT
MINERALIZATION
LIMONITE GOSSAN
0 40 80
Feet
TRACED FROM WESTEC CORP. PLATE 2
HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578
Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers


11,000 N
10,800 N
10,600 N
10,400 N
10,200 N
10,000 N
9800 N
9600 N
9400 N
9200 E
9400 E
9600 E
9800 E
10,000 E
N
B
A
X Proposed Drill Site
X Sample Nos 2610, 2611, 2612 in adit - 101 below here
Sample No. 2616
Sample No. 2613
Sample No. 2615
Sample No. 2617
Sample No. 2618
Sample No. 2604
Sample No. 2607
Sample No. 2614
Sample Nos. 2605, 2606
EXPLANATION
DIABASE
LIMESTONE BRECCIA
JASPEROID
RHYOLITE PORPHYRY
REDBED SCHIST
FOOTWALL SCHIST
SYMBOLS
CONTACT
FAULT OR FRACTURE
FOLIATION
SHAFT
MINERALIZATION
LIMONITE GOSSAN
0 40 80
Feet
TRACED FROM WESTEC CORP PLATE 2
HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578
Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers

COMMENTS ON I.P. AT RED ROVER
MAY 1968 FOR MR. PAUL KAYSER

One spread of 750 foot dipole I.P. was centered about 370 feet north (N16°W) of the Red Rover vertical shaft, and oriented N75°E. Frequencies used were 0.05 and 3.0 Hz on a collinear dipole-dipole electrode configuration.

No anomalism was seen in the vicinity of the expected continuation of mineralization. A very weak anomaly was seen in the vicinity of Station 37.5E, however. This anomalism was not entirely crossed by the I.P. traverse and therefore can't be interpreted in detail but it would appear to be caused by a steeply dipping tabular body narrow, with respect to the dipole spacing (750') and being slightly less conductive than the surroundings.

It is recommended that the vicinity of this anomaly be inspected geologically to help determine its significance. If of interest geologically, further I.P. may be warranted but preferably on a smaller dipole spacing (300' to 500').

The lack of anomalism in the area to be drilled does not negate geological reasons for drilling since an economic sulfide body in this type of mineralization could be undetectable. This is partially because of the very electrically nonconductive zone that the mineralization occurs in and the unfavorable depth to thickness ratio. The I.P. does indicate that no strong sulfide body having 100 feet or so width and 750 feet or more strike length and depth occurs in the vicinity of the center of the line.

The resistivity indicates a relatively conductive material of a few hundred feet in thickness overlying more resistive material. Also, the resistivity suggest more conductive surface material thickening to the west. There was no anomalous self potential effects on the line which also indicates a lack of significant quantities of oxidizing sulfides within several hundred feet of the surface.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig
Senior Geophysicist

CSL:jc

RED ROVER

D.D.H. #1 - SUMMARY

0-12'

diabase - strongly weathered

12-144'

diabase - less than one percent pyrite intermittently
some sections moderately magnetic

144-295'

siltstone, reddish, arkosic, minor limestone near top of section

295-523'

igneous rock (rhyolite ?) porphyritic, fine grained matrix, phenocrysts mostly feldspars, some quartz

523-692'

siltstone or arkose, reddish

692-744'

porphyritic rhyolite

744 to bottom of Hole

siltstone or arkose - changes from reddish to gray before the bottom

Recovery is essentially 100% except 0-16' which is about 25%.

COMMENTS ON I.P. AT RED ROVER
MAY 1968 FOR MR. PAUL KAYSER

One spread of 750 foot dipole I.P. was centered about 370 feet north (N16°W) of the Red Rover vertical shaft, and oriented N75°E. Frequencies used were 0.05 and 3.0 Hz on a collinear dipole-dipole electrode configuration.

No anomalism was seen in the vicinity of the expected continuation of mineralization. A very weak anomaly was seen in the vicinity of Station 37.5E, however. This anomalism was not entirely crossed by the I.P. traverse and therefore can't be interpreted in detail but it would appear to be caused by a steeply dipping tabular body narrow, with respect to the dipole spacing (750') and being slightly less conductive than the surroundings.

It is recommended that the vicinity of this anomaly be inspected geologically to help determine its significance. If of interest geologically, further I.P. may be warranted but preferably on a smaller dipole spacing (300' to 500').

The lack of anomalism in the area to be drilled does not negate geological reasons for drilling since an economic sulfide body in this type of mineralization could be undetectable. This is partially because of the very electrically nonconductive zone that the mineralization occurs in and the unfavorable depth to thickness ratio. The I.P. does indicate that no strong sulfide body having 100 feet or so width and 750 feet or more strike length and depth occurs in the vicinity of the center of the line.

The resistivity indicates a relatively conductive material of a few hundred feet in thickness overlying more resistive material. Also, the resistivity suggest more conductive surface material thickening to the west. There was no anomalous self potential effects on the line which also indicates a lack of significant quantities of oxidizing sulfides within several hundred feet of the surface.

Respectfully submitted,

HEINRICHS GEOEXPLORATION COMPANY

Chris S. Ludwig
Senior Geophysicist

CSL:jc

Red Rover ~~DDH #1~~
DDH #1 - Summary

0-12'
diabase - strongly weathered

12-144'
diabase - less than one percent pyrite intermittently
some sections moderately magnetic

144-295
siltstone, reddish, arkosic, minor limeston near top
of section

295-523'
igneous rock (rhyolite?) porphyritic, fine grained
matrix, phenocrysts mostly feldspars
some quartz.

523-692
siltstones or arkose, reddish

692-744
porphyritic rhyolite

744 to bottom of Hole
sitstone or arkose - ~~becomes~~ changes from
reddish to gray before the bottom.

Recovery is essentially 100% except
0-16' which is about 25%.

Red River DDH-1

elev. 4300 Approx

0-12'

weathered diabase

12-144'

diabase

144'-295'

siltstone - Reddish -

295-523

porphyritic igneous rock - rhyolite

523-692

arkosic siltstone

692-744

porphyritic rhyolite

744 →

arkosic siltstone

10 February 1969

Mr. Paul Kayser
800 Main Street
Houston, Texas 77002

Re: Vertical Drill Hole
Deviation Red Rover
D.D.H. #1

Dear Mr. Kayser:

Analysis of the down hole survey on Red Rover D.D.H. #1 indicates that the position of the bottom of the hole relative to the collar position is horizontally 218 feet from the collar on a bearing S 80° W. (See attached sheet) The length of the hole is 1109 feet.

Observations were taken at four intervals down the hole as follows:

DEPTH	DRIFT	DIRECTION
	1° 30 Feet	S 26° W
270 Feet	6° 30 Feet	S 75° W
540 Feet	12° 30 Feet	S 83° W
810 Feet	21° 00 Feet	S 80° W
1109 Feet		

The readings are all from an Eastman Oil Well Survey Instrument run by Mr. Janco on 21 January 1969.

The original thought on drilling this property (p. 24, Westec Corporation Report 27, April 1967) was to drill three holes from this location in an attempt to intersect a zone of potential mineralization at 600 feet depth. One was to be vertical, two others to be angled to determine the lateral extent of the inferred dipping body as shown on Section B-B', through vertical shaft (27 April 1967) which was thought to have dimensions of 1000 feet length and 400 feet thick (p. 23). If the target zone was contained within these parameters, the first drill hole, as drilled, should have intersected the zone, at least near the top of it, regardless of present drill hole deviation.

The chances of another drill hole showing any significant difference in the present situation are not good, even if the hole were vertical. Going back into the original drill hole (D.D.H. #1) with directional drilling techniques will be expensive and probably will not be of any distinct advantage other than to show that the rocks under the drill hole at that depth are probably the same as those already encountered in the hole already drilled.

In lieu of additional encouragement and other reliable information this becomes a poor type of target to drill for. The reported veins of mineralization are much smaller than the jasperoid body drill target. Also, most of the suppositions are based on surface geology and projections from a 40 year old map of now inaccessible workings which does not show the geology.

Between what is observed on the surface, what is presently accessible underground, and the drill hole, any existing ore bearing formation may have changed drastically in size or disappeared completely.

At this time we do not recommend a directional drilling program in the existing drill hole nor do we have any recommendations for another drill site.

Sincerely yours,
HEINRICHS GEOEXPLORATION COMPANY

Donald B. Cooley, Geologist

APPROVED:
HEINRICHS GEOEXPLORATION COMPANY

Walter E. Heinrichs, President
General Manager

DBC/plg

Enclosure

Ron:

Mistake was made in copying from original. Overlapped Top 4 samples on results

Jack

This copy correct 501'–564' to [illegible]

OCT 24 1968

BOX 5671 TUCSON, ARIZONA
Phone: (AREA 602) 623-0578

CORRECTED COPY* 501'-~~554'~~ 574'

Shop No. 4207
File No. 1206 PK

Date 22 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

HEINRICHS GEOEX
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

OCT 24 1968

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

THIS CERTIFIES
Samples submitted for assay contain as follows:

(RED ROVER MINE * D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
D.D.HOLE # 1									
PK #4207									
501'-506'		.10		TRACE				0.020	
506'-511'		.10		NIL				0.015	
511'-516'		.10		NIL				0.010	
516'-521'		.10		NIL				TRACE	
521'-526'		.10		NIL				NIL	
526'-531'		.10		NIL				TRACE	
531'-536'		.10		NIL				NIL	
536'-541'		.10		NIL				0.030	
541'-546'		.10		NIL				0.020	
546'-550'		.10		NIL				0.020	
550'-554'		.10		NIL				0.020	
554'-559'-		.10		NIL				0.020	
559'-564'		.10		NIL				0.015	
564'-569'		.10		TRACE				0.040	
569'-574'		.10		TRACE				0.045	

Charges $..........

Assayer.......... Jack Stone

REGISTERED ASSAYER
CERTIFICATE EXPIRES
DEC. 31, 1968
ARIZONA, U.S.A.

JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. 4222

File No. 1211 PK

Date 22 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold
1 oz. Silver
1 lb. Copper
1 lb. Lead
1 lb. Zinc

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

THIS CERTIFIES
Samples submitted for assay contain as follows:

(RED ROVER MINE - D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON		GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON		TOTAL VALUE PER TON of Gold & Silver		PERCENTAGE COPPER				REMARKS
HOLE # 1 PK #4222															
574'-579'		.10			NIL						0.040				
579'-584'		.10			NIL						0.015				
584'-589'		.10			NIL						0.020				
589'-594'		.10			NIL						0.020				
594'-599'		.10			TRACE						0.055				
599'-604'		.10			NIL						0.015				
604'-609'		.10			NIL						0.020				
609'-614'		.10			NIL						0.010				
614'-619'		.10			NIL						0.010				
619'-624'		.10			NIL						0.010				
624'-629'		.10			NIL						0.010				
629'-634'		.10			NIL						0.015				
634'-639'		.10			NIL						0.010				
639'-644'		.10			NIL						0.010				
644'-649'		.10			NIL						0.020				

Charges $

Assayer [signature]

JACK STONE Reg. No. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC 31, 68 ARIZONA, U.S.A.

ANDY CHUKA, PRINT

Shop No. 4101 Date 3 OCT 1968
File No. 1194 PK

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation
1 oz. Gold $35
1 oz. Silver $2.00
1 lb. Copper
1 lb. Lead
1 lb. Zinc

MR.PAUL KAYSER

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

(RED ROVER MINE)

MARKS		SILVER PER TON Ozs.	Tenths	VALUE PER TON	GOLD PER TON Ozs.	100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
HOLE # 1										
#4101	0'-8'		.20		TRACE				0.045	
	8'-16'		.20		NIL				0.040	
	16'-21'		.20		NIL				0.030	
	21'-27'		.20		NIL				0.020	
	27'-30'		.20		TRACE				0.030	
	30'-33'		.20		NIL				0.040	
	33'-38'		.20		NIL				0.040	
	38'-43'		.20		NIL				0.050	
	43'-48'		.20		NIL				0.055	
	48'-52'		.20		NIL				0.040	
	52'-56'		.20		NIL				0.070	
	56'-61'		.20		NIL				0.050	
	61'-65'		.10		TRACE				0.050	
	65'-69'		.10		TRACE				0.050	
	68'-74'		.10		NIL				0.050	

PAGE # 1
Charges $ D.D.HOLE # 1
ANDY CHUKA, RED ROVER MINE

Assayer [signature]
JACK STONE REG. NO. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31 ARIZONA, U.S.A.

PAGE # 2

Shop No. 4101

File No. 1194 PK

Date 3 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold....

1 oz. Silver....

1 lb. Copper....

1 lb. Lead....

1 lb. Zinc....

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

THIS CERTIFIES
Samples submitted for assay contain as follows:

(RED ROVER MINE)

MARKS		SILVER PER TON Ozs.	Tenths	VALUE PER TON	GOLD PER TON Ozs.	100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
HOLE # 1												
4116	74'-79'		.10		NIL				0.050			
	79'-83'		.10		NIL				0.050			
	83'-88'		.10		NIL				0.045			
	88'-93'		.10		NIL				0.045			
	93'-98'		.10		TRACE				0.050			
	98'-103'		.10		TRACE				0.030			
	103'-109'		.10		TRACE				0.030			
	109'-112'		.10		TRACE				0.030			
	112'-116'		.10		NIL				0.030			
	116'-120'		.10		NIL				0.070			
	120'-125'		.10		NIL				0.030			
	125'-130'		.40		TRACE				0.035			
	130'-135'		.10		NIL				0.040			
	135'-140'		.10		NIL				0.010			
	140'-144'		.10		NIL				0.015			

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC 31 ARIZONA, U.S.A.

Charges $....

Assayer.... Jack Stone

JACK STONE REG. NO. 5479

ANDY CHUKA, PRINT

PAGE # 3

Shop No. 4101 Date 3 OCT 1968

File No. 1194 PK

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(RED ROVER MINE)

MARKS		SILVER PER TON Ozs. Tenths	VALUE PER TON	GOLD PER TON Ozs. 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
HOLE # 1										
4131	144'-149'	.10		NIL			0.015			
	149'-154'	.10		NIL			0.015			
	154'-158'	.10		NIL			0.020			
	158'-163'	.10		NIL			0.020			
	163'-168'	.10		NIL			0.020			
	168'-173'	.10		NIL			0.030			
	173'-177'	.10		NIL			0.035			
	177'-182'	.10		NIL			0.040			
	182'-187'	.10		NIL			0.030			
	187'-191'	.10		NIL			0.040			
	191'-195'	.10		NIL			0.090			
	195'-200'	.10		NIL			0.040			
	200'-205'	.10		NIL			0.110			
	205'-210'	.10		NIL			0.050			
	210'-215'	.10		NIL			0.090			
	215'-220'	.10		NIL			0.040			

Charges $ PAGE # 3 D.D. HOLE # 1
RED ROVER MINE

Assayer..........
JACK STONE REG. NO. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31, 19.. ARIZONA, U.S.A.

Jack Stone

ANDY CHUKA, PRIN

Shop No. 4147 Date 10 OCT 1968

File No. 1199 PK

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

RED ROVER MINE

HOLE MARKS # 1	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
4147									
320'-324'		.10		NIL				0.015	
324'-327'		.10		NIL				0.030	
327'-332'		.10		NIL				0.010	
332'-337'		.10		NIL				0.015	
337'-342'		.10		NIL				0.020	
342'-347'		.10		TRACE				0.010	
347'-352'		.10		NIL				0.020	
352'-356'		.10		NIL				0.015	
356'-360'		.10		TRACE				0.035	
360'-365'		.10		NIL				0.010	
365'-370'		.10		TRACE				0.015	
370'-374'		.10		NIL				0.020	
374'-379'		.10		TRACE				0.025	
379'-383'		.10		TRACE				0.030	
383'-388'		.10		TRACE				0.025	

HEINRICHS GEOEX
TUCSON, ARIZONA
OCT 18 1968
BOX 5671 TUCSON, ARIZONA 85703
Phone (AREA 602) 623-0578

REGISTERED ASSAYER
CERTIFICATE EXPIRES
DEC. 31,
ARIZONA, U.S.A.

Jack Stone

Charges $..........

Assayer..........
JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. 4162 Date 16 OCT 1968

File No. 1301 PK

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

THIS CERTIFIES
Samples submitted for assay contain as follows:

(RED ROVER MINE)

HOLE # 1 MARKS	Silver per Ton Ozs.	Silver per Ton Tenths	Value per Ton	Gold per Ton Ozs.	Gold per Ton 100ths	Value per Ton	Total Value per Ton of Gold & Silver	Percentage COPPER				Remarks
4162												
288'-292'		.10		TRACE				0.055				
292'-297'		.10		NIL				0.040				
297'-302'		.10		NIL				0.035				
302'-307'		.10		TRACE				0.030				
307'-312'		.10		TRACE				0.015				
312'-317'		.10		TRACE				0.015				
317'-322'		.10		TRACE				0.015				
322'-327'		.10		TRACE				0.010				
327'-331'		.10		TRACE				0.010				
331'-335'		.10		NIL				0.020				
335'-339'		.10		NIL				0.020				
339'-344'		.10		TRACE				0.015				
344'-348'		.10		TRACE				0.020				
348'-353'		.10		TRACE				0.095				
353'-358'		.10		TRACE				0.010				

Charges $..........

Assayer..........
JACK STONE REG. NO. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31, 19 ARIZONA, U.S.A.

ANDY CHUKA, PRINT

Shop No. 4177 Date 16 OCT 1968

File No. 1302 P K

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold........................

1 oz. Silver........................

1 lb. Copper........................

1 lb. Lead........................

1 lb. Zinc........................

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(RED ROVER MINE)

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
HOLE # 1 4177									
358'-363'		.10		TRACE				0.020	
363'-368'		.10		TRACE				0.040	
368'-373'		.10		TRACE				0.030	
373'-378'		.10		NIL				0.025	
378'-383'		.10		NIL				0.090	
383'-388'		.10		TRACE				0.025	
388'-393'		.10		NIL				0.070	
393'-397'		.10		NIL				0.030	
397'-402'		.10		NIL				0.030	
402'-406'		.10		NIL				0.040	
406'-411'		.10		NIL				0.030	
411'-416'		.10		NIL				0.030	
416'-421'		.10		NIL				0.030	
421'-426'		.10		TRACE				0.035	
426'-431'		.10		TRACE				0.030	

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31, 19.. ARIZONA, U.S.A.

Charges $........................ Assayer........................

JACK STONE REG. NO. 5479

ANDY CHUKA, PRINT

Shop No. 4192

File No. 1204 P K

VALUES
Latest Quotation

1 oz. Gold..........

1 oz. Silver..........

1 lb. Copper..........

1 lb. Lead..........

1 lb. Zinc..........

THIS CERTIFIES
Samples submitted for assay contain as follows:

Date 16 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

RED ROVER MINE

HOLE MARKS # 1	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
4192											
431'-436'		.10		NIL				0.050			
436'-441'		.10		NIL				0.030			
441'-446'		.10		NIL				0.030			
446'-451'		.10		NIL				0.030			
451'-456'		.10		NIL				0.030			
456'-460'		.10		NIL				0.040			
460'-466'		.10		NIL				0.035			
466'-470'		.10		NIL				0.040			
470'-474'		.10		NIL				0.030			
474'-478'		.10		NIL				0.030			
478'-482'		.10		TRACE				0.035			
482'-487'		.10		TRACE				0.030			
487'-492'		.10		TRACE				0.06 0			
492'-496'		.10		NIL				0.040			
496'-501'		.10		TRACE				0.050			

REGISTERED ASSAYER
CERTIFICATE EXPIRES DEC. 31, 19..
ARIZONA, U.S.A.

Charges $..........

Assayer..........
JACK STONE Reg. No. 5479

ANDY CHUKA, PRINT

#4207
Shop No. 501'-564'   Date 18 OCT 1968
File No. 1206 PK

Doy

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER
(RED ROVER MINE)(HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
#4207-									
501'-506'		.10		TRACE				0.030	
506'-511'		.10		TRACE				0.060	
511'-516'		.10		NIL				0.040	
516'-521'		.10		TRACE				0.050	
521'-526'		.10		TRACE				0.020	
526'-531'		.10		NIL				0.015	
531'-536'		.10		NIL				0.010	
536'-541'		.10		NIL				TRACE	
541'-546'		.10		NIL				NIL	
546'-550'		.10		NIL				TRACE	
550'-554'		.10		NIL				NIL	
554'-559'		.10		NIL				0.030	
559'-564'		.10		NIL				0.020	

HEINRICHS GEOEX
TUCSON, ARIZONA
OCT 19 1968
BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

REGISTERED ASSAYER
CERTIFICATE EXPIRES DEC. 31,
ARIZONA, U.S.A.

Charges $..........   Assayer.......... Jack Stone

JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. 4237
File No. 1211 PK

VALUES
Latest Quotation

1 oz. Gold....................
1 oz. Silver....................
1 lb. Copper....................
1 lb. Lead....................
1 lb. Zinc....................

THIS CERTIFIES
Samples submitted for assay contain as follows:

Date 24 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MR. PAUL KAYSER

(RED ROVER MINE -D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON		GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON		TOTAL VALUE PER TON of Gold & Silver		PERCENTAGE COPPER			REMARKS
HOLE # 1 PK#4237-														
649'-654'		.10			NIL						0.015			
654'-659'		.10			NIL						0.010			
659'-664'		.20			TRACE						0.015			
664'-669'		.10			TRACE						0.015			
669'-674'		.10			TRACE						0.025			OCT 26 1968
674'-679'		.10			NIL						0.020			BOX 5871 TUCSON, ARIZONA 85703 PHONE (AREA 602) 623-0578
679'-684'		.10			NIL						0.020			
684'-689'		.10			NIL						0.070			
689'-694'		.10			TRACE						0.050			
(694-699)		.10			TRACE						0.015			
699'-704'		.10			TRACE						0.015			
704'-709'		.10			TRACE						0.025			
709'-714'		.10			TRACE						0.025			
714'-719'		.20			TRACE						0.020			
719'-724'		.20			TRACE						0.020			

Charges $....................

Assayer....................
JACK STONE REG. NO. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES JACK STONE DEC. 31, 19 69 ARIZONA, U.S.A.

ANDY CHUKA, PRINT

Shop No. 4235

File No. 1212 PK

Date 24 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold....................

1 oz. Silver....................

1 lb. Copper....................

1 lb. Lead....................

1 lb. Zinc....................

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR.PAUL KAYSER

(RED ROVER MINE-D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs. Tenths	VALUE PER TON	GOLD PER TON Ozs. 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER				REMARKS
HOLE # 1 PK 4252-										
724'-729'	.20		NIL			0.040				
729'-734'	.20		TRACE			0.040				
734'-739'	.10		NIL			0.025				
739'-744'	.20		NIL			0.030				
744'-749'	.20		TRACE			0.025				
749'-754'	.10		TRACE			0.025				
754'-759'	.10		TRACE			0.030				
759'-764'	.10		TRACE			0.025				
764'-769'	.10		TRACE			0.015				
769'-774'	.10		TRACE			0.010				
774'-779'	.10		TRACE			0.015				
779'-784'	.10		TRACE			0.055				
784'-789'	.10		NIL			0.025				
789'-794'	.10		TRACE			0.015				
***********										

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31 ARIZONA, U.S.A.

Charges $....................

Assayer....................
JACK STONE Reg. No. 5479

ANDY CHUKA, PRINT

Shop No. 4281
File No. 1321 PK

Date 3 NOV 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold
1 oz. Silver
1 lb. Copper
1 lb. Lead
1 lb. Zinc

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(RED ROVER MINE-D. D. HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
868'-873 #4281		.10		NIL				0.015			
873'-878 #4282		.10		NIL				0.035			
878'-883 #4283		.10		NIL				0.02			
883'-887' #4284		.10		NIL				0.03			
887'-890' #4285		.10		NIL				0.025			
890'-895' #4286		.10		NIL				0.025			
895'-900' # 4287		.10		NIL				0.025			
900'-905' # 4288		.10		NIL				0.02			
905'-910' # 4289		.10		NIL				0.015			
910'-915' # 4290		.10		NIL				0.03			
915'-920' # 4291		.10		NIL				0.04			
920'-925' # 4292		.10		NIL				0.045			
925'-930' # 4293		.10		NIL				0.035			
930'-935' # 4294		.10		NIL				0.045			
935'-940' # 4295		.10		NIL				0.04			

HEINRICHS GEOEX
GEOPHYSICAL ENGINEERS
TUCSON, ARIZONA

NOV 6 1968

BOX 5671 TUCSON, ARIZONA 85703
Phone: (AREA 602) 623-0578

REGISTERED ASSAYER CERTIFICATE ... DEC. 31 ... ARIZONA, U.S.A.

Charges $ PAGE # 1
INVOICE # 1321 PK

Assayer Jack Stone
JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. [illegible]
File No. 1221 P K

Date [illegible]

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(RED ROVER MINE -D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs. | Tenths	VALUE PER TON	GOLD PER TON Ozs. | 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
D.D.HOLE # 1							
940'-945'	.10		NIL			0.04	
945'-950'	.10		NIL			0.035	
950'-955'	.10		NIL			0.04	
955'-960'	.10		NIL			0.04	
960'-965'	.10		NIL			0.035	
965'-970'	.10		NIL			0.04	
970'-974'	.10		NIL			0.035	
974'-980'	.10		NIL			0.03	
980'-984'	.10		NIL			0.025	
984'-990'	.10		NIL			0.03	
990'-995'	.10		NIL			0.04	
995'-1000'	.10		NIL			0.04	
1000'-1005'	.10		NIL			0.035	
1005'-1010'	.10		NIL			0.03	
1010'-1015'	.10		TRACE			0.035	

Charges $ 195.00

Assayer..........
JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. 4266
File No. 1218 PK

Date 2 OCT 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold..........
1 oz. Silver..........
1 lb. Copper..........
1 lb. Lead..........
1 lb. Zinc..........

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(REDROVER MINE HOLE # 1)

GEOPHYSICAL ENGINEERS TUCSON, ARIZONA

NOV 18 1968

BOX 5671 TUCSON, ARIZONA 857[illegible]
Phone: (AREA 602) 623-057[illegible]

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
HILE # 1 4266											
794-799		.40		NIL				0.02 0			
799-804		.40		NIL				0.020			
804-809		.10		TRACE				0.035			
809-814		.10		NIL				0.035			
814-819		.10		NIL				0.025			
819-824		.10		NIL				0.075			
824-829		.10		NIL				0.020			
829-834		.10		NIL				0.010			
834-839		.10		NIL				0.010			
839-844		.10		NIL				0.010			
844-849		.10		NIL				NIL			
849-853		.10		NIL				0.010			
853-858		.10		NIL				0.025			
858-863		.10		NIL				0.030			
863-868'		.10		NIL				0.015			

REGISTERED ASSAYER
CERTIFICATE EXPIRES
DEC. 31, 19[illegible]
ARIZONA, U.S.A.

Charges $..........

Assayer..........
JACK STONE REG. No. 5479

ANDY CHUKA, PRINT

Shop No. 4281
File No. 1321 PK

Date 3 NOV 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold.....
1 oz. Silver.....
1 lb. Copper.....
1 lb. Lead.....
1 lb. Zinc.....

Short Ton ..... 2000 Lbs.
Short Ton Unit ..... 20 Lbs.
Long Ton ..... 2240 Lbs.
Long Ton Unit ..... 22.4 Lbs.

MR. PAUL KAYSER

(REDROVER MINE-HOLE # 1)

THIS CERTIFIES
Samples submitted for assay contain as follows:

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
HOLE # 1 #4281									
868-873		.10		NIL				0.015	
873-878		.10		NIL				0.025	
878-883		.10		NIL				0.020	
883-887		.10		NIL				0.030	
887-890		.10		NIL				0.025	
890-895		.10		NIL				0.025	
895-900		.10		NIL				0.025	
900-905		.10		NIL				0.020	
905-910		.10		NIL				0.015	
910-915		.10		NIL				0.030	
915-920		.10		NIL				0.040	
920-925		.10		NIL				0.045	
925-930		.10		NIL				0.035	
930-935		.10		NIL				0.045	
935-940		.10		NIL				0.040	

Charges $.....

Assayer..... Jack Stone

REGISTERED ASSAYER ... ARIZONA, U.S.A.

JACK STONE Reg. No. 5479

ANDY CHUKA, PRINT

Shop No. 4296 Date 3 NOV 1968
File No. 1221 PK

VALUES
Latest Quotation

1 oz. Gold ....
1 oz. Silver ....
1 lb. Copper ....
1 lb. Lead ....
1 lb. Zinc ....

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(REDROVER MINE HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
HOLE # 1 # 4296									
940-945'		.10		NIL				0.040	
945-950		.10		NIL				0.035	
950-955		.10		NIL				0.040	
955-960		.10		NIL				0.040	
960-965		.10		NIL				0.035	
965-970		.10		NIL				0.040	
970-974		.10		NIL				0.025	
974-980		.10		NIL				0.030	
980-984		.10		NIL				0.025	
984-990		.10		NIL				0.030	
990-995		.10		NIL				0.040	
995-1000'		.10		NIL				0.040	
1000-1005		.10		NIL				0.035	
1005-1010		.10		NIL				0.030	
1010-1015'		.10		TRACE				0.035	

Charges $ ....

Assayer ....
JACK STONE REG. No. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31, ARIZONA, U.S.A.

Shop No. 4311 Date 5 NOV 1968

File No. 1222 P K

Arizona Assay Office

815 NORTH FIRST STREET

Phone: 253-4001

Phoenix, Arizona 85001

P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold........

1 oz. Silver........

1 lb. Copper........

1 lb. Lead........

1 lb. Zinc........

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR.PAUL KAYSER

(REDROVER MINE-HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER	REMARKS
HOLE # 1 #4311									
1015'-1020'		.10		NIL					
1020-1025		.10		TRACE					
1025-1030		.10		NIL					
1030-1035		.10		NIL					
1035-1040		.10		TRACE					
1040-1045		.10		NIL					
1045-1050		.10		TRACE					
1050-1055		.10		NIL					
1055-1060		.10		NIL					
1060-1065		.10		NIL					
1065-1070		.10		NIL					
1070-1075		.10		NIL					
1075-1080		.10		TRACE					
1080-1085		.10		TRACE					
1085'-1090'		.10		NIL					

REGISTERED ASSAYER – CERTIFICATE EXPIRES – ARIZONA U.S.A.

Charges $........

Assayer........
JACK STONE REG. NO. 5479

PAGE # 2
Shop No. 4311-4348 Date 5 NOV 1968
File No. 1222 PK

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

VALUES
Latest Quotation

1 oz. Gold
1 oz. Silver
1 lb. Copper
1 lb. Lead
1 lb. Zinc

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

THIS CERTIFIES
Samples submitted for assay contain as follows:

MR. PAUL KAYSER

(RED ROVER MINE D.D.HOLE # 1)

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON		GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON		TOTAL VALUE PER TON of Gold & Silver		PERCENTAGE COPPER	PERCENTAGE	PERCENTAGE	PERCENTAGE	REMARKS
4326															
1090'-1095'		.10			NIL						0.035				
1095'-1100'		.10			NIL						0.015				
1100 - 1105'		.10			NIL						0.015				
1105'-1110'		.10			TRACE						0.010				
1110'-1115'		.10			NIL						0.010				
1115'-1120'		.10			NIL						0.020				
1120'-1125'		.10			NIL						0.025				
1125'-1130'		.10			NIL						0.030				
1130'-1135'		.10			TRACE						0.020				
1135'-1140'		.10			TRACE						0.025				
1140'-1145'		.10			TRACE						0.020				
1145'-1150'		.10			TRACE						0.025				
1150'-1155'		.10			TRACE						0.015				
1155'-1160'		.10			NIL						0.010				
1160'-1165'		.10			NIL						0.010				

Charges $ PAGE # 2 INVOICE # 1222 PK

Assayer [signature]
JACK STONE REG. No. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES ARIZONA, U.S.A.

ANDY CHUKA, PRINT

Shop No. 4341
File No. 1222 PK

VALUES
Latest Quotation

1 oz. Gold............
1 oz. Silver............
1 lb. Copper............
1 lb. Lead............
1 lb. Zinc............

THIS CERTIFIES
Samples submitted for assay contain as follows:

Date 5 NOV 1968

Arizona Assay Office

815 NORTH FIRST STREET
Phone: 253-4001

Phoenix, Arizona 85001
P. O. BOX 1148

MR. PAUL KAYSER

(REDROVER MINE-HOLE # 1)

Short Ton .... 2000 Lbs.
Short Ton Unit .... 20 Lbs.
Long Ton .... 2240 Lbs.
Long Ton Unit .... 22.4 Lbs.

MARKS	SILVER PER TON Ozs.	SILVER PER TON Tenths	VALUE PER TON	GOLD PER TON Ozs.	GOLD PER TON 100ths	VALUE PER TON	TOTAL VALUE PER TON of Gold & Silver	PERCENTAGE COPPER			REMARKS
HOLE # 1 #4341											
1165'-1170'	.10			NIL				0.005			
1170-1175	.10			NIL				0.005			
1175-1180	.10			NIL				TRACE			
1180-1185	.10			NIL				0.005			
1185-1190	.10			NIL				0.005			
1190-1195	.10			NIL				0.010			
1195-1197	.10			NIL				0.005			
1197'-1200'	.10			NIL				0.010			
END OF HOLE											

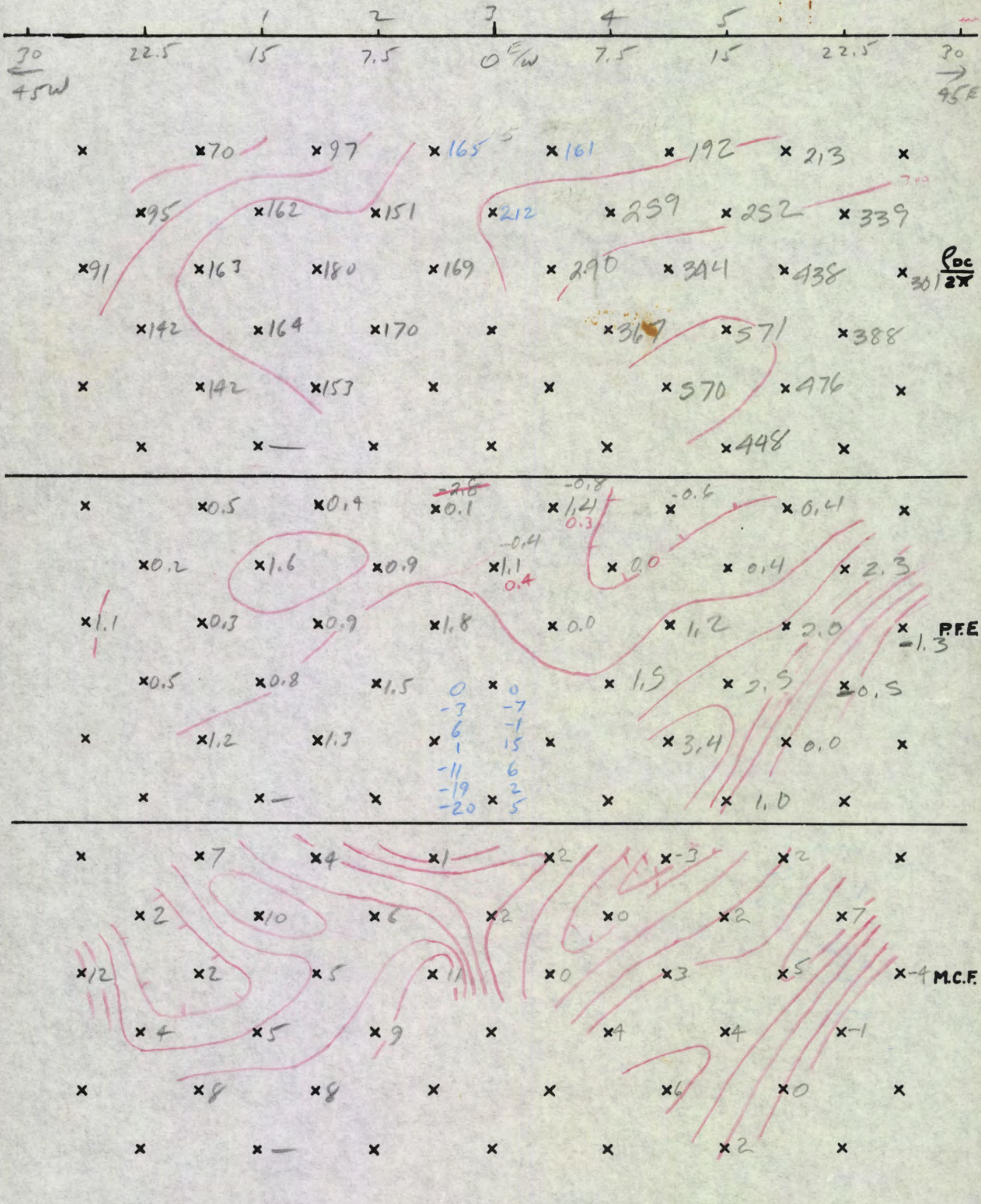
Charges $............

Assayer............
JACK STONE REG. No. 5479

REGISTERED ASSAYER CERTIFICATE EXPIRES DEC. 31, ARIZONA, U.S.A.

ANDY CHUKA, PRINT

HEINRICHS GEOEX. INDUCED POLARIZATION SECTIONAL DATA PLOT, LOOKING N 15° W



AREA Kaycee Red River LINE 1 a = 750' SCALE: 1" = 750' DATE: May '68

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PAGE

PROJECT 254-68 5-22-68
LINE 1 HALF W SP. 1 DATE

SEND	45	34	45	23	34	45	12	23	54	45
RECEIVE	0-7.5W	7.5-15W	—	15-22.5	—	→	22.5-	30W —	—	—
RANGE	300	1000	100	300	300	30	300	300	106	30
DC 1	215 218	661 661	700 692	256 252	147 148	220 220	121 122	105 109	700 711	105 115
DC 2	215 218	661 661	699 689	256 252	147 148	220 221	121 122	105 109	700 711	105 116
DC 3			698 689							105 116
DC 4										5 [illegible]
DC 5										
DC 6										
DC 7										
DC 8	217	661	69.45	254	147.5	220.5	121.5	104.5	70.55	11.05
DC AVG.										
AC 1	214	655	68.2	251	145	21.5	120	103	69.4	10.8
AC 2	214	655	68.2	251	145	21.5	120	103	69.4	10.8
AC AVG.	-2.7									
S.P.	+2.7	+8.9	—	-5.0	—	—	-11.6	—	—	—
AC NOISE	<.2	<.2	—	<.2	—	—	<.2	—	—	—
POT RES.	5K	1.5K	—	2K	—	—	4K	—	—	—

HEINRICHS GEOEXPLORATION CO.
I.P. RECEIVER NOTES

PAGE

PROJECT 254-68 LINE 1 HALF W S.P. 1 DATE 5-22-68

SEND	12	23	34	45	12	23	34	45	CAL	
RECEIVE	30-37.5W				37.5-45W				2A/12	
RANGE	100	100	100	10	30	30	30	3	–	
DC 1	426900	406441	339301	571570	150 16A	195 175	174 142			
DC 2	426400	406442	339301	571568	154 166	196 174	174 142			
DC 3		405442	339 301	576565	152 167	198 173	175 141			
DC 4										
DC 5									197	
DC 6									194	15
DC 7									197	2:30
DC 8									194	
DC AVG.	413	42.36	32.0	5.706	15.89	18.54	15.81		195.5	
AC 1	40.9	41.9	31.5	5.59	15.6	18.3	15.5	1.97	194	
AC 2	40.9	41.9	31.5	5.59	15.6	18.3	15.5		194	
AC AVG.									194	
S.P.	-8.1				-0.5					
AC NOISE	<.2				<.2					
POT RES.	3K				3K					

PAGE 1

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PROJECT 254-68
LINE 1 HALF W SP. 1 DATE 5/22

SEND	4-5	3-4	4-5	2-3	3-4	4-5	1-2	2-3	3-4	4-5
RECEIVE	0.75W	-								
RANGE	- *									
VOLTAGE	780	500V	✓	800V	✓	✓	700V	✓	✓	✓
CURRENT	3	9.0	✓	6.0			4.0			
SEND	1-2	2-3	3-4	4-5		1-2	2-3	3-4	4-5	CAL-
RECEIVE										1-2
RANGE										
VOLTAGE	✓					✓	✓	✓	✓	340V
CURRENT										

FREQUENCIES .05 3.0
SENDER NO. MK-4
OPERATOR Sam B
RECEIVER NO. -
OPERATOR Sam KING

COMMENTS:
* FOR CAL FACTOR SEE NOTES FOR E HALF 5/23/68

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 254-68 5-23-68

LINE 1 HALF E S.P. 1 DATE

PAGE

SEND	12	23	12	34	23	12	45	34	23	12
RECEIVE	0-7.5E	7.5-15E	—	15-22.5E	—	—	22.5-30E	—	—	—
RANGE	300	1000	100	1000	300	100	300	300	100	30
DC 1	210 214	422 415	690 690	775 756	186 158	396 380	279 285	251 251	926 900	262 228
DC 2	210 214	422 415	710 680	775 256	186 158	400 362	279 285	251 251	926 900	258 226
DC 3			720 680			400 370	279 285	251 251	926 900	261 227
DC 4										
DC 5										
DC 6	-2.8	-0.8	-0.4	-0.6	0.0	0.0	0.4	0.4	1.2	1.5
DC 7										
DC 8	212	418.5	69.7	765.5	172	38.5	282	251	913	24.35
DC AVG.										
AC 1	218	422	70.0	770	172	38.5	281	250	90.2	24.0
AC 2	218	422	70.0	770	172	38.5	281	250	90.2	24.0
AC AVG.										
S.P.	-7.0	+6.3	—	+15.6	—	—	-9.3	—	—	—
AC NOISE	<.2	<.2	—	<.2	—	—	<.2	—	—	—
POT RES.	1.5K	5K	—	4K	—	—	3K	—	—	—

HEINRICHS GEOEXPLORATION CO.

I.P. RECEIVER NOTES

PROJECT 254-68

PAGE

LINE 1 HALF E SP. 1 DATE 5-23-68

SEND	45	34	23	12	45	34	23	12	CAL	
RECEIVE	30-37.5E	——	——	——	37.5E-45E	——	——	——	2A/4S	
RANGE	300	300	100	30	100	100	100	30		
DC 1	114 111	175 175	762 752	219 210	402 390	776 778	362 352	100 114		
DC 2	114 111	175 174	760 752	219 212	400 400	771 762	371 344	94 121		
DC 3	114 113.5	174 174	766 756	220 214	399 398	780 761	370 364	94 116		
DC 4				221 215	402 396	774 776	360 358	100 114		
DC 5					404 398	770 771	377 344	94 118	198	
DC 6	2.3	2.0	2.5	3.4	-1.3	-0.5	0.0	98 109	200	
DC 7					*.15 ——	——	——	→ 1.0	198	
DC 8	112.5	174.5	75.78	21.61	39.88	77.14	36.1	10.61	200	
DC AVG.									199	
AC 1	110	171	73.9	20.9	40.4	77.5	36.1	10.5	199	
AC 2	110	171	73.9	20.9	40.4	77.5	36.1	10.5	199	
AC AVG.										
S.P.	-3.7	——	——	——	+2.7	——	——	——		
AC NOISE	<.2	——	——	——	<.2	——	——	——		
POT RES.	4K	——	——	——	1.8K	——	——	——		

HEINRICHS GEOEXPLORATION CO.

I. P. SENDER NOTES

PAGE

PROJECT 254-68

LINE 1 HALF E SP. 1 DATE 5/23/68

SEND	1-2	2-3	1-2	3-4	2 3	1-2	4-5	3-4	2-3	1-2
RECEIVE	0 .75									
RANGE										
VOLTAGE	520	820	520	460	810	500	780	460	810	500
CURRENT	3	6	3	9	6	3	3	9	6	3
SEND	4-5	3-4	2-3	1-2	4-5	3-4	2-3	1-2		CAL
RECEIVE										4-5
RANGE					* →	→	→	→		
VOLTAGE	780	460	800	500	780	460	800	500		520
CURRENT	3	9	6	3	3	9	6	3		2

FREQUENCIES .05 3.0

SENDER NO. 156735

OPERATOR DAVE S

RECEIVER NO.

OPERATOR Jim KING

COMMENTS:

* .15 DC

45 = 3 23 = 6
34 = 9 12 = 4

0.05
3.0

750' = a

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page_____

Project Red River Kayser Line 1 W½ Field date____ Data page____ Comp. date____. Comp by____

(A) Send	34	45	23	34	45	12	23	34	45	12	23	34
(B) Receive												
(C) n separation												
(D) I	9	3	6	9	3	4	6	9	3	4	6	9
(E) Vdc (avg)	661	69.45	254	147.5	220.5	121.5	105.15	70.55	11.05	41.3	42.36	32.0
(F) DCcal												
(G) Kn x 10-3	2.25	9	2.25	9	22.5	2.25	9	22.5	45	9	22.5	45
(H) ρ dc=ExFxGx10³/D	169	213	97	151	169	70	162	180	170	95	163	164
(I) Vac Σ	655	68.2	251	145	21.5	120	103	69.4	10.8	40.9	41.9	31.5
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρac=ExL/K												
(N) PFE=(M-1)(10²)	0.1	1.1	0.4	0.9	1.8	0.5	1.6	0.9	1.5	0.2	0.3	0.8
(O) MCF=(M-1)(10⁵)/H	1	5	4	6	11	7	10	5	9	2	2	5

Project____ Line____ Field date____ Data page____ Comp. date____ Comp by____

(A) Send	45	12	23	34	45	Cal						
(B) Receive												
(C) n separation												
(D) I	3	4	6	9	3	2000						
(E) Vdc (avg)	5.706	15.89	18.54	15.81	[illegible]	195.5						
(F) DCcal						1.023						
(G) Kn x 10^{-3}	78.75	22.5	45	78.75	12.6							
(H) ρ dc=ExFxGx10³/D	153	91	142	142	85							
(I) Vac Σ	5.59	15.6	18.3	15.5	1.97	194						
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.						0.992						
(M) ρdc/ρac =ExL/K												
(N) PFE=(M-1)(10²)	1.3	1.1	0.5	1.2								
(O) MCF=(M-1)(10⁵)/H	8	12	4	8								

HEINRICHS GEOEXPLORATION COMPANY
INDUCED POLARIZATION SURVEY COMPUTATION SHEET

Page______

Project Kuyper Red River 254-68 Line 1 a=750 Field date______ Data page______ Comp. date______. Comp by______

(A) Send	12	23	12	34	23	12	45	34	23	12		
(B) Receive												
(C) n separation												
(D) I	3	6	3	9	6	3	3	9	6	3		
(E) Vdc (avg)	212	418.5	69.7	765.5	172	38.5	282	251	91.3	24.35		
(F) DCcal												
(G) Kn x 10-3	2.25	2.25	9	2.25	9	22.5	2.25	9	22.5	45		
(H) ρ dc=ExFxGx10³/D	160	158	210	192	259	290	213	252	344	367		
(I) Vac Σ	218	422	70.0	770	172	38.5	281	250	90.2	24.0		
(J) AC noise x 2												
(K) Vac(corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.												
(M) ρ dc/ρ ac=ExL/K												
(N) PFE=(M-1)(10²)	-2.8	-0.8	-0.4	-0.6	0.0	0.0	0.4	0.4	1.2	1.5		
(O) MCF=(M-1)(10⁵)/H												

Project______ Line______ Field date______ Data page______ Comp. date______ Comp by______

(A) Send	45	34	23	12	45	34	23	12		Cal	45	
(B) Receive												
(C) n separation												
(D) I	3	9	6	3	3	9	6	3		2000	3	
(E) Vdc (avg)	112.5	174.5	75.78	21.61	39.88	77.14	36.1	10.61		199	217	
(F) DCcal										1.005		
(G) Kn x 10-3	9	22.5	45	78.75	22.5	45	78.75	126			2.25	
(H) ρ dc=ExFxGx10³/D	339	438	571	570	301	388	476	448			164	
(I) Vac Σ	110	171	73.9	20.9	40.4	77.5	36.1	10.5		199	214	
(J) AC noise x 2												
(K) Vac (corr) = $\sqrt{I^2 - J^2}$												
(L) AC-DC cal.										1.000		
(M) ρ dc/ρ ac =ExL/K												
(N) PFE=(M-1)(10²)	2.3	2.0	2.5	3.4	-1.3	-0.5	0.0	1.0			1.4	
(O) MCF=(M-1)(10⁵)/H												

(.15)

SOLID LINES — CLAIMS INCLUDED IN KAYSER-WESTEC AGREEMENT.
DASHED LINES — OTHER CLAIMS IN AREA

HEINRICHS
GEOEXPLORATION COMPANY
POST OFFICE BOX 5671, TUCSON, ARIZONA, 85703
Phone: 602/623-0578 Cable: GEOEX, Tucson
vancouver
sydney
geophysical engineers

COMPOSITE CLAIM MAP
RED ROVER MINE
MINERAL SURVEYS 3577A & B, 3569
APRIL-MAY 1919
FOR
MR. PAUL KAYSER

SCALE 1" = 600'	DRAWN BY: D.B.C.	DATE: MAY 1968